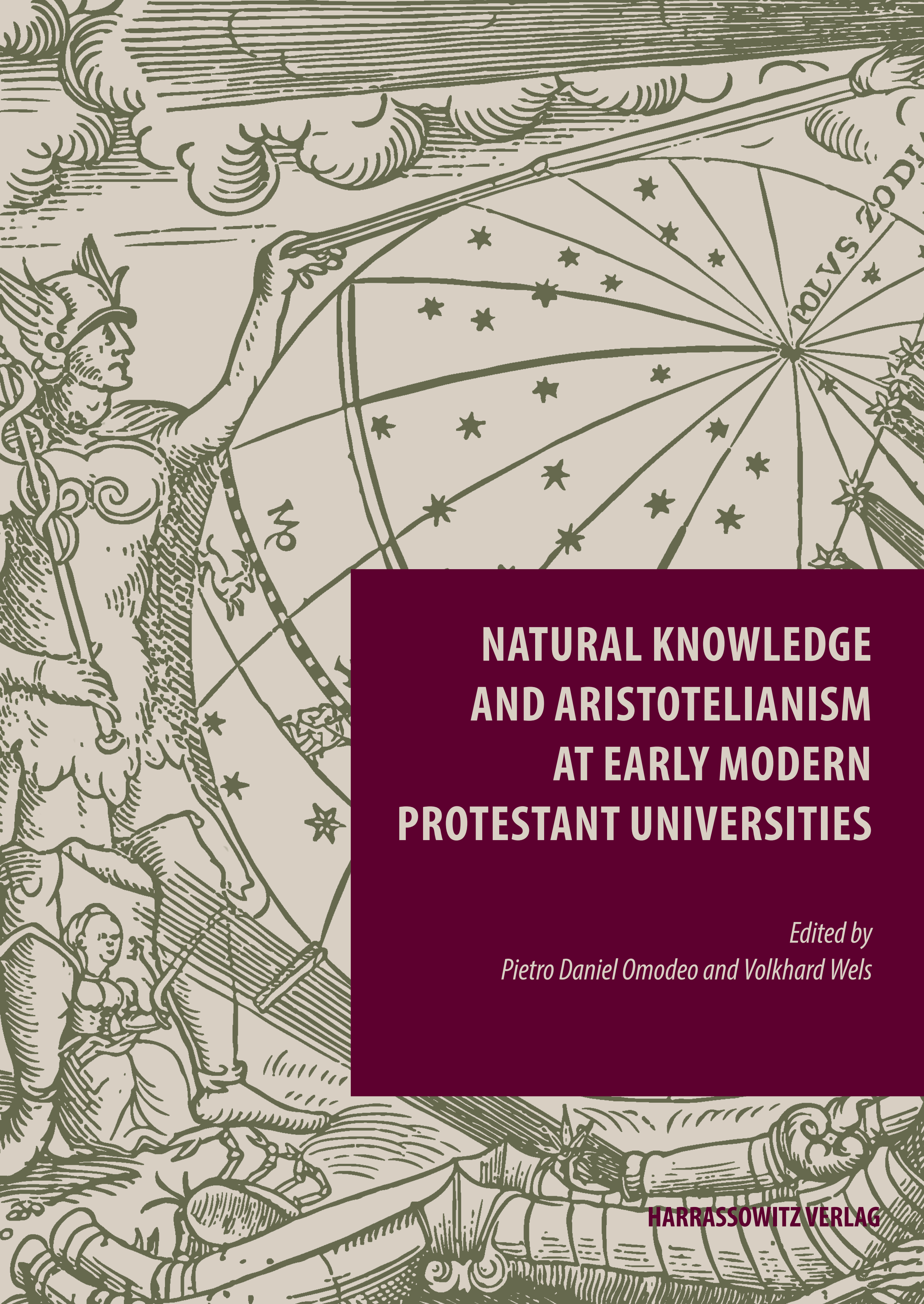

NATURAL KNOWLEDGE AND ARISTOTELIANISM AT EARLY MODERN PROTESTANT UNIVERSITIES

Edited by
Pietro Daniel Omodeo and Volkhard Wels

HARRASSOWITZ VERLAG

Natural Knowledge and Aristotelianism
at Early Modern Protestant Universities

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Episteme in Bewegung

Beiträge zu einer transdisziplinären Wissensgeschichte

Herausgegeben von Gyburg Uhlmann
im Auftrag des Sonderforschungsbereichs 980
„Episteme in Bewegung.
Wissenstransfer von der Alten Welt
bis in die Frühe Neuzeit“

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Die Reihe „Episteme in Bewegung“ umfasst wissensgeschichtliche Forschungen mit einem systematischen oder historischen Schwerpunkt in der europäischen und nicht-europäischen Vormoderne. Sie fördert transdisziplinäre Beiträge, die sich mit Fragen der Genese und Dynamik von Wissensbeständen befassen, und trägt dadurch zur Etablierung vormoderner Wissensforschung als einer eigenständigen Forschungsperspektive bei.
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Preface

Andrew James Johnston and Gyburg Uhlmann

Since its inception in July 2012, the Collaborative Research Centre (CRC) 980 "Episteme in Motion. Transfer of Knowledge from the Ancient World to the Early Modern Period", based at the Freie Universität Berlin, has been engaging with processes of knowledge change in premodern European and non-European cultures.

The project aims at a fundamentally new approach to the historiography of knowledge in premodern cultures. Modern scholars have frequently described premodern knowledge as static and stable, bound by tradition and highly dependent on authority, and this is a view that was often held within premodern cultures themselves.

More often than not, modern approaches to the history of premodern knowledge have been informed by historiographical notions such as 'rupture' or 'revolution', as well as by concepts of periodization explicitly or implicitly linked to a master narrative of progress.

Frequently, only a limited capacity for epistemic change and, what is more, only a limited ability to reflect on shifts in knowledge were attributed to premodern cultures, just as they were denied most forms of historical consciousness, and especially so with respect to knowledge change. In contrast, the CRC 980 seeks to demonstrate that premodern processes of knowledge change were characterised by constant flux, as well as by constant self-reflexion. These epistemic shifts and reflexions were subject to their very own dynamics, and played out in patterns that were much more complex than traditional accounts of knowledge change would have us believe.

In order to describe and conceptualise these processes of epistemic change, the CRC 980 has developed a notion of 'episteme' which encompasses 'knowledge' as well as 'scholarship' and 'science', defining knowledge as the 'knowledge of something', and thus as knowledge which stakes a claim to validity. Such claims to validity are not necessarily expressed in terms of explicit reflexion, however – rather, they constitute themselves, and are reflected, in particular practices, institutions and modes of representation, as well as in specific aesthetic and performative strategies.

In addition to this, the CRC 980 deploys a specially adapted notion of 'transfer' centred on the re-contextualisation of knowledge. Here, transfer is not understood as a mere movement from A to B, but rather in terms of intricately entangled processes of exchange that stay in motion through iteration even if, at first

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glance, they appear to remain in a state of stasis. In fact, actions ostensibly geared towards the transmission, fixation, canonisation and codification of a certain level of knowledge prove particularly conducive to constant epistemic change.

In collaboration with the publishing house Harrassowitz the CRC has initiated the series “Episteme in Motion. Contributions to a Transdisciplinary History of Knowledge” with a view to showcase the project’s research results and to render them accessible to a wider scholarly audience. The volumes published in this series represent the full scope of collaborating academic disciplines, ranging from ancient oriental studies to medieval studies, and from Korean studies to Arabistics. While some of the volumes are the product of interdisciplinary cooperation, other monographs and discipline-specific edited collections document the findings of individual sub-projects.

What all volumes in the series have in common is the fact that they conceive of the history of premodern knowledge as a research area capable of providing insights that are of fundamental interest to scholars of modernity as well.

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Introduction

Pietro Daniel Omodeo and Volkhard Wels

The role of universities in the developments of the scientific culture of early modernity has been the subject of intense scholarly debates and research for several years. New studies have changed the opinion, widespread only fifty years ago, that knowledge institutions were not particularly relevant to the advance of modern science. Such a negative judgement on the history of universities and their culture was connected to the predominant notion of the Scientific Revolution which was seen as an intellectual rupture with all that preceded the mathematization of nature which culminated in Isaac Newton's *Philosophiae naturalis principia mathematica* (1687). Historians of science especially tended to dismiss Aristotelianism and scholasticism. They perhaps believed they could retroactively take a side in old polemics, namely those opposing Galileo Galilei, the 'Copernicans', and the empiricist and mechanical philosophers against the 'bookish' professors. But the resulting narratives often neglected two fundamental aspects of science as a cultural phenomenon: first, the relevance of controversy as a motor of intellectual advance, particularly in the natural sciences, and, second, the relevance of education, especially university formation, as a shared background against which conceptual innovation can be appreciated. Moreover, the canon of disciplines and contexts relevant to the history of science cannot be restricted to a few select sciences—basically the mathematized natural sciences that were cherished by nineteenth-century and early twentieth-century epistemologists in the wake of positivism. But closer scrutiny of the *reality* of early-modern scientific culture forces us to embrace a broader conception of science, one capable of addressing the interdisciplinary entanglements of paradigmatic disciplines such as astronomy and mechanics with astrology, alchemy, natural philosophy, theology, and so forth. The Aristotelian environment of reformed universities and institutions of early modernity offers a suitable area of inquiry into the dialectics of tradition and innovation which characterized a time of scientific transformation. This volume is dedicated to the study of early-modern 'episteme in motion': the evolution of scientific knowledge and its categories within confessional and cultural-political institutional settings.

Studies on the institutional foundations and university embodiments of intellectual history flourish today. The importance of institutions of higher education for early modern science has been at the center of influential works such as those by Charles B. Schmitt on university Aristotelianism during the Italian Renaissance, Mordechai Feingold on the mathematical apprenticeship at English

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institutions, and Antonella Romano and Ugo Baldini on the teaching of science at Jesuit colleges.[1] Specific studies have been devoted to the socio-cultural settings of early-modern universities in Catholic Italy, Protestant Germany, and more broadly in Europe that point to their cultural-political dimensions as well as to the habitus of an academy that passed from a fundamentally oral to a written and ultimately printed culture.[2] The encounters, negotiations, and hybridization of scholarly traditions and novel approaches to nature have been variously treated. Among many possible instances, in this volume we will address Cartesian scholasticism, rhetoric and epistemology in Renaissance Germany, and the Aristotelian metaphysics that guided the developments of post-Copernican astronomy in northern European Protestant centers.[3] Moreover, Edward Grant has helped us to understand the complexity of lasting the transformations of scholastic philosophy, which survived the end of the medieval system of education and became part of the scientific discourse of modernity.[4] Studies on the connections of Protestantism and science have often stressed the cultural and theological background of scientific debates. Among others, Sachiko Kusukawa looked at the concept of providence underlying Melanchthonian scientific culture, whereas Theo Verbeek and Rienk Vermij reconstructed Calvinist theological-philosophical controversies over the introduction of Copernicus and Cartesian philosophy into Dutch reformed universities.[5] Astronomical culture in Protestant environments

1 Charles Schmitt, *Studies in Renaissance Philosophy and Science*, London 1981; Mordechai Feingold, *The Mathematicians' Apprenticeship: Science, Universities and Society in England 1560–1640*, Cambridge 1984; Antonella Romano, *La contre-réforme mathématique: Constitution et diffusion d'une culure mathématique jésuite à la Renaissance*, Rome 1999; Baldini, Ugo, *Saggi sulla cultura della Compagnia di Gesù (secoli XVI–XVIII)*, Padua 2000; also see Marcus Hellyer, *Jesuit Natural Philosophy in Early Modern Germany*, Notre Dame 2005.

2 See Paul F. Grendler, *The Universities of the Italian Renaissance*, Baltimore 2002; William Clark, *Academic Charisma and the Origins of the Research University*, Chicago 2006; and Ku-ming Chang, "From Oral Disputation to Written Text: the Transformation of the Dissertation in Early Modern Europe," in: *History of Universities* 19/2 (2004), pp. 130–187.

3 See, among others, Roger Ariew, *Descartes among the Scholastics*, Leiden 2011; Riccardo Pozzo, *Adversus Ramistas: Kontroversen über die Natur der Logik am Ende der Renaissance*, Basel 2012; Pietro Daniel Omodeo, "Metaphysics Meets Urania: Daniel Cramer and the Foundations of Tychonic Astronomy," in: *Unifying Heaven and Earth: Essays in the History of Early Modern Cosmology*, ed. Miguel A. Granada, Patrick Boner and Dario Tessicini, Barcelona 2016, pp. 159–186.

4 Edward Grant, *Much Ado about Nothing: Theories of Space and Vacuum from the Middle Ages to the Scientific Revolution*, Cambridge 1981 and id., *Planets, Orbs and Spheres: The Medieval Cosmos (1280–1687)*, Cambridge 1994.

5 Sachiko Kusukawa, *The Transformation of Natural Philosophy: The Case of Philip Melanchthon*, Cambridge 1995; Theo Verbeek, *Descartes and the Dutch: Early Reactions to Cartesian Philosophy 1637–1650*, Carbondale 1992; and Rienk Vermij, *The Calvinist Copernicans: The Reception of the New Astronomy in the Dutch Republic, 1575–1750*, Amsterdam 2002. Also, see Johan Arie van Ruler, *The Crisis of Causality: Voetius and Descartes on God, Nature and Change*, Leiden 1995. On the interplay of Protestantism and science, cf. Peter Harrison, *The Bible, Protestantism, and the rise of natural science*, Cambridge 1998; Charlotte Methuen, *Kepler's Tübingen: Stimulus to a*

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has received much attention, including in seminal studies by Robert Westman.[6] However, the inquiry into the contributions to science of smaller religious groups such as the Socinians is still a desideratum in the history of science.

Although accurate studies on early-modern German Protestant universities already exist,[7] there is still much work to be done to clarify their roles in the scientific advances of the seventeenth century. The editors of this volume have already contributed to the study of early university culture in connection with Melanchthon's curricular reforms and their impact and dissemination through the networks of Protestant universities and gymnasia.[8] This volume aims to continue this line of inquiry, substantially integrating existing scholarship on early-modern intellectual history within its institutional settings, and contributing to the overarching, comparative study of epistemic networks.[9]

We specifically deal with forms of the institutionalization of science and the role of Aristotelianism as the backbone of knowledge at early-modern Protestant universities. This was a dynamic tradition, which we regard as a form of 'mobile episteme' in line with the research program of the Collective Research Centre *Episteme in Motion* and the ERC endeavor *EarlyModernCosmology*. The transformation of academic science depended on its circulation through institutional and intellectual connections. Every passage, transfer, and exchange of knowledge implied a reformulation and often deep alteration, even in those cases in which the explicit intention of the historical actors was to preserve and secure a received canon of knowledge such as the *corpus Aristotelicum* or Aristotelian methodologies of inquiry. As a matter of fact, an inter-pollination of 'early' forms of knowledge and 'modern' perspectives produced changes of content, theory, and experience. The fields concerned with major hybridizations and shifts range

Theological Mathematics, Aldershot 1998; and Dino Bellucci *Science de la nature et Réformation: La physique dans l'enseignement de Philippe Mélanchthon*, Rome 1998.

6 Robert S. Westman, "The Melanchthon Circle, Rheticus and the Wittenberg Interpretation of the Copernican Theory," in: *Isis* 66 (1975), pp. 163–193.

7 See, among others, Barbara Bauer, (ed.), *Melanchthon und die Marburger Professoren (1527–1627)*, Marburg 1999; Heinz Kathe, *Die Wittenberger philosophische Fakultät 1502–1817*, Vienna, Cologne, Weimar 2002; Rolf Darge (ed.), *Der Aristotelismus an den europäischen Universitäten der frühen Neuzeit*, Stuttgart 2012.

8 Volkhard Wels, "Melanchthon's Textbooks on Dialectic and Rhetoric as Complementary Parts of a Theory of Argumentation", in: *Scholarly Knowledge. Textbooks in Early Modern Europe*, eds. Emidio Campi, Simone De Angelis, Anja-Silvia Goeing and Anthony T. Grafton, Geneve 2008, pp. 139–156; id., *Manifestationen des Geistes. Frömmigkeit, Spiritualismus und Dichtung in der Frühen Neuzeit*. Göttingen 2014, pp. 89–130; Pietro Daniel Omodeo with Karin Friedrich (eds.), *Duncan Liddel (1561–1613): Networks of Polymathy and the Northern European Renaissance*, Leiden 2016; id., "Institutionalized Metaphysics of Astronomy at Early-Modern Melanchthonian Universities," in: *Iteration und Wissenswandel*, ed. Eva Cancik-Kirschbaum and Anita Traninger, Wiesbaden 2016, pp. 51–78.

9 This topic is presently being investigated by the ERC project "Institutions and Metaphysics of Cosmology in the Epistemic Networks of Seventeenth-Century Europe," at Ca' Foscari University of Venice (Horizon 2020 Research and Innovation Programme, GA n. 725883 *EarlyModernCosmology*).

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from astronomy to astrology, medicine, soul theories, alchemy, physics, and biology. In this process, methodology was reassessed and transformed as well. In this respect, logic, rhetoric, theories of argumentation and epistemology should be regarded as an integral part of the early-modern transformation of *episteme*.

The encounter between Aristotelians and *novatores* who proposed new natural viewpoints should be considered in its ambiguity and complexity. Such encounters could take various forms ranging from adaptation to assimilation, transformation, demarcations, and exclusion. Aristotelian and scholastic philosophy have often been judged as an intellectual dead end, intrinsically flawed by excessive reliance on tradition and written sources instead of curiosity and the exploration of the book of nature with 'unprejudiced eyes'. The historical category of the 'Scientific Revolution' once epitomized the idea of the abrupt emergence of a new science of nature in contrast to preexisting, prejudiced knowledge. The contributions in this volume question the static vision of pre-modern academic culture, despite its reliance on received forms of knowledge. They explore the intricacies of a story in which conflict and negotiation are important elements together with the harmonization and synthesis of eclectic elements. In the sixteenth and seventeenth centuries, Aristotelianism was not a fossilized relic of the past, an unchangeable set of norms and doctrines. Rather, it was a movable philosophy capable of interacting and merging with—and reacting to—impulses coming from many directions, for instance Parcelsism in medicine, Cartesianism in physics and physiology, and Ramism in methodology.

The confessional element of early modern philosophy and science continuously emerges as a significant epistemic drive. In the context of Protestant institutions, Aristotelianism was often connected with 'Philippism', that is to say, Melanchthon's intellectual and pedagogical legacy. The curricular reform that Melanchthon introduced at Wittenberg and spread throughout its institutional network was not restricted to theological faculties. The confessional implementation of a humanistic Lutheran culture with marked Aristotelian bias invested astronomy (Erasmus Reinhold, Kaspar Peucer), physics (Paul Eber), alchemy (Andreas Libavius), and medicine (Daniel Sennert), to mention some of the most relevant fields (and authors). The essays in this volume will address the main figures of this tradition, which was particularly lively in late-humanistic centers such as the universities and gymnasia of Rostock, Helmstedt, Frankfurt (Oder), Copenhagen, Königsberg, Altdorf, and Marburg. Much research is still required to fully clarify the relevance of this intellectual process for the natural science that radiated far beyond German-speaking territories.

In addition, Aristotelian-Melanchthonian natural philosophy can be considered in its more or less intended opposition to competing currents that were marked by different religious tendencies and alliances. Melanchthon's followers confronted philosophical projects (such as Ramism in the sixteenth century and Cartesianism in the seventeenth) that were considered to be tinged with Calvinist bias for contingent historical reasons, namely, their geographical origin. However,

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philosophical currents did not threaten the Philippist hegemony as much as theological ones, for instance the Gnesiolutheran rejection of methodological Aristotelianism for theological reasons during the sixteenth century. At a different level, neo-Platonic and philosophically heterodox tendencies backed anti-academic attitudes. The explosive potential of intellectual divergences clearly emerges from the conflict opposing the Paracelsists, on the one hand, and Thomas Erastus and Andreas Libavius, on the other. In this and many other cases, both sides of the polemic should be taken into consideration in order to comprehend the cultural strategies and scientific policies underlying different scientific programs.

In chapter one, Volkhard Wels explores the link between Melanchthon's logic and rhetoric, which the Philippists saw as the methodological basis for natural investigations, particularly alchemy. Wels particularly deals with the rhetorical definition of a pedagogical genre (*genus didascalicon*), which Melanchthon introduced in 1530 in his *Rhetoric*. The aim of this genre was to secure knowledge and information on specific themes and to present them in a plain and comprehensible manner. Andreas Libavius's 'alchemy' is an illuminating case of the application of such requirements. In following Melanchthon's rhetorico-methodological requirements, Libavius undertook a reformulation of alchemical knowledge, in which the usefulness of Philippist Aristotelianism was magnified through its application to empirical knowledge. Libavius proposed a new codification of alchemy by moving away from the arcane language that was typical of the discipline in the Middle Ages.

According to Günter Frank in the second essay of this collection, the relevance of natural knowledge for Protestant theology was mainly due to Melanchthon's conception of the providence of God, seen as the architect who created the well-ordered *machina mundi* and keeps it in motion. In his conception nature is not only God's creation but also the *genesis* or the 'origin' of worldly beings, according to the etymology of the Latin word '*natura*'. Melanchthon especially looked at nature as an important medium of divine revelation, equivalent to the Sacred Scriptures. Therefore, he defended the idea that humans can grasp God's wisdom and justice through nature on the basis of anthropocentric premises. In this manner, he supported a 'creationist optimism' in contrast with Luther's rather pessimistic rejection of the notions of man as God's image (*imago* or *similitudo Dei*).

Sascha Salatowsky expands on these topics in chapter three. His contribution deals with the question of the relevance of physics in early modern religious culture. He engages in an inter-confessional comparison which takes into account various religious settings. These settings are relevant to assess the transformations of the conception of the divine in connection with the 'new physics', especially insofar as time and space are concerned. Salatowsky compares viewpoints on the essence of God that go beyond scriptural exegesis and which are marked by different confessional contexts. Specifically, he deals with the Catholic scholastic Francisco Suárez, the Calvinist and crypto-Socinian Conrad Vorstius, the Lutheran Johann Gerhard and the Socinian Christoph Stegmann. Salatowsky ar-

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gues for the proximity between the arguments of the Catholic Suárez and the Lutheran Gerhard as far as God's relation to time and space are concerned. By contrast, the other natural theologians considered here, Stegeman and Vorstius, rejected the paradoxes entailed in the idea of a God-space-time relation for different reasons. In fact, they embraced a pre-enlightenment position directed towards a rational foundation for religion.

Pietro Daniel Omodeo and Jonathan Regier readdress a classic theme in the history of Renaissance astronomy, namely the Wittenberg reception of Copernicus (chapter four). Luther and Melanchthon's skepticism or even criticism relative to the Copernican hypotheses did not lead to the rejection of his astronomical work, but rather to its transformative reception. The reconstruction of the institutional context of the earliest reception of Copernicus's *De revolutionibus orbium coelestium* (1543) helps us understand the reasons for attempts to transpose Copernican parameters and models onto a geocentric framework, and eventually onto a geo-heliocentric one, which became typical of Protestant circles from the 1580s onwards. Attentive consideration of the manuscript version and various editions of Melanchthon and Eber's *Introduction to Physics* (*Initia doctrinae physicae*) sheds new light on the intricacies of the so-called 'Wittenberg interpretation' of Copernicus.

In chapter five, "Nicolaus Andreae Granius: Physics and Cosmology at Helmstedt," Stefano Gulizia outlines the epistemic and pedagogical foundations of teaching Aristotelian cosmology against the background of the universities of Rostock and Helmstedt at the turn of the seventeenth century. These objectives are achieved by the case study of a Swedish mathematician, Nicolaus Andreae Granius (ca. 1569—1631), who, in addition to being a cross-cultural mediator in the Baltic region, was also appointed as a professor of natural philosophy in Helmstedt and had strong ties among the 'Caseliani', a circle of Protestant humanists interested in theology, logic, and medicine. Granius was educated in Germany as part of a new class of intellectuals who used Lutheran academic relations in a climate of relative tolerance to reevaluate the methodological ramifications of Zabarella's Aristotle within their work. As Gulizia shows in his chapter, Granius's experience reveals the polycentric cultural processes that were animated by academic disputes and circulated through humanist techniques of note-taking.

Barbara Mahlmann-Bauer (chapter six) discusses the progressive decline of astrology as a science, specifically looking at the Socinian contribution to the debates. The profound changes in astronomy during early modernity did not immediately marginalize astrological practices. Rather, the two sides of the science of the heavens coexisted and reinforced each other for a while. Yet, the legacy of medieval allegations against astrology on theological and ethical grounds entered the Renaissance debates, and was eventually received and reinvigorated by Socinian and reformed scholars. Andreas Dudith-Sbardellati's circle in Breslau is a case in point: religious motives accompanied a keen interest in astronomy together with the rejection of astrology. The intellectual legacy of this group lasted

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up to the late seventeenth century in connection with cometary apparitions and controversies (in 1618/19, 1652–1654, 1664/65 and 1680–1682).

Anna Jerratsch describes the Aristotelian elements underlying Protestant conceptions of comets in chapter seven. Her overview of sixteenth-century and seventeenth-century developments of cometary theories begins with a presentation of the Renaissance attempts to cope with comets as 'challenging objects'. Initially, comets were treated as multilayered objects that integrated elements derived from natural philosophy, astrology, and theology. The German-speaking literature on comets offers a wide body of sources on the phenomenon. In such popular texts, comets were seen as harbingers of famine, war, and diseases and interpreted in accordance with astrological viewpoints, theological doctrines, and natural philosophical theories. Jerratsch considers the progressive dissolution of the integrated view of comets (astrological-theological-physical) and especially points to the marginalization of astrology.

In chapter eight, Miguel Ángel Granada considers the Danzig professor of philosophy Bartholomäus Keckermann as an early modern defender of the Aristotelian doctrine of comets as sublunary meteorological phenomena. Keckermann saw the mathematical determination of the heavenly nature of comets as an attack against scholastic physics. He raised fundamental doubts concerning the reliability of astronomical instruments and mathematical computations as a counter-argument against their celestial nature. In contrast to mathematical astronomers, he believed that comets are produced by atmospheric exhalations and allotted them a theological overdetermination as signs of divine intervention into nature. Mathematicians promptly reacted to his allegations. Among them, Christoph Hunichius defended the thesis of comets' superlunarity and argued for their exclusively natural origin. The polemic opposing Keckermann and Hunichius is paradigmatic of the institutional development of the natural sciences at the crossroads of tradition and innovation.

Bruce Moran's contribution deals with alchemy (chapter nine). He shows that the Latin terminology of logic, as taught at Protestant universities on the basis of Aristotle, Ramus, and Melanchthon, was at the basis of the linguistic choices of Andreas Libavius' chemical Œuvre. Libavius acted in a context in which many scholars were dismissive of Aristotelian logic in the name of a Ramist reform, but his efforts were directed at creating a synthesis of Aristotle and Ramus. Such an eclectic sythesis formed the basis for his chemical science, a two-sided theoretical-practical project resulting from the interconnection of *scientia* and *ars*. In spite of his intention to purify chemistry from the metaphysical implications of hermetic alchemy, Libavius did not succeed in establishing the teaching of his old-new science at universities.

Libavius is also at the center of Elisabeth Moreau's essay (chapter ten). She deals with the development of his pharmaceutical theory of elemental mixtures based on a merging of Hippocratic-Galenic humoral pathology with medieval *alchemia medica*. Such an endeavor was rooted in the conception that every human

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being has his or her own inner principle. This principle is marked by a similitude to the creator and is the result of the composition of *materia*, *forma,* and *privatio*. This triad was directed against the Paracelsian *tria prima* doctrine embraced by the physician Petrus Severinus. Libavius accused his opponents of unduly abandoning the Aristotelian ground of alchemical concepts and principles.

Bernd Roling (chapter eleven) presents the occult doctrines of the hermetic thinker Johann Ludwig Hannemann in Kiel in the passage from the seventeenth to the eighteenth century. These occult doctrines constituted a special path to natural philosophy informed by Platonism and Paracelsism that implied the rejection of key terms and concepts of Aristotelian philosophy, especially *forma specifica* and *privatio*. As an alternative, Hannemann proposed a dynamic conception of reality as a material stream, which is organized by God and animated by the world-soul of Platonic origin. Materiality was reduced to three Paracelsian principles, *sal*, *sulfur,* and *mercurius*, which Hannemann traced back to a mythical Nordic alchemical tradition.

Simon Rebohm (chapter twelve) looks at the editorial practice of commenting as documented by the *Miscellanea curiosa*, a multi-volume medical and natural encyclopedia that was published under the auspices of the scientific society *Academia naturae curiosorum* (later *Academia imperialis Leopoldina*) from 1670 onwards. The early volumes of the *Miscellanea* are marked by the large presence of commentaries referring to Aristotle. These references often had a rhetorical meaning, as they served to introduce new natural viewpoints. After 1676, references to Aristotle abruptly disappeared as a consequence of the new scholarly direction of the editorial project.

Martin Urmann concludes the volume with a comparative study on the French academic context (chapter thirteen). He specifically discusses the change in the relationship between *natura* and *ars* that occurred when Cartesian language theories penetrated conceptions of rhetoric during the seventeenth century. The essay first considers the reception of Descartes by the French universities and *collèges* in order to explore what can be called the epistemic transfer between Aristotelianism and the new Cartesian philosophy. The focus then shifts to Bernard Lamy's conception of rhetoric as presented in his principal work *De l'art de parler* (1675). Based upon the Cartesian theory of passions, Lamy's book redefines rhetoric in a way that current research has labelled a 'grammar of affects'.

The essays in this volume thus bring into focus the institutional mechanisms of the transformation of traditional knowledge and its capacity to merge, adapt, or react to novelty against the background of early-modern religious reforms. The 'stability' of received forms of knowledge, particularly Aristotelianism, resided in its 'mobility'. In Protestant institutional contexts, Aristotelian thought proved to be adaptable and compatible with the natural and theological views brought forward by Melanchthon and, later, with the mechanical philosophy and other conceptions linked to contemporary advances in science. Explicitly anti-Aristotelian currents, such as Ramism, Paracelsism, radical Platonism, and hermeticism,

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were more difficult to integrate into the university curricula. Aristotelianism sometimes acted as a transformative force that was deeply theoretical as was the case with the geocentric reception and transmission of Copernicus in the Wittenberg connection. Alchemy, astronomy, and astrology, alongside cometary theories, natural philosophy, and theology are the most important dimensions of early modern science investigated in this volume. They are reconstructed in their cultural embedment as part of a science that was established, continued, and constantly revised in the mobile settings of knowledge institutions.

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Melanchthon's Logic and Rhetoric and the Methodology of Chemical Knowledge in Libavius's *Alchymia*

Volkhard Wels

The point that I make in this paper is relatively simple. I aim to show that Andreas Libavius's methodical treatment of chemical knowledge in his 1597 book *Alchemia* has its roots in the method developed by Philip Melanchthon in his textbooks on rhetoric and logic half a century earlier. This is my first claim. My second claim is that the method that Melanchthon laid out in his books and that Libavius later took up and applied to chemistry has bearing for the content of the knowledge that it is applied to. For both Melanchthon and Libavius, the methodical treatment of knowledge is informed by a strong rationalist, anti-speculative thrust. It is precisely the speculative and religious dimensions of knowledge that Melanchthon's method excludes from the domain of natural philosophy. As Bruce Moran has already demonstrated in detail, Libavius's pointed critique of Paracelsus follows out of his methodical treatment of chemical knowledge,[1] which, as I want to show in this paper, is wholly reliant on Melanchthon.

I'll begin by saying a few basic things about Melanchthon's concept of method. Then I will show how Libavius draws on the concept in his own textbook on logic and applies it in his *Alchemia*. Both the structure and the content of the chemical knowledge described in the book make clear that Libavius was a student of Melanchthon. Third, I will show how Libavius's concept of method sets him apart from both the older traditions of alchemy and the Paracelsians. In contrast to them, Libavius treated chemistry as a body of technical knowledge, and in doing so, he drew on technical texts on smelting. Finally, I would like to show how

1 Bruce T. Moran, *Andreas Libavius and the Transformation of Alchemy. Separating Chemical Cultures with Polemical Fire.* Sagamore Beach, Ma 2007. Among Moran's other works on the subject, see Bruce T. Moran, "Medicine, Alchemy, and the Control of Language: Andreas Libavius versus the Neoparacelsians", in: *Paracelsus: The Man and His Reputation, His Ideas and Their Transformation*, ed. Ole Peter Grell, Leiden 1998, pp. 135–149; Bruce T. Moran, "Andreas Libavius and the Art of 'Chymia'. Words, Works, Precepts, and Social Practices", in: *Bridging Traditions. Alchemy, Chemistry, and Paracelsian Practices in the Early Modern Era*, ed. Karen Hunger Parshall a.o. Kirksville, Missouri 2015, pp. 59–78. See also his contribution to this volume. Owen Hannaway, *The Chemists and the Word: the Didactic Origins of Chemistry.* Baltimore, London 1975, pp. 124–151 already discussed Libavius's concept of method and its relation to Melanchthon and Ramus.

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method functions as an anti-speculative, anti-metaphysical epistemological principle in the works of both Melanchthon and Libavius.

1 Melanchthon on Method

In an oration from 1536 with the title "On Philosophy", Melanchthon makes the following praise of method:

> Furthermore, there are two things for the acquiring of which great and varied knowledge and long practice in many arts are necessary, namely method and style of discourse. For no one can become a master of method, unless he is well and rightly versed in philosophy—indeed in that one kind of philosophy that is alien to sophistry, searches for and discloses truth properly and by the right path. Those who are well versed in these studies, and have obtained for themselves the habit (*hexin*) of relating to method everything that they want to understand or teach to others, also know how to represent methods in religious discussions, how to clear up what is complicated, pull together what is scattered and shed light on what is obscure and ambiguous.[2]

Thus, Melanchthon holds method and rhetoric, "methodus et forma orationis", to be the decisive elements of the transmission of knowledge. Method is the procedure one has to follow to find the truth and present it in a systematic fashion ("ordo et recta via"). While method provides guidelines for the orderly presentation of knowledge, rhetoric deals with the linguistic form this presentation takes. The points that Melanchthon summarizes in his short text from 1536 are things he had discussed in detail in his textbooks on logic and rhetoric: the book on logic dealt with method, that on rhetoric on linguistic form.

Logic and rhetoric were Melanchthon's two core interests.[3] The first version of his textbook on logic was published in 1520, the last in 1528. The first version of the book on rhetoric was published in 1519, the last in 1547. Both were bestsellers

2 Philipp Melanchthon, *De philosophia*, in: idem, *Werke in Auswahl Bd. 3: Humanistische Schriften*, ed. Richard Nürnberger, Gütersloh 1969, pp. 88–95, here p. 91: 'Deinde duae res sunt, ad quas comparandas opus est magna et varia doctrina, et longa exercitatione in multis artibus, videlicet, methodus et forma orationis. Nemo enim fieri artifex methodi potest, nisi bene et rite assuefactus in philosophia, et quidem in hoc genere philosophiae, quod alienum est a sophistica, quod veritatem ordine et recta via inquirit et patefacit. Qui in eo studio bene assuefacti <hexin> sibi paraverunt, revocandi omnia ad methodum, quae intelligere aut tradere aliis cupiunt, hi norunt etiam in disputationibus religionis informare methodos, evolvere intricata, dissipata contrahere, obscuris et ambiguis addere lumen.' I quote the English translation by Christine F. Salazar, see Philip Melanchthon, "On Philosophy," in: *Orations on Philosophy and Education*, ed. Sachiko Kusukawa, transl. Christine F. Salazar. Cambridge 1999, pp. 126–132, here p. 128.

3 On the close relation between dialectics and rhetoric see Volkhard Wels, "Melanchthon's Textbooks on Dialectic and Rhetoric as Complementary Parts of a Theory of Argumentation", in: *Scholarly Knowledge. Textbooks in Early Modern Europe*, eds. Emidio Campi, Simone De Angelis, Anja-Silvia Goeing and Anthony T. Grafton, Genf 2008, pp. 139–156.

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in the sixteenth century, and about 100 editions of each were published in the run of the century. It is nothing contentious to say that most students who studied at Protestant universities in the sixteenth century used Melanchthon's textbooks in their basic studies in the *artes* faculty.

But what exactly does this method that Melanchthon develops in his book on logic consist of? The answer actually seems pretty banal. Melanchthon describes his method as a sequence of ten questions that should guide research on any given object of study. The questions are: 1. What does the word or concept that signifies this object mean? 2. Does the object exist? 3. What is the object? In other words, how should it be defined? 4. What parts make up the object? 5. What are the object's types and subtypes? 6. What causes it (both its efficient cause and its final cause)? 7. What are its effects? 8. What things belong to it ("adiacentia")? 9. What is related to it? 10. What are its opposites? According to Melanchthon, if one can answer these ten questions, then one knows the most important things about the object in question.[4]

By formulating these ten questions, Melanchthon was the first to bring the concept of method into European theory of science.[5] From the very beginning, Melanchthon's method was both a method for determining what knowledge is relevant for a given object of study and a method for presenting this knowledge in a clear, didactically efficacious form. Melanchthon's ten methodical questions are a sort of checklist that one can use to see if one knows everything pertinent there is to know about a given object of study and if one has put this knowledge in the right order. Thus, Melanchthon's method is not yet the kind of method for acquiring knowledge like those developed in the seventeenth century. It is just a method for presenting knowledge, which is an important point to keep in mind.

While Melanchthon's method is supposed to help guide research into the content of an object of study, its linguistic form—"forma orationis"—is treated by rhetoric. Melanchthon's textbook on rhetoric lays out the complement of the method of dialectic: the *genus didaskalikon*.[6] Melanchthon's concept of *genus didaskalikon* adds a new category to the Antique doctrine of the *genera dicendi*. Ancient rhetoric had three *genera dicendi*: the *genus iudiciale*, the *genus demonstrativum* and the *genus deliberativum*—speech at a court of law, advisory speech, and speech that praises and chastises. Melanchthon supplemented this classification with a

4 Philipp Melanchthon, *Erotemata dialectics*, in: idem, *Opera quae supersunt omnia*, ed. Carl Gottlieb Brettschneider. Bd. 13, Halle 1846, col. 508–752, here col. 573–578.

5 On the concept of method in the Early Modern period in general see Neal W. Gilbert, *Renaissance Concepts of Method*, New York, London 1960, as for Melanchthon there pp. 121–128. A more recent survey can be found in Peter Schulteß, "Die philosophische Reflexion auf die Methode", in: *Die Philosophie des 17. Jahrhunderts. Bd. 1: Allgemeine Themen, Iberische Halbinsel, Italien*, ed. Jean-Pierre Schobinger, Basel 1998 (= Grundriss der Geschichte der Philosophie, begründet von Friedrich Ueberweg, völlig neubearb. Ausg. Hg. von Helmut Holzhey), pp. 63–120.

6 See Philipp Melanchthon, *Elementa Rhetorices. Grundbegriffe der Rhetorik*, ed., transl. and comment. Volkhard Wels, Berlin 2001, pp. 41–59. Available in open access: http://nbn-resolving.de/urn:nbn:de:kobv:517–opus-51446

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fourth genus because he thought that it failed to account for a wholly distinct type of speech act, namely, speech that does nothing but transmit knowledge.

According to Melanchthon, the *genus didaskalikon* has the exclusive purpose of *docere*, of transmitting what we would today call information. If one only wants to inform his listeners and readers and make things comprehensible for them, says Melanchthon, he has to use clear, grammatically correct language that dispenses with all ornaments and flourishes. In his book on rhetoric, Melanchthon describes in detail the criteria that exclusively informative speech acts and texts should adhere to.

Melanchthon's concept of the *genus didaskalikon* puts rhetoric and logic in close relation to one another, making them practically interdependent. The *genus didaskalikon* makes the method that Melanchthon developed in his book on logic into a central aspect of rhetoric itself. It constitutes the rhetorical complement to the logical method of describing an object in a clear, correct, systematic fashion. For Melanchthon, every explanation—in the broadest sense of the term—is an instance of the *genus didaskalikon*. The *genus didaskalikon* is the speech act that describes an object in a methodical, clear, comprehensive way using sober, matter-of-fact language.

Melanchthon was before his time. In the early sixteenth century, he was calling for something that the Royal Society in London would still be calling for in the mid-seventeenth century when laying out how they thought their new form of knowledge learned through experiment should be presented: namely, for a "plain style" that dispenses with all rhetorical ornamentation. The following passage from Thomas Sprat's 1667 *History of the Royal Society of London* is relatively famous:

> They [that is, the members of the Royal Society] have therefore been most rigorous in putting in execution, the only Remedy, that can be found for this extravagance: and that has been, a constant Resolution, to reject all the amplifications, digressions, and swellings of style: to return back to the primitive purity, and shortness, when men deliver'd so many things, almost in an equal number of words. They have exacted from all their members, a close, naked, natural way of speaking; positive expressions; clear senses; a native easiness: bringing all things as near the Mathematical plainness, as they can: and preferring the language of Artizans, countrymen, and Merchants, before that, of Wits, or Scholars.[7]

This is pretty much what Melanchthon was saying more than a century earlier.[8]

7 Thomas Sprat, *The History of the Royal Society of London for the Improving of Natural Knowledge*, London 1667, p. 113. The context of this quote is reconstructed in Werner Hüllen, *"Their manner of discourse". Nachdenken über Sprache im Umkreis der Royal Society*, Tübingen 1989. Tina Skouen, "Science vs. Rhetoric. Sprat's 'History of the Royal Society' Reconsidered", in: *Rhetorica* 29 (2011), pp. 23–52 treats Sprat's position in the history of rhetoric.

8 The only difference between the demands of Melanchthon and those of Sprat—and it is a very important difference—is that Melanchthon is aware that the "plain style"—or the *genus*

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2 Method in the Works of Libavius

This brings me to my second point: Andreas Libavius's adoption of Melanchthon's teachings on rhetoric and method. Published in 1597, Libavius's *Alchemia* has rightfully been crowned as the first ever textbook on chemistry. The work constitutes nothing other than the first attempt to give a systematic account of chemical knowledge in sober, clear, unembellished language. In doing so, Libavius fulfills the prescriptions set forth by Melanchthon in his concept of *genus didaskalikon*, which, as is easy to show, is not a matter of coincidence. In 1595, two years before publishing his *Alchemia*, Libavius published a textbook on logic whose title itself lays bare the work's reliance on Melanchthon: "Two books on logic, the first book containing the rules of logic taken from the best authors, especially from Aristotle, Petrus Ramus and Philipp Melanchthon […]".[9]

It is easy to understand why Aristotle is named first, because every textbook on logic is ultimately based on the works of Aristotle. I can't say much about the extent of Ramus's influence, but it seems to not have been nearly as significant as that of Melanchthon. In some places, sections of Melanchthon's books on logic and rhetoric are simply transcribed word-for-word, and in others, they are paraphrased or reformulated. Perhaps most importantly, Libavius imitates the structure of Melanchthon's textbook on logic. Because the book was written based on lessons Libavius held, one can probably imagine that Libavius simply rephrased parts of Melanchthon to fit his own needs as a teacher, adjusting them to fit the newest principles laid out by Ramus.[10] At any rate, Libavius's book is not an original work, but a remake of Melanchthon's textbook on logic.

So naturally, Libavius's book also has a chapter on method.[11] And like Melanchthon's, Libavius's method is a method for presenting and organizing knowledge, not a method for acquiring or producing it. Using Melanchthon's words, Libavius says that every methodical presentation begins with precise definitions and proceeds by naming the object's parts, its subcategories, its causes, etc. This is doubtless drawn from Melanchthon's ten questions.

But Libavius's logic is not really what interests me here, which is why I'd now like to turn to Libavius's application of Melanchthon's method in his *Alchemia*. His use of the method enabled him to do nothing less than write the first real chemistry

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didaskalikon—is a rhetorical art that is difficult to achieve. In contrast, Sprat seems to believe—like so many other natural scientists in the following centuries—that the "plain style" is simply a matter of dispensing with all rhetoric and attempting to come as close as possible to mathematics. Melanchthon's view that the "plain style" is itself a rhetorical artifice is much more modern than this naïve view. There is no non-rhetorical language.

9 Andreas Libavius, *Dialecticae emendatae libri duo in quorum hoc priore continentur praecepta dialectica ex optimorum autorum, praecipue Aristotelis, P. Rami et Ph. Melanchthonis sententiis usuque rationis eruta, congesta, itaque exposita, ut ubivis discentibus possint esse usui*, Frankfurt/M. 1595.

10 Libavius strongly distances himself from Ramism in the foreword to the *Alchemia*, f. b2^{r}: "Ramisticas argutias ineptasque nugas quas ineptiunt hodie multi, ad Cynosares abire iubeo."

11 Libavius, *Dialecticae emendatae libri duo* p. 287. Here, too, Libavius combines ideas—and phrases—from Melanchthon and Ramus.

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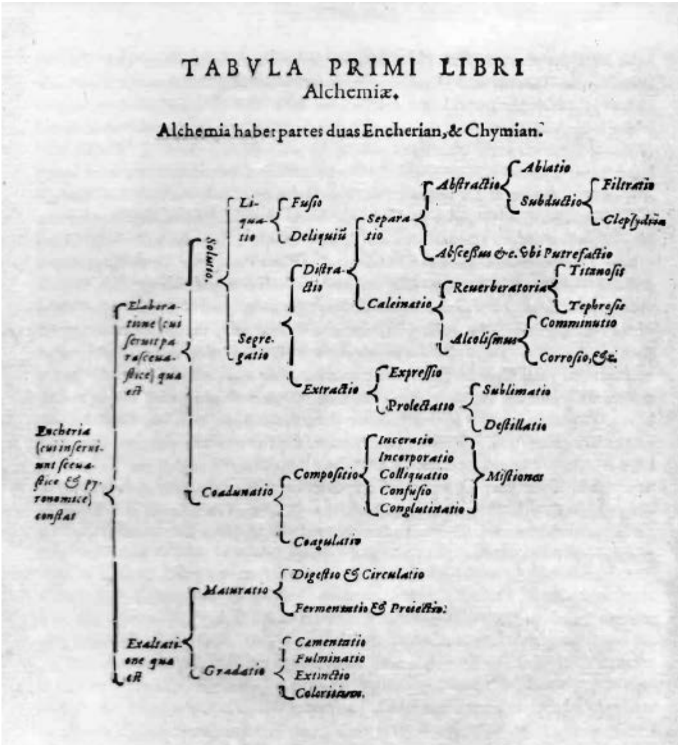

Fig. 1a: Graphic depicting the structure of the *Alchemia*

textbook. The title page itself makes clear that Libavius wants to provide his readers with a methodical presentation of chemical knowledge. The work was composed "primarily by bringing together scattered bits of knowledge from the best of the older and newer authors and various general writings; on the basis of theoretical contemplations and extensive practical experience, they are then presented in a careful methodical fashion (*Methodo accurata explicata*) and forged into a complete work."[12] "Methodo accurata explicata" is a clear reference to Melanchthon's method.

The textbook is structured in line with the method. Libavius begins with a definition of chemistry and then goes on to a chapter on the constitutive parts of alchemy, thus following Melanchthon's ten questions. The first part of the *Alchemia* deals with the "Encheria," or "equipment and tools," along with chemical processes like sublimation, filtration, distillation, calcification, and rotting. The

12 Andreas Libavius, *Alchemia […] e dispersis passim optimorum autorum, veterum et recentius exemplis potissimum, tum etiam praeceptis quibusdam operose collecta, adhibitisque ratione et experientia, quanta potuit esse, methodo accurata explicata et in integrum corpus redacta*, Frankfurt/M. 1597. A German translation was published in 1964: *Die Alchemie des Andreas Libavius. Ein Lehrbuch der Chemie aus dem Jahre 1597*, transl. Friedemann Rex, Weinheim/Bergstraße 1964.

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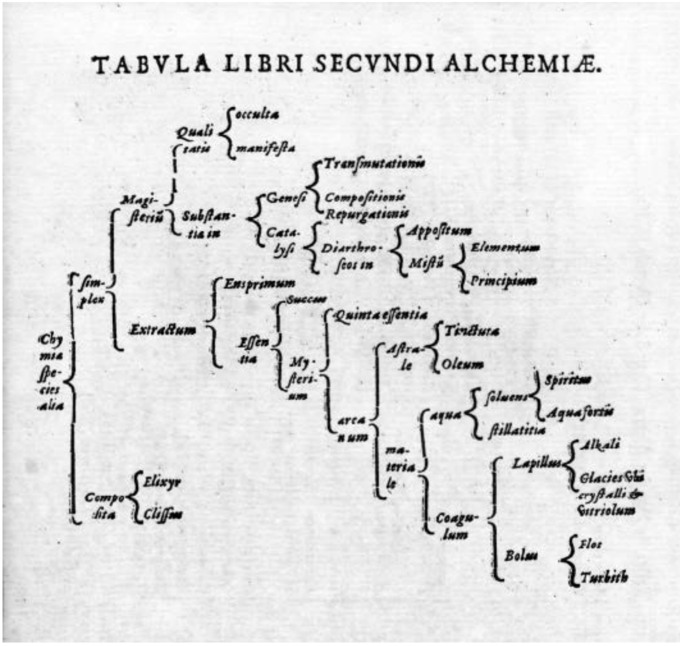

Fig. 1b: Graphic depicting the structure of the *Alchemia*

second part treats "Chymia," or the end products of chemical processes. Examples include liquids, extracts, elixirs, essences, powders, and oils. A diagram on the first pages of the *Alchemia* gives a visual depiction of the system of chemical knowledge, a form of presentation clearly influenced by Ramus.

But Melanchthon's method doesn't just guide the overall structure of the book—it is also used to organize the individual chapters. Every chapter begins with a definition of a chemical process and the requisite instruments and materials, then proceeds to a description of its subcategories and parts, which is then followed by a description of the process's chemical qualities and its practical uses. It is this methodical, systematic form of presentation that distinguished Libavius's *Alchemia* from all its predecessors and made it the first textbook of chemistry.

Indeed, Libavius too thought that the methodical structure of the *Alchemia*—both as a whole and in its parts—was his primary accomplishment. The introduction and the preface are nothing other than a justification of the method. The first sentence of the introduction states that he, Libavius, systematized chemical knowledge "led by a method that aims to convey knowledge" ("ductu methodi scientiis informandis attributae").[13] He continues by writing that, while there are of course many extant observations and bits of knowledge, he was trying to de-

13 Libavius, *Alchemia* f. a2^{v}.

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duce the general categories for classifying them. In other words, chemistry as a discipline was not, in his eyes, lacking concrete knowledge. What it lacked was a methodical presentation of this knowledge in clear language.[14] Libavius states in no ambiguous terms that readers should not expect to learn "new experiments" (*experimenta*, which might also be translated as "new experiences") from his book, because he had simply brought together what others had already observed before him. He simply provided the form of presentation, "expositio et modus docendi." And if he is successful in this venture, he says, he'll be happy: "If the presentation and form of exposition are mine, that's enough for me."[15]

3 Libavius's Concept of Chemistry: Critique of Traditional Alchemy and Paracelsus and the Use of Technical Literature on Smelting

Libavius's consequentially methodical treatment of chemical knowledge distinguishes his work from both traditional alchemy and from Paracelsus and his followers. The method alone is what separates his work from traditional alchemy, not the discrete knowledge itself. Indeed, Libavius held high the findings of traditional, pre-Paracelsian alchemy. What Libavius disliked about it was its obscurantism and secretiveness, the fact that the old alchemists didn't make their findings accessible to a broad audience. He criticizes them for either not publishing their work or, when they did, only distributing it in manuscripts that were difficult to obtain and were written in a highly codified language that used all kinds of obscure terms. Of course, he was talking about the imagistic language of traditional alchemy with its green lions, unicorns, dragons, hermaphrodites, bathing kings, and beheaded ladies.

Nevertheless, he offered a defense of what this language concealed, writing that it was wrong to believe that it was just a bunch of charlatanism and fraud:

> Of course I know that excellent, reliable authors referred to one and the same thing with all kinds of different terms, and strange terms to boot, in order to keep their findings secret and protect them from being maligned; however, I would like you to share in my conviction that their thinking was always genuine and sound, because it was not just deceptive chatter, but represented the correspondence of facts and experience: there is no reason to put these men on the same level as frauds and tricksters.[16]

14 Libavius, *Alchemia* f. a2 v: ‚Catholica silent, nec est amussis ad quam revocari singularitates et iudicari queant. Itaque evenit ut cum plures eiusdem rei extent formulae, non sit promptum iudicare, nec ad quod caput artis pertineant, quove nomine sint appellandae, nec quam legitime sint descriptae.'—'There is nothing said of general concepts, and there is no guiding rule that would allow us to order and analyze the discrete facts. Thus, when there are multiple "formulas" for the same material, it is difficult to say where they belong in the canon of chemistry, what name they should be referred to by, and if they are described in an adequate fashion.'

15 Libavius, *Alchemia* f. a4 r: 'Si mea est expositio et modus docendi, sat est.'

16 Libavius, *Alchemia* f. a3 r: 'Non quidem ignoro, etiam praestantes probatosque autores occultandi sua inventa et arcendi improbitatem caussa, variis, iisque monstrosis nominibus eadem appelalsse: sed tibi persuasum velim, concordem constantemque ipsorum fuisse

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Thus, for Libavius, the imagistic language of traditional alchemy was not a sign of charlatanry. Rather, he viewed it as what we would today call a technical language:

> For people who are unfamiliar with the key precepts of the discipline of chemistry, everything sounds, as one says, mysterious, even if they are expressed in clear, well-defined concepts that the adepts can understand. Thus, all the arts remain foreign to outsiders, particularly when they are not translated into vernacular and the termini technici (*vocabula disciplinae*) change.[17]

He criticizes traditional alchemy for its failure to present its findings in a systematic manner, its habit of merely making lists of discrete observations without trying to integrate them into a system, and for its obscurantism and secretiveness. He writes that lots of alchemists make you promise a hundred times that you won't tell anyone about what they say before they entrust you with their arcane knowledge.[18] Libavius thought that the end effect of this secretiveness was that alchemy never made any real progress: if people can't publicly discuss and test the alchemists' findings, then they can't try to verify or falsify them either:

> There are also people of the opposite conviction who believe that it is disgraceful that certain arcana be published in such clear words. They claim that you have to do it like the philosophers and adepts, who conceal otherwise clear things through obscure words and teachings and reserve science for their followers (*filii doctrinae*). I have no need to counter these people; for me there are no arcana; if there are any, God has made them accessible through science (*disciplina*), keen minds, and experience.[19]

For this reason, Libavius did not give the "concealed procedures" a place in his text, because, as he states in no uncertain terms: "In order to test them, they have to have been public for a long time. Thus, if they are kept secret, they cannot be counted as part of the art."[20]

Thus, it is clear that, beyond its strict scientific function, Libavius viewed his methodical presentation of chemical knowledge as a plea for openness and ac-

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semper mentem, quam cum non dictio fallax, sed rerum concursus et experientia aperuerit: non est ut hos impostorum similes facias.'

17 Libavius, *Alchemia* f. a4^{r}: ,Qui disciplinae Chymicae morem non callent, ab his occulta sunt omnia quae dicuntur, etiamsi manifestis exponantur, suisque notis, quas intelligent satis initiati. Ita omnes artes ab extraneis sunt remotae, praesertim si non in vulgi transferantur sermonem et vocabula disciplinae mutent.'

18 Libavius, *Alchemia* f. a2^{v}.

19 Libavius, *Alchemia* f. a3^{v}: ,Audies aliquando etiam in adversam partem inclinantes, qui turpe iudicabunt arcana quaedam publicari tam mnaifestis verbis. Imitandum esse Philosophos, qui rem manifestam nominibus, modoque docendi occultarunt, filiisque doctrinae reliquerunt. Non opus est mihi adversus hos responsione: arcani enim mihi nihil est: si quid es, Deus patefecit per disciplinam, artificesque praestantes et experientiam.'

20 Libavius, *Alchemia* a4^{v}: ,Ut comprobentur, diu in publico esse debent. Non ergo habentur pro artificiosis, si sunt occulti.'

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cessibility in science and the publication of chemists' findings. He believed that scientific progress could only be made if alchemists put an end to the obscurantism and secretiveness of traditional alchemy. Not only must findings be verifiable and falsifiable, he claimed—they also have to be made public.[21] Thus, Libavius was already stressing the need for scientific community half a century before Robert Boyle made similar claims.[22]

While Libavius's criticisms of traditional alchemy are thus relatively moderate, his criticisms of Paracelsus and his school are considerably harsher. He writes that while traditional alchemy strove to be difficult to understand, Paracelsus and his followers didn't want to be understandable at all. He complains that even in those places where Paracelsus says something about real chemical knowledge and not just about theological and metaphysical speculations, you still have to proceed with caution, "because he deliberately covers everything with all kinds of mysterious references, obscuring even the most obvious things, and doesn't want people to be able to understand him."[23] Thus, Libavius takes pains to underscore that people should in no way confuse chemistry with what Paracelsus had made of it:

> Chemistry is not a discovery of Paracelsus; it should not be traced back to him; and this book, along with the commentary, will make clear that only the most miniscule part of chemistry has anything to thank the work of Paracelsus, even though the public already has access to works much superior to anything that grubby magician could have ever achieved. It would be a sad state of things for chemistry if it had to build on the works of Paracelsus.[24]

Because Bruce Moran has said pretty much everything there is to say about Libavius's critique of Paracelsus, I would like to turn to another part of the preface to the *Alchemia*, which leads back to the concept of method. In the preface, Libavius doesn't limit himself to distancing his project from Paracelsus and stating his partial affinity with traditional alchemy. He also explicitly mentions the techni-

21 In the same section in the first edition of the *Alchemia*, Libavius wrote that he would gladly amend his text and asked readers to write him if they were to find any errors, which he would then correct. Libavius, *Alchemia* a4 v: 'Qui boni sunt et liberali ingenio nati, in quibus videbunt me deficere, aut ipsi edent meliora, aut ad me edenda in commentariis mittent.'

22 See Stephen Clucas, "Alchemy and Certainty in the Seventeenth Century", in: *Chymists and Chymistry. Studies in the History of Alchemy and Early Modern Chemistry*, ed. Lawrence M. Principe. Sagamore Beach 2007, pp. 39–51. Clucas compares the claims of Boyle and Libavius, arguing that while Libavius plead for clarity and verifiability in order to make chemistry a *scientia* in the Aristotelian sense, Boyle wanted to make experiment into the bedrock of chemistry.

23 Libavius, *Alchemia* f. b^{r}: 'Sed eo pauciora valde trepidanter allegavi, quod studiosissime omnia implicet aenigmatis et obscuret etiam manifestissima, nec velit intelligi.'

24 Libavius, *Alchemia* f. b^{v}: ‚Chymia non est inventum Paracelsi: ad eum referri non debet et minimam etiam artis partem huius notitiae deberi, ostendet hic liber cum commentariis, quanquam iam in publico existant longe nobiliora, quam unquam impurus ille magus potuit assequi.'

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cal knowledge of the "steel works people" ("Metallhüttenleute"), that is, smelters who worked at the mines. Libavius was in all likelihood referring to works like Georg Agricola's *De re metallica* (published in 1556), so-called smelting manuals, "Probierbüchlein," or books on assaying silver and gold, and other purely technical writings. These kinds of technical works had always existed alongside strictly alchemical writings. Indeed, Agricola's *De re metallica* contains a critique of alchemy that is in many ways similar to that of Libavius.[25]

Libavius explicitly states that he wants to raise the technical knowledge of these workers to the level of a philosophy, which is to say, to the level of an *ars*, a university discipline:

> I also don't have anything to fear from the judgment of those who will say that my work has given smelters and other craftsmen a place in the world of philosophy, people who have up to now been held far from philosophy and demeaned to the level of menial workers. Because when chemistry is no longer just the servant of medicine, but comes to be recognized as a noble part of the knowledge of nature (*contemplatio physica*), then the engineers (*mechanici*) will ascend the throne of physics.[26]

This is a remarkably prophetic statement: if chemistry is founded on the knowledge of craftsmen, then the engineers will ascend the throne of physics. While Paracelsus based his chemical knowledge on theological and metaphysical speculation, Libavius wanted to base chemical knowledge on the technical knowledge of the artisans.

This brings me to my next point. I would now like to return to Philip Melanchthon's concept of method as a systematic presentation of knowledge. Melanchthon's method is not just a formal procedure that leaves the knowledge that it is applied to untouched. The knowledge produced by methodical procedure is not the same as knowledge brought forth by speculation or divine revelation.

A simple reference to Descartes' *Discours de la méthode pour bien conduire sa raison, et chercher la vérité dans les sciences* (1637) suffices to demonstrate this claim. Like for Descartes a century later, method had a critical function for Melanchthon. In other words, the rationalism expressed in Melanchthon's method determines the very content of the knowledge that it structures. Thus, Descartes was not the first one to conceive of method as the enemy of speculative knowledge and modes of acquiring knowledge based on speculation. Melanchthon, too, had the very same aim.

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25 Georg Agricola, *De re metallica*, Basel 1556. Widmung, f. a3^{r}: ‚Sunt alii multi de hac re libri, sed omnes obscuri: quod scriptores isti res alienis, non propriis vocabulis nominent: et quod alii aliis atque aliis vocabulis, a se confictis, utantur, cum res nun mutent.'

26 Libavius, *Alchemia* a4 v: 'Nec formidanda mihi est eorum iudicum sententia, qui dicent mea opera effectum ut et fabris metallurgis, aliisque opificibus hactenus e Philosophica libertate ad servilia abiectis, sit tutus in philosophia locus: cum enim Chymia non tantum ministra sit medicinae, sed et physicae contemplationis pars honoratior, in solium physicae evehentur mechanici.'

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4 Method as an Anti-Speculative Principle of Knowledge in the Works of Melanchthon and Libavius

The implications of Melanchthon's method become clear when one takes a look at the way he applied it to theology in his 1521 *Loci communes theologici*. Melanchthon's *Loci communes theologici* has rightly been called the first dogmatic textbook of Lutheranism. Following the plan laid out in his works on logic and rhetoric, Melanchthon defines the central concepts of theology, identifies its subcategories and its parts, describes its causes and effects, and explains what is related to them and what their opposites are. In doing so, Melanchthon subordinates theology to the rules of logic. This is not something that should be taken for granted, and it stands in sharp contrast to the works of the early Luther.[27]

The preface of the *Loci* states clearly and precisely that the truths of Biblical revelation have the same degree of certainty as the statement "two multiplied by four equals eight."[28] It continues that all the other principles of belief can be deduced from these truths of revelation with the same certainty. Belief and logic are not contradictory for Melanchthon. For him, logic is, as the universally applicable method of knowledge, no less an instrument of theology than it is for every other discipline. Sure, in contrast to disciplines like mathematics, theological propositions cannot lead us to demonstrative, absolutely necessary proofs. But the deduction of these propositions out of the contents of the Bible can be tested with the hermeneutic-philological principles that Melanchthon formulates in his rhetoric and the laws of method laid out in his logic.[29]

Nevertheless, this is not to say that Melanchthon subordinates the whole of theology to reason as Descartes's followers would do later on. One of the first sentences of the 1521 *Loci theologici* states that theology contains "mysteria divinitatis" that are inaccessible to reason. Melanchthon counts among these "mysteria" the Holy Trinity, the incarnation of Christ, and the Divine creation of the world ex nihilo. These "mysteria divinitatis," Melanchthon writes, cannot be analyzed—they can only be marveled at.[30] They are beyond the grasp of reason and method, which for Melanchthon means that they mark the end of theology as science and the beginning of the domain of speculation. This makes the method's significance for theology quite clear.

I think we can well illustrate Melanchthon's position with the famous concluding sentence of Ludwig Wittgenstein's *Tractatus logico-philosophicus*: "Whereof one cannot speak, thereof one must be silent." Like Wittgenstein, Melanchthon

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27 See Volkhard Wels, *Manifestationen des Geistes. Frömmigkeit, Spiritualismus und Dichtung in der Frühen Neuzeit*, Göttingen 2014, pp. 77–84.

28 Philipp Melanchthon, "Loci praecipui theologici von 1559" (1. Teil), in: idem, *Werke in Auswahl*. Bd. 2.1, bearb. v. Hans Engelland, fortgeführt von Robert Stupperich, Gütersloh 1978, praefatio p. 190.

29 Melanchthon, "Loci praecipui theologici von 1559", praefatio p. 190.

30 Philipp Melanchthon, „Loci communes rerum theologicarum seu hypotyposes theologicae. 1521", in: idem, *Werke in Auswahl*. Bd. 2.1, bearb. v. Hans Engelland, fortgeführt von Robert Stupperich, Gütersloh 1978, p. 19.

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was a logician who saw his task in demarcating the limits of language, which he thought were identical with the limits of reason.[31] What one can and must speak about are the central concepts of Christian theology, which are of the utmost significance for the life of a Christian. These are the "loci communes theologici," which God revealed in the Bible: the power of sin, the law, grace. These make up the bedrock of dogmatic theology. But about the "mysteria divinitatis," like the Holy Trinity, the incarnation of Christ, and the *creatio ex nihilo*, one cannot speak. They cannot be grasped with reason, and thus cannot be grasped with language.

Conclusion

That brings me to my conclusion: my basic claim is that the way Libavius applied Melanchthon's method to chemical knowledge is grounded in reason, which means that it is explicitly against mixing chemical knowledge with religious speculation.

Libavius's methodical organization of chemical knowledge paved the way for a new conception of chemistry as a science free of metaphysics that built on the knowledge of craftsmen. This new orientation of chemistry was an explicit attack on Paracelsus, because he and his followers were engaged in nothing other than investing chemical knowledge with metaphysical subtleties. The chemistry of Paracelsus and his followers was only marginally interested in empirical knowledge and observation, primarily drawing its insights from divine inspiration and religious, metaphysical speculation.

The examples are countless, so I'll just take up three here chosen more or less at random: Oswald Croll, Alexander von Suchten, and Heinrich Khunrath. Oswald Croll's *Basilica Chymica* (1609) has the metaphysical speculations of the Paracelsus school written all over its cover.[32] The title page states that the book seeks to use chemistry to clarify the Holy Trinity by bringing it into analogy with all kinds of other trinities. It is precisely the Holy Trinity—the fact that God is at once one and three—that Melanchthon claimed could not be grasped by reason. Thus, Croll treats chemistry less as a form of technical knowledge and more as a complement of Kabbalah and magic.

In his *De tribus facultatibus* (written before 1590, published in 1608), Alexander von Suchten seeks to give a chemical explanation of the act of *creatio ex nihilo*

31 The comparison of Humanist philosophy of language with Wittgenstein's "ordinary language philosophy" has been around for some time now. I make this comparison in the same vein as Lodi Nauta, *In Defense of Common Sense. Lorenzo Valla's Humanist Critique of Scholastic Philosophy*. Cambridge, Mass; London 2009, pp. 269–291. On page 288, Nauta claims that both share "the basic conviction that philosophical problems are rooted in a misunderstanding of language."

32 Oswald Croll, *Basilica chymica continens philosophicam propriam laborum experientiam confirmatam descriptionem et usum remediorum chymicorum selectissimorum e lumine gratiae et naturae desumptorum*, Frankfurt/M. [ca. 1611]. Ndr. Hildesheim, Zürich, New York 1996. On the differences between Libavius and Croll see Owen Hannaway, *The Chemists and the Word: the Didactic Origins of Chemistry*, Baltimore, London 1975.

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Fig. 2: Title Page of Croll's *Basilica Chymica*

by using Paracelsus's doctrine of principles.[33] According to him, salt, sulfur, and mercury are the three principles that can explain the act of creation described in Genesis; importantly, mercury represents the divine spirit that entered the world itself on the first day of creation. Suchten was not the only one to try his hand at such speculation. The followers of Paracelsus made nothing less than the creation of the world into a choice object of speculation, seeking to study its chemical dimension. The "physica mosaica," or chemical interpretation of Genesis, pretty much became its own text genre among the Paracelsians. Heinrich Khunrath's

33 Alexander von Suchten, *De tribus facultatibus*, in: idem, *Chymische Schriften*, ed. Ulrich c. Dagitza, Frankfurt/M. 1680, pp. 357–382.

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Fig. 3: Rebis—Etching from Khunrath's *Amphitheatrum*

Amphitheatrum sapientiae aeternae solius verae, christiano-kabalisticum, divino-magicum, nec non physico-chymicum, tertriunum, catholicon (1595/1609) is probably the most famous among them.[34] Khunrath seeks to provide an alchemical, kabbalist, magical explanation for nothing other than Melanchthon's "mysteria divinitatis": the *creatio ex nihilo*, the Holy Trinity, and the incarnation of Christ.

Libavius wasn't interested in any of this. His *Alchemia* contains no theological speculations and no metaphysics. Instead, Libavius gives the reader definitions, classifications, and descriptions of concrete chemical instruments, materials, and processes. This is what I meant at the beginning of this paper when I said that Libavius was a student and follower of Melanchthon. The application of Melanchthon's method to chemical knowledge had massive consequences for what counted as chemical knowledge and what did not.

Chemical knowledge was cleansed of all theological speculation and—again in Libavius' own words—ascended as technology the throne of physics.

34 See the new edition: Heinrich Khunrath, *Amphitheatrum Sapientiae Aeternae—Schauplatz der ewigen allein wahren Weisheit, vollständiger Reprint des Erstdrucks von [Hamburg] 1595 und des zweiten und letzten Drucks 1609*, eds. Carlos Gilly, Anja Hallacker, Hanns-Peter Neumann and Wilhelm Schmidt-Biggemann, Stuttgart-Bad Cannstatt 2014.

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—, *Alchemia […] e dispersis passim optimorum autorum, veterum et recentius exemplis potissimum, tum etiam praeceptis quibusdam operose collecta, adhibitisque ratione et experientia, quanta potuit esse, methodo accurata explicata et in integrum corpus redacta*, Frankfurt/M. 1597.

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Nature as Revelation
Philipp Melanchthon's Image of Nature

Günter Frank

1

The question of a possible connection between religion—or, more precisely, the emerging confessions—and the modern image of nature has led to a broad and ongoing discussion in the twentieth century, especially in the Anglo-American tradition of the 'social history of science'. In a pioneering study from 1938 that built on the Weberian thesis, the American sociologist Robert King Merton argued that the modern image of nature had been primarily the work of English Puritans and German Pietists.[1] In the period that followed, this thesis was frequently criticized, supplemented, and expanded, and various aspects were re-evaluated—for example, in the studies of the British historian of science Alfred Ruprecht Hall[2] and the British historian Christopher Hill.[3]

Research on Melanchthon in the twentieth century was rather unimpressed by this discussion and considered the question of his image of nature from various other perspectives. Usually, it was discussed against the backdrop of the oft-observed significance of astronomy and astrology to the humanists and Reformers and specifically in the context of the (alleged) Melanchthon-Copernicus controversy, that is, the contrast of the geocentric and heliocentric astronomical models. Melanchthon's so-called conservative attitude toward Nicolaus Copernicus and his insistence on ancient and Christian astronomy and astrology were interpreted from different viewpoints. From the perspective of the Reformation, this astronomical-astrological inertia was an 'unfortunate canonization of antiquity' based on a dogmatic faith in Aristotle and the Stoics, who had suppos-

1 Robert King Merton, *Science, Technology and Society in Seventeenth-Century England*, New York 1970; orig. pub. *Osiris* 4, no. 2 (1938), pp. 360–632.
2 Alfred Ruprecht Hall, *From Galileo to Newton, 1630–1720*, London 1963; idem, "Merton Revisited, or Science and Society in the Seventeenth Century", in: *History of Science* 2 (1963), pp. 1–16.
3 Christopher Hill, "Puritanism, Capitalism and the Scientific Revolution" in: Charles Webster, ed., *The Intellectual Revolution of the Seventeenth Century*, London 1974, pp. 243–253. From the literature in German, see Ruth Groh and Dieter Groh, *Weltbild und Naturaneignung: Zur Kulturgeschichte der Natur*, 2nd ed., Frankfurt am Main 1996. A kind of interim assessment of these extensive discussions can be found in H. Floris Cohen, *The Scientific Revolution: A Historiographical Inquiry*, Chicago 1994, here pp. 314–377.

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edly blinded Melanchthon to more recent scientific findings.[4] Wilhelm Maurer descended into speculation on this point: He argued that Melanchthon had a basically positive view of the new scientific discoveries. The real conflict, however, was said to be of a more religious nature in that Melanchthon had feared that the heliocentric worldview would revive a new astral divinity, which would conflict with the Reformist faith and the freedom of God and human beings.[5] Karl Hartfelder, in turn, traced Melanchthon's conservative tendency, his 'mind inclined to superstition', back to a biographical, characteristic trait rooted in his Swabian homeland that distinguished him from Luther and that was supposedly even more influential than his humanism.[6]

All these interpretations found their impetus in Melanchthon's commentaries on Aristotelian physics, the *Initia doctrinae physicae* of 1549, which they either considered irreconcilable with Luther's theology or understood as a hindrance to modernity in view of the emergence of the early modern natural sciences. The latter argument was based above all on Melanchthon's handwritten note on the first printed version of his physics in which, without naming names, he spoke of the innovation-addicted revolutionaries of astronomy, but in the editions from 1550 onward he essentially withdrew this sharp criticism.[7] In the later editions, of course, he did speak of the *De revolutionibus orbium caelestium*, which Copernicus, the canon of Thorn (now Toruń), had published in 1543. According to this view, therefore, Melanchthon had rejected the heliocentric model and thereby prevented innovations in science in Wittenberg. This (biased) judgment does not—as we know in the meantime—do justice to the historical circumstances. Since it is now generally agreed that Copernicus' heliocentric model was only gradually accepted by scientists and became widely accepted only during the seventeenth century,[8] so that now the question that must be answered is how to explain this history of the belated influence of *De revolutionibus*. In his pioneering study published in 2002,[9] Owen

4 Heinrich Bornkamm, "Kopernikus im Urteil der Reformatoren", in: idem, *Das Jahrhundert der Reformation: Gestalten und Kräfte*, 2nd ed., Göttingen 1966, pp. 177–185.

5 Wilhelm Maurer, *Melanchthon-Studien*, Gütersloh 1964, pp. 36, 65–66.

6 Karl Hartfelder, *Philipp Melanchthon als Praeceptor Germaniae*, Berlin 1889, pp. 190–197. On the context, see Günter Frank, *Die theologische Philosophie Philipp Melanchthons, 1497–1560* (Erfurter theologische Studien 67), Leipzig 1995, here pp. 301–314.

7 Melanchthon's relationship to Copernicus has been discussed thoroughly and convincingly in Walter Thüringer, "Paul Eber (1511–1569): Melanchthons Physik und seine Stellung zu Copernicus", in: Heinz Scheible, ed., *Melanchthon in seinen Schülern* (Wolfenbütteler Forschungen 73), Wiesbaden 1997, pp. 285–320; the handwritten note on the addiction to novelty ('amore novitatis') is published there: ibid., pp. 319–320.

8 On this, see the highly instructive references in Dieter Groh, *Schöpfung im Widerspruch: Deutungen der Natur und des Menschen von der Genesis bis zur Reformation*, Frankfurt am Main 2003, here pp. 613–621.

9 Owen Gingerich, *An Annotated Census of Copernicus' 'De Revolutionibus' (Nuremberg 1543 and Basel, 1566),* Leiden 2002. On this, see also the review by Christoph Lüthy, "Verspätete Wende: Wie Kopernikus im sechzehnten Jahrhundert gelesen wurde", *Frankfurter Allgemeine Zeitung*, no. 150 (July 2, 2003), p. N 3.

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Gingerich was able to demonstrate using all the surviving copies of the Nuremberg first edition and the Basel second edition with marginal notes, commentaries, calculations, and hypotheses by readers that many contemporary astronomers remained rather indifferent to the heliocentric model as long as its theories remained unproven empirically. For Copernicus had, strictly speaking, advanced two main theses: First, the famous thesis of the heliocentric model and, second, the thesis that all movements in the heavens were symmetrical in terms of structure and movement (the axiom according to which all celestial motions are uniform and circular or result from the composition of uniform and circular motions). This second thesis, however, was problematic. Based on the measurements Tyco Brahe had presented of the orbit of Mars, Johannes Kepler felt compelled to assume that it was neither circular nor regular. A significant empirical confirmation of heliocentric model, albeit partial, came only with Galileo's telescopic discovery of the phases of Venus in 1616. Only after Keplers and Galileos concurring achievements did the true career of the heliocentric model begin for the modern sciences.[10]

Melanchthon's relationship to Copernicus' heliocentric model was then again interpreted in connection with nominalism, insofar as his image of nature was said—by Hans Blumenberg, for example—to have consisted essentially of an anthropocentric teleology derived from Cicero and basic ideas of the Stoics.[11] So-called nominalism,[12] however, has to deal first with the problem of universals, that is, the question whether universal concepts truly exist or whether they are human constructions. This question is thus part of ontology, that is to say, a discipline Melanchthon did not address at all in his extensive scientific oeuvre. De-

10 Hans Bieri, *Der Streit um das kopernikanische Weltsystem im 17. Jahrhundert*, 2nd ed., Bern 2008.

11 Hans Blumenberg, "Melanchthons Einspruch gegen Kopernikus: Zur Geschichte der Dissoziation von Theologie und Naturwissenschaft", in: *Studium Generale* 13 (1960), pp. 174–183. Similarly, Groh, *Schöpfung im Widerspruch*, pp. 620–621, who refers to Thüringer, "Paul Eber", who does not, however, speak of nominalism or 'via moderna' in this context.

12 David Malet Armstrong, *Universals: An Opinionated Introduction*, Boulder, Col., 1989; Joseph M. Bochenski, Alonso Church, and Nelson Goodman, eds., *The Problem of Universals: A Symposium*, Notre Dame, Ind., 1956, esp. Bochenski, "Zum Universalienproblem", in: item, ed., *Logisch-Philosophische* Studien, Freiburg/München 1959, pp 131–152; Pierre Bourdieu, *Pascalian Meditations*, transl. Richard Nice, Stanford, CA, 2000; Carl Friedrich Gethmann, s.v. "Allgemeinheit", in: *Handbuch philosophischer Grundbegriffe*, vol. 1., 2nd ed., Munich 2003, pp. 32–51; see also s.v., "Universalien, Universalienstreit und Universalienstreit, moderner", in: *Enzyklopädie Philosophie und Wissenschaftstheorie*, vol. 4, ed. Jürgen Mittelstrass, Stuttgart 1996, pp. 406–413; Guido Küng, *Ontologie und logistische Analyse der Sprache: Eine Untersuchung zur zeitgenössischen Universaliendiskussion*, Vienna 1963; Wolfgang Künne, *Abstrakte Gegenstände: Semantik und Ontologie*, Frankfurt am Main 2007; Alain de Libera, *La querelle des universaux: De Platon à la fin du Moyen Âge*, Paris 1996; Wolfgang Stegmüller, *Glauben, Wissen und Erkennen. Das Universalienproblem einst und jetzt*, 3 rd ed., Darmstadt 1974; idem, ed., *Das Universalien-Problem*, Wege der Forschung 83, Darmstadt 1978 (an anthology with an introduction by Stegmüller); Peter Frederick Strawson, *Individuals: An Essay in Descriptive Metaphysics*, London 1971; Hans-Ulrich Wöhler, ed., *Texte zum Universalienstreit*, 2 vols., Berlin 1992.

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spite these two distinct traditions, whose content could never be reconciled, Melanchthon has often been called a nominalist Aristotelian.[13]

Finally—and this is the third approach to Melanchthon's image of nature—these commentaries on Aristotelian natural philosophy are said to have transformed it into a 'Lutheran discipline' in that it was determined by Luther's essential theological principles, above all Luther's distinction between the Law in the Gospel.[14] In noting this Sachiko Kusukawa had indeed identified an essential theological principle that characterizes Melanchthon's adaptation of the *Physics*. But it does not seem reasonable to me to call this a 'Lutheran' natural philosophy. That thesis assumes that Aristotle's natural philosophy became 'Lutheran' when

13 The suggestion that Melanchthon's belonging to the 'via moderna' in Tübingen made him an adherent of nominalism can be traced all the way back to a note by his friend and first biographer: Joachim Camerarius, *De vita Philippi Melanchthonis Narratio, recensuit, Notas, Documenta, Bibliothecam Librorum Melanchthonis Aliaque Addidit Ge. Theodor. Strobelius*, Halle 1777, pp. 22–23. Camerarius is describing here the Platonic theory of ideas from which particulars are constituted, as the doctrine of 'reales' or as 'via antiqua', whereas the doctrine of 'Nominales' or of the 'moderni' is characterized by the doctrine that universal concepts are constituted from particulars in cognition: 'Quarum una veluti *Platonicam* de Ideis seu formis abstractis separatisque ab iis, quorum moles corporum sensibus subiiceretur, sententiam tuebatur. Haec de eo quod generalis cogitatio comprehendit, ut Hominem, Animantem, pulcritudinem, etiam spondam atque mensulam, quia natura et res singularis constituitur, *Reales* isti sunt nominati. Altera pars *Aristotelem* magis sequens, speciem istam de iis, quae suam naturam ipsa haberent, universis colligi docens, et concipi intelligendo notionem hanc ex singulis quibusdam existentem atque contractam, neque naturas esse has per se ipsas priores ingulis, neque re, sed nomine tantum consistere: *Nominales* appellati fuere et moderni.' (ibid., p. 22) This is not the place to examine further whether Camerarius' characterization accurately depicts either so-called Tübingen nominalism or Melanchthon's. Melanchthon's so-called nominalist Aristotelianism became a main concept of the twentieth century. See, for example, Hartfelder, *Philipp Melanchthon*, p. 42; Hans Maier, *An der Grenze der Philosophie: Melanchthon, Lavater, David Friedrich Strauss*, Tübingen 1909, pp. 29–30; Wilhelm Dilthey, "Das natürliche System der Geisteswissenschaften im 17. Jahrhundert", in: idem, *Aufsätze zur Philosophie*, ed. M. Marquardt, East Berlin 1986, p. 241; Ulrich Leinsle, *Das Ding und die Methode: Methodische Konstitution und Gegenstand der frühen protestantischen Metaphysik*, Augsburg 1985, pp. 15–16; Heinz Scheible, s.v. "Melanchthon, Philipp", TRE 22 (1992), p. 371; idem, *Philipp Melanchthon: Vermittler der Reformation; Eine Biographie*, Munich 1997, p. 26. The question of Melanchthon's 'nominalism' can also be approached via his position on the problem of universals, which he discussed repeatedly (CR 20, pp. 714–715; CR 13, pp. 519–520, 529, 750–51; CR 13, pp. 142–143, 145–146, 165–166). But the rather minimal importance of the question of universals in comparison to his oeuvre as a whole, as well as in its consequences for his understanding of philosophy, suggests rather a certain restraint is in order when judging his nominalism. On this discussion, see Siegfried Widenhofer, *Formalstrukturen humanistischer und reformatorischer Theologie bei Philipp Melanchthon* (Regensburger Studien zur Theologie 2), 2 vols., Berlin 1976, pp. 102–106; and Frank, *Die theologische Philosophie*, pp. 33–37.

14 Sachiko Kusukawa, *The Transformation of Natural Philosophy: The Case of Philipp Melanchthon* (Ideas in Context 34), Cambridge 1995, on this, see also the review by Maija Kallinen, "Natural Philosophy 'Melanchthonized', or How to Create a Lutheran Discipline?", *Studies in History and Philosophy of Science* 27, no. 3 (1996), 381–386. See also Sachiko Kusukawa, "The Natural Philosophy of Melanchthon and His Followers", in: *Sciences et religions: De Copernic à Galilée, 1540–1610; Actes du colloque international organise par l'École Francais de Rome*, Rome 1999, pp. 443–453.

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Melanchthon adapted it because one of Luther's theological principles, the dialectic of the Law and the Gospel, found its way into the physics of the Stagirite. Here the paradigm of confessionalization, which has recently become an important hermeneutic key for the early modern history of science,[15] seems to claim validity for the history of science in general that as a Lutheran natural philosophy Melanchthon adaptation of Aristotelean physics is itself part of confessionalization.

Before we can answer the question of how to categorize his image of nature, it is necessary to describe the character of Melanchthon's commentaries on Aristotelian natural philosophy and present their central ideas. It should be pointed out first that his adaptation is neither a commentary nor a paraphrase of Aristotelian physics. In keeping with his topical understanding of science, Melanchthon instead used this model to develop a few of his own basic questions of physics.[16] At the same time, it is striking that a chapter of the physics is dedicated to the philosophical concept of God.[17] In Aristotle, reflections on the idea of God are found not in the *Physics* but rather in the twelfth book of the *Metaphysics*, in which Aristotle explained his theory of the νοῦς that thinks itself. What concept of God does Melanchthon develop in his physics?

15 Only the most fundamental studies from the enormous literature on this subject can be mentioned here: *Die katholische Konfessionalisierung: Wissenschaftliches Symposium der Gesellschaft zur Herausgabe des Corpus Catholicorum und des Vereins für Reformationsgeschichte*, Münster 1995; Arno Herzig, *Der Zwang zum wahren Glauben: Rekatholisierungspolitik vom 15. bis zum 18. Jahrhundert*, Göttingen 2000; Maximilian Lanzinner, "Konfessionelles Zeitalter", in: *Handbuch der deutschen Geschichte*, ed. Wolfgang Reinhard, 10th ed., Stuttgart 2001, pp. 3–203; Ernst Walter Zeeden, *Konfessionsbildung: Studien zur Reformation, Gegenreformation und katholischen Reform*, Stuttgart 1985; Heinz Schilling, ed., *Die Reformierte Konfessionalisierung in Deutschland: Das Problem der 'Zweiten Reformation'* (Wissenschaftliches Symposium des Vereins für Reformationsgeschichte 1985), Gütersloh 1986; Hans-Christoph Rublack, ed., *Die Lutherische Konfessionalisierung: Wissenschaftliches Symposion des Vereins für Reformationsgeschichte 1988*, Gütersloh 1992; Wolfgang Reinhard, "Gegenreformation als Modernisierung? Prolegomena einer Theorie des konfessionellen Zeitalters", in: *Archiv für Reformationsgeschichte* 68 (1977), pp. 226–251; idem, "Sozialdisziplinierung, Konfessionalisierung, Modernisierung: Ein historiographischer Diskurs", in: Nada Boskovka Leimgruber, ed., *Die Frühe Neuzeit in der Geschichtswissenschaft: Forschungstendenzen und Forschungserträge*, Paderborn 1997, pp. 39–55; Harm Klueting, "'Zweite Reformation': Konfessionsbildung, Konfessionalisierung: Zwanzig Jahre Kontroversen und Ergebnisse nach zwanzig Jahren", in: *Historische Zeitschrift* 277 (2003), pp. 309–341; idem, *Das Konfessionelle Zeitalter, 1525–1648*, Stuttgart 1989; Kaspar von Greyerz, et. al., eds., *Interkonfessionalität, Transkonfessionalität, binnenkonfessionelle Pluralität: Neue Forschungen zur Konfessionalisierungsthese* (Schriften des Vereins für Reformationsgeschichte 201), Gütersloh 2003.

16 For details on Melanchthon's understanding of science, see Günter Frank, *Topik als Methode der Dogmatik: Antike, Mittelalter, Frühe Neuzeit* (Theologische Bibliothek Töpelmann 179), Berlin 2017, here pp. 172–79; idem, "Zum Wissenschaftsverständnis: Melanchthons Topik", *Melanchthon-Handbuch*, ed. Günter Frank, Berlin 2017, pp. 321–331.

17 See "De Deo", in: *Initia doctrinae physicae* (CR 13, pp. 198–202).

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2

Melanchthon's philosophical definition of the concept of God is: 'God is the eternal mind, the cause of good in nature.'[18] Just as the Pythagorean Timaeus had spoken of the composition of the world according to mathematical numbers, Melanchthon follows Plato in speaking of God as a geometer in whom the wisdom of a divine architect is said to be revealed.[19] And, as Melanchthon emphasizes at the beginning of his natural philosophy, this concept of God should explicitly be preferred to the Aristotelian understanding (in the sense of the *Metaphysics*).[20]

These initial observations already make it clear that Melanchthon's natural philosophy is superimposed with Platonic or Neoplatonic ideas.[21] Following Augustine,[22] he derived his understanding of nature from the creation myth of Timaeus, and it amounted to a justification of the intelligibility of reality, insofar as the whole of reality with its quasi-mechanic causal connection—Melanchthon explicitly speaks of the machine of the world (*machina mundi*)—has emerged from the ideas inherent in the divine spirit. In a fundamental sense, this belongs to the

18 Ibid., p. 199: 'Talis est haec Platonica: Deus est mens aeterna, causa boni in natura'.

19 CR 12, pp. 246–247.

20 CR 13, p. 195: 'Notum est, Aristotelem initio dicere de materia elementorum. Sed nos ordiemur a prima causa efficiente, et a corporibus coelestibus, ut Plato in Timaeo, ut studiosi initio ordinem rerum praecipuarum in natura considerent.'

21 On the Platonic superimposition of Aristotle's natural philosophy, see Melanchthon's own reference at the beginning of his *Initia doctrinae physicae* (CR 13, p. 195; see note 20). This Platonic superimposition of Aristotle's natural philosophy following on Timaeus' Platonic myth of creation has yet to be taken into account in the scholarship on Melanchthon. As far as the current discussion is concerned, Melanchthon continues to be interpreted as an Aristotelean (on the discussion of this, see Frank, *Die theologische Philosophie*, pp. 15–30). It is, however, completely overlooked in this discussion, which is made more difficult by W. Maurer's scarcely tenable references, that Melanchthon had not only explicitly developed a Platonic concept of God as the culmination of his philosophical theology (more on this later), but that his commentary on the Aristotelian doctrine of the soul is also superimposed platonically (for detail on this, see Frank, *Die theologische Philosophie*). Melanchthon also explicitly wrote commentaries on the Platonic laws, that have not yet been studied at all for their significance to moral philosophy. It is more important in our context, however, that in March 1534 a large commentary on the collected works of Plato, above all on Timaeus, was published in Basel. This monumental commentary written in Greek, which is in the library of the Protestant ministry of St Augustine's Monastery in Erfurt and bears the significant title "*ΑΠΑΝΤΑ ΠΛΑΤΩΝΟΣ: Platonis omnia opera cum commentariis Procli in Timaeum & Politica, thesauro veteris Philosophiae maximo*", has not only remained almost entirely unknown to Melanchthon scholarship but has not even been discussed as part of his biography. The same is true for research on the early modern period in general. After Marsilio Ficino's first publication of it in Florence in 1482–84, published in Latin translation in Venice in 1513, Melanchthon's handwritten commentaries in Simon Grynäus' edition of Plato's *Opera omnia*, Basel: Johann Walder 1534, is probably the second extensive commentary of the early modern period in the Latin Occident. Finally, it is notable, though no longer surprising after these references, that Melanchthon himself justified the history of creation explicitly based on Plato's *Timaeus* in his foreword to Martin Luther, *In librum Mose enarrationes*, Wittenberg: n.p., 1544, (CR 5, pp. 258–268, here: p. 261).

22 Augustine, *De diversis Quaestionibus octoginta tribus liber unus*, XLVI, 2; MPL 40 (*Op. omn.* 6), p. 30.

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Platonic or Neoplatonic tradition, however strong the echoes of Aristotle may be. On the basis of this Platonic concept of God, moreover, a wealth of statements on the divine essence are derived that go far beyond the tradition of medieval and Scholastic theology. As Melanchthon emphasizes, this concept of God—and this is made particularly clear by the optimistic possibility of knowledge in this theological/philosophical conception—that God is a spiritual being, intelligent, eternal, cause of the good in nature, that is, true, good, just, omnipotent creator of all good things, and so on. These reflections on the human mind (*cogitationes humanae mentis*) are also contained in the Platonic definition; as Melanchthon emphasizes, they are true, learned, and founded on certain proofs, even if it is necessary to supplement them by knowing how God revealed himself.[23]

The Platonic idea of God has other implications as well. We should mention here first the theory of the relatedness of the essence of the divine and the human mind. This theory is at the same time the philosophical basis for Melanchthon's concept of God, which he repeatedly and exclusively traced back to Plato: 'God is the eternal mind, the cause of good in nature.'[24] This concept of God represents in the sense the culmination of his image of nature, but central intelligence of the theology are also linked to concerns of the philosophical theology and that is precisely, according to Melanchthon, what turns the understanding of nature into 'natural theology', although he does not use that term. This is true first and

23 This argument is especially detailed in CR 21, p. 610: 'Platonica haec est: Deus est mens aeterna, causa boni in natura. […] Deum esse mentem aeternam, id est, essentiam spiritualem, intelligentem, aeternam, causam boni in natura, id est, veracem, bonam, iustam, omnipotentem conditricem bonarum rerum omnium et totius ordinis in natura et humanae naturae ad certum ordinem, id est, ad certam obedientiam. Haec omnia complexus est Plato. Sed hae sunt adhuc humanae mentis cogitationes, quae etsi verae et eruditae sunt et ex firmis demonstrationibus natae, tamen addendum est, qualem se Deus ipse patefecerit.'

24 He did so explicitly for the first time in his *Enarratio in Evangelium Johannis* of 1536 (CR 15, p. 103): 'Alii sunt, ut Plato, Cicero, qui moventur ratione, ut sentiant Deum esse aliquam mentem aeternam, sicut Plato dicit, causam boni'. On the many citations of this Platonic concept of God in Melanchthon's writings, see Frank, *Die theologische Philosophie,* p. 211 n. 83. In his foreword to Luther's *De novissimis verbis Davidis*, transl. Caspar Cruciger, Leipzig 1550, with an eye to the knowledge of God and the associated concept of God, Melanchthon himself referred to Plato's knowledge, which was to be taken seriously even if, like all pagan knowledge, it needed to be supplemented (CR 7, pp. 581–585). In addition to this widespread Platonic concept of God, there is just one passage in the *Erotemata dialectices* of 1547 in which Melanchthon seems to suggest an Aristotelian concept of God in that he relates the concept of substance to God (CR 13, p. 528). The extent to which this application of the concept of substance to the concept of God is significant can ultimately only be demonstrated by this philosophical significance of the theory of categories. Like many humanists, however, Melanchthon interpreted the theory of categories rhetorically, that is to say, he was interested not in the ontological significance of the categories but in a real relationship of 'res et verba'. Moreover, this passage in the dialectic later contains a reference to the human mind being too weak to penetrate the interior of the thing, which shows that the concept of God in this dialectic is Platonic as well and based on the theory of 'notitiae'. (CR 13, p. 529: 'et Deo gratias agamus, quod aliquo modo et sese et naturam rerum nobis ostendit, et aliquas notitias certas tradidit').

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foremost for the justification based on the theology of creation for a philosophical knowledge of God. 'God wanted to be known and be seen. So he both created all creatures and established the wonderous work of art in order to prove to us irrefutably that reality does not exist by chance but rather that an eternal, architectural mind exists, good and just, who sees and judges the deeds of human beings.'[25] In Creation, God communicated the best things in him to the human mind, namely, wisdom, justice, joy, and free will.[26] But that means in a fundamental sense that for Melanchthon nature should always be understood as creation. In his idea of nature's creation, that is, as a place of revelation in which the final reality of the world appears, resonates throughout the ancient idea of the image of nature.[27] In Greek philosophy, the concept of 'nature' was expressed both as κόσμος and as φύσις. They understood κόσμος to mean the beautiful order. The word φύσις was translated into Latin as *natura*. *Natura*, in turn, derives from *nasci*, or 'to be born'. Its counterpart in Greek is γένεσις, or 'coming into being', whereby this always meant a kind of appearance, a being-brought-to-light. The Latin concept of nature emphasizes less appearance and showing oneself than being produced and becoming. But both meanings come together in the understanding of nature as creation that is characteristic of Melanchthon. Nature is at once the place of revelation, that is, of the appearance of its ultimate reality, and also that which has been made by the Creator. This concept of nature is thus still an attempt to reconcile physics with biblical Creation. The first to separate the two perspectives, and hence introduce the modern concept of nature tied only to empirical practice, was probably Francis Bacon.[28]

3

At the center of this nature understood as creation is the human being. This outstanding role of the human being in nature is already clear by Melanchthon's Platonic or Neoplatonic theory of the relatedness of the essence of the human and the divine spirit.[29] The core of this philosophical definition of the essence of the human mind is the theory of exemplarism, which ultimately goes back to

25 CR 21, p. 637: 'Voluit Deus innotescere et se conspici. Ideo et condidit omnes creaturas et miram artem adhibuit, ut convinceret nos, non extitisse res casu, sed esse aeternam mentem, architectatricem, bonam, iustam, spectantem hominum facta et iudicantem.'

26 CR 12, p. 592; 13, pp. 124–125, et passim. The theological foundation of Melanchthon's image of nature is also emphasized in Peter Barker and Bernhard R. Goldstein, "Theological Foundations of Kepler's Astronomy", *Osiris* 16, no. 2 (2001): pp. 88–113, here pp. 94–95.

27 For a detailed discussion of what follows, see Georg Picht, "Die Entwicklung des Naturbegriffs", in: idem, *Der Begriff der Natur und seine Geschichte*, 2nd ed., Stuttgart 1990, pp. 79–95.

28 See Friedrich Kaulbach, s.v. "Natur. V. Neuzeit", in: *Historisches Wörterbuch der Philosophie*, vol. 6, Basel 1984, 468–478, here p. 469.

29 I restrict myself here to the essential aspects of the theory of the relatedness of human and divine essence. For a detailed discussion of this complex theory, which in the 'notitiae naturales' is linked to aspects of the philosophy of mind, epistemology, cognitive and noetic psychology, epistemology, and gnoseology, see Frank, *Die theologische Philosophie*, pp. 112–29; idem, *Die Vernunft des Gottesgedankens: Religionsphilosophische Studien zur frühen Neuzeit*

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the Platonic—and (since Augustine[30]) Christian-baptized—theory of methexis.[31] Melanchthon interprets the particular-form relationship of the divine and the human mind as a relationship of participation,[32] in which the human mind and the 'notitiae naturales' with which it is endowed represent more than just a light of divine wisdom. In the faculties of the soul, the human mind even participates in the divine rule of the world.[33]

This central position of the human being in nature understood as creation clarifies a programmatic parenthetical remark in his physics in which Melanchthon addresses the question what the world is: 'This so great and wondrous work was created by God so that it could be the home of human nature in which God wanted to be known and seen, and the goodness of God and his enormous love of the human species must be made known again and again, because in truth such a great work has been undertaken for our sake'.[34] Melanchthon was thus part of an early modern 'trend toward the establishment of an optimistic-metaphysical worldview' and of an 'anthropocentric theology'.[35] For not only does the human mind, because of its essence of relatedness, stands in a special relation to God, but it is also the instrument through which God can be known. For that reason, God created human beings so that a knowledge of God which can shine in them and so they themselves would be the clearest evidence of God's existence.[36] Although, as Melanchthon adds, this light of the knowledge of God is darkened by the Fall, at least rays of light (*scintillae*) remain, so that, for example, there is no doubt

(Quaestiones 13), Stuttgart 2003, here pp. 58–64. On this, see also the discussion in Groh, *Schöpfung im Widerspruch*, pp. 630–634.

30 *De ordine* II 18, 47.

31 *Parmenides* 132–36; *Phaidon* 100 b–d.

32 CR 13, p. 5: 'Exemplumque Dei quisque est in imagine parva'; see also in the *Doctrina anatomica* of 1550 (CR 11, p. 941): 'hominem esse parvum mundum, quia mens imago Dei est.' For additional citations from various writings that are relevant to this theory of the relatedness of human and divine essence, which is central to Melanchthon's thought, see Frank, *Die theologische Philosophie*, pp. 88–89 esp. nn. 154–159.

33 CR 11, p. 942: 'Nec tantum convincit nos hic ordo, ut esse Deum fateri cogamur, sed etiam qualis sit, monet, et imaginem gubernationis divinae in nobis circumferimus. Tota antiquitas hoc modo distribuit homines vires.'

34 CR 13, pp. 213–14: 'Quid est Mundus […] conditum esse hoc tantum et tam mirandum opus a Deo, ut sit domicilium humanae naturae, in qua Deus innotescere et conspici voluit, ac saepe cogitanda est bonitas Dei, et erga genus Humanum, ingens amor, quod vere nostra causa tantus labor institutus est.'

35 For more detail on this, see Günter Frank, "Philipp Melanchthons 'Liber de anima' und die Etablierung der frühneuzeitlichen Anthropologie", in: Michael Beyer and Günther Wartenberg, eds., *Humanismus und Wittenberger Reformation: Festgabe anlässlich des 500. Geburtstages des Praeceptor Germaniae Philipp Melanchthon am 16. Februar 1997, Helmar Junghans gewidmet*, Leipzig 1996, pp. 313–326, here p. 316.

36 For example, in Melanchthon's *Liber de anima* of 1553 (CR 13, p. 138): 'Sicut autem homo conditus est, ut in eo luceat notitia Dei, et ut ei Deus communicet suam sapientiam et bonitatem, ita mentem humanam voluit evidentissimum de ipso testimonium esse.'

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about numbers.[37] And based on this ability to recognize God, which can even be lost though the Fall, proofs of God become possible for Melanchthon, which he then lays out in detail both in his physics and in his commentary on the Epistle to the Romans of 1540: the proof of causality, movement, finality; the proof from the 'ordo naturae' from numbers, Providence, the order of the world, astronomy and astrology, as well as—the strongest proofs—the human mind itself and the ability with which it is endowed distinguish between good and evil as well as the experience of conscience.[38] For Melanchthon, proofs of God are 'true rational reasons that are endowed to the human soul'.[39] 'For from the many vestiges, that of God is inferred. But such inference would not be possible if the [human] mind were not endowed by God with certain "notitia" or πρόληψις'.[40] Nature is not just the place of the appearance of God as final reality but becomes at the same time the place of the knowledge of God.

In this context, already in the tradition, the doctrine of human beings being the image of God and the consequences of the Fall play a special role. The fact that the human being can use reason is an expression of being made in the image of God.[41] Already in the early church, this question was discussed in direct connection with the problem of the consequences of the Fall. How far did the faculties of the human soul reach when it had perhaps been destroyed by the Fall? From the time of Irenaeus of Lyon (d. 202), it had been a universal conviction of Christianity that the consequences never went so far as to eliminate the human abilities of reason and will—it was called the 'imago'—whereas the human being as image of Christ (*similitudo*) had been lost because of sin. According to Melanchthon, the Fall had led to the loss of the 'imago' and of the state of original righteousness; nevertheless 'even now after the Fall, the mind and the true "notitiae" in the mind are evidence that God exists and that he is an intelligent being, a true, just, beneficent, pure deliverer from the wicked'.[42] 'Notions of God' (*notitiae de Deo*) are indications of the structural similarity to God that human beings did not lose as a result of the Fall and that therefore form the basis for the possible knowledge of

37 Ibid.: 'Esset autem haec lux in nobis multo clarior, si natura hominum non languefacta esset, sed tamen adhuc religquae sunt scintillae tantae, ut, de numeris nulla est dubitatio.'

38 For more detail on this, see Frank, *Die theologische Philosophie,* pp. 227–334.

39 See the references following the proofs of God in the commentary on the Epistle to the Romans: 'Postea profecto ad confirmandas bonas opiniones, multum prodest tenere infixas animo veras rationes, quae testantur esse Deum conditorem et conservatorem rerum' (CR 15, p. 566).

40 Ibid., 564: 'Nam ex multis vestigiis ratiocinatur ista de deo. Neque tamen hae ratiocinaretur, nisi etiam insita esse menti quaedam notitia seu πρόληψις de Deo.'

41 Christoph Markschies, s.v. "Gottebenbildlichkeit. II. Christentum", in: *Religion in Geschichte und Gegenwart*, vol. 3, 4th ed., Tübingen 2000, pp. 1160–1163; Leo Scheffczyk, s.v. "Gottebenbildlichkeit. III. Theologie- und dogmengeschichtlich", in: *Lexikon für Theologie und Kirche*, vol. 4, 3 rd ed., Freiburg im Breisgau 1995, pp. 874–876.

42 CR 12, pp. 591–592: 'nunc post lapsum tamen mens et verae notitiae in mente testimonia sunt, quod sit Deus et quod sit essentia intelligens, vera, bona, iusta, benefica, casta, vindex scelerum etc.'

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God. And, finally, what is characteristic of the relationship of philosophy and theology as a whole is also true for the knowledge of God: philosophical knowledge of God is the knowledge of the Law[43] and must therefore be distinguished from the Gospel, that is, whatever is accessible to the human mind in the knowledge of God is insufficient in terms of the theology of revelation and soteriologically irrelevant. Melanchthon made this distinction, which goes back to Luther's dialectic of the Law and the Gospel, clear terminologically as well. Statements about the existence of God and statements about the essence of the divine that are accessible to philosophical knowledge of God are ordinarily placed under the heading of 'qualis sit Deus', whereas the term 'essentia Dei' refers exclusively to those predicates of essence such as the divine Trinity or to soteriology, which are the subjects of revelation.[44] Nevertheless, despite this insufficiency in terms of the theology of revelation and soteriology, it is clear for Melanchthon in any case that there is a knowledge of God that is possible for all human beings even outside of the church and the theology of revelation.[45]

4

From the discussion thus far, we can already bring out central aspects of Melanchthon's image of nature:

1. Nature is the result of creation by a divine, architectural mind. In this respect, nature is always creation and at the same time revelation of this architectural creator.
2. At the center of the understanding of nature as creation stands the human being. The human mind not only has an essential relatedness to the divine mind, weakened by the Fall but not lost, but can also recognize the architectural creator in nature.

But what does the true image of nature that Melanchthon provided in his writings look like?

Nature is characterized by a thorough intelligibility that not only has its foundation in the eternal, architectural mind as its creator but is also manifested in mathematical structures that constitute the order of the cosmos.[46] Just as the Py-

43 CR 24, p. 865: 'Intelligitne natura esse Deum. Respondeo: Ratio naturaliter intelligit esse Deum, et agnoscit aliquo modo, qualis sit. Nam mens habet aliquam notitiam legis: sicut Plato dicit: Deus est mens aeterna, causa boni in natura.'

44 CR 7, pp. 582–585; CR 14, pp. 415–417; CR 21, pp. 609–610; CR 23, p. 497.

45 CR 23, p. 213: 'Platonica (descriptio), etsi est insufficiens, tamen eas proprietates continet, quae utcunque luce naturali de Deo sine patefactione divina cerni possunt. Est autem haec descriptio Deus est mens aeterna causa boni in natura.'

46 For more detail on what follows, see Günter Frank, "Gott und Natur: Zur Transformation der Naturphilosophie in Melanchthons humanistischer Philosophie", in: idem and Stefan Rhein, eds., *Melanchthon und die Naturwissenschaften seiner Zeit* (Melanchthon-Schriften der Stadt Bretten 4), Sigmaringen 1998, pp. 43–58. See also the references in Groh, *Schöpfung im Widerspruch*, esp. pp. 605–608.

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thagorean Timaeus spoke of the composition of the body of the world based on ratios of numbers,[47] Melanchthon follows Plato in speaking of God as a geometer in whom the wisdom of the divine architect is revealed.[48] This also justifies the primacy given to the teleological thinking that determines this image of nature. But to the extent that nature in general and the teleology of nature are the place of the revelation of its creator, the teleology of nature becomes the theology of nature. Corresponding on the other side to this fundamental reflection based on the metaphysics of numbers is the outstanding importance of the geometric/mathematical method as a model to a general methodology for all scientific disciplines;[49] more than that: mathematics itself becomes a proof of God.

Melanchthon's idea of nature—he himself speaks of the physics of the 'machina mundi'[50] or of the 'universa machina'[51]—is characterized by a continuous causal nexus and by mathematical structures that are not separate from the divine reason for the world but is itself the work of an ordering, intelligent reason, a work that can also be recognized by the human mind. This idea inevitably leads to an understanding of nature that presents an almost optimistic image of the world and is characterized by three aspects:

1. The idea of a continuous causal nexus to explain nature that has its counterpart in the human mind, which can also make true statements about nature
2. The idea of a machine of the world (*machina mundi*) as the work of an ordering and intelligent reason, which
3. to the extent all of nature is created for human use, leads to (theological) anthropocentrism.[52]

This metaphysical optimism had been established under the guise of Melanchthon's theology, above all the theology of creation and the human being as image of God. That is to say, despite the absolute primacy of the theology of salvation, the rationality and intelligibility of the world are recognized. It is clear that the

47 *Timaios* 31c–32b, 53b–54c.
48 CR 12, pp. 246–247.
49 For more detail on this understanding of science, see Frank, *Die theologische Philosophie*, pp. 159–182.
50 CR 13, p. 206.
51 Ibid., p. 294.
52 This theological anthropocentrism is illustrated by various motifs: everything is created for the use of human beings because God cares for them (CR 13, pp. 204–205: 'Cum autem manifestum sit haec ordinata esse propter hominum utilitatem, fatemur vitam hominum Deo curae esse. Xenophon hoc argumentum recitans, inquit, Deum esse φιλόζωον, id est, amantem animantium, quia instituerit temporum distributionem, convenientem rebus nascentibus, quae necessariae sunt ad tuendam vitam animantium'.); the world was created as a 'domicilium' for human beings (ibid., p. 213: 'propterea quod miranda est pulchritudo coelestium et terrestrium corporum, et humanae naturae, propter quam hoc tantum et tam ornatum domicilium conditum est'); and the Ciceronian motif that everything in nature exists for the sake of human beings (ibid., p. 214: 'omnia in natura rerum propter homines nasci, homines autem natos esse propter Deum, videlicet, ut innotescat et celebretur Deus').

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theology of salvation and the theology of creation will compete with each other somewhat. Since even outside of revelation—and here Melanchthon takes up Augustine's theme of the 'book of nature'[53]—nature is a book or mirror in which God reveals himself.[54] This talk of the 'book of nature' is of course already natural theology, since just as God reveals himself in the book of the Holy Scriptures, so too he reveals himself in the (second) book of nature.

Such an image of nature determined the early modern image of the world and is documented for scholars such as Copernicus, Galileo Galilei, Isaac Newton, Robert Boyle, and Giambattista Vico.[55] Melanchthon's metaphysical optimism joined with the return of the Platonic myth of creation and the Stoic idea of an anthropocentric theology of nature. Scholars today largely agree that this Platonic conception, which is essentially 'natural theology', was superimposed on Aristotelian nature philosophy and became established at the threshold to the early modern period. And this worldview had a successful career, as studies in the social history of modern science, in particular by Anglo-American scholars, have been able to show.

However—and here I return to the point mentioned at the beginning, which Sachiko Kusukawa raised with her interpretation of Melanchthon's physics as a Lutheran discipline—this metaphysical optimism of Melanchthon's image of nature is subordinated to a salvation doctrine. For all the metaphysical optimism, intelligibility of the world, and teleological anthropocentrism that characterize his image of nature, it is merely the recognition of the Law. 'As in the doctrine of the church', as Melanchthon emphasizes in the chapter 'Deo' in his physics, 'it is necessary to remind people frequently of the difference between the Law and the Gospel, so I remind my reader that the natural philosophical knowledge of God is knowledge from the Law and not from the Gospel'.[56] This theological structural principle, which Melanchthon took from Luther's theology and applied to all of his scientific works, amount to a recognition that all human knowledge is insufficient soteriologically, that is, for the state of human salvation before God. Does this soteriological proviso turn Melanchthon's commentaries on Aristote-

53 Augustine, *De Genesi ad litteram*, MPL 34 (*Op. omn.* 3.1), pp. 219–222.

54 CR 13, p. 198: 'Hanc doctrinam de Deo mens humana circumferens, tanquam liber est et speculum monstrans Deum.' On the theological and philosophical assumptions and their tradition by the early church fathers up to Augustine, see Ruth Groh, "Theologische und Philosophische Voraussetzung der Rede vom Buch der Natur", in: Aleida Assmann, Ulrich Gaier, and Gisela Trommsdorff, eds., *Zwischen Literatur und Anthropologie: Diskurse, Medien, Performanzen*, Tübingen 2004, pp. 139–146, and Dieter Groh, "Die Entstehung der Schöpfungstheologie oder der Lehre vom Buch der Natur bei den frühen Kirchenvätern in Ost und West bis zu Augustin", in: ibid., pp. 147–160.

55 On the whole picture with relevant literature, see Frank, "Gott und Natur"; Groh and Groh, *Weltbild und Naturaneignung*; Dieter Groh, *Göttliche Weltökonomie: Perspektiven der Wissenschaftlichen Revolution vom 15. bis zum 17. Jahrhundert*, Frankfurt am Main 2010.

56 CR 13, p. 198: 'Ut autem in doctrina Ecclesiae, necesse est saepe commonefieri homines de discrimine Legis et Evangelii, ita hic praemoneo auditores, physicam de Deo notitiam, esse Legis notitiam, non Evangelii.'

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lian physics into a 'Lutheran discipline'? This question combines various motifs from Luther's theology that seem to contradict such metaphysical optimism, for example, his radical doctrine of Original Sin or even his theological critique of Aristotle, which led to his epistemologically resigned principle: 'Reason cannot grasp and understand even the natural work of God's creation'.[57] Hardly anyone has taught that a philosophical knowledge of God could lead to human salvation. I am only aware of the treatise—very influential in early modern discussions—*Liber naturae sive creaturarum* (written 1434–1436) by the Catalan physician and philosopher Raymond of Sabunde (d. 1436), which over the course of its publication history was also known as *Theologia naturalis*.[58] Sabunde's treatise was, in general, written to counter the idea that reason and faith, philosophy and theology, were irreconcilable opposites. On the contrary, according to Sabunde, the latter science is said to easily teach all the necessary truths about God and human beings and everything that is necessary for salvation of human beings, so that they can achieve through it (natural theology) eternal life.[59]

Unlike for Sabunde, for Melanchthon it is clear that however far-reaching the human ability to know God and nature might be, they are fundamentally insufficient for their salvation. And perhaps that is also the reason why there is no surviving critique by Luther of Melanchthon's metaphysical optimism or the teleological anthropocentrism of his image of nature.

57 WA Tr 3, p. 426.

58 Raymond of Sabunde, *Incipit theologia naturalis siue liber creaturarum: Specialiter de homine et de natura eius*, Deventer ca. 1485. On Rabunde's natural theology, see David Matzke, *Die natürliche Theologie des Raymundus von Sabunde: Ein Beitrag zur Dogmengeschichte des 15. Jahrhunderts*, Breslau 1846; Gabriel Compayré, *De R. Sabundo ac de theologiae naturalis libro.* Paris 1872; F. Cicchiti-Suriani, *Sopra R. Sabonda, teologo, filosofo e medico del secolo XV*, L'Aquila 1889; Johannes Schenderlein, *Die philosophischen Anschauungen R. von Sabunde*, Leipzig 1898; Konrad Feiereis, *Die Umprägung der natürlichen Theologie in Religionsphilosophie: Ein Beitrag zur deutschen Geistesgeschichte des 18. Jahrhunderts* (Erfurter theologische Studien 18), Leipzig 1965, pp. 6–10; Jaume de Puig, "Escriptura i actitud humanistica en el 'Liber Creaturarum' de Ramón Sabunde", in: *Revista Catalana de Teologia* 3 (1978): 127–151; idem, *Les sources de la penseé philosophique de Raimond Sebond (Ramon Sibiuda)*, Études montaignistes 17, Paris 1994; idem, *La filosofia de Ramon Sibiuda*, Barcelona 1997.

59 See the evidence in Feiereis, *Die Umprägung der natürlichen Theologie*, pp. 6–10; esp. p. 7 nn. 9–13.

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God in Time and Space
Socinian Physics and Its Opponents

Sascha Salatowsky

1 Introduction

In the course of the 17th century, substantial changes took place both in physics and theology that encompassed also their mutual relationship. The old scholastic unity of philosophy and theology disintegrated. Philosophy was no longer the handmaid of theology (*ancilla theologiae*), but fought instead for its autonomy and freedom to philosophise (*libertas philosophandi*) independently from theological requirements. At the same time, theology lost its status as a leading science and came under increasing pressure to justify its doctrines, to demonstrate the truth of the Scripture and to accept the independence of philosophy and the sciences. Physico-theology at the end of the 17th and the beginning of the 18th century was only an interlude which could not prevent the fundamental separation of these disciplines.[1] Moreover, the foundation of philosophy in general and physics in particular in the Aristotelian framework and tradition was abandoned. The mathematization of physics was the result of this new understanding of sciences characterised significantly by experiments.

A very striking example of this kind of change is astronomy which became the new leading science in the 16th century. The Copernican revolution of the heliocentric world-view lead to a new understanding of the universe that opened up the "boundaries" of heaven into infinity, as Alexandre Koyré has shown in his famous book *From the Closed World to the Infinite Universe* (1957).[2] What happened here had immense impact on the concept of space as well, which was therefore in the centre of scientific interests at that time, encompassing different theories such as atomism (Pierre Gassendi (1592–1655), Daniel Sennert (1572–1637) etc.), extensive debates about the possibility of void space or vacuums[3] and the idea of absolute space postulated by Isaac Newton (1643–1727).[4] As a result, the old astro-

1 Cf. Anne-Charlott Trepp, *Von der Glückseligkeit alles zu wissen. Die Erforschung der Natur als religiöse Praxis in der Frühen Neuzeit*, Frankfurt/Main 2009.
2 Cf. Alexander Koyré, *From the Closed World to the Infinite Universe*, Baltimore 1957.
3 Cf. especially Edward Grant, *Much Ado About Nothing. Theories of Space and Vacuum from the Middle Ages to the Scientific Revolution*, Cambridge 1981; for a short overview Fritz Krafft: "Horror vacui", in: *HWPh* 3 (1974), pp. 1206–1212.
4 For the concept of space in the medieval and early modern period cf. Alexander Gosztonyi, *Der Raum. Geschichte seiner Probleme in Philosophie und Wissenschaften*, 2 vols, Freiburg et al. 1976, here vol. 1, pp. 202–374.

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nomical convictions concerning nature, creation, matter, earth, universe, space, the order of up and down as an ontological structure of the geocentric model were either changed or totally abandoned.

Of course, these debates did not remain without effects on important doctrines of theology because they called into question a certain understanding of the Bible. Space as a scope of creation, as "place" of divine actions was always a central category of theological thinking. The descriptions of the Bible about heaven and earth are numerous, beginning with the history of creation that describes the division between light and dark, the Firmament and the waters, heaven and earth and so forth (Gen. 1:1–17) and ends with the revelation of the Last Judgement, i. e. with the destruction of this "old" earth and the creation of a "new" heaven, a "new" earth and a "new" Jerusalem (Rev. 21:1), together with the resurrection of the true believers in a "new" spiritual body (1 Cor. 15:44). Numerous, too, are the biblical descriptions of God as the creator of the world who acts *in* the world, who shows himself "corporeally" in a place (Ex. 3:4; 19:20 etc.), who lives in heaven (1 Kings 8:27; Isa. 66:1 etc.) and who is not far from every human being (Jer. 23:23; Acts 17:27). But in what sense should we understand all these references—literally, metaphorically or spiritually? "Where" is God, where is the "space" of God? What does it mean that He is ubiquitous in view of the debates about both the infinite and void space which was so difficult to believe for many Christians? What does space and place mean? What is a (mathematical) point in this context? What does 'heaven' mean, what 'earth' as a heavenly body? One of the main tasks of theology in the Early Modern Period was to find an answer to these questions in order to reconcile once again scientific and theological doctrines concerning space and the relation of God to it.

The new scientific problems concerned, however, not only the concept of space but also the concept of time. "Here" (*hic*) as one principle of living beings is always accompanied by "now" (*nunc*) that gives—as a measure of motion—all here and there temporal direction. And it was again astronomy which was responsible for large-scale debates about the understanding of time. Hans Blumenberg has rightly concluded in his famous work *Die Genesis der kopernikanischen Welt* (1975, *The Genesis of the Copernican World*) that "the intensification of the problematic of time, which is characteristic of the modern age, can also not be understood apart from the alteration that Copernicus had set about making in the model of the world".[5] With the daily rotation of the Earth on its own axis, the sun or rather the whole heaven was no longer the basis for reading off time in the course of the year. This function was from then on an attribute of this earthly planet that had previously been considered dormant. For Blumenberg, the problem of time clearly illustrates "why the Earth not only *could* become a star among stars but *had to* become one".[6]

5 Hans Blumenberg, *The Genesis of the Copernican World*. Transl. by Robert M. Wallace. Cambridge, Mass. et al. 2000, p. 433.
6 Ibid., p. 435. (Italics in original)

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The predominant position of the Earth in the geocentric model as the centre of the universe—embedded in the eternity of the immovable highest spheres, where God was supposed to live—was dramatically reversed: The Earth became a star among stars, incorporated into universal generation and corruption, into time that is itself a creation of God, who outside of it rules in eternity. However, in the same way as the universe became infinite with dramatic consequences for the question "Where is God?", time—as measure of infinite motions—became infinite (or eternal) with equally dramatic consequences for the old conviction that there is a difference between eternity (as an attribute of God) and time (as an attribute of the living things).

From a biblical point of view, God is not only the creator of the universe, i. e. the whole space in which all things are happening, but also the creator of time which is the beginning of all motions (Gen. 1:14–18). His "pre-temporality" extends out of time (Ps. 90:2), his "post-temporality" returns to eternity (Ps. 102:25–28), his "over-temporality" reaches into time (Ex. 3:14), and his "inner-temporality" finally rises above time (Isa. 41:4). All times are to Him like a moment (Ps. 90:4) and a day like thousand years (2 Pet. 3:8). But what is the relation between eternity and time? How can the eternal act on the temporal, the infinite on the finite? How can one understand the temporal action of the eternal God? What is time and eternity? At this point, the relation between space and time is evident, as Johann Peter Lange puts it: "As the space is consistently the cosmos of appearances so is time their rhythm."[7] The Christian God as the creator of both of them must find his determination beyond space and time without disappearing into the infinite, i. e. into indeterminable everywhere and nowhere or forever and never. This task has already been at stage before the Copernican revolution began but became now more urgent. Theology was forced to prove once again the compatibility between the new physics of space and time and the view of God in the Bible.

It might be surprising that the classical understanding of space and time, as it was described for the first time by Aristotle and found its way into the philosophical and theological tradition of Western Europe, did not change much in the aftermath of Copernicus.[8] It is significant that Dirk Evers in his study *Raum—Materie—Zeit* (2000, *Space—Matter—Time*) comes to a very critical judgement when viewing orthodox Protestantism as a whole: "Despite all the closeness of content and the connection with the new [i. e. heliocentric] model of the world manifested in outstanding individuals like Kepler one does not arrive in the questions regarding the doctrine of God and creation and of cosmology, despite impressive systematizing permeation and modifications in detail, at an understanding

7 Johann Peter Lange, *Christliche Dogmatik*, Vol. 2, Heidelberg 1851, p. 74: "So wie der Raum durchweg der Kosmos der Erscheinungen ist, so die Zeit ihr Rhythmus." Unless otherwise noted, all translations are my own.

8 There were, of course, some changes and revisions of the Aristotelian understanding of space already in the medieval period and later in the Renaissance. Cf. Max Jammer, *Das Problem des Raumes. Die Entwicklung der Raumtheorien*, Darmstadt 1980, pp. 55–101; Gosztonyi, *Der Raum*, vol. 1, pp. 164–229.

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that would be capable of a constructive engagement with modern science."[9] Even stronger was the judgement of Werner Elert in his famous book *Morphologie des Luthertums* (1932, *The Structure of Lutheranism*). According to him, Lutheranism was hopelessly entangled in a last-lying and convulsively struggling world-view, namely in an apology of the simple biblical world-view without realising that Copernicanism with the possibility of a plurality of worlds and the infinity of the universe requires totally different answers than a mere reference to the Bible.[10] However, the Lutherans were here in "good harmony" with the Catholics and the Reformed, who responded only passively and very slowly to the Copernican change of the world-view, too.[11]

I find it remarkable that the classical concept of God, especially His attributes of immensity, ubiquity, and eternity, have been questioned long before the Copernican revolution would lead to very similar questions, although against a totally different scientific background. It seems to me that the Catholics and Protestants were more interested in fighting the "old" enemies of the orthodox dogmatics than in fighting the "new" enemies of the natural sciences. Of course, what was at stage, was very important for the whole structure of theology: Is God omnipresent without having a specific place in the whole universe and is He eternal without having a beginning and/or an end in time? And if this is the case, how is it possible that the ubiquitous and eternal God acts at specific places and in different times without actually being there? What kind of being beyond space and time is God? The answers to these questions were not controversial between the three orthodox denominations, but between them and different dissident movements. The most prominent dissidents of the 16th and 17th centuries were the Socinians, who called themselves "Polish Brethren" or "Unitarians".[12] The Socinians will therefore be the focus of this study.

9 Dirk Evers, *Raum—Materie—Zeit. Schöpfungstheologie im Dialog mit naturwissenschaftlicher Kosmologie*, Tübingen 2000, p. 120: "Trotz aller inhaltlichen Nähe und der sich in einzelnen herausragenden Gestalten wie Kepler manifestierenden Verbindung mit dem neuen [i. e. heliozentrischen] Weltbild stößt man in den Fragen der Gottes- und Schöpfungslehre und der Kosmologie trotz eindrucksvoller systematisierender Durchdringung und Modifikationen im einzelnen nicht zu einem Verständnis durch, das zur konstruktiven Auseinandersetzung mit der neuzeitlichen Wissenschaft fähig wäre."

10 Cf. Werner Elert, *Morphologie des Luthertums. Erster Band. Theologie und Weltanschauung des Luthertums hauptsächlich im 16. und 17. Jahrhundert*, Munich [2]1958, p. 356.

11 There were, of course, some Lutheran, Catholic and Calvinist Copernicans. Cf. Rienk Vermij, *The Calvinist Copernicans. The Reception of the New Astronomy in the Dutch Republic, 1575–1750*, Amsterdam 2002; Pietro Omodeo, *Copernicus in the Cultural Debates of the Renaissance: Reception, Legacy, Transformation*, Leiden 2014.

12 For the history, theology and philosophy of the Socinians cf. Otto Fock, *Der Socinianismus nach seiner Stellung in der Gesamtentwicklung des christlichen Geistes, nach seinem historischen Verlauf und nach seinem Lehrbegriff*, Kiel 1847, Reprint Aalen 1970; Earl Morse Wilbur, *A History of Unitarianism: Socinianism and its Antecedents*, Vol. 1, Cambridge (Massachusetts) 1946; idem, *A History of Unitarianism: In Transsylvania, England, and America*, Vol. 2, Cambridge (Massachusetts) 1952; Herbert John McLachlan, *Socinianism in Seventeenth-Century England*, Oxford 1951; Sarah Mortimer, *Reason and Religion in the English Revolution. The Challenge of*

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With their particular method of philosophizing—I call this the *ratio philosophandi Sociniana*—as part of the Aristotelian heterodox tradition and with their specific manner of exercising theology, i. e. the conviction that *libertas prophetandi* had a basis in the prophetic writings of the Bible, the Socinians can be accredited with ground-breaking work for the later Enlightenment. This concerns not only the radical rejection of the core Christian tenets, such as the doctrine of the trinity, of the incarnation of Christ, of justification etc., a new understanding of the relationship between reason and faith, a historical-critical method of reading and interpreting the Bible, but also a philosophical and theological materialism unique to the time.[13] This "metaphysical" materialism was also responsible for the development of new "Socinian" physics which will be the main subject of this paper.

At this point, I can address a question that has been discussed several times in recent years: Was there something like confessional physics in the Early Modern Period? Cees Leijenhorst has replied in the affirmative, by dealing with "Calvinist Physics"[14] or even more generally in a second article, published together with Christoph Lüthy, with "Confessional Physics".[15] In his study, Marcus Hellyer describes at length the "Catholics Physics" of the Jesuits in Early Modern Germany.[16] The topic of all these studies is especially the description of the philosophical and theological positions of the different orthodox denominations regarding the Eucharist and the Lord's Supper.[17] The issues at stake here were very intriguing: How

Socinianism, Cambridge 2010; Sascha Salatowsky, *Die Philosophie der Sozinianer. Transformationen zwischen Renaissance-Aristotelismus und Frühaufklärung*, Stuttgart-Bad Cannstatt 2015. Kęstutis Daugirdas, *Die Anfänge des Sozinianismus. Genese und Eindringen des historisch-ethischen Religionsmodells in den universitären Diskurs der Evangelischen in Europa*, Göttingen 2016.

13 Cf. Salatowsky, "Unknown relations: Materialism and the concept of the soul. Christoph Stegmann—John Locke—Joseph Priestley" (in preparation).

14 Cees Leijenhorst, "Place, Space and Matter in Calvinist Physics", in: *The Monist* 84,4 (2001), pp. 520–541.

15 Cees Leijenhorst and Christoph Lüthy, "The Erosion of Aristotelianism. Confessional Physics in Early Modern Germany and the Dutch Republic", in: *The Dynamics of Aristotelian Natural Philosophy from Antiquity to the Seventeenth Century*, ed. c. Leijenhorst. Leiden et al. 2002, pp. 375–411.

16 Marcus Hellyer, *Catholic Physics. Jesuit Natural Philosophy in Early Modern Germany*, Notre Dame (Indiana) 2005.

17 Cf. Leijenhorst, "Calvinist Physics", p. 521: "What has not been taken into account at all is the effect of the very heart of confessional strife, *viz.* sacramental theology, most notably the doctrine of the Eucharist. It is the explanation of Christ's real presence in the consecrated bread and wine that most divided the various confessions and hence constitutes the best criterion to distinguish between Roman Catholics, Calvinists and Lutherans, certainly from the end of the sixteenth century onwards." Leijenhorst/Lüthy, "Confessional Physics", p. 376: "The confessional battles between Protestants and Catholics, but also among Protestants themselves soon created a new demand for Aristotelian philosophy. Especially the controversies in Eucharistic theology made precise definitions of such key terms as ‚substance', ‚place' and ‚person' more necessary than ever." Hellyer, *Catholic Physics*, p. 7: "Perhaps the best example of how theological concerns could limit what natural philosophers were able to say was the question of how the transubstantiation of the bread and wine into the body and blood of Christ could be explained physically—what we can term the physics of the Eucharist." For

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can one justify the specific understanding of the Lord's Supper with passages from the Bible and support it with philosophical principles? Important philosophical concepts such as matter, body, substance, person, place, space etc. had to correspond to the respective denominational understanding. This has led to characteristic transformations of the Aristotelian philosophy in the Early Modern Period.

In this paper, I would like to show that the Socinians have developed their own confessional physics which is characterised by a materialistic understanding of the Aristotelian philosophy combined with a rational reading of the Bible. According to the Socinians, reason is the most fundamental category of both philosophy and theology that excludes everything which is contrary to or even above reason.[18] For them, mysteries are not the main focus of Christianity. This radical "demystification" applies also to God who does not break the rules of the world at discretion but is linked to them. He is, to give only one example, the creator of the world. However, the creation did not arise out of nothing but from the unformed prime matter.[19] God is bound to the physical principles, especially to the principle of contradiction formulated by Aristotle in his *Metaphysics*: "It is, that the same attribute cannot at the same time belong and not belong to the same subject in the same respect."[20] What does this mean for the concept of God? Are the mysteries necessarily part of the concept of God? I want to focus here on the following question taking into account the present topic: Are God's "heavenly" attributes of ubiquity and eternity for the Socinians attributes of its own class without having any connection to the "earthly" attributes of space and time? My thesis is that the Socinians developed a new rational understanding of God that ties Him back to the physical laws of space and time which He Himself created.

I have illustrated in my earlier study "Die Entlastung Gottes" (2015, "*The Discharge of God*") the change of the concept of God in the works of Fausto Sozzini (1539–1604), the leader of the Polish Brethren, and Conrad Vorstius (1569–1622), a Reformed theologian, however, with strong Socinian tendencies.[21] I addressed the question of the omnipotence and omniscience of God (*potestas et praescientia Dei*) and also those of His simplicity (*simplicitas*) and eternity (*aeternitas*). The study demonstrated that Sozzini and Vorstius created an anti-speculative and even anti-metaphysical concept of God, who was divested by and by of His most important orthodox attributes. For this reason, the German Lutheran Johann Gerhard (1582–1637) accused Vorstius and the Socinians in several sections of his work *Loci theo-*

Hellyer, the sacrament of the Eucharist "was one of the most bitterly contested battlefields of the Confessional Age" (ibid., p. 90).

18 Cf. Salatowsky, *Philosophie der Sozinianer*, pp. 130–186.

19 Cf. ibid., pp. 292–297; 321–324.

20 Aristotle, Met. IV 3, 1005b19–20. Quoted from: *The Complete Works of Aristotle*, ed. and transl. Jonathan Barnes, Vol. 2, Princeton 1984, here p. 1588.

21 Cf. Sascha Salatowsky, "Die Entlastung Gottes. Sozzini, Vorstius und die Folgen ihrer Theologie", in: *Ideengeschichte um 1600. Konstellationen zwischen Schulmetaphysik, Konfessionalisierung und hermetischer Spekulation*, eds. Wilhelm Schmidt-Biggemann and Friedrich Vollhardt, Stuttgart-Bad Cannstatt 2017, pp. 231–265.

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logici (1610–1625) of undermining the divine attributes in many ways.[22] The Dutch Reformed Samuel Maresius (1599–1673) noted very similarly in his treatise *Systema theologicum* (1673) that Vorstius, the Arminians and Socinians "nibble away" the attributes of God, especially His omnipresence and immensity.[23] The Jesuit Martin Becanus (1563–1624) too claimed in his *Tituli Calvinistarum* (1614) that Vorstius was the leading representative of the atheistic tendencies of the Reformed theologians who rejected among other things the infinity of God.[24] These different statements illustrate that the pressure on the classical concept of God around 1600 was already wide spread, especially in regard to His metaphysical and physical properties.

It is worth mentioning that the concept of God at that time was not a subject only of dogmatics, but also of metaphysics and even of physics. In dogmatics, the concept of God usually formed the first part of the treatise, describing God in His essence and with His attributes, especially in relation with the doctrine of the trinity. In metaphysics, God was the most important subject of the *Metaphysica specialis*, the second part, which describes the three main substances, i. e. God, the angels and the separated soul (*anima separata*). In physics, the description of the concept of space or place and time was connected with the question of how God relates to them. This threefold access also applies to the Socinian concept of God. However, due to the absence of a Socinian treatise on physics,[25] I will describe here only one metaphysical and one theological treatise. Consequently, it is just possible to compare the philosophical and theological arguments.

The *Metaphysica repurgata* (1635) of Christoph Stegmann (ca. 1597–1646), who worked officially as a Lutheran pastor in Brandenburg, but was secretly a radical Socinian, is one of the most radical *philosophical* attempts at revaluating the concept of God.[26] In the brief foreword to the reader he makes no secret of his intention: Metaphysics was to be purged of the opinions of the Scholastics, even if

22 Cf. Johann Gerhard, *Loci theologici cum pro adstruenda veritate tum pro destruenda quorumvis contradicentium falsitate per theses nervose solide et copiose explicati* (Jena 1610–1622), 9 vols, ed. Eduard Preuss, Berlin 1863–1875, here t. I, lc. II, c. VIII, s. III, § 131, p. 305b: "Simplicitatem Dei labefactat Vorstius tract. de Deo […]." Ibid., s. IV, § 141, p. 308b–309a: "Opponenda haec sunt […] 4. *Vorstio*, qui multis modis doctrinam de aeternitate Dei labefactat." In the following, references are given both to the Preuss edition and in brackets to the new English translation, cf. Gerhard: *On the Nature of God and on the most Holy mystery of the Trinity*, transl. Richard J. Dinda, St. Louis 2007, here p. 135 and 141.

23 Cf. Samuel Maresius, *Systema Theologicum: Hactenus saepius recusum, nunc verò locupletatum prolixis annotationibus, ad illius explicationem & defensionem facientibus*, Groningen 1673, lc. II, § XXXII, p. 76a: "*Ubi* similiter, vel *Ubietas*, Deo non convenit, sed absoluta *Ubiquietas*, sive perfecta *Immensitas*: quam frustra admordent juxta Vorstium, Arminiani ac Sociniani […]."

24 Cf. Martin Becanus, *Tituli Calvistarum*, Mainz 1614, tit. IV, p. 289.

25 The manuscript *Physicae problemata* of Andrzej Wiszowaty jun. (1608–1678) was never printed and is today presumed lost.

26 Cf. Christoph Stegmann, [Ms] *Metaphysica repurgata*, Lögnitz 1635. Gottfried Wilhelm Leibniz Bibliothek, Niedersächische Landesbibliothek, LH IV I 9, pp. 1–57. Only this copy in the Leibniz archive has survived. For a description of Stegmann's life and philosophy cf. Salatowsky, *Philosophie der Sozinianer*, pp. 41f.; 310–327; 419–427.

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this was considered more difficult than cleaning the Augean stables.[27] The aim is to liberate the concepts and content of metaphysics from all scholastic trappings. What makes this treatise so important for the history of philosophy is the fact that Gottfried Wilhelm Leibniz (1646–1716) wrote in 1708 a reply to this treatise as an antidote. Leibniz was convinced that the Socinians created "a philosophy of their own",[28] a philosophy, which he recognised because of its allegedly destructive character as a great danger for the convictions and beliefs of the people. The "best" paradigm for this danger was exactly Stegmann's *Metaphysics*, which Leibniz called a "peculiar little book". He criticized in particular that Stegmann almost completely reduced God to the status of creatures and debased our minds to the level of matter.[29] Purging metaphysics from all scholastic trappings as the aim of Stegmann's treatise leads to a radical revaluation of the concept of God. I will expound his concept in the fifth section of this paper.

The *Tractatus theologicus de Deo* (1610) of Vorstius, who was, I repeat here the common view, a Reformed theologian with Socinian tendencies, is one of the most radical *theological* attempts of revaluating the concept of God.[30] In the foreword of his treatise, he emphasises that the subject of this treatise, the concept of God, is for the human senses and for natural reason according to its essence and to its attributes alike so difficult and sublime to perceive, recognise and to understand, that a lot of different opinions of the old and the new interpreters exist.[31] He accuses in particular the Scholastics of expanding the human curiosity beyond the divine word and of mixing philosophical and theological doctrines by using Aristotelian concepts in theological matters.[32] The Scholastics, for example, would ascribe to God such an eternity, which coexist integer with any time, including also the smallest one, and which introduce in this way an admirable existence of all things in eternity. The Scholastics would further impose on us such an immensity of God which excludes him totally from every empty space, but let him be on the other side integer at every other, even discontinuous, plac-

27 Cf. Stegmann, *Metaphysica*, p. 1 r: "Augiae stabulum citius purges, candide lector, quam omnia Scholasticorum de rebus Metaphysicis placita sub examinis incudem revoces."

28 Gottfried Wilhelm Leibniz, "Ad Christophori Stegmanni Metaphysicam Unitariorum", in: Nicholas Jolley, "An Unpublished Leibniz MS in Metaphysics", in: *Studia Leibnitiana*, vol. VII/2 (1975), pp. 161–189, here p. 176, l. 1–10: "Constat eos qui Fausti Socini et similium Theologiam probant, et pleraque christianae fidei mysteria, sed maxime Trinitatem in Unitate divina, et incarnationem divinae naturae in Christo impugnant, propriam sibi Philosophiam condidisse; ei oppositam qua Scholae utebantur, et nunc quoque pro magna parte utuntur, non tantum eae quae Romam venerantur, sed etiam quae frequentantur apud Protestantes."

29 Cf. ibid., p. 177, l. 16–22: "Stegmanni opusculum titulo Metaphysicae repurgatae conscriptum nactus olim juvenis discusseram, stricturis quibusdam additis, ut ostenderem viros doctos et acutos, abuti passim acumine suo nec Theologiam tantum, sed et philosophiam quandam extenuatam, nobis dare, in qua vix quicquam egregium et sublime supersit, Deo ipso propemodum in ordinem creaturarum redacto. Mente etiam nostra in materiae naturam degenerante."

30 Cf. Conrad Vorstius, *Tractatus theologicus de Deo, sive de natura & attributis Dei*, Steinfurt 1610.

31 Ibid., praef., p. *2 r–v.

32 Ibid., p. *3 r.

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es.[33] Vorstius draws from this a radical conclusion which reveals his Socinian tendencies: "Finally, I add that I will deviate here sometimes freely not only from the Catholics, such as Thomas Aquinas and Francisco Suárez, but also from some of us [i. e. Reformed theologians], and that solely out of love for the truth."[34] Vorstius refers here to the free church of Christ, in which everyone has the right to speak freely. In section three of this paper, I will explain his concept of God, in particular his understanding of the infinity, omnipresence (*omnipraesentia & ubiquitas*) and eternity (*aeternitas*) of God. My aim is here to show that Vorstius was *in these matters* without restrictions indeed a Socinian.

I would like to contrast these two Socinian writings, Stegmann's *Metaphysica repurgata* and Vorstius's *Tractatus theologicus*, with two treatises from the opposing orthodox denominations, namely by Catholics and Protestants: the *Disputationes Metaphysicae* (1597) of Suárez (1548–1617) and the *Loci theologici* of Gerhard. Both of these systematic tracts were essential parts of the discussions on the concept of God in general, and both of them were deeply involved in the Socinian debates in particular.

The *Disputationes metaphysicae* of Suárez, the leading Jesuit metaphysician of his time, are one of the most important *philosophical* attempts to reconfirm once again the essential unity of philosophy and theology from a *Catholic* perspective, a unity that manifests itself in the common processing of the concept of God as the nucleus of all Christian thinking.[35] As we just have seen, Vorstius mentioned Suárez as a negative example for the typical Scholastic manner of mixing philosophy and theology together. It is therefore appropriate to examine the judgement of Vorstius by describing the position of Suárez. With his *Disputationes metaphysicae*, he wrote the most comprehensive work of this discipline in the Early Modern Period, which became the standard work for all orthodox denominations.[36] The significance of his systematic work for the subject of this paper, the concept of God, is evident. What Edward Grant has described for the problem of God and space, applies universally: "Among scholastic authors who concerned themselves with the problem of God and space, few if any ever reached the high level of lucid and intelligent analysis attained by Francisco Suarez."[37] In section 2, I will

33 Ibid., p. *3 v: "[…] dumque talem Aeternitatem ei [sc. Dei] adscribunt [sc. Scholastici], quae cuilibet tempori, etiam minimo, integra coexistat, ac perinde mirificam rerum omnium in aeternitate existentiam inducat; dum praeterea talem nobis Dei immensitatem obtrudunt, quae ipsum a vacuis quidem spaciis penitus excludat, in aliis autem omnibus, licet discontinuis, locis integrum praesentem sistat […]."

34 Ibid., p. *4 v: "Tandem hoc adjicio: non tantum a Pontificiis, ut Th. Aquinate, Fr. Suarez, & sed a quibusdam etiam Nostrorum, interdum hic libere me dissentiere: idque solius amore veritatis." Vorstius mentions here by name Girolamo Zanchi (1516–1590).

35 Cf. Francisco Suárez, *Disputationes Metaphysicae* [=DM]. *Tomus prior & posterior*, Mainz 1630.

36 Cf. Ernst Lewalter, *Spanisch-jesuitische und deutsch-lutherische Metaphysik des 17. Jahrhunderts. Ein Beitrag zur Geschichte der iberisch-deutschen Kulturbeziehungen und zur Vorgeschichte des Deutschen Idealismus*, Hamburg 1935, Reprint Darmstadt 1967.

37 Grant, *Much Ado About Nothing*, p. 153. In this fascinating study, Grant is primarily con-

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expound Suárez's *philosophical* arguments for God's ubiquity and eternity, which can serve as the starting point for all subsequent debates of that time.

The *Loci theologici* of Gerhard, the leading Lutheran theologian of his time, are one of the most comprehensive *theological* attempts to secure the fundamental harmony between philosophy and theology from a *Lutheran* perspective.[38] As mentioned above, Gerhard was one of the most prominent opponents of Vorstius's concept of God. His importance for the theological debates of the early modern period is indisputable. In the early 17th century, he was "the greatest representative of Lutheran orthodoxy". In his *Loci*, he "broke new ground in the development of theological method".[39] In section 4, I will explain Gerhard's theological position and analyse his criticism of Vorstius.

In section 6, I will summarize the results of this paper.

2 Franciso Suárez: Manifesting God's ubiquity and eternity

The concept of God reveals the close unity of Aristotelian philosophy and Christian theology in the Early Modern Period. On the one hand, God is the most important subject of the *Metaphysica specialis*, the second part of metaphysics. In this manner the Lutheran Christoph Scheibler (1589–1653) explains in detail in the second book of his *Opus Metaphysicum* (1617) the three main substances God, the angels and the separated soul.[40] According to him and other philosophers, it is primarily due to the description of God as a "hyperousia" or "super-substantia" and "super-ens" (*esse super omne ens*) that required this special metaphysics.[41] As an *ens simplicissimum* He is in fact part of the existence of all beings. However, as the creator He is at the same time no part of this "chain of being".[42] It was therefore a common opinion that there is no relation between the finite and the infinite (*finitum non est capax infiniti*).

cerned with the concept of separate space understood as a vacuum. He deals not with the concept of space in general.

38 Cf. Gerhard, *Loci*.

39 *A documentary history of Lutheranism*, *Vol. 1. From the Reformation to Pietism*, ed. Eric Lund, Minneapolis 2017, p. 170a (for both quotations).

40 Vgl. Christoph Scheibler, *Metaphysica specialis sive Metaphysicorum liber II. Continens tractationem de substantiis (adeoque de Deo, Angeliis, & Anima separata) & singulis accidentium generibus*, Gießen 1617, c. II, art. II, p. 69–76. Scheibler defines God strictly speaking as "spiritus infinitus" (c. III, p. 76). Because of our imperfect mode of thinking, which is not able to recognise God in a direct way, we are forced to describe God in a more negative way as "infinitum, incorporeum, invisibilem, incircumscriptum etc." (ibid., 88).

41 Cf. Jacob Martini, *Exercitationum metaphysicarum libri duo*, Wittenberg 1608, l. II, ex. IV, th. II, p. 647: "Ergone Deus negatur esse substantia? non negatur substantia: sed negatur substantia, quae in praedicamentis locatur, atque adeo perfecte sub rationem & naturam genericam cadit. Est alioquin DEUS supersubstantialiter substantia: quippe, qui omnia supereminenter superat Entia, quae ab ipso sunt. Quid autem hoc? genusne Logicum; ut quidam somniant? Non Logicum, non Physicum, non Metaphysicum; sed hypermetaphysicum, hoc est, non genus. Terminus igitur (*supersubstantialiter substantia*) hoc vult, quod a nobis dictum est, intelligere nos Deum & esse, & esse super omne ens."

42 Cf. Arthur Lovejoy, *The Great Chain of Being. A Study of a History of Idea*, Cambridge (Mass.) 1936.

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On the other hand, God was the starting point in the dogmatics. The *Systema theologicae* of the Reformed Bartholomäus Keckermann (1572–1608) offers an example for this. Very similar to Scheibler, he defines God as a "*spiritus primus infinitus*" and "supersubstantia".[43] Only the way of eminence (*via eminentia*e) allows us to ascribe to God in the most eminent manner the relative perfections we discover in humans. However, these are only approaches to God, whom—as the most perfect being and creator of the universe—we can describe in finite terms and pictures alone, not in His real immensity. Philosophy in general and metaphysics in particular are only tools for theology, providing the concepts and methods with which theology is able to develop the concept of God according to revelation. This double description of God in philosophy and theology encompasses necessarily the concept of space and time. What is the relation of God to these basic categories of living and non-living things? To lay a foundation for this discussion, it will be useful to summarize briefly Aristotle's concepts of place[44] and time.

In his *Physics*, Aristotle defines place (τόπος) as "boundary of the containing body at which it is in contact with the contained body" or rather some lines later as a "the innermost motionless boundary of what contains it".[45] Place is neither matter nor form or extension but the boundary of a body, the immediate comprehensive of it, however, no part of it. To be more precise, place is thought to be a kind of surface (ἐπίπεδον), and a vessel (ἀγγεῖον), i. e. a container (περιέχον) of a thing (cf. Phys. IV 3, 212a28–29). Since the place determines the ratio of the bodies to another, there is no empty space for Aristotle. The doctrine that nature abhors a vacuum—which became proverbial as *horror vacui* in the Scholastics—can be explained in such a way that in an empty space on the one side a once moved thing is unable to become tranquil because of the lack of resistance and on the other side neither a forced nor a natural movement without medium can arise or be maintained. That means, an empty space does not enable motion, but prevents it.[46] The motion of the fixed stars requires a first mover that is not itself moved by anything else (cf. *Phys*. VII 5, 256a13–16 and *Met*. XII 6, 1072a10–18). If movement ever exists because it is impossible that it should either come into being or cease to be (cf. *Met*. XII 6, 1071b7f.), the first mover must have always been and must still be. Its essence is pure actuality (ἐνέργεια), and it must be without matter for it must be eternal (cf. *Met*. XII 6, 1071b19–21).

43 Bartholomäus Keckermann, *Systema S.S. Theologiae, tribus libris adornatum*, Hanau 1602, l. I, c. II, p. 6.

44 Strictly speaking, Aristotle did not develop a theory of space (χώρα), "jedenfalls nicht in dem Sinne, dass der Raum Prinzip für Eigenschaften und Verhältnisse von Gegenständen im Raum wäre". (Hellmut Flashar, "Aristoteles", in: *Grundriss der Geschichte der Philosophie. Die Philosophie der Antike. Bd. 3. Ältere Akademie, Aristoteles, Peripatos*, ed. Hellmut Flashar, Basel 2004, pp. 167–492, here p. 347.

45 Aristotle, *Physics* IV 4, 212a5–6 and 212a20. Quoted from: *Complete Works of Aristotle*, vol 1, p. 360 and 361.

46 Cf. Grant, *Much Ado About Nothing*.

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Aristotle defines time (χρόνος) in his *Physics* then as a „number of motion in respect of before and after.“[47] Only in relation to motion it is possible to speak of time, insofar as time is something "in" the movement, namely the measure of the change of the movement between the before and the after. The time itself is no part of the movement: It is the measure of motion, by which one measures, not the measured itself. Circular motion is the most original, simple and complete movement because it alone is characterised by continuity. That means that motion which achieves the endpoint is identical with the motion that starts anew from it. Due to the retrograde motion of the circular motion in itself, it experiences no interruption and makes it possible to maintain a coherent movement. If circular motion is the most perfect motion, then the fixed star sphere is the first and most original movement and it always gives all time its cosmic measure. Like movement, time does not arise or pass, for there could not be a before and an after if time did not exist (cf. *Met*. XII 6, 1071b7), although that what is in time necessarily is subject to perishing and becoming (cf. *Phys*. IV 12, 221b28–30). Vice versa, it is also true that things which are *always* are not, as such, in time; for they are not contained by time, nor is their being measured by time (cf. *Phys*. IV 12, 221b3–5).

In what way does Suárez follow this Aristotelian concept of place and time in his *Disputationes Metaphysicae*? He begins the second volume of his *Metaphysica specialis* in Disputation 28 with the basic subdivision of *all* beings in an infinite being (*ens infinitum et increatum*) and a finite being (*ens finitum et creatum*).[48] In Disputation 29, Suárez comes up with some metaphysical and scientific reasons for the existence of God. In Disputation 30, he deals in great detail with the essence of the very first being (*primum ens*), which is God alone. Starting from the assertion that God is firstly a simply necessary being (*ens simpliciter necessarium*)—because it is not from another thing (*ab alio*) or depends on it but is alone out of Himself (*ex se*)—and that He is secondly a completely perfect being (*ens omnino perfectum*) that needs nothing, is lacking nothing, but is complete in itself,[49] Suárez asserts the thesis that God is infinite.[50] Infinite means here on the one side the *infinitas durationis*, i. e. the infinity as eternity, as perpetual being without beginning and end, and on the other side the *infinitas virtutis*, i. e. die infinite power of the first mover. The "ontological" infinity belongs to God because He is by Himself in His essence, independent from any other being, never become, but out of Himself that is what He is, and this for ever, so that He always exists. The "ontic" perfection is most suitable to Him because He is the first cause of every thing, quasi the whole being (*totum ens*) that releases all things out of themselves, nothing absorbing, never exhausted, always active, always moving, always in the being of the powerful movement.

47 Aristotle, *Physics* IV 11, 219b1f. Quoted from: *Complete Works of Aristotle*, vol 1, p. 372.
48 Cf. Suárez, *DM* XXVIII, sec. I, §§ I–III, p. 5a–b.
49 Cf. ibid., *DM* XXX, sec. I, §§ I–II, p. 42b.
50 Cf. ibid., *DM* XXX, sec. II, § I, p. 44b: "nam evidentissimum est Deum esse aeternum, & consequenter duratione infinitum."

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This results in the following description of God as a pure act and completely simple being (*actus purus & ens omnino simplex*), as this perpetual being that excludes every potentiality and passivity, is instead always active in itself, pure, unmixed, indivisible, free from every composition and participation.[51] God is therefore not a composition of form and matter. He is in fact completely immaterial and unextended, as Suárez emphasizes with references to Aristotle, Plato and Hermes Trismegistus.[52] For such a substance of form and matter is subject to quantity, i. e. it is extended in its bodily parts. This corresponds, however, to a very imperfect being, such as plants, animals, and the humans. Hence, such a *compositio substantialis* cannot be attributed to the first being (*ens primum*) since there is an infinite difference between it and the beings dependent on it. "Anyone who invents a corporal God must therefore at least assume (so as not to make things completely absurd) that God has an immaterial and spiritual part, connected with a very noble and incorruptible body. However, one cannot conceive of God physically without a composition of form with corporal matter because God must be at least thought more perfect than man: But He would not be more perfect if He did not have at least an immaterial and spiritual form."[53] At this point, one can already recognise the classical conception of God as a completely immaterial being—a *substantia spiritualis immaterialis* according to the common definition—which stands with the created world in space and time only in an external, top-down relationship. This follows also from the further descriptions of the attributes of God.

In resuming the concept of infinity, Suárez equates it with immensity (*immensitas*). As mentioned above, the concept of infinity encompasses omnipresence as a "non-spatial" category of the "everywhere" (in contrast to where) as well as eternity as a "non-temporal" category of the "forever" and "all the time" (in contrast to when). Infinity is therefore the attribute of God which keeps Him away from every model of the world, be it geocentric or heliocentric, no less than from time, which in its flow cannot hold the "static" eternal. Space and time are therefore no categories for Suárez to describe God's essence. Only with the idea of an infinity of space and time does this model falter, since God then loses Himself in "infinite" Nothingness. As long as God enclosed a limited space and a limited time, he still had a relation to both of them. With the Copernican revolution, this relation loses ground in the long run.

51 Cf. ibid., *DM* XXX, sec. III, §§ II–III, p. 50a–b.
52 Cf. ibid., *DM* XXX, sec. IV, § XV, p. 53b.
53 Ibid., *DM* XXX, sec. IV, § XV, p. 54a: "Quare, qui Deum fingere corporeum, saltem existimare deberet (ne omnino esset irrationalis) habere Deum partem immaterialem, & intellectualem, coniunctam alicui corpori nobilissimo, & incorruptibili: atque ita non potest Deus cogitari corporeus sine compositione alicuius formae cum materia corporali, quia saltem cogitari debet Deus perfectior quam homo: non esset autem perfectior, nisi forma saltem haberet immaterialem, & intellectualem."

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Suárez understands immensity strictly speaking as a "disposition toward a place, or the presence of God in all things".[54] In this respect, it is possible to say that God is everywhere. Suárez emphasizes here the novelty of the Christian religion and its distance to the ancient world of the heathens: Many ancient philosophers have located God in a particular place—either in the centre of the universe or at the highest place.[55] However, one can prove with natural reason that He is (incorporeal) everywhere: Since He is the universal efficient agent for all things (as the first mover of all beings), and in all things, He is intimately present in all things.[56] For Suárez, this is also in accordance with the Bible, especially with Acts 17:2f. and Ps. 139:8f., where the presence of God in this world and at all places is described. This, of course, does not refer to an anthropocentrism in the sense that God would act only in the world. Rather, one must say that God is present in His immensity also out of this world (*extra hunc mundum*). For He cannot be limited by any space, but is everywhere, i. e. even in these very large locations outside the world we know. Who would dare limit God to this tiny place where our world is located?[57] The consequence is clear: "Because God can act outside the world with-

54 Ibid., *DM* XXX, sec. VII, § I, p. 64a: "Immensitas ergo stricte sumpta dicit habitudinem ad ubi seu praesentiam Dei in rebus omnibus."

55 Cf. Aristotle, *Physics* VIII 10, 267b6f. In *De Coel*. I 3, 270b5–10 Aristotle mentioned the assumption of the barbarians or Greeks who agree in allotting the highest place to the deity.

56 Cf. Suárez, *DM* XXX, sec. VII, § III, p. 64b: "Nam omne agens debet esse coniunctum passo in quod operatur. Sed Deus est universale agens efficiens omnia, & in omnibus quae sunt: ergo est intime praesens in rebus omnibus." For the same position of the Reformed, cf. Clemens Timpler, *Metaphysicae systema methodicum libris quinque*, Hanau 1608, Reprint Hildesheim et al. 2018, l. II, c. V, probl. II–III, p. 108–114.—Once again, the old pre-Copernican model of the world becomes visible, according to which there is no remote action of forces, but only the immediate action of something on something in the sense of pushing or pulling. However, there is, so Grant, "the powerful Scotist tradition against any attribution of spatial immensity to God". (Grant, *Much Ado about Noting*, p. 153) According to this position, it is not necessary that God is present everywhere in order to be able to act since He acts with His infinite power. He rather resides in the highest place knowing everything beforehand. Suárez explicitly rejects this view: Like a finite form requires unity and closeness to matter in order to be able to act the active power, *even if it is infinite*, needs the closeness and immediacy with the passive and effected things in order to be able to act. Even if the active power could act over an infinite distance, it would be much better if it were active without a great distance from the effected thing. Only in that case does it achieve the highest perfection in action and the highest reign in the effected thing not only through its power, but also through its disposition and proximity to the effected thing. Cf. Suárez, *DM* XXX, sec. VII, § XIII, p. 66b. For a critical description of Suárez's position cf. aza Goudriaan, *Philosophische Gotteserkenntnis bei Suárez und Descartes im Zusammenhang mit der niederländischen reformierten Theologie und Philosophie des 17. Jahrhunderts*, Leiden et al. 1999, pp. 87–92.

57 Cf. Suárez, *DM* XXX, sec. VII, § XXX, p. 70a. With a reference to Augustine, *De civitate Dei* XI 5: "They [sc. the Platonists] of God, neither enclosing the divine substance in any place, nor setting any limits to it, nor giving it any extension in space, but rather acknowledging that it is everywhere incorporeally present in its entirety. Are they then going to say that it is absent from the vast expanses of space beyond the world and occupies only the once place where the world is located, which is no more than a tiny place in comparison with that infinite expanse of space? My own opinion is that they will not go so far as this kind of

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out any change in His nature, He is really outside the world."[58] Both aspects belong together: Firstly, God acts in the world, but He is not embraced by it because of His immensity, and secondly, God is outside the world, but He is neither in a particular place nor in an infinite imaginary space (*spatium imaginarium*).[59] On the contrary, He is where He acts freely, and is truly present.[60] In conclusion, Suárez answers the question "Where is God?" with His ubiquity: God is too immeasurable and immense to be located even in the (limited) heaven. The relationship between ubiquity and place is therefore mediated over the omnipotence of God.

But what is place exactly? For an answer, we have to look at Disputation 51, where Suárez deals with the "where" (*ubi*) as one of the ten Aristotelian categories (cf. *Cat*. 4, 1b25–27). He defines it as an intrinsic modus, by which a body is corporeal really present where it is.[61] This "where", this *modus praesentiae*, does not depend on the exterior enclosure of a place (*locus*), but is part of the interior capacities of an extended body. In this context, Suárez refers to the *ultima sphaera coelestis*, which as a body has a real presence where it is but still has no place since it is not in another, even more comprehensive heaven.[62] That means that we have to distinguish between the spatial extension of a body, which is the capacity within its surface, and its location in space.[63] In other words: The intrinsic where (intrinsecum ubi) of an extended body, i. e. the being of a body, and the extrinsic place (extrinsecum locus), i. e. the relation of a body in a place to another body[64] are not congruent.

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empty nonsense." Quoted from *The works of Saint Augustine* (part 1, book 7: The city of God, XI–XXII), ed. Boniface Ramsey, tr. William Babcock, New York 2013, p. 7.

58 Suárez, *DM* XXX, sec. VII, § XXXII, p. 70b: "Ratio vero sumitur ex dictis, quia Deus potest operari extra mundum sine mutatione sui: ergo iam actu est extra mundum."

59 Suárez does not deny the necessity of a imaginary space. With this concept, he introduces an absolute space which is mandatory since otherwise the last sphere of heaven which is not a physical place, would be inconceivable. Cf. Suárez, *DM* XXX, sec. VII, § XXVIII, p. 69b: "Addunt [sc. theologi] etiam argumentum supra tactum, quia nulla res est in nihilo: extra hunc autem mundum nihil est, nam spatium imaginarium non est, sed imaginatione fingitur." The imaginary space, as it were, closes the heaven, which would otherwise be endless, sets the sky a dormant, i. e. immovable point. Suárez emphasizes that according to our way of thinking, we are forced to resort to this imaginary space in which we conceive of expansion, as well as geometric points, lines and surfaces. Cf. ibid., *DM* LI, sec. II, § vI, p. 623b. For a detailed description of Suárez's *spatium imaginarium* and the reaction of some Dutch Cartesians cf. Goudriaan, *Philosophische Gotteserkenntnis*, pp. 93–108.

60 Cf. Suárez, *DM* XXX, sec. VII, § XXXVI, p. 71b.

61 Cf. Suárez, *DM* LI, sec. I, § XIV, p. 620a: "Dico ergo primo, esse in quolibet corpore proprium quendam modum intrinsecum ex natura rei distinctum a substantia, quantitate, & aliis accidentibus corporibus, a quo modo essendi formaliter habet unumquodque corpus esse praesens localiter alicubi, seu ibi, ubi esse dicitur."

62 Cf. ibid., *DM* LI, sec. I, § XXI, p. 621b.

63 Cf. Ulrich Beuttler, *Gott und Raum—Theologie der Weltgegenwart Gottes*, Göttingen 2010, p. 43.

64 Place, or more precisely, the extrinsic place describes the relative position of the bodies to each other. Cf. Timpler, *Metaphysicae systema*, l. II, c. V, probl. VII, p. 118: "Locus non est ens absolutum, sed relatum." Place is, according to his respective nature, nothing but the vessel of a body located there: "Hinc igitur patet locum secundum essentiam suam respectivam in genere nihil aliud esse, quam receptaculum locati." (ibid., p. 118f.)

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Further, this *ubi* is not simply equated with space (*spatium*), as if it were a vessel filled with another body; rather, it is an intrinsic space (*spatium intrinsecum*), which is to be determined as a being of reason (*ens rationis*): "To me, this space seems to be a being of reason, which is not, like impossible beings, fashioned gratuitously; it rather has a foundation in the bodies themselves inasmuch as they are apt to constitute real space not only where they now are but also to infinity outside the last heavenly sphere."[65] Suárez refers here to the immensity of God described above in order to show that the difference between the real space on the one side and the intrinsic or imaginary space on the other side is essential for an appropriate understanding of God's relation to place and space. His concept is the background against which the description of place and space is made. God, who is outside of heaven but includes at the same time all things in heaven, "needs" an immeasurable "(every-)where", which as a real "place" must be able to relate to all things and places. From the very beginning, this real "place" must be understood therefore in a way that it "holds" or "encompasses" God's immensity.

The same tension that characterises Suárez's description of the relation of ubiquity and place can be found in his explanation of the relation of eternity and time in his Disputation 51, which is now the subject of our consideration. It is not time as the duration of movement (*duratio motus*) which is of particular interest here.[66] It is duration in the strict sense of the word that clarifys the relation between eternity and time. The most prominent difference between time and duration is that the latter is not measured by movement. Duration means for Suárez: A thing lasts that persists in its existence. Duration is, therefore, the same as permanence in being.[67] Specifically, Suárez speaks here about the inner duration, which is independent of external circumstances. God lasted by virtue of his eternity, even if there was nothing outside of Him. Duration as persistence in existence is thus firstly something real, secondly distinguished from imaginary or absolute time, the merely imaginary *successio continua*, and thirdly is not to be confused with relative time, i. e. the measured duration, which has a foundation in things.

65 Suárez, *DM* LI, sec. I, § XXIV, p. 622b: "Itaque quatenus hoc spatium apprehenditur per modum entis positivi distincti a corporibus, mihi videtur esse ens rationis, non tamen gratis fictum opere intellectus sicut entia impossibilia, sed sumpto fundamento ex ipsis corporibus, quatenus sua extensione apta sunt constituere spatia realia, non solum quae nunc sunt sed in infinitum extra coelum, prout supra etiam in disp. 31 dictum est, tractando de Deo immensitate." For the problem of the being in reason see John P. Doyle, *Collected studies on Francisco Suárez, S.J. (1548–1617)*, ed. Victor M. Salas, Leuven 2010, pp. 161–208.

66 Cf. Suárez, *DM* XVI, sec. IX, § XI, p. 374b. More specifically, Suárez distinguishes between a *tempus extrinsecum* as the duration of movement of the heaven with respect to the duration of the other movements and a *tempus intrinsecum* as the real and intrinsic duration determined in a continuous motion.

67 Cf. ibid., *DM* L, sec. I, § I, p. 580a: "Deinde supponimus durationem non attribui, vere ac proprie, nisi rebus actu existentibus. Dicitur enim durare res, quae in suae existentia perseverat: unde duratio idem esse censetur, quod permanentia in esse."

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The uncreated duration is the eternity, which belongs to God alone.[68] This is the infinity of time, which in a certain sense is only the other side of the infinity of space, the omnipresence of God. He always really exists so that there is no beginning and no end of being in Him; His being always takes and will always last. Suárez follows here the view of Boethius and Thomas Aquinas, according to which eternity is "the total, simultaneous and perfect possession of unending life",[69] i. e. the immutable and endless presence of God in itself. *Tota simul* denotes the absence of any progress of time in God, the perfect present without before and after; *interminabilis vitae* marks the absence of any possible change in His being because there is no difference whatsoever between being and life; *perfecta possessio* describes finally the necessary and perfect stability of God's being and actions without any change. Eternity has no numerical value for Suárez at all: It is not measurable and it has no relation to the measurable, which is time. Nor can it be described as immutability because it is too much related to the changeability of time. Eternity is more appropriately described as a positive perfection that excludes everything negative from itself.[70]

It is solely due to the human imagination that we say that God has always been, is always and will always be because we imagine Him in our own way in the ongoing true or imaginary succession of time, rather than understanding Him as He really is in His eternity. In this way, we comprehend the whole eternity, which has existed up to this moment, as a space or as a latitude flowing without beginning. "In reality, however, there is in the eternity of God Himself no flow, and consequently neither past nor future, but He is only by an extrinsic denomination regarding the coexistence of our time according to our way of thinking."[71] Suárez recalls here the limitations of human imagination which prevents us from knowing God in His eternal immensity. It is clear, however, that this eternal duration is to be distinguished from all other kinds of duration. The closest one is the so called *aevum*.[72] *Aevum* does indeed describe a certain duration *a parte post*, but not an infinity *a parte ante*, for as a created duration (*duratio creata*) it is not in that way in and through itself that it is deprived of the *capax successionis*. The created duration belongs to the angels as creatures created by God, who,

68 Cf. ibid., *DM* L, sec. III, § II, p. 586b: "Primo quia Deus vere ac proprie dicitur ex aeternitate realiter durasse: ergo per durationem realem & non in alio existentem: ergo per durationem increatam existentem in ipso Deo. Item Deus semper realiter extitit, ita ut nunquam in eo signari potuerit initium existendi, & in eo esse realiter permansit ac permanet, ergo realiter duravit, & durat sua intrinseca duratione, quae non potest esse nisi increata." See the similar position of Timpler, *Metaphysicae systema*, l. I, c. V, probl. IX, p. 59.

69 Suárez, *DM* L, sec. III, § VI, p. 587b: "Et priorem indicavit satis Boetius in recepta illa definitione aeternitatis, quod sit *interminabilis vitae tota simul, & perfecta possessio*." Referring to Thomas Aquinas, *ST* 1, q. 10, art. 1.

70 Cf. Suárez, *DM* L, sec. IV, § XV, p. 591a.

71 Ibid., *DM* L, sec. III, § XII, p. 588b: "Re tamen vera, in ipsa aeternitate Dei nullus est fluxus, & consequenter nec praeteritum aut futurum, sed per denominationem extrinsecam ex coexistentia nostri temporis, iuxta modum concipiendi nostrum."

72 Cf. ibid., *DM* L, sec. V, § XXVI, p. 595b.

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in His perfect presence alone, surveys everything at the same time. Even greater is the difference between eternity and time, which as a continuum means real successive duration (*realis duratio successiva*) which manifests itself in movement.[73] The duration thus accompanies the time that remains bound to the former. Duration that released time was first. Suárez concludes by emphasizing the primacy of God's eternity before creating any time, in the same way, as he has previously demonstrated the primacy of God's omnipresence over each place and space He has created. Metaphysics, that is the conclusion, sets God outside of space and time, as the orthodox dogmatics of the time demanded.

3 Conrad Vorstius: Questioning the immensity and eternity of God

The "case" of Conrad Vorstius has already been the subject of various research.[74] The dramatic ramifications of the publication of his *Tractatus theologicus de Deo* in the second edition of 1610 are apparent, both for his public career as a professor of theology in Leyden and for his reputation as a Reformed theologian. In discovering certain Socinian tendencies in his work, a heated debate arose about his "true" orthodox faith, which ended with his dismissal at the Synod of Dort in 1618 and with banishment by the Dutch states from their territories. In the most recent research on this case, Kęstutis Daugirdas called Vorstius a "Semi-Socinian Semi-Nikodemit".[75] He explains "Semi-Socinianism" as follows: "Vorstius's programmatic insistence of a Bible-relatedness and reason-conformity of the speech of God was accompanied by a historicizing of the conception of God".[76] In the tradition of Sozzini, who denied the classical view of God's eternity as a atemporal presence in favour of a divine knowledge which is determined by the three time modes, Vorstius went a step further in describing God as living in a place and acting in time. I want to describe this idea of "finitisation" of God here in detail, supplemented, however, by His "spatialization", which characterises the second aspect of my interest here.

The third disputation of the *Tractatus theologicus* with the subtitle *De Deo, nempe de natura Dei in genere* does not reveal any remarkable dissonances with the classical concept of God. Vorstius and his respondent Heinrich Weingarten define the nature of God as simple, infinite, immutable, individual, eternal and

73 Cf. ibid., *DM* L, sec. VIII, S. 603a–b.

74 Cf. Wilhelmus Johannes Kühler, *Het Socinianisme in Nederland*. Leiden 1912. ND Leeuwarden 1980, esp. 57–76; Willem van 'T Spijker, "Heidelberger Gutachten in Sachen Vorstius", in: *Späthumanismus und reformierte Konfession. Theologie, Jurisprudenz und Philosophie in Heidelberg an der Wende zum 17. Jahrhundert*, ed. Christoph Strohm et al., Tübingen 2006, p. 207–225; Jan Rohls, "Der Fall Vorstius", in: *Religiöser Nonkonformismus und frühneuzeitliche Gelehrtenkultur*, ed. Friedrich Vollhardt, Berlin 2013, p. 179–198; Daugirdas, *Anfänge des Sozinianismus*, p. 392–438.

75 Daugirdas, *Anfänge des Sozinianismus*, p. 392: "Vorstius: Ein semi-sozinianischer Semi-Nikodemit […]. Die Vergeschichtlichung des Gottesgedankens."

76 Ibid., p. 407: "Mit dem programmtischen Instistieren auf die Bibelbezogenheit und Vernunftkonformität der Rede von Gott ging bei Vorstius die Vergeschichtlichung des Gottesgedankens einher […]."

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immense.[77] Only the extensive notes to the third disputation show the dramatical shift in the understanding of God which takes place here. Vorstius describes God's duplex infinity as both encompassing His eternity and His immensity, i. e. His omnipresence and ubiquity.

1. God's eternity is, strictly speaking, "nothing more than infinite duration lacking any beginning and end".[78] At first glance, this definition fits very well to the classical understanding of eternity, as just illustrated with Suárez. However, Vorstius sets a first counter point in equating duration with time. He refers here to the Lutheran Nicolaus Taurellus (1547–1606) and the Reformed Petrus Ramus (1515–1572) in differentiating between a physical and metaphysical time. While the former one is solely an attribute of *finite* beings without existing *ante mundum*, so is the latter one an attribute of *all* beings, always existing *ante & post mundum*. In other words: There is a double time, a finite time and an infinite, i. e. eternal time.[79] Time and eternity are equated here. This was postulated first by Sozzini in his *Praelectiones theologicae* (1609)[80] and afterwards became common opinion within Socinianism.[81]

77 Cf. Vorstius, *Tractatus*, disp. III, pp. 17–19.

78 Ibid., notae III, p. 202: "Est [sc. aeternitas] autem, absolute loquendo, nihil autem, quam perennis duratio, principio & fine carens." See ibid., p. 209: "In summa: Aeternitas in se spectata nihil est aliud, quam tempus aeternum, sive duratio infinita, h.e. principio & fine carens […]."

79 Cf. ibid., notae III, p. 204: "Ut igitur duplex ἀιών sive seculum in Scriptura traditur (unde & ἀιώνιον) sive seculare dupliciter dici potest) ita nihil vetat, duplex tempus ibidem describi, alterum finitum, alterum infinitum, sive aeternum." Vorstius seems to follow Petrus Ramus (1515–1572) here. According to Ramus, everything is in time. In developing this idea, Ramus divides time into an infinite and eternal time, which related to God, and a finite time, which belonged to the created things.

80 Cf. Fausto Sozzini, "Praelectiones theologicae", in: idem, *Opera omnia in duos tomos distincta. Quorum prior continet ejus Opera exegetica & didactica, posterior Opera ejusdem Polemica comprehendit*, Irenopoli [=Amsterdam] 1656 [=1668], tomus primus, pp. 537–600, here p. 545a: "Praeterea dicimus, rationis confirmationem quam afferunt, nullius momenti esse. Tempus enim aeternum est, quidquid Theologi nostri contra disputent, semperque & fuit & futurum est, ut & praeteritum aliquid, & praesens, & futurum sit. Nec vero in mundi creatione, ut ipsi arbitrantur, tempus primum extiti, sed tantummodo temporis mensura quaedam." For a detailed analysis of this treatise see Daugirdas, *Anfänge des Sozinianismus*, pp. 138–153.

81 Other important representatives of this opinion were Adam Goslav (1577–1642) and Johannes Crellius (1590–1633). In his dispute with the Reformed Bartholomew Keckermann (1571/3–1609) on the concept of the Trinity, Goslav argues for the identity of time and eternity: "Sed quaeret hic aliquis, Ergo tu tempus aeternum statuit, ut dicas, Deum in tempore esse? Ego vero non video, cur negem tempus aeternum. Platonis opinionem, quam magna pars Theologorum sequitur, refutavit Aristoteles: ut mirer, quid desiderent nostri, vel Theologi, vel Philosophi; maxime cum nec ratio contrarium suadeat, nec scriptura sacra aliud ingerat." (Goslav, *Refutatio eorum, quae Bartholomaeus Keckermannus in libro primo Systematis sui Theologici disputat*, Raków 1613, p. II, c. VIII, p. 101) In his famous book *De Deo et ejus attributis* (1630), Crellius agrees with the common opinion that eternity is to be understood as everlasting duration of a thing and that the most perfect eternity belongs to God: "Est enim Deus aeternus, quia & semper fuit, & semper erit, & sic non minus initio caruit, quam fine cariturus est." (Crellius, "De Deo et ejus attributis", in: idem, *Operum tomus quartus scripta ejusdem didactica & polemica complectens*, Irenopoli [=Amsterdam] 1656 [=1668], pp. 3–116 [separate pagination], here c. XVIII, p. 41b) However, this understanding of eternity does not mean that God is outside of time: "Non potest autem nobis eorum probari subtilitas, qui aeternitatem

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For Vorstius, God is really and strictly speaking eternal, i. e. His Life is free from every beginning and end. He is therefore uncreated, immortal, incorruptible, and everlasting. However, the Reformed theologian emphasizes God is *not* outside of time. Surprisingly, he does not mean here the metaphysical, infinite time, but the physical, finite time. Despite some biblical references, in which God is described in explicit terms as eternal (cf. Gen. 21:33; Ps. 90:2; Rom. 16:26 etc.), Vorstius refuses to acknowledge these passages as absolutely true: "However, on the basis of this, God's absolute eternity is not proven solidly because whatever was before this world is not necessarily from eternity."[82] Vorstius refers here to the example of the angels who were created a long time before the world, but who do not exist from eternity. A further explanation is that it was not Moses' aim to prove God's absolute eternity but His long-held and constant affection for His people, or His paternal and eternal benevolence toward us.

The consequences are overwhelming: Like the Socinians, Vorstius denies the common view that the whole eternity (of God) exists together (*simul*, "at the same time") and that it coexists with all times. According to this view, there is no motion, no succession of the past or the future but only one present time which contains all times in itself like a point which encompasses all lines in itself. This view reflects the famous phrase of Ps. 90:4, according to which a thousand years in God's sight are like a day that has just gone by. Vorstius, however, recognises here a serious contradiction of the twofold consequences: On the one hand, all times and things would be and would be not at the same, which is impossible. On the other hand, God, who is outside of time in eternity, could effect that the past were not really the past and the future not really the future. The absurdity of this would be that for one thing the past is no longer and the future is not already yet, while otherwise both of them are really present in God's eternity.[83] Therefore, the true understanding of God's eternity is that He is *in* time like all beings with His own present, past and future (cf. Rev. 1:4). Against this background, the true meaning of Ps. 90:4 is that time does not seem so long to God as it does to us who

Dei, omnia, quae unquam extiterunt, temporum spacia complectentem, in unius puncti sei angustias cogunt. Indivisibilem enim eam esse statuunt; nihilque in ea prius, nihil esse posterius. Itaque quicquid Deus unquam egit, acturusve est, id eum simul agere. Omnia ipsi praesentia; nihil praeteritum, nihil futurum. Quae sententia & sacris literis repugnat, & sibi ipsi, omninoque contradictionem non unam involvit." (ibid., p. 43b) A concise overview of the Socinian position offers Fock, *Socinianismus*, p. 427–431.

82 Vorstius, *Tractatus*, notae III, p. 205: "Sed hinc tamen non solide probatur absoluta aeternitas quum non continuo ab aeterno sit, quidquid ante hunc mundum fuit […]." Some years later, the Socinian Valentinus Smalcius (1572–1622) argues exactly in the same way in his confrontation with the Lutheran Wolfgang Franz (1564–1628). Cf. Smalcius: *Refutatio thesium D. Wolfgangi Frantzii […] de praecipuis Christianae religionis capitibus anno 1609, & 1610 disputandas proposuit*. Raków 1614, disp. 1, p. 12.

83 Cf. Vorstius, *Tractatus*, notae III, p. 207: "Hinc porro sequetur, Deum ratione aeternitatis efficere posse, ut praeteritum non sit vere praeteritum, futurum non vere futurum. Nam illud jam non amplius est: hoc vero nondum est: & tamen utrumque revera praesens est in aeternitate, si utrumque aeternitati coexistit."

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do not live forever. This "in-the-time-fetching" of God is reinforced by the fact that Vorstius agreed to the Socinian view that the first matter is equal to God. Like God Himself, it is uncaused and immortal.[84]

2. One can find the same type of rational arguing in Vorstius's description of God's immensity which is strongly connected with His alleged omnipresence or ubiquity. Vorstius enumerates three main attributes of God's immensity, namely 1. His incomprehensible and immeasurable magnitude of His essence, 2. His ubiquitous presence completing heaven and earth, holding all creatures quasi in His hands, and 3. His various grades and modes of presence in the created things, so that God is, for example, in heaven in another way than on earth.[85] Not surprisingly, Vorstius does not agree with this common view. Right at the beginning of his argumentation, he stresses that "nowhere in Scripture is taught explicitly that God is substantially ubiquitous and is therefore per se infinite."[86] Of course, Vorstius is very well familiar with all the biblical references such as Ps. 139:16 and 11, Jer. 23:23, and Acts 17:27 that orthodox opponents refer to in order to legitimise the ubiquitous of God. For him, however, no solid proof of the immensity of God is possible with these references. From Jer. 23:23 one can only infer that the divine essence is simultaneously both at all locations and at every single place, but not that He is ubiquitous at every place. On the contrary, from Isa. 66:1 Vorstius concludes that God is substantially in the highest heaven, however, in a way that He is with all of His power near to us (cf. 1. Kings 8:27, Acts 17:27). The conclusion is thus clear: "We therefore plainly believe that the Bible inculcates that God lives really according to His substance (which is extensive and great, in respect to our substance immense and at the same time most glorious) in the highest and most capacious heaven: On earth, however, He is to be present to us with His power and wisdom, with His effective operation and providence."[87] In locating God in heaven, Vorstius follows the Scotist tradition, as mentioned above. However, with his last step he leaves even this path and turns towards Socinianism in making God finite.

With reference to Mt. 18:10, 1. John 3:2, and Rev. 22:4—"and they shall see his [i. d. God's] face"—Vorstius concludes with regard to the substance of God: "Thus, it [sc. substantia] is not completely and simply infinite."[88] The explanation for this radical heterodox view is totally rational: If God's substance would be infinite, it could not be apprehend with a (created) sense because there must be a relation

84 Cf. ibid., notae III, p. 209. For the position of the Socinians cf. Salatowsky, *Philosophie der Sozinianer*, pp. 292–296 and 321–324.

85 Cf. ibid., notae III, p. 210.

86 Ibid., notae III, p. 212: "Ad primum illud genus excipi potest, nusquam diserte in Scriptura doceri, Deum substantialiter ubique praesentem, adeoque simpliciter infinitum esse."

87 Cf. ibid., notae III, p. 216: "Simpliciter igitur credamus quod S. literae toties inculcant, Deum revera sua substantia (quae ut amplissima & maxima, nostrique respectu immensa, ita simul summe gloriosa est) in coelo altissimo, eodemque capacissimo, habitare: in terra vero ubique virtute & sapientia sua, sive efficati operatione & providentia sua nobis adesse."

88 Ibid., notae III, p. 216: "Substantia Dei videtur jam ab Angelis Matth. 18.10. & videbitur olim a nobis facie ad faciem. 1. Joh. 3.2. Apoc. 22.4. Ergo non est prorsus & simpliciter infinita."

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between the object, which has to apprehend, and the person, who apprehends it. According to Vorstius, nothing in all of nature can be really infinite since all of the beings have a certain definite essence by which they are what they are. How much Vorstius reckons God among the finite things becomes clear from the next syllogism: No matter can really be infinite because it cannot receive infinite forms. "No number, no magnitude is really infinite. So God too. For, to be really infinite and to be this or that in particular, contradicts each other."[89] The next step in his argumentation is that Vorstius declares that not only the substance of God is finite but also His power. The *potentia Dei* may be immense or infinite in regard to us and to all possible things; however, strictly speaking, it is not. The argument is once again plainly rational: God's power does not extend over the impossible things, because even in God Himself natural qualities exist to which He is bound.[90] Consequently, He can *not* undo what happened, and He can *not* stop time.[91]

In his concluding remarks to this topic, Vorstius finally abandons the idea of the infinity of God which culminates in his materialistic, i. e. Socinian view of a bodily God. For him, attempts to interpret the Bible in a specific way in order to avoid a literal reading are futile. "Who can deny that in the Scripture a magnitude and local presence is continuously attributed to God? And that it is clearly affirmed that this place is really in the highest heaven?"[92] Vorstius agrees with the common opinion that God does not have a thick or sensible body such as the bodies of created things have. However, he emphasises furthermore, and that marks the crucial Socinian difference, that also a spirit, even God, has his spiritual magnitude which is, of course, not sensible but intelligible.[93] In securing this view, Vorstius is even willing to give up the classical Aristotelian opinion of place as a boundary of the containing body and to accept an empty area (*vacua regio*).[94]

89 Ibid., notae III, p. 216f.: "Nec numerus ullus, nec magnitudo ulla actu infinita est &c. Ergo nec Deus. Nam actu infinitum esse & in specie hoc vel illud esse, contradictoria sunt […]."

90 Cf. ibid., notae III, p. 217: "Potentia Dei, etsi respectu nostri, & rerum possibilium, recte immensa dicitur, non tamen prorsus infinita est: quia non extenditur ad impossibilia: immo in ipso Deo consistit intra naturales Dei qualitates: Ergo nec essentia infinita est […]."

91 It is striking that Vorstius does not mention in this chapter the key reference of Josh. 10:12f. which stands paradigmatic for the heavy debate about the question of the geocentric or heliocentric model of the world. It is well-known that Joshua spoke to the Lord "O sun, stand still over Gibeon, O moon, over the valley of Aijalon" and that indeed "the sun stood still in the midst of heaven". While for the orthodox Christian Aristotelians, this reference was one of the most important proofs for the geocentric model, the Copernicans like Kepler and Galilei denied this interpretation of the Bible as being in contradiction with the laws of physics. For a discussion of this topic cf. Omodeo, *Copernicus*, esp. pp. 271–318. It can be assumed that Vorstius was a Copernican.

92 Vorstius, *Tractatus*, notae III, p. 218: "Aut quis negare potest, & magnitudo, et localem praesentiam, in S. Scriptura Deo passim attribui? Et, locum etiam revera in supremo coelo esse, perspicue affirmari?"

93 Ibid., notae III, p. 218: "Sed quid vetat, etiam spiritus, imo & Deum, suam habere spiritualem magnitudinem; non quidem sensilem, sed aliquo tamen modo intelligibilem?"

94 Vorstius refers here to the "Christian philosophers" Joseph Justus Scaliger (1540–1609) and Taurellus. Whether this reference is justified or not, can not be examined here.

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Finally, in his concept of God Vorstius adopts the position of the Socinians to such a great degree that it is right to call him not only a "semi-Socinian" but a "full-fledged" Socinian. This will become clearer in section 5 which describes Christoph Stegmann's very similar concept of God. This impression is also confirmed by the strong reaction of the orthodox theologians of all denominations, accusing Vorstius of being a Socinian. One of his most famous opponents was the Lutheran Johann Gerhard.[95]

4 Johann Gerhard: Saving the essence and attributes of God

In the dedication of the second volume of his *Opus metaphysicum* the Lutheran Scheibler described the dramatic shift which took place in his times: "It is sad that that what was considered and demonstrated in earlier centuries as common and correct in the doctrine of God in our time has been called into question by some people, with reasons often of little importance, or at least diminished and degraded from the truth to something suspect. I mean Conrad Vorstius and his adherents."[96] According to Scheibler, Vorstius left almost nothing from the divine attributes unharmed. He mentioned the infinity and power of God, His simplicity and eternity etc. For Scheibler, it is one of the main tasks of the *Metaphysica specialis* to explain these attributes of God which can be recognized by the light of natural reason.

Some years later, in 1625, Gerhard published his *Exegesis sive uberior explicatio articulorum de Scriptura Sacra, de Deo et de persona Christi* which he understood as a supplement to the first volume of his *Loci theologici* from 1610.[97] Actually, it is a revision of the first edition with which Gerhard reacted to the latest developments in philosophy and theology, especially to the rise of Socinianism as the most "dangerous enemy" of the Christian faith. In his dedication in the first volume, Gerhard called the Photinians—the Neo-Arians, later known as the Socinians—successively a "disease", a "virus or epidemic of contagion", a "pest" or a "cancer".[98]

95 A second example for these disputes, which end in the Vorstius affair, is offered by Albert Grawer: *Centuria I. Illustrium Quaestionum Theologicarum: De 1. Deo Uno & Trino. 2. Christo, in specie. 3. Spiritu Sancto, in specie. 4. Creatione. 5. Bonis & Malis Angelis. 6. Prima causa & Natura Mali. Disputationibus decem propositarum & D. Conrado Vorstio & Photinianis maxima ex parte oppositarum*. Jena 1614. Further editions were printed in 1617 and 1661.

96 Scheibler, *Opus Metaphysicum* II, epist. ded., p. 2 r: "Dolendum est […] ea quae superioribus seculis, in Doctrina de Deo, communiter, idque recte credita & demonstrata fuerunt, hoc nostro tempore, per rationes saepe nullius ponderis, a nonullis in controversiam vocari, vel saltem extenuari, & de veritate suspecta reddi. *Conradum Vorstium* intelligo, ejusque asseclas."

97 Cf. Johann Gerhard, *Exegesis sive uberior explicatio articulorum de Scriptura Sacra, de Deo et de persona Christi in tomo primo locorum theologicorum concisius pertractatorum*, Jena 1625. Preuss included this work in his edition of the *Loci*, mixing therefore the first edition with the supplement. Nevertheless, as the new English edition of Gerhard's *Loci* I will follow the Preuss edition.

98 Gerhard, *Loci*, t. I, epist. ded., p. IX [not included in the English edition]: "Verum enim vero idem ille morbus resurgit hodie, idem virus pestilens infernalis draco e suis hodieque exhalat faucibus. Ut enim silentiis nube involvam varias, eas tamen omnes erroneas opiniones, quibus plurimi ipsissimum Nestorianismum et Eutychianismum postliminio in ecclesiam reducere annituntur, an non ingentem minantur pestem recentiores illi sive Samosatenia

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However, while the edition of 1610 focused on the writings of Sozzini and Christoph Ostorodt (ca. 1560–1611), in the edition of 1625 the new works of Smalcius and Vorstius dominated the agenda. In the following, I will limit myself to Gerhard's dispute with Vorstius on the divine attributes of eternity[99] and immensity.

For a better understanding, it should be noted that Gerhard divides the attributes of God into essential and relative attributes. This subdivision is, of course, only a conceptual one because the unity of the essence of God is before any distinction: God is of all beings maximally one (*maxime unum*), just as he is also the greatest being (*summum ens*).[100] This in turn means that all divine attributes are really and most simply one with the divine essence.[101] Gerhard justifies this with the absolute simplicity of the divine nature, free of all composition, mixture, and division, and, therefore, of all accidents.[102] From this follows, first of all, the incorporality and thus the spirituality of God, as Gerhard, citing John of Damascus, proves with the following rational argument: "No body is utterly simple, and an utterly simple being cannot be corporeal because every body is compounded, is passively potential, and is divisible. God is an utterly simple being and is not passively potential. Therefore, he is not corporeal."[103] The simplicity of God thus prevents any kind of composition that belongs solely to the bodies.[104]

Similar to Suárez, Gerhard defines God as "eternal with a true, properly spoken, and infinite eternity".[105] He refers here not only to the definition of Boethius, already mentioned by Suárez, but also to the specification of the Scholastics, according to which this eternity means an interminable, indivisible, and independent duration with no beginning and end. This view is based on numerous biblical references (like Gen. 21:33, Ps. 55:20 and 90:5, Rm. 16:26, and 2 Pet. 3:8), on some quotations of the church fathers like Hilary and Augustine and finally on the following "evident" reason: "He who is the creator of all things and all times, before whom there is nothing, with whom there is neither past nor future, neither before nor after, who is utterly simple and immutable, who remains immovable

ni sive Photiniani, quos vulgos Neo-Arianos vocat, quibus tamen illi longe pejores sunt et pestilentiores! […] Sed enim ut apparet, quam omnino pestilens tabes et quam virulentum carcinoma sit Photinianorum istorum doctrina […]."

99 For this section, I will refer to my study "Entlastung Gottes", pp. 261–263.

100 Cf. Gerhard, *Loci*, t. I, lc. II, c. VI, § 95 & 96, p. 288a [99].

101 Cf. ibid., t. I, lc. II, c. VII, § 104, p. 295b [114].

102 Cf. ibid., t. I, lc. II, c. VIII, s. III, § 129, p. 305b [133]: "*Essentia divina est simplicissima* expers omnis compositionis, admixtionis ac divinisionis adeoque omnium accidentium."

103 Ibid., t. I, lc. II, c. VIII, s. I, § 114, p. 299a [122]: "Nullum corpus est simplicissimum, et ens simplicissimum non potest esse corporeum, quia omne corpus est compositum, est in potentia passiva ac dividuum. Deus est ens simplicissimum, non est in potentia passiva. Ergo non est corporeus."

104 Gerhard criticises Vorstius here for his confusion both of things and of words, because spirit and body are contradistinct species. Cf. Gerhard, *Loci*, t. I, lc. II, c. VIII, s. I, § 115, p. 300b [124].

105 Ibid., t. I, lc. II, c. VIII, sec. IV, § 137, p. 307 [139]: "*Deus est aeternus vera, proprie dicta et infinita aeternitate*." (Italics in original)

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outside of every succession and every movement, who lives and rules forever, He indeed is truly and properly eternal. But all these things belong to God."[106] This is a typical example for the Scholastic way of reasoning by presupposing that what would have to be proved or at least demonstrated first. It is significant for the Lutheran theology at that time that Gerhard here also refers to Thomas Aquinas.

Subsequently, Gerhard deals extensively with the objections of Vorstius which he refutes step by step. Thus, he emphasized Vorstius's opinion that on the basis of Ps. 90:2, God's absolute eternity is not proved solidly so that also a participated eternity is possible that this eternity is unknown to the Bible. Here, as in general, we must keep a distance from our own speculations or mere assertions of some of the fathers, but only follow the Scripture which alone called God in the strict sense of the word eternal.[107] Gerhard criticises Vorstius no less for his opinion that in God's eternity is a succession of past, present, and future so that not all things are simultaneously present to Him. According to Gerhard, eternity is not an accident but God's essence which must therefore be understood absolutely without any limitations. In the form of a syllogism, Gerhard tries to demonstrate this eternity: "God's eternity is nothing else but the duration of God. The duration of God is nothing else but His enduring existence, and the existence of God is the very essence of God. Ergo, eternity is the essence of God Himself."[108] Instead of seeing that God's eternity is described in the Scripture in human fashion with words that indicate the succession of time but that, nevertheless, must be understood in a manner fitting for God, Vorstius minimizes the greatness of God, thinking in a childish way of the creator of all things. For Gerhard, God's eternity coexists very well with the segments of time taken separately and succeeding one another. Therefore, [as] the distinction of times in creatures does not take away God's eternity, so God's eternity does not take away the distinction of times in creatures.

Gerhard presents the following comparison for this parallelism: As the heavenly machinery revolves around an immovable pole with an eternal motion, and the immovability of the pole is not disturbed by the motion of the heavenly machinery nor the movement of the machinery caused to stop by the immovability of the pole, so also eternity coexists with the segments of time that follow each other, and neither is the fixed immovability of eternity disturbed by the contin-

106 Ibid., t. I, lc. II, c. VIII, sec. IV, § 139, p. 308b [140]: "Qui est omnium rerum ac temporum creator, ante quem nihil est, apud quem nihil praeteritum aut futurum, nihil prius aut posterius, qui est simplicissimus et immutabilis, qui extra omnem temporis successionem et extra omnem motum immobilis permanet, qui in aeternum vibit et regnat, is etiam vere et proprie est aeternus. Sed haec omnia Deo competunt. Ergo."

107 Cf. ibid., t. I, lc. II, c. VIII, sec. IV, § 142, p. 309b [142]: "Respondemus 1. non nostris hic indulgendum speculationibus nec nudis patrum quorundam assertionibus. […] sed Scriptura unice audienda est, quae τὸ esse ante conditum mundum, antequam essent terra et montes, proponit, ut propriam aeternitatis descriptionem et ut attributum Deo unice conveniens."

108 Ibid., t. I, lc. II, c. VIII, sec. IV, § 143, p. 309b [143]: "Aeternitas Dei nihil aliud est quam duratio Dei. Duratio Dei nihil aliud quam durans exsistentia, exsistentia Dei est ipsa Dei essentia. Ergo aeternitas est ipsa Dei essentia."

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uous successions of flowing times nor is the succession of time destroyed by the fixed immovability of eternity.[109] In a way, one can find here a confirmation of the old idea that God is what creation is not. He is, as already mentioned, the very Other who can only be described by the way of negation (via negationis), in the reversal of all that what man is, thinks and acts. Gerhard does not conceal in this context the great difficulties that arise in the chapter De natura Dei which are strongly connected with the blindness of our mind: Because all the works of God are marvellous and mystic, filled with mysteries, how much more marvellous and sublime will be the creator of these works, God Himself?[110]

According to Gerhard, from God's eternity follows His immortality[111] and infinity[112] which only indicate in other words that God is incorruptible that He can neither be limited by time nor place, but that He is infinite in His own nature and essence, infinite, however, not in the sense of corporeal quantity or extension, but of (incorporeal) essence and perfection.[113] In some ways, immensity, in turn, is the same in all ways as infinity, signifying that God is of Himself not limited or measured by any place or time nor any other thing. However, strictly speaking, immensity is the kind of property of God that signifies that He "is measured and circumscribed to no place but penetrates and fills each and every place without the multiplication, extension, inclusion, and division of His own essence."[114] This presence (*adessentia*) at all places at all times ultimately means the omnipresence or ubiquity of God (*omnipraesentia, ubiquitas*) which Gerhard describes as follow:

109 Cf. ibid., t. I, lc. II, c. VIII, sec. IV, § 143, p. 310b [144].

110 Cf. ibid., t. I, lc. II, prooem., § 4, p. 242a [5]: "Cum enim omnia Dei opera sint mirabilia et μυστηριώδη, mysteriis plena, quanto mirabilior et sublimior erit operum illorum effector ipse Deus?" It is clear from this statement that the orthodox Christianity was essentially a religion of mysteries which were seen as impenetrable for the human mind because of his weakness. However, scholars like Vorstius and the Socinians were no longer willing to accept such mysteries which stand in an obvious contradiction to the human reason. It should be noticed that this criticism took place long before John Toland published in 1696 his *Christianity not mysterious*, the destruction of Christianity as the great mystery. That this was, of course, not the opinion of the clergies, is clear from the answer of the Puritan Thomas Beverley, *Christianity the great mystery. In answer to a late treatise, Christianity not mysterious: That is not above, not contrary to reason. In opposition to which is asserted , Christianity is above created reason, in its pure estate. And contrary to humane reason, as fallen and corrupted: and therefore in proper sense, mystery*, London 1696.

111 Cf. Gerhard, *Loci*, t. I, lc. II, c. VIII, sec. VI, § 159, p. 316a [156]: "*Deus est immortalis et incorruptibilis*." (Italics in original)

112 Cf. ibid., t. I, lc. II, c. VIII, sec. VII, § 162, p. 317b [158]: "*Deus vere est infinitus*." (Italics in original)

113 Gerhard emphasises, of course, the "incorporeal essence" of God right from the beginning, defining God as "a spirit without a body" (Gerhard, *Loci*, t. I, lc. II, c. VIII, sec. I, § 114, p. 299a [121]) and accusing Vorstius of disseminating fictions and fabrications about God (ibid., p. 300b [124]).

114 Cf. ibid., t. I, lc. II, c. VIII, sec. VIII, § 171, p. 320a–b [164]: "Immensitas est talis Dei proprietas, per quam nullo loco mensurari ac circumscribi, sed omnia et singula loca citra essentiae suae multiplicationem, extensionem, inclusionem ad divisionem penetrare ac replere significatur." For a more detailed description of this topic in Lutheranism see Beuttler, *Gott und Raum*, p. 38–42.

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"This immensity and essential omnipresence of God must be understood in this way that God is present with all things not only by His might and efficacy nor only by His sight and knowledge but also in His total indivisible essence, for He is also immense and infinite not only in His power and wisdom but also in His essence."[115] God is at all places, but He can not be located; God is in all things, but He is not included; God is out of all things, but he is not excluded, and so forth.[116] The reason is: He creates space, He possesses space in Himself, and His "spatiality" is identical with His being. He is free from any kind of limitation in the sense of His *immensitas*, *adessentia* and *omnipraesentia*, from which arises the threefold omnipresence through His essence, presence, and power (*per essentiam, praesentiam et potentiam*, in accordance with Thomas Aquinas). In describing this all outstanding property of God, Gerhard quotes the old sentence of the Scholastics: "In being, presence, and power, God is here and everywhere."[117]

Gerhard uses also in his more detailed description of this ubiquity the conventional Scholastic terminology. According to that, God is everywhere but *neither locally* (*localiter*) or *in circumscribed fashion* (*circumscriptive*)—i. e. in the way a body is in a place, a body that is circumscribed by its own corporeal place—*nor definitely* (*definitive*)—i. e. at a specific place or "where" (*ubi*) as intelligent forms like the immaterial angels or the human soul are in a place, who are not locally circumscribed, but in their nature finite, so that they are "somewhere"—but "*repletively*, which must be understood not in a gross, corporeal manner—as if God filled all places like a body that fills its own place in such a way that it keeps another body from being put in the place it occupies—but in a *divine way*, because God, closed up in no place, contains all things because of the immensity of His own essence."[118] The repletive omnipresence of God is all-pervading,—fulfilling, and—containing, though He is and still remains separated from all places and things.

God as the creator, as can be seen from this Lutheran description—and there is not much difference to the Catholic position of Suárez—, exists completely out-

115 Gerhard, *Loci*, t. I, lc. II, c. VIII, sec. VIII, § 172, p. 320b [164]: "Haec immensitas et essentialis Dei omnipraesentia ita intelligenda est, quod Deus non tantum virtute et efficacia, nec tantum visione et scientia, sed etiam tota et individua sua essentia sit omnibus rebus praesens, neque enim tantum potentia et scientia, sed etiam essentia est immensus et infinitus."

116 With these paradoxical descriptions the danger of a pantheistic (or Spinozistic) identity of God and nature should be blighted. Cf. Beuttler, *Gott und Raum*, p. 40.

117 Gerhard, *Loci*, t. I, lc. II, c. VIII, sec. VIII, § 172, p. 320b [164]: "*Enter praesenter Deus hic et ubique potenter*." (Italics in original) This hexameter is handed down from the early Middle Ages.

118 Gerhard, *Loci*, t. I, lc. II, c. VIII, sec. VIII, § 172, p. 320b [164]: "Scholastici dicunt Deum esse ubique non *localiter seu circumscriptive*, quo modo corpus est in loco, quod a loco suo corporeo per partes quantas divisibili capitur ac circumscribitur, *nec definitive*, quo modo formae intelligentis, angeli scilicet et animae sunt in loco vel potius in certo ποῦ, quia sunt essentiae finitae definitae, sed *repletive*, quod tamen non intelligendum est crasso et corporeo modo, quod Deus ita repleat omnia loca, sicut corpus, quod locum suum eo modo replet, ut impediat ne in loco, quem occupat, aliud corpus locetur, sed *modo divino*, quod Deus nullo modo conclusus omnia loca propter essentiae suae immensitatem contineat." (Italics in original)

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side of space and time. In His immensity, He can only be described in His omnipresence and eternity without the possibility to say "where" God exactly exists and "when" He acts. In this understanding of God as the *supersubstantia*, the new heliocentric model which opened up the possibility of the infinity of space initially changed little.[119] God remained outside of time and place, deprived of human access in thought, but close in faith in everyday life.

5 Christoph Stegmann: Introducing the finite God in time and place

In contrast to Suárez's *Disputationes metaphysicae*, Stegmann's *Metaphysica repurgata* does not contain a *metaphysica specialis*: There is no particular doctrine of God, of the angels and the separated soul. This corresponds to the view that there is only being that has its basis in matter, but no transcendent being that is in some way or other immaterial. Everything that applies to being as being, also applies to God, to the angels, and to the human soul. Assuming that there are only two constitutive principles of being, namely form and matter, and that both of them are equally involved in the "forming" of being—matter takes on the form, form informs matter –, Stegmann draws three profound conclusions from this: (1) We can not accept the idea that form gives complete being to the thing. Complete and specific being is given neither by matter nor form alone, but results from the interaction of both of them. (2) "There is no existing thing that is pure form without matter. (3) Also God, the angels, the accidents, the beings of reason, in short, all existing things consist of form and matter."[120]

We would be mistaken to think that this materialism of all things was a widespread view within Socinianism—on the contrary. Crellius, for example, defines God in the classical way as a spirit, by which he understands a substance that lacks the thickness and materiality that we observe in bodies.[121] Following Augustine, he refers to God as a spiritual substance. We find this description in Stegmann too,[122] but used with a different meaning. Whereas for Crell, it is evident that the anthropomorphic description of God in the Bible must not be understood literally,[123] Stegmann sees things exactly the other way around. "The Holy Scripture describes God to us, but *never* states that he is immaterial and unformed, but rather that he has matter and form."[124] Quoting 1 Cor. 15:40 and following Ter-

119 Cf. Omodeo, *Copernicus*, p. 158–196.

120 Stegmann, *Metaphysica*, p. I, c. II, p. 9 r: II. "Nullum dari Ens quod sit pura forma absque materia. III. Etiam Deum, Angelos, accidentia, entia rationis, summatim omnia Entia materia & forma constare."

121 Crell, *De Deo*, c. XV, p. 37a: "Posterior definitio constitui potest hujusmodi, ut Deum dicamus esse Spiritum aeternum. […] Spiritum cum nominamus, substantiam intelligimus ab omni crassitie, qualem in corporibus oculorum arbitrio subjectis cernimus, alienam."

122 Cf. Stegmann, *Metaphysica*, p I, c. II, p. 9 v.

123 Cf. Crell, *De Deo*, p. I, c. XV, p. 37b.

124 Stegmann, *Metaphysica*, p I, c. II, p. 9 v: "Scriptura autem nobis talem ubique describit Deum, non quod sit ἄυλος et ἄμορφος, sed qui materiam & formam habeat." Stegmann follows here the opinion of Vorstius.

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tullian, he emphasises that there are *no* non-physical substances. Consequently, even spiritual substances such as God and the angels are physical: "It is said that God is a spiritual thing. A spiritual thing, however, is without flesh and bones. I answer: What is correct is that every spiritual thing is substantial and physical, even if it is without flesh and bones."[125] There are many different kinds of bodies, *not* only those that consist of flesh and bones.

A first intermediate result shows that Leibniz was not totally wrong with his criticism that Stegmann had reduced God almost completely to the status of creatures. Up to now, we have seen that Stegmann defines God as a spiritual, but no less *material* substance, and that he therefore denies any transcendental ontological status of God. However, a second step reveals further revaluations of the concept of God concerning His attributes of ubiquity and eternity. I would like to show this with reference to Stegmann's chapter *De tempore et loco.*

For Stegmann, time and space are part of metaphysics, even if they are extrinsic characteristics of being which have to be dealt with—together with the intrinsic characteristics of unity and composition, within the same discipline. Although—unlike the intrinsic characteristics—they do not flow from the principles of existing things themselves, they nevertheless necessarily accompany the latter. According to Stegmann, time and space are therefore no transcendental categories, but affections of the real being (*affectiones entis*).[126] This description, too, confirms that Stegmann does not make any distinction between the different kinds of beings. The Scholastics criticize such an approach because it undermines the differences between eternity and time, ubiquity and place and so forth. The Carmelite Francisco Gabriel, for example, emphasises that "not all beings are in a place, but only the corporeal one".[127] Once again, metaphysics and physics are here deeply involved in theological requirements which Stegmann wants to purge.

Stegmann differentiates between a mathematical (i. e. physical) and metaphysical consideration of time. That considers time as dependent on the movement of heaven and stars. According to him, this describes time only in an improper sense, which is not the essence, but the measure of time alone. This considers time under the aspect of eternity, that is, insofar as it has been before there were heaven and stars, nay, insofar as it has existed from eternity.[128] For Stegmann, time is

125 Ibid., p. I, c. VII, p. 48 r: "Pergis: Deus est Spiritus, Spiritus autem carnem et ossa non habt. Respondeo. Recte est omnis Spiritus substantialis & corporeum licet carnem et ossa non habeant."

126 Ibid., p. I, c. IV, p. 23 r and 25 r.

127 Francisco Gabrieli, *Physica, continens etiam materiam de Mundo, de Caelo, & de Meteoris*, Rome 1670, disp. V, p. 231b: "Resp. quod non omnia entia sunt in loco, sed tantum corporea; ac proinde locus non est affectio entis in communi, sed tantum entis mobilis, quod est obiectum philosophiae."

128 Stegmann, *Metaphysica*, p I, c. IV, p. 22 v: "Tempus consideratur vel Mathematicè, quatenus nimirum à motu coeli et syderum dependet. Et hoc non est Metaphysicae considerationis, neque propriè tempus est, sed potius mensura temporis. Vel Metaphysicè quod fuit antequam coelum et sidera essent, imò quod ab aeterno extitit."

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the general term (*genus*) of eternity, not the other way around. In other words: Eternity is part of time (*pars temporis*): "Eternity is the perpetual past, present and future duration of being. Eternity is therefore time."[129] Stegmann follows here the position of Socinus, Crellius, and Vorstius. Time as the perfect eternity, namely *a parte ante* and *a parte post*, without beginning and end belongs only to God. In this way, He differs essentially from the angels and the chosen who at the end of the days will receive "only" an *aeternitas a parte post*. In this view, Stegmann and the other Socinians agree with the orthodox understanding of God's eternity.

The crucial difference, however, lies in the fact that for the latter, as shown above, eternity is not part of time, but is totally different from it. For Suárez, Gerhard, and many other scholars, God is not temporal, but is rather the only thing that is eternal in the actual sense of the word, that means, without beginning and end. As such, he is that which time is not. Stegmann sees this exactly the other way around: "Also God is in time, and all spirits, nay, everything that is."[130] In other words, God's eternity, the semi-eternity (*aevitas*) of the angels, and the time of the sublunary things—everything *is* time. For this reason God's eternity, His being without beginning and end, means that He has been at all times, is now, and will always be, as is clear from Rev. 1:4 and 8. A temporal difference is also ascribed to Him in Ps. 90:2 and 102:27, i. e. a being marked by the past, present, and future which, although it may be eternal and pass through all times, nonetheless has a before and after.

Stegmann rejects the view according to which God's eternity does not permit temporal differences, but instead exists in an indivisible moment in which everything is always in the present. As mentioned above, this view was often defended by refering to Ps. 90:4 and 2. Peter 3:8, according to which a thousand years to God are like a day, and a day like a thousand years. For Stegmann, by contrast, it is clear from these words that the temporal difference is as nothing to God, as the infinity of the years remains a mere number to him. This does not mean, however, that there is no progress in God, or that there is no difference between before and after.[131]

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129 Ibid., p I, c. IV, p. 23 r: "Aeternitas est duratio Entis perpetua praeterita, praesens, et futura. Est itaque aeternitas tempus."

130 Ibid., p. I, c. IV, p. 23 v: "Respondeo. Etiam Deus in tempore est, et omnes spiritus, imo omnia quae sunt." Cf. ibid., p. 24 r–24 v: "[…] cum Deum in tempore esse diximus, Deus vero ab aeterno fuerit, unde et aeternitatem partem temporis fecimus, necessario sequi tempus ab aeterno fuisse. Et ita est." If time were not eternal, then it would start sometimes in time. But when time begins in time, then there is time before it begins, which is absurd. Stegmann refers here to Aristotle's law of noncontradiction.

131 Ibid., p. I, c. IV, p. 30 v: "Deinde verba illa Psalmi et Petri nihil quoque ad hanc rem faciunt. Nihil enim aliud volunt, quam discrimen illud temporum, quod nos maximi merito facimus, apud Deum nihili fieri, cum illi infinitas annorum, et qui nunquam definirent, numerus restet, ita ut mille annos non pluris quam unum diem facere possit, secus ac nobis fit, qui crastinum nobis polliceri non audemus: at interim non dicitur in mille illis annis, ut et in uno illo die apud Deim nullam esse successionem, nullam prioris et posterioris differentiam."

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As an affection of the living being, place is the "somewhere", the space in which something is. In other words: "Place is the space of a located thing."[132] This sounds ordinary, but Stegmann sets immediately the counterpoint. He rejects the classical Aristotelian definition of place as "the innermost motionless boundary of what contains it". The first argument for his rejection is typical for Stegmann's way of thinking: Place belongs to every being, as well to the outermost heaven as to mathematical or incorporeal things. According to him, it is not justified to exclude some things arbitrary from this understanding of place. A further argument concerns the difference between place and surface: The former is immobile, the latter is mobile. Place cannot therefore be moved by a moved body. Instead, a moved body will acquire a new place. Place is in this way equal with the located thing, but only as long as no movement takes places. Surface, however, is not equal with the located thing because it has only longitude and latitude, but in contrast to place no altitude.

Most important for the right understanding of the consequences of Stegmann's definition of place is, however, his following conviction: "But as we have talked about time, so we must also say this about space, namely that it is eternal."[133] Stegmann supports this view by arguing that God, because He is eternal, must be somewhere, i. e. in some place. Consequently, place must be eternal in the same way as God is eternal. If it were not eternal, it would then have been made, that is, it would have been made somewhere, i. e. in a place. Thus, it would have been before it had been made which is absurd. Stegmann makes reference here (similar to Crellius[134]), for example, to Ps. 2:4 and Mt. 5:16, in which heaven is ascribed to God as the place of His being. For Stegmann, the localization of God in heaven is accompanied by the idea that He is, according to His essence, not present everywhere, that is to say, He is not ubiquitous, which clearly follows from Acts 17:24 and Jer. 23:23. The reason is: "For if God is everywhere, in what way has He revealed Himself more in heaven than elsewhere? And what would it take to lead us from the earthly things to the heavenly, if God is by His nature present everywhere by that time?"[135] Further, if God were ubiquitous, he would either be in the same place as another object at the same time, or everything else outside of the

132 Ibid., p. I, c. IV, p. 25 r: "Locus est spatium rei locatae." Stegmann emphasises here his agreement with the Platonists who define "place" exactly in that way.

133 Cf. ibid., p. I, c. IV, p. 26 r: "Ut autem de tempore diximus, ita etiam de loco hoc asserimus, illum aeternum esse."

134 Cf. Crellius, *De Deo*, c. XXVII, p. 92b.

135 Stegmann, *Metaphysica*, p. I, c. IV, p. 27 r: "Nam si Deus est ubique, quomodo se magis patefecit in cœlis, quam alibi? Et quid opus nos à terrenis ad coelestia abduci, si ubique essentiâ praesentem hactenus Deum?" Crellius emphasises that in the case of ubiquity God should be indeed everywhere: "Ejus [sc. Dei] autem essentiam in quovis pulvisculo atque atomo totam latere, ac in locis quibusvis spurcissimis non minus, quam in angustissimo coelorum domicilio extare, & porro obscoenissimis etiam atque impurissimis actionibus plane mediam intervenire, & cum iis rebús intime jungi, a quibus vel cogitatio abhorret; id de Deo sanctissimo atque augustissimo omnino sentiendum esse, & sine certissima jactura ignorari non posse, nondum ex sacris literis discere potuimus." (*De Deo*, c. XXVII, p. 92b) He expresses understanding for those who do not dare to set God in lower places because

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divine essence would be nowhere. Indeed, Stegmann goes so far in stressing the necessity of having to be in a place as to claim that "God is not infinite, much less absolutely and simply, but finite. God is not immense."[136] Insofar that 'being in a place' means being restricted by a place, God cannot be in an unbounded place, and therefore cannot be Himself infinite, immense and ubiquitous, may He not be locked in a place like a bird in a cage.

Stegmann's two "bombshells" concerning the existence of God in space and time were the radical end of the Socinian concept of God. It does not come as a surprise that certainly not all of the Socinians agreed with this position. In his letter to Leibniz from the year 1707, in which he announced him the early submission of Stegmann's *Metaphysica repurgata*, Samuel Crellius (1660–1747), grandson of Johannes Crellius, expressed his profound dismay about this position: "Furthermore, I do not like everything about this metaphysics. The physical God is philosophized very roughly."[137] As we have seen, this assessment agrees with that which Leibniz should then give later in his refutation. God's eternity as boundless time on both sides means a "necessary existence" in contrast to the creatures who are affected by the flux of time and do not exist necessarily.[138] Leibniz also accused Stegmann of abusing passages of the Bible in order to confine God to a particular place which is ridiculous. If that would be the case, how can He know distant things or act on them? To maintain that God is finite proves only the crass ideas of Stegmann which are very remote from the true divine nature. In short, Stegmann's "attenuated philosophy" is a bad example for a way of philosophizing in which "scarcely anything outstanding and sublime survives".[139] God as the creator of the world has to separate ontologically from it in order to save the transcendental hierarchy of all beings just like the transcendental structure of the whole universe. According to Leibniz, space and time are the inner-worldly conditions of an "imperfect" universe whose "outer-worldly" God is pure and stripped of all imperfections. However, this concept of God were not rewarded by success in the view of an Enlightenment which adopted more and more the Socinians ideas of theology and philosophy.

of His highest majesty, but place him in heaven. In this context, Crell mentions Vorstius who rejects rightly the usual view of the diffusion of the divine essence through all things.

136 Ibid., p. I, c. IV, p. 30 v: "Deus non est infinitus, nedum absolute et simpliciter, sed finitus. Deus non immensus."

137 Samuel Crellius, *Letter to Leibniz*, December 1, 1707. Gottfried Wilhelm Leibniz Bibliothek, Niedersächische Landesbibliothek, Lbr 182, p. 1 r: "Caeterum non per omnia mihi placet ista Metaphysica. De corpore Deo crasse satis philosophatur."

138 Leibniz, "Ad Christophori Stegmanni Metaphysicam Unitariorum", p. 184, l. 225–230: "Aeternitatem autor ait esse Tempus utrinque interminatum seu durationem omnimodo infinitam. Hoc excusari potest, modo observetur interim aeternitatem quando de Deo dicitur, plus aliquid notare, nempe Existendi necessitatem. Ita Deus fluxu temporis non afficitur, ut creaturae, quae existendi necessitate carent, et aliunde semper pendent."

139 See footnote 29.

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6 Conclusion

It is astonishing to see that the change of the Copernican model in astronomy in the 16 and 17th century did not lead to a revaluation of the concept of God, neither in the case of the Socinians nor in the case of the Catholics or Protestants. In my opinion, the most possible explanation for this is that even for most Copernicans—with the notable exceptions of Digges and Bruno—the new heliocentric model continues to describe only a *finite* universe so that the old opposition between infinity and finity, heaven and earth, eternity and time did not experience any change. That the finite is incapable of the infinite remained for most of the theologians, philosophers and mathematicians a seldom contradicted belief. Even the Socinians, who were the "rationalisers" of Christian religion, did not change their concept of God, although at least some of them were defenders of the Copernican system.[140] As long as heaven did not become infinite, there was no need to question the place of God in the outermost heaven.

The juxtaposition of Stegmann and Vorstius on the one hand and Suárez and Gerhard on the other has led to astonishing constellations concerning the concept of God. Contrary to the usual antithesis of Catholicism and Protestantism, in the matter of God no big differences could be determined. On the contrary, the similarities were so great that Gerhard constantly used the terms or arguments of the Scholastics for his own argumentation. This does, of course, not mean that they were no differences in the concept of God between the Catholics and Protestants. But in the case of the question of the relation of God to time and space discussed here, that did not matter much. God is understood as an immaterial spirit, existing from eternity to eternity, without a beginning or end, ubiquitously present in the whole universe, crossing all times and spaces with no difference, being in the outermost heaven as well as being near to you.

Stegmann and Vorstius did not accept this paradoxical description of God, which let Him be there and nowhere, which let Him act eternally in time. Both of them were defenders of a rational religion that deny not only *in abstracto* but also *in concreto* any contradiction between philosophy and theology. Both disciplines relate to each other on an equal footing, both being based on reason—their highest common principle. God's action has therefore been a part of the events of nature from the very beginning. Indeed, God Himself is not outside of this world but is rather situated *in* the world in the heavens, where, in an eternity that is to be understood in temporal terms, He shapes the course of events in time. Revelation is thus not a transcendental event, but can be integrated in the natural metaphysics of being, which maintains itself in one way or another in constant change through matter. In my opinion, a radical and worldly point of view of this kind could have

140 Martin Ruar (1588/90–1657), Johannes Ludwig von Wolzogen (1600–1661), and Andreas Wissowatius (1608–1678) were defenders of the Copernican model. Cf. Kęstutis Daugirdas, "Rezeption der chronologischen und astronomischen Schriften Keplers in Johannes Ludwig von Wolzogens Evangelienkommentaren", in: *Barok. Historia—Literatura—Sztuka* 31 (2009), pp. 169–190.

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arisen only outside universities and represents a further example of what Martin Mulsow has described as "Moderne aus dem Untergrund", i. e. a modernity that first found expression in the realm of the forbidden and the subterranean.[141] Stegmann and Vorstius are excellent representatives of this modernity.

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141 Cf. Martin Mulsow, *Moderne aus dem Untergrund. Radikale Frühaufklärung in Deutschland 1680–1720*, Hamburg 2002.

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The Wittenberg Reception of Copernicus: At the Origin of a Scholarly Tradition*

Pietro Daniel Omodeo & Jonathan Regier

The paradoxes of the Wittenberg reception of Nicolaus Copernicus's astronomy constitute one of the most debated issues in the cultural history of Renaissance science. The relevance of the main theological and academic center of the Lutheran Reformation for the early dissemination of Copernicus's *De revolutionibus orbium coelestium* [On the revolutions of the celestial spheres] (1543) is beyond question. The two professors of mathematics whom Philipp Melanchthon appointed in 1537, Georg Joachim Rheticus (lower mathematics) and Erasmus Reinhold (higher mathematics), made the relevance of Copernicus's planetary theory, his application of geometrical devices and his parameters appreciable to a wide scholarly public.[1] Rheticus learned the details of the new astronomy from Copernicus himself and announced his teacher's novel views through the *Narratio prima* [First report] (1540), a clear and non-technical introduction. Moreover, he mediated between Copernicus and the Nuremberg printer Johannes Petreius, to whom he consigned the precious manuscript of *De revolutionibus*. As far as the other Wittenberg mathematician is concerned, Reinhold computed the first tables based on Copernican values, the extremely successful *Prutenicae tabulae* [Prutenic tables] (1551). In the short run, Rheinhold's practice-oriented work was much more effective in disseminating Copernicus than Rheticus's enthusiastic defense of the most radical theses, that is to say, the centrality and immobility of the Sun and the motions of the Earth.[2] At Wittenberg, Reinhold and his pupils were reformed humanists with strong mathematical training. Despite the general rejection of scholastic theology in the Lutheran intellectual community, and despite hostility toward the Aristotelian tradition from certain quarters, they were well grounded in Aristotelian natural philosophy. All these factors impacted on their influential dissemination of *De revolutionibus*. Their efficacy in promoting

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1 See Robert S. Westman, "The Melanchthon circle, Rheticus and the Wittenberg interpretation of the Copernican theory," in: *Isis* 66 (1975), pp. 163–193 and Claudia Brosseder, *Im Bann der Sterne: Caspar Peucer, Philipp Melanchthon und andere Wittenberger Astrologen*, Berlin 2004.

2 Cf. Owen Gingerich, "Reinhold, Erasmus", in: *Dictionary of Scientific Biography* 11 (1975), pp. 365–367. On the reception of his tables, see Gingerich, "Erasmus Reinhold and the Dissemination of Copernican Theory," in: Gingerich, *The Eye of Heaven: Ptolemy, Copernicus, Kepler*, New York 1993, pp. 221–251.

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these new astronomical results was selective, since they generally rejected the cosmological theses at the center of the new system (terrestrial motion alongside solar centrality and immobility). In their mitigated reception of Copernicus, they followed the most charismatic Wittenberg intellectuals, Martin Luther and Melanchthon. In what follows, we will discuss Melanchthon's role in shaping this reception. In this context, Rheticus was exceptional in his realist defense of the Copernican system. However, he left Wittenberg in 1542, when Copernicus' major work was still in press, in order to take up a position as professor of higher mathematics at the University of Leipzig.[3] After fleeing Leipzig and his subsequent banishment from that city due to a sex scandal, he eventually settled in Cracow, Poland, where he continued his mathematical research and supported himself as a physician. Reinhold, for his part, strengthened the selective reception of Copernicus by carefully avoiding geokinetic, heliostatic, or heliocentric doctrines and even reinforcing the traditional order of the heavens. In this essay we will recapitulate and assess the cultural context in which the Wittenberg interpretation was born and its institutionalization took place.

The reception of Copernicus rested on various epistemological, natural, and scriptural presuppositions. In turn, historians of astronomy have interpreted it in different ways. Robert Westman labeled the two-sided appropriation-cum-rejection of *De revolutionibus* "the Wittenberg Interpretation" and considered it to be fundamentally "mathematical" as opposed to "physical" (or natural philosophical). In other words, Wittenberg mathematicians were especially attracted to Copernicus's use of minor epicycles to replace the Ptolemaic equant, reducing variation in speed to a composition of uniform circular motions. As Westman reports, Reinhold wrote the following inscription in his own personal copy of *De revolutionibus*, "Axioma Astronomicum: Motus coelestis aequalis est et circularis vel ex aequalibus et circularibus compositus", that is, "Axiom of astronomy: Heavenly motions are either uniform and circular or composed of uniform and circular [motions]."[4] The Wittenberg astronomers were also interested in the possibility of developing improved sets of tables for astronomical computation. However, they did not accept the most daring cosmological hypotheses.

The question then arises: How could such a bipolar reception take place? How could Wittenberg mathematicians get along with such a reading of Copernicus? How could they ignore the first and the fifth book of *De revolutionibus* on the

3 On Rheticus, bio-bibliography, see Karl Heinz Burmeister, *Georg Joachim Rhetikus (1514–1574): Eine Bio-Bibliographie*, 2 vols, Wiesbaden 1967–1968. Also, see Jarosław Włodarczyk, *Introduction* to Georg Joachim Rheticus, *Narratio prima or First Account of the Books* On the Revolutions *by Nicolaus Copernicus*, Warsaw 2015, pp. 9–70. For a recent intellectual biography in English, see Dennis Danielson, *The First Copernican: Georg Joachim Rheticus and the Rise of the Copernican Revolution*, New York 2006.

4 Westman, "The Melanchthon Circle", p. 176. See also in Owen Gingerich, *An Annotated Census of Copernicus' 'De revolutionibus' (Nuremberg, 1543 and Basel, 1566)*, Leiden-Boston-Köln 2002, the description of Reinhold's copy of *De revolutionibus* 1543, pp. 268–278, with the reproduction on p. 269 of Reinhold's motto on the "Axioma Astronomicum".

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general hypotheses and on planetary motions of longitude, respectively? Did they perhaps disentangle mathematical astronomy from a natural-philosophical treatment of celestial motions? Or did they search for a different synthesis? The Wittenberg program has constituted a puzzle for historians of Renaissance astronomy who read it in various ways, particularly as a conventionalist or instrumentalist enterprise (following Pierre Duhem's interpretation), as a revival of physical Aristotelianism, or as a consequence of Scriptural literalism.[5] In this essay we will first recapitulate the main lines of the historiographical debate, then reconsider the sources—manuscript and printed—on which an informed assessment of Wittenberg astronomy is grounded. We will pay close attention to its institutional settings and address the question of the possible confessional dimension of astronomy developed there. Additionally, we offer a translation of Melanchthon's most relevant pages on Copernicus and terrestrial motion.

1 On Melanchthon's Changing Attitudes towards Copernicus

In our view, the most suitable point of departure for a historiographical summary of our present topic is an article by the historian of Renaissance science Emil Wohlwill, "Melanchthon und Copernicus," which appeared in the German journal for the history of medicine and natural science, *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaft* in 1904. Wohlwill focused on Melanchthon's rejection of terrestrial motion in the astronomical section of the latter's *Initia doctrinae physicae* (1549), which can be freely translated as *Introduction to Physics*. His rejection was clearly directed against the Copernican theory and even Copernicus in person. The tone of Melanchthon's criticism was harsh. In the section "Quis est motus mundi?" [What is the motion of the world?], one reads the following critique:

> But here there are some who either by love of novelty or to show off their cleverness have argued that the Earth is moved and reject the movement of the eighth sphere and the Sun, whereas they assign motion to other celestial spheres. They moreover put the Earth among the stars.[6]

And a few lines later:

> Although subtle specialists inquire into many things in order to exercise their wits, it is not right to openly affirm such absurdities, and it sets a damaging example. It is right for the mind to reverentially embrace the truth shown by God, to be at peace therein, to thank God for kindling and

5 See the discussion in Peter Barker and Bernard R. Goldstein, "Realism and Instrumentalism in Sixteenth Century Astronomy: A Reappraisal," in: *Perspectives on Science* 6/3 (1998), pp. 232–258.

6 Philipp Melanchthon (and Paul Eber), *Initia doctrinae physicae*, Wittenberg 1549, book I, f. 47 v: "Sed hic aliqui vel amore novitatis vel ut ostentarent ingenia, disputarunt moveri Terram, et contendunt nec octavam Sphaeram, nec Solem moveri, cum quidem caeteris coelestibus orbibus motum tribuant, Terram etiam inter Sidera collocant."

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> preserving some light in the minds of men, and to consider how to be led toward God by this light and in what way life should be guided and aided by the knowledge of truth.[7]

Melanchthon believes that Copernicus's theses are absurd from both a physical viewpoint and a theological. It bears recalling that physics and theology should not contradict one another, since Creation reveals the wisdom of its Creator in the eyes of the pious astronomer. The pious framework of Melanchthon's physics is stated clearly from the beginning. The heavens, the most noble part of creation, reveal God's glory and, accordingly, constitute the most important field of physical contemplation:

> After consideration of man's nature, it is beneficial to look at the heavens and consider what the affinity between the heavenly bodies and the inferior ones is, especially in relation to man. In fact, it is not likely that those most beautiful bodies in the heavens were created in vain, especially since they remain the same and have motions that were ordained with great wisdom. It is something great to know what they are and what forces they have.[8]

In the section "Quid est finis et usus physics?", that is, "What is the aim and the utility of physics," Melanchthon affirms that all of nature is like a theatre that God created for the human mind to contemplate.[9] In line with these presuppositions, Melanchthon's physics descends from the heavens to Earth. The first topics (*loci praecipui*) he deals with and their order is telling:

De Deo	(On God),
De providentia	(On Providence),
De contingentia	(On contingency),
De Mundo	(On the world).[10]

This is the background against which one has to understand Melanchthon's indignation vis-à-vis the heliocentric revolution and his harsh words against Copernicus. Still, as Wohlwill pointed out, he later tamed his judgement. He removed the harshest attacks on Copernicus's ideas and person from the 1550 Wittenberg edi-

7 Ibid., f. 48 r: "Etsi autem artifices acuti multa exercendorum ingeniorum causa quaerunt, tamen adseverare palam absurdas sententias non est honestum, et nocet exemplo. Bonae mentis est veritatem a Deo monstratam reverenter amplecti et in ea acquiescere, et Deo gratias agree, aliquam accedenti lucem, et servant in hominum mentibus, ac deinde considerare, quis ad Deum aditus sit per eam lucem, et quomodo vita regenda et iuvanda sit agnitione veritatis."

8 Ibid., chap. "Quid est physica doctrina?", f. 9 v: "Deinde considerata hominis natura, suspicere in coelum iuvaret, et considerare, quae sit cognatio coelestium corporum cum inferioribus, ac praesertim cum homine. Non est enim verisimile haec pulcherrima corpora in coelo, frustra condita esse, praesertim cum et maneant eadem, et leges habeant motuum magno consilio ordinatas. Haec quid sint, et quam vim habeant, penitus scire magnum quiddam esset."

9 Ibid., f. 19 v: "Tota natura velut theatrum est humani ingenii, quod Deus vult aspici."

10 Ibid., f. 26 r.

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tion of the *Initia*. Whereas he had called the Copernican theses "absurd statements" (*absurdas sente*ntias) in 1549, he replaced these words with a neutral pronoun, "*talia*" [such issues], in 1550. The beginning of the aforementioned passage "*Sed hic aliqui vel amore novitatis vel ut ostentarent ingenia, disputarunt moveri Terram*" was rewritten as "*Sed hic aliqui disputarunt moveri Terram*".[11] Another criticism was erased:[12]

1549	1550
His divinis testimoniis confirmati, veritatem amplectamur, nec praestigiis eorum, qui decus ingenii esse putant, conturbare artes, abduci nos ab ea sinamus.	His divinis testimoniis confirmati, veritate amplectamur.
Encouraged by these divine testimonies, we should embrace the truth. Let us not be led astray by the deceptions of those who think it the glory of their cleverness to throw the arts into confusion.	Encouraged by these divine testimonies, we should embrace the truth.

A new passage was inserted. The following one:

> Although subtle specialists [*artifices*] inquire into many things [different theories] in order to exercise their wits, nonetheless the youth should know that they ought not dare to affirm such theories. In their first education, [students] shall appreciate theories [*sententias*] transmitted with the shared consensus of the specialists, which are minimally absurd. If [students] grasp that truth is manifested by God, they will embrace [this truth] with reverence and be satisfied with it.[13]

These words bear witness to the fact that Melanchthon, "the teacher of Germany" (*praeceptor Germaniae*), did not eventually restrict the study of Copernicus's paradoxes to specialists, but only teaching them to the students (*iuniores*). It seems that by 1550 Melanchthon's concern relative to the geokinetic doctrine shifted to pedagogy. He admitted specialists' discussions of Aristarchus's theory—that is to say, the Copernican planetary theses attributed to the ancient astronomer who, according to Archimedes's *Sand reckoner*, first envisaged heliocentrism[14]—but be-

11 Emil Wohlwill, "Melanchthon und Copernicus," in: *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaft* 3 (1904), 260–267, p. 261.

12 Ibid., p. 262.

13 Melanchthon, *Initia* (Wittenberg 1550), f. 40: "Etsi autem artifices acuti multa exercendorum ingeniorum caussa quaerunt, tamen sciant iuniores, non velle eos talia adseverare. Ament autem in prima institutione sententias receptas communi arificum consensu, quae minime sunt absurdae, et ubi intelligunt veritatem a Deo monstratam esse, reverenter eam amplectantur, acquiescant in ea."

14 Eduard J. Dijksterhuis, *Archimedes*, Copenhagen 1956, pp. 360–373, Chap. XII, "The Sand

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lieved that they should refrain from teaching it in their university classes. As Wohlwill also noticed, Melanchthon expunged all references to *De revolutionibus* in later editions of the *Initia* (e. g. positive remarks concerning the theory of Mercury and Venus). The teaching of Copernican hypotheses, alongside Ptolemaic astronomy and Tycho Brahe's geo-heliocentric hypotheses, would be introduced in Melanchthonian universities much later at the turn of the 1590s.[15]

The most important point raised by Wohlwill in 1904 is that a correct appreciation of Melanchthon's views should not be exclusively based on the *editio princeps* of his textbook on physics but should also consider textual differences between the first and the second editions. Since the only recent edition of the *Initia* available is that of the *Corpus Reformatorum*, which was solely based on the version of 1549, Wohlwill's warning is still precious for Melanchthon studies and the history of Renaissance astronomy.

2 On the Composition of Melanchthon's *Initia*

More recently, Walter Thüringer has contributed to our understanding of Melanchthon's evolving position on Copernican astronomy by examining the manuscript version of the *Initia* and pointing out neglected textual differences relative to the printed versions of the book. The manuscript is still extant, preserved in the city library of Nuremberg (Stadtbibliothek Nürnberg, coll. Cent. V App. 21). The manuscript shows that Melanchthon did not write the book alone. In fact, it was the result of a shared enterprise, which mainly consisted of a co-authorship with the Wittenberg professor of natural philosophy, Paul Eber. The different handwriting permitted Thüringer to establish the respective contributions of the two scholars. Eber authored the last part of book one, which is the part of utmost interest here. It is the book on the most general principles of nature, their link to the power and wisdom of God, the order of the cosmos and astronomy.[16] Melanchthon is the author of the more relevant part as far as the Copernican question is concerned. He also penned the refutation of terrestrial motion. Handwriting also shows that the professor of mathematics, Reinhold, read through the manuscript and inserted an-

Reckoner." See also Edward Rosen, "Aristarchus of Samos and Copernicus", now in Rosen, *Copernicus and His Successors*, London and Rio Grande 1995, pp. 1–9.

15 This is witnessed by the Scot mathematician Liddel's astronomical classes in Rostock and Helmstedt, which became the issue of a contention with Brahe, who suspected Liddel of plagiarizing his system with the planets encircling a Sun that encircles the Earth at the center of the world. Cf. "The European Career of a Scottish Mathematician and Physician," in: *Duncan Liddel (1561–1613): Networks of Polymathy and the Northern European Renaissance*, ed. Omodeo with Karin Friedrich, 2016, pp. 35–92, pp. 65 and ff. Another testimony is afforded by Michael Maestlin's teaching at Tübingen and Kepler's scholarly defense of the motion of the Earth in 1593. On this, see Nicholas Jardine, "Kepler's 'lightly woven cosmography': on the sources, identity and significance of Kepler-Ms 18, 238 v-241 r, Russian Academy of Sciences, St Petersburg" in Caroline Noirot and Nuccio Ordine, *Omnia in uno: Hommage à Alain-Philippe Segonds*, pp. 453–465 and Charlotte Methuen, "Maestlin's Teaching of Copernicus: The Evidence of His University Textbook and Disputations", in: *Isis* 87 (1996), pp. 230–246.

16 Eber wrote from the section on lunar theory onwards.

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notations and small corrections on mathematical and astronomical details, as well as some computations and technical terms in Greek. One of Reinhold's insertions is particularly significant. It has so far escaped the attention of historians of astronomy that the mathematical astronomer who computed the first Copernican tables also commented on a passage arguing that terrestrial motion would be excessively rapid. Reinhold calculated the exact speed in a marginal note: "In one hour every point of the Earth would cover 225 [German] miles; in a minute 3,75 [German] miles."[17]

In the manuscript of the *Initia*, the refutation of terrestrial motion is full of corrections. Evidently, Melanchthon rewrote these pages several times, changed words, erased passages, and reconsidered his arguments and their order.[18] The Copernican challenge kept him very busy. It is interesting to remark that his initial tone was even cruder than that of the first printed edition concerning Copernicus's persona. For instance, the passage "Nec recens hi ludi conficti sunt" (These games have not been invented recently) first read "Nec sunt his furores recentes" (This insanity is not recent).[19] Another erased passage is reminiscent of Luther's reported objection, in 1539, "Der Narr will die gantze kunst Astronomiae umkehren" (That fool wants to turn the whole art of astronomy upside down).[20] Here Melanchthon's original words follow (left):

Manuscript of the *Initia*	Printed version of *Initia* (Wittenberg 1549)
[Sed hic ingeniorum petulantia fingit conturb/ quae amat contra[-dictiones]/ quae dedicatur conturbatione artium, finxit moveri Terram, et ad [… contendit Solem nam non moveri] Sed hic aliqui vel amori novitatis vel [propter alias causas] ut ostentarent ingenia disputarunt moveri Terram, […]	Sed hic aliqui vel amori novitatis vel ut ostentarent ingenia disputarunt moveri Terram, […]

17 Philipp Melanchthon and Paul Eber, manuscript of *Initia doctrinae physicae*, Nürnberg, Stadtbibliothek, coll. Cent. V App. 21, f. 191 v: "In una hora 225 milliaria efficeret terrae quodlibet punctum. In minuto horae 3 ¾ milliaria."

18 Walter Thüringer, "Paul Eber (1511–1569): Melanchthons Physik und seine Stellung zu Copernicus," in: *Melanchthon in seinen Schülern*, ed. Heinz Scheible, Wiesbaden 1997, pp. 285–321.

19 Melanchthon, *Initia* (1549), book I, f. 47 v and Melanchthon and Eber, manuscript of *Initia*, f. 179 r.

20 Martin Luther, *Werke* vol. II 1 *Tischreden*, Weimar 1912, p. 419. Cf. Michel-Pierre Lerner, "'Der Narr will die gantze kunst Astronomiae umkehren': sur un célèbre Propos de table de Luther," in *Nouveau ciel nouvelle terre: La révolution copernicienne dans l'Allemagne de la Réforme (1530–1630)*, ed. Miguel Ángel Granada and Edouard Mehl, Paris 2009, pp. 41–65.

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Manuscript of the *Initia*	Printed version of *Initia* (Wittenberg 1549)
[But here the petulance of clever minds has fabricated confusion / which loves contradictions / which delights in upending the arts, has fabricated that the earth is moved, and [argued that the sun is not moved]. But here there are some who either by love of novelty or [because of other reasons] to show off their cleverness, have argued that the Earth is moved […]	But here there are some who either by love of novelty or to show off their cleverness, have argued that the Earth is moved […]

In spite of the piece of evidence he uncovered, Thüringer argued that Melanchthon's lengthy examination of the Copernican question and the revision of his position bear witness to his keen interest in *De revolutionibus*. Thüringer believes that the most important exponent of academic culture of the early reformation rejected the Copernican theory only for scriptural reasons[21] but was open to conventionalist readings of *De revolutionibus*.

> All these natural-scientific criticisms against the heliocentric system were not decisive for Melanchthon, although he brought forward a great number of such arguments in his *Physics*. The main reason for the rejection was only the contrast with biblical assertions. Still, he did not reject the system as such, but rather Copernicus's claim about its physical reality. Otherwise, how could he have sent off Erasmus Reinhold's *Prutenic Tables* with the remark that they are computed according to Copernicus's theory […] without criticizing them?[22]

However, the manuscript, just like the published editions, does not support such an assessment, because it shows that Melanchthon examined the physical arguments and, to some extent, the mathematical ones as well (as witnessed by Rheinhold's intervention, among others) (see figure 1). Melanchthon was a staunch opponent of terrestrial motion and the new planetary system, although his judgement on the person of Copernicus softened with time. Also, he believed that mathematics and physics should be in agreement.

21 Cf. Melanchthon, *Initia* (1549), book I, f. 48 r-v.

22 Thüringer, "Paul Eber", p. 315: "Für Melanchthon waren alle diese naturwissenschaftlichen Einwände gegen das heliozentrische System nicht entscheidend, obwohl er selbst in seiner Physik eine große Zahl derartiger Argumente vorbrachte. Den Ausschlag zur Ablehnung gab allein der Gegensatz zu den Aussagen der Bibel. Er lehnte jedoch nicht das System als solches ab, sondern nur den von Copernicus erhobenen Anspruch auf physikalische Realität. Wie sonst hätte er die Preußischen Tafeln des Erasmus Reinhold verschicken können mit der Bemerkung, sie seien nach der Lehre des Copernicus anfertigt […] ohne Kritik zu üben."

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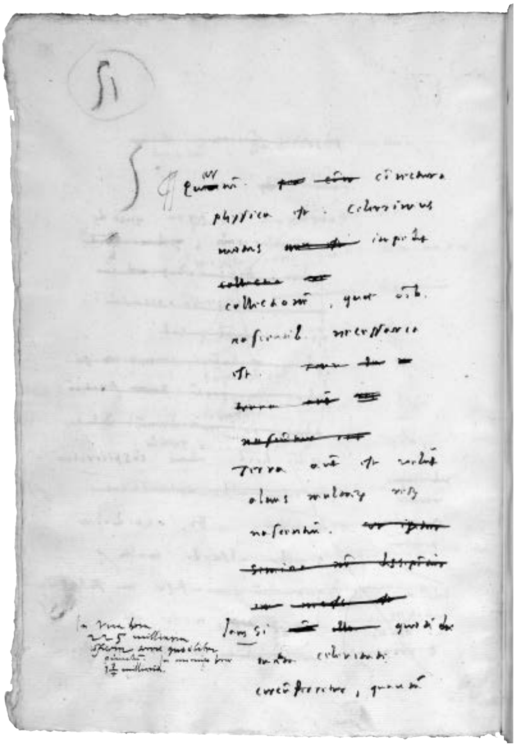

Fig. 1: Reinhold's marginal note to the manuscript of Melanchthon and Eber, *Initia doctrinae physicae*, Stadtbibliothek Nürnberg, coll. Cent. V App. 21, f. 191v.

3 Dispelling Conventionalist Interpretations of the Wittenberg Interpretation

The interpretation of the first mathematical reception of Copernicus in conventionalist (fictionalist, or instrumentalist) terms can be traced back to Pierre Duhem's epistemological history of astronomy. Over the last century his *Sōzein ta phainomena: essai sur la notion de théorie physique de Platon a Galilée* [To save the phenomena: An essay on the idea of physical theory from Plato to Galileo] (1908) has played an important role, either as hero or foil, in the question of how pre-Copernican astronomers considered their own work in relation to nature. For Duhem, most sixteenth-century astronomers were, quite rightly in his opinion, skeptical about the real motions. What mattered for them was computational accuracy. Duhem devotes several pages to the "École de Wittemberg." Recognizing Melanchthon and Reinhold as its founders, he characterizes Reinhold's position on astronomical hypotheses as thoroughly instrumentalist.[23] Hence,

23 Duhem, *Sauver les apparences*, Paris 1908, pp. 83–84.

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according to Duhem, when Reinhold adopts Copernican techniques and celebrates Copernicus as a restorer of astronomy, this signifies that Reinhold does not believe astronomical hypotheses represent the actual celestial nature or movements. On this count, Duhem underestimates the importance of uniform motion for Reinhold. Uniform motion, whether for physical or metaphysical reasons, was for Reinhold the initial and principle attraction of Copernican astronomy. During the last three decades, historians of astronomy have largely supplanted Duhem's view of sixteenth-century astronomers with another view, wherein most were moderate or "perpetually frustrated realists" (Reinhold included).[24] As for Melanchthon, Duhem views him as a theologian rather than a philosopher,[25] a characterization that Melanchthon would have disputed.[26] Duhem believes that mid-sixteenth-century theologians agreed with astronomers on an instrumentalist view of astronomical statements, meaning that he must explain why Melanchthon was so set against terrestrial motion, this opinion appeared in the harsher 1549 edition of the *Initia*. According to Duhem, the Wittenbergians could be at once instrumentalists regarding astronomy and yet convinced geocentrists because they believed true knowledge of terrestrial things was achievable (e. g., the immobility of the Earth), as opposed to true knowledge of celestial things.[27] Hence, Melanchthon could perfectly well argue in the *Initia* for the immobility of the Earth, while elsewhere saying that astronomy could do no better than reproduce the celestial positions. Yet Duhem's reading is inaccurate, as an examination of the *Initia* shows. Melanchthon's rejection of terrestrial movement is not only "au nom de la Physique et de l'Écriture," as Duhem believes. After administering his theological arguments, Melanchthon writes:

> And while physical arguments that show the Earth to be immobile can be shunned, let us nevertheless discuss some [such arguments] readily at hand that satisfy those who judge with moderation and love truth.[28]

24 Barker and Goldstein, "Realism and Instrumentalism in Sixteenth Century Astronomy", p. 253. Also see, Robert Westman, "The Astronomer's Role in the Sixteenth Century: A Preliminary Survey," in: *History of Science* 18 (1980), pp. 105–47, p. 107; and Omodeo, *Copernicus in the Cultural Debates of the Renaissance: Reception, Legacy, Transformation*, Leiden 2014, pp. 66–71.

25 Duhem, *Sauver les apparences*, pp. 104–105.

26 See Sachiko Kusukawa, *The Transformation of Natural Philosophy: The Case of Philip Melanchthon*, Cambridge/New York 1995, pp. 51–58.

27 Duhem, *Sauver les apparences*, pp. 91–92. Duhem makes this argument while discussing the planetary hypotheses of Melanchthon's son-in-law and Reinhold's follower, Caspar Peucer. Peucer was the author of a work on planetary hypotheses in which he tried to adapt Copernican models to a geocentric framework, thus paving the way for subsequent geo-heliocentric hybrid models. Cf. Peter Barker, "The *Hypotyposes orbium coelestium* (Strasbourg, 1568)," in: *Nouveau ciel nouvelle terre: La révolution copernicienne dans l'Allemagne de la Réforme (1530–1630)*, ed. Miguel Á. Granada and Edouard Mehl, Paris 2009, pp. 85–108.

28 Melanchthon, *Initia doctrinae physicae* (1549), book I, f. 48 v: "Et quamvis eluduntur physica argumenta, quae ostendunt terram non moveri, tamen aliqua in promptu teneamus, quae moderate iudicantibus, et veritatem amantibus satisfaciunt."

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What then follows, before the strictly physical arguments, is a list of basic astronomical inequalities that would be observed if the Earth were not at the center of the world (e. g., inequalities concerning equinoxes, solstices, the zodiac, and the length of days and nights). This list, in sequence and content, is a summary of book one, chapter four of the *Almagest*. Not incidentally, these Ptolemaic arguments were elucidated with diagrams by Reinhold in his 1549 commentary of the *Almagest*.[29] Melanchthon clearly believes that the centrality of the Earth can be established on astronomical grounds. Only then does he turn to Aristotle and actual physical arguments (e. g., the nature of simple bodies).

It should also be noted that Melanchthon's theological arguments are not a matter of scriptural authority *tout court*. Thanks to scholarship on Melanchthon's epistemology, we have a much clearer idea of how he viewed the strengths—and essential post-lapsarian weakness—of the human intellect.[30] In its outlines, he held a natural-light epistemology close to Augustine's. He believed that the basic intellectual capacities of Adam remained, thanks to the grace of God, but that these capacities were deeply clouded because of sin. In Melanchthon's view, philosophy and the arts were indispensable in remedying the intellectual and moral situation of humanity. But the arts were not perfect—or rather, the human mind remained fundamentally imperfect. Hence, Melanchthon believed that the natural philosopher could and should turn to Scripture:

> Although some people mock the natural philosopher who cites divine testimony, we judge it correct that, wherever possible, philosophy consult with heavenly gospel and examine divine authority from within the deep fog of the human mind.[31]

Melanchthon's position is rooted in a respect for the disciplinary boundaries and hierarchies typical of Renaissance universities, where theology remained dominant. To respect these boundaries was to preserve the methods and objectives that they fostered. It was in this sense that he defended the importance of philosophy and rhetoric for theology, because without correctly structured demonstrations, there could be no discussion, theological or otherwise. And it was in this sense that he elsewhere defended astronomers against a too strict imposition of physical constraint: the goals of astronomers were not the same as those of phys-

29 See Omodeo and Irina Tupikova, "Post-Copernican Reception of Ptolemy: Erasmus Reinhold's Commented Edition of the *Almagest*, Book One (Wittenberg, 1549)", in: *Journal for the History of Astronomy* 44 (2013), pp. 235–256.

30 See Günter Frank, "The Reason of Acting: Melanchthon's Concept of Practical Philosophy and the Question of the Unity and Consistency of His Philosophy," in: *Moral Philosophy on the Threshold of Modernity*, ed. Jill Kraye and Risto Saarinen, Dordrecht 2005, pp. 217–33; Peter Harrison, *The Fall of Man and the Foundations of Science*, Cambridge 2007, pp. 93–103.

31 Melanchthon, *Initia doctrinae physicae*, book I, f. 48 r: "Quanquam autem rident aliqui physicum testimonia divina citantem, tamen nos honestum esse censemus philosophiam conferre ad coelestia dicta, et in tanta caligine humanae mentis autoritatem divinam consulere, ubicumque possumus."

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icists.[32] Melanchthon sums up the theological portion of his attack on Copernicus as follows:

> Encouraged by these divine testimonies, we should embrace the truth. Let us not be lead astray by the deceptions of those who think it the glory of their cleverness to throw the arts into confusion.[33]

In other words, Copernicus's physical hypothesis is a threat to the order and dignity of the liberal arts, and so a threat to the university itself, an institution that had one of its greatest champions in Melanchthon.

4 On the Circle of Melanchthon

Robert Westman is perhaps the scholar who most prominently emphasized the institutional setting of the Wittenberg debate over Copernicus. Back in the late 1970s he provided an important account of the Melanchthon circle as a case study of theory reception within a scientific community. Lynn Thorndike had already argued for the relevance of the Wittenberg community in the history of astrology and introduced the expression "the circle of Melanchthon" to characterize the astrology-centred attitude of his group.[34] Westman, for his part, worked out the details of the Copernican reception with a view toward criticizing Kuhn's notion of paradigm shifts. The Kuhnian theory, at least in its naïve form, assumes an immediate cleavage between practitioners who understand a new paradigm and those who do not; Westman argued that the Wittenberg reception shows us instead how new theories can be taken as multi-layered. Communities can accept, adopt, and assimilate certain features of a theory, while ignoring or criticizing other features:

> Indeed, certain parts of the new theory were to be adopted and preferred as consistent with the foundations of astronomy if interpreted in a framework where the earth was at rest, while other aspects were rejected or ignored as irrelevant or as possessing low truth content.[35]

Westman also emphasizes how Melanchthon and the mathematicians in his orbit were able to frame Copernican astronomy for subsequent generations. These generations would not be confronted with any paradigm choice or clash—instead, advanced students would learn about Copernican astronomy as a kind of technical innovation in planetary theory rather than a wildly new interpretation of the

32 Duhem, *Sauver les apparences*, pp. 106–107.

33 Melanchthon, *Initia doctrinae physicae*, book I, f. 48 v: "His divinis testimoniis confirmati, veritatem amplectamur, nec praestigiis eorum, qui decus ingenii esse putant, conturbare artes, abduci nos ab ea finamus."

34 Lynn Thorndike, *A History of Magic and Experimental Science*, 8 vols, London/New York 1923–1941, vol. 5, p. 378. Cf. Claudia Brosseder, "The Writing in the Wittenberg Sky: Astrology in Sixteenth-Century Germany," in: *Journal of the History of Ideas* 66/4 (2005), pp. 557–576.

35 Westman, "The Melanchthon Circle," p. 167.

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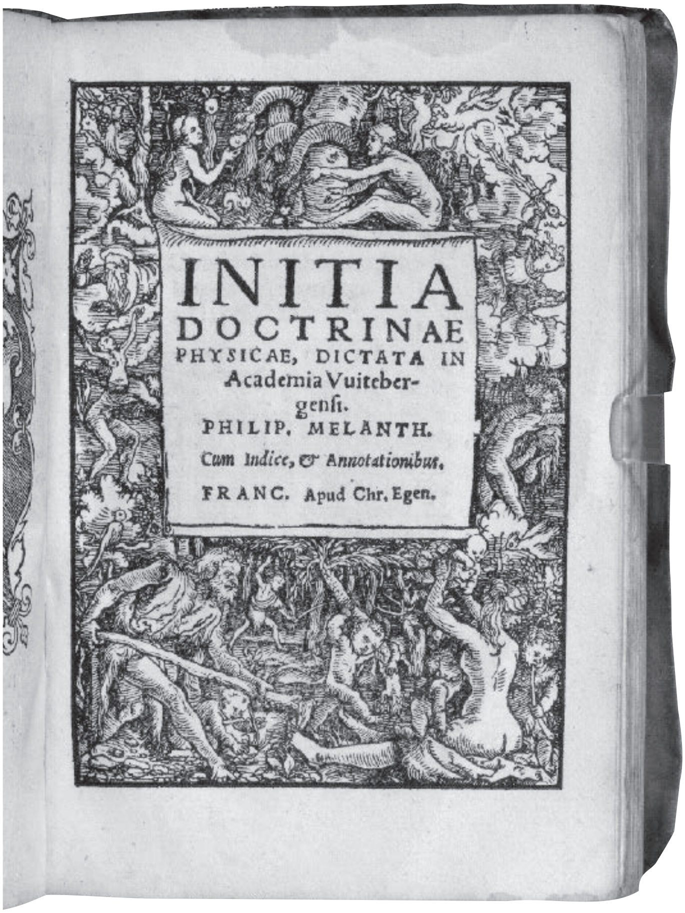

Fig. 2: Frontispiece of the 1550 Frankfurt edition of Melanchthon and Eber's *Initia doctrinae physicae* with scenes of the fall of Adam and Eve.

universe's structure. In Westman's description, Melanchthon emerges both as a savvy institutionalist and a fatherly figure to his students and colleagues. Westman stresses that Melanchthon set a tone where professional mathematicians were allowed "considerable freedom to explore new pathways."[36]

In his more recent work on *The Copernican Question*, Westman has emphasized the astrological commitment by Melanchthon and his pupils.[37] Rheinhold's Copernican tables could be read against the background of a shared commitment

36 Ibid., 174.
37 Richard Westman, *The Copernican Question: Prognostication, Skepticism, and Celestial Order*, Berkeley/Los Angeles/London, 2011, pp. 160–164.

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to astrology as the science of God's Providence. In addition, his theoretical work on planetary theory, as well as that of Caspar Peucer, who succeeded him as a professor of mathematics in Wittenberg, was motivated by Melanchthon's program to decipher the divine project inscribed in the heavens. The endeavour had clear eschatological tones, since astronomy and the related science of chronology aimed to determine the epoch corresponding to apocalyptical prophecies.[38]

It would be interesting to stress the continuity with Rheticus's work here, which manifests an effort to understand history, especially political history, through improved astronomy. Rheticus's dispute *pro gradu* for his Master's degree in 1536 dealt with the legitimacy of astrology. He answered negatively the *quaestio* "whether the laws prohibit astrological predictions" (*an leges damnent praedictiones astrologicas?*). To the contrary, he argued with the *Republic* (546 A-D) that "Plato states that the republic changes due to some celestial causes which impel cyclical changes of cities and empires."[39] Such a commitment to astrology clearly earned him Melanchthon's approval, as he was soon appointed professor of lower mathematics. The astrological-political theme would figure prominently in the *Narratio prima*, where Rheticus argued that the variations of the Earth's eccentricity produce changes of rulers, this in the section "Ad motum centri eccentrici Monarchias mundi mutari" (The Kingdoms of the World Change with the Motion of the Centre of the Eccentric). Rheticus thus established a lasting connection between Copernican astronomy and astrology by asserting that Copernicus's model of terrestrial eccentricity relates to the wheel of fortune.[40] In his late years in Poland, Rheticus would apply his political astrology to compose a prediction concerning the seven next kings of Poland (*Vaticinium ex parte Regum Septe post decessum Sigismundi Augusti per Rheticum Doctorem et Astrologum Medicum illustrem editum*, 1572).[41]

5 Additional Elements to Assess the *Initia*, Its Circulation, and Its Goals

Further elements for an assessment of the impact, circulation, and setting of the *Initia* can be derived from a closer look at the manuscript and the first printed editions. In the same year in which Melanchthon had the revised version of the *Initia* printed in Wittenberg with his softened judgment on Copernicus, two other editions were printed, one in Basel and one in Frankfurt/Main. Neither of them incorporated the author's revisions, therefore they further circulated the highly critical statements (e. g., the words "adseverare palam absurdas sententias") of

38 Miguel Ángel Granada, "La 'tradición de la casa de Elías': Astronomía, cronología, historia," in *Res Publica: Revista de Historia de las Ideas Politicas* 18/2 (2015), pp. 315–338, p. 328.

39 Georg Joachim Rheticus, "Quaestio: an leges damnent praedictiones astrologicas? recitata […] d. 17. April. 1636", *in*: *Corpus reformatorum*, vol. 10, Halle 1842, col. 712–715, col. 713. Cf. Włodarczyk, *Introduction* to Rheticus, *Narratio prima*, p. 13.

40 See Edward Rosen, *Three Copernican Treatises*, New York 1939, pp. 121–127. Omodeo, *Copernicus in the Cultural Debates of the Renaissance*, pp. 34–35.

41 Ludwik A. Birkenmajer, *Mikołaj Kopernik*, Cracow 1900, pp. 613–614.

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the 1549 *editio princeps*. Later Wittenberg editions (1553 and 1555) reproduced the tamed edition (*talia asseverare*) from 1550, followed by a Leipzig edition (1559).[42] The parallel circulation of the two versions shows that Melanchthon's more moderate approach to Copernicus needed time to be appreciated among his readers. If one considers that the version included in the *Corpus Reformatorum* is the one from 1549, one clearly sees that the shift could pass unobserved for a long time.

Does not Melanchthon's correspondence also include a very harsh institutional attack against Copernicus? In 1541 he wrote to his correspondent, the physician Burchard Mithoff, about "that Sarmatian astronomer, who sets the Earth in motion and fixes the Sun" (*ille Sarmaticus Astronomus, qui movet Terram et figit Solem*) calling for extreme measures against such extravagances: "Without question—he wrote—wise rulers should suppress intellectual immodesty" (*profecto sapientes gubernatores deberent ingeniorum petulantiam cohercere*).[43] The political dimension of Melanchthon's engagement with physics is witnessed in the first version of the introduction to the book, which remains in the Nuremberg manuscript. The relevant pages are a section, from f. 14 r to the beginning of f. 19 r, that was not printed, as indicated in the manuscript with the following words in a different hand than Melanchthon's (possibly that of the typesetter): "All these [words] are omitted in the printed exemplar, which goes on with that which follows after five pages."[44] The erased passage addressed rulers, inviting them to foster letters rather than military projects. Also, it opposed the theological obscurantism of those who would ban the study of physics from a pious education. Here Melanchthon's words follow, in our translation:

> According to our judgment regarding the Church and the fatherland, the greatest leaders would deserve merit if they took care that this part of philosophy be well presented by the designated masters, and that the other arts be wisely taught, rather than try to imitate Babylonian walls by constructing ramparts and fortifications. Physics [*doctrina physica*] does not relate negligibly to the Church, nor does the knowledge of physics contribute little to the judgements to be shaped and, in the process of education, to the quality to be fostered. Frequently [*saepe*] the comparison of physics can add some light [or something of clarity] to the explanation of celestial teachings [*dogmatum celestium*]. Whenever the parts of the human body are to be taught, when there is a demonstration of how many forces [in the body] may be rendered inactive, [it is also taught that] these parts can be governed through discipline. Thus the wise natural philosopher is pious: he discerns many traces of God in this variety of nature, by whose consid-

42 We could not yet check the Leipzig 1560 and the Lyon 1552 editions.

43 Melanchthon to Mithobius (16 October 1541), in: Philipp Melanchthon, *Melanchthons Briefwechsel*. Kritische und kommentierte Gesamtausgabe, vol. 10, Stuttgart-Bad Cannstatt 2009, nr. 2830, pp. 542–543, p. 543.

44 Melanchthon, original preface to the *Initia*, manuscript f. 14 r: "Omnia haec in exemplari excuso omissa sunt, et quae post paginarum quinque sequuntur adiecta."

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eration a verification of providence is formed. In whatever manner God, in his design, exhibited so much art in nature, to remind us of himself, why would this study be either prohibited or neglected, as some in the Church wish. It is doubtless that Adam, Seth, and others have first joined most studiously this wisdom, this consideration of nature, the parts [of this discipline], with the teaching conveyed by God, and […] [when] they experienced that force to be marveled at [in nature], have given grace to God, have honored and invoked him. It is a great virtue to imitate their piety and zeal.

Wittenberg, 1 September 1549[45]

6 Considerations on the institutional settings of Wittenberg astronomy

The rejection of geocentrism for natural and theological reasons is not the salient element of the Wittenberg reception of Copernicus. Rather, we would like to stress the reconfiguration and the transformative reception that took place in the specific institutional framework of Wittenberg. Melanchthon's "middle way" aimed to connect many cultural strands and perspectives. In fact, it brought together humanism and reformation, theological anti-scholasticism and methodological Aristotelianism, mathematics and physics, education in the natural sciences and religion. He and most of his mathematical and philosophical collaborators considered the Copernican hypotheses to be too radical to be accepted and disseminated to students. Nonetheless, their commitment to astronomy and astrology, which they saw as the science of God's Providence, fueled their keen interest in Copernicus's work, so far as parameters, methods, and technical solutions were concerned. *De revolutionibus* offered a new basis for their mathematical-astronomical work: it constituted a new synthesis of Ptolemaic and post-Ptolemaic science (especially Islamicate). Still, *De revolutionibus* had to be domesticated. It had to be made usable for practice and teaching. The Wittenberg approach was multi-pronged. Rheinhold's *Prutenic Tables* (1551) offered astronomical and astrological

45 Ibid., ff. 14 r–16 v: "Nostro iudicio melius de Ecclesia et de patria mererentur summi principes si curarent a delectis artificibus ad hanc philosophiam partem recte conscribi, et alias artes sapienter tradi, quam cum aggeribus et moenibus instruendis Babylonicos muros imitari conantur. Non si nihil ad Ecclesiam pertinet doctrina physica, nec nihil ad formanda iudicia et ad proprietatem in docendo tuendam, cognitio physices. Sepe collatio physices aliquid lucis addit dogmatum celestium explicationi. Quoties de partibus humanis docendum est, cum ostendendum est quot vires languefactae sint, quae partes regi disciplina possint. Denique pius est sapiens physicus multa dei vestigia cernit in hac varietate naturae, quorum consideratione adsensio de providentia valde conformatur. Cumque deus hoc ipso consilio tantam in condenda natura artem adhibuerit, ut nos de seipse commonefaceret, cur haec studia vel prohiberi vel negligi in Ecclesia nonnulli volunt. Non dubium est hanc sapientiam, hoc est naturae considerationem, primos illas partes Adam, Seth, et ceteros studiosissime cum doctrina a deo tradita coniunxisse, et […] sepe eum mirandum vim experiventur [experiverunt], deo gratias egisse eum celebrasse, et invocasse. Horum et pietatem et studia imitari excellens virtus est. Witebergae Calendis Spetemb. Anno 1549"

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practitioners a useful instrument of heavenly computation, while Melanchthon prevented the circulation of heliocentrism and geokinetic theory among students. In Melanchthon's view, the centrality and immobility of the Earth had to be maintained as it was in accordance with fundamental principles of physics and basic astronomy, and with established literal interpretations of Biblical passages on the order of the heavens. Therefore, he was not willing to admit any form of conventionalism in the modern sense of the term. On this point, he had a different epistemological agenda than the theologian Andreas Osiander, author of the anonymous introduction to *De revolutionibus*. Osiander attempted to protect Copernicus from criticism by erecting disciplinary and methodological walls, stressing the distance between theological truths, which are revealed, physical explanations based on causes, and mathematics, which are hypothetical. He intended to secure a relative autonomy for scholars in various fields of inquiry by downplaying the physical import of Copernicus's challenge, while also insulating mathematical practice from theological and physical interventions. Melanchthon and his circle deeply disagreed with such a disaggregated epistemology. Rather, they were committed to an integration of the various levels of ontological and natural knowledge. In this sense, Rheticus, the author of the *Narratio prima* and keen supporter of heliocentrism as the *real* world system was no less realist than his anti-heliocentric colleagues, Melanchthon, Eber, and Reinhold. Yet, his program of "radical Copernicanism" did not prevail and the Wittenberg core group chose to stay geocentric and geostatic.

In the same year in which Melanchthon and Eber had the *Initia* printed in Wittenberg, Reinhold printed a bilingual edition of the first book of the *Almagest* in which he commented on Ptolemy's cosmological premises and reinforced the anti-heliocentric arguments of the ancient authority on mathematical astronomy. Reinhold added several *scholia* and diagrams aimed to make Ptolemy's arguments clear. They permitted the reader to consider details that had been left implicit in the original work. The aim was pedagogical, since Reinhold's intended readership were students of the liberal arts:

> For the advantage and happiness of the public schools, I began an edition of Ptolemy's excellent work, in which the universal theory of heavenly motions is raised on its first foundations. The present edition of the first book is aimed at making students familiar with the basics [of astronomy], which are preliminary to [a correct understanding of] the other books [of the *Almagest*]. Without any doubt, it is very useful to present to young people these sources of the discipline. Still, since the beginners are not yet conversant with the Greek language, I have added a Latin translation, for whose inaccuracy I beg the pardon of the specialists. I also hope that somebody will eventually accomplish a complete and clear translation of Ptolemy for public interest. Moreover, to help the students, I have commented and explained some difficult passages. I hope that all these efforts will be

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> pleasing to God and be approved by all experts. My intention is, in fact, that the youth not strive merely for the void shadow of the art [*doctrina*], but that they be made familiar with mathematics and with this art useful for human life and peace.[46]

Reinhold's edition of Ptolemy is patently embedded in Melanchthon's educational and cultural program.[47] This new edition of Ptolemy reinforced the geocentric and geostatic convictions of the Wittenberg circle and could serve as a reference for Melanchthon's anti-Copernican arguments in the *Initia*. As a matter of fact, Reinhold checked those pages in the *Initia* on astronomical subjects, as is documented in the manuscript marginalia and corrections as well in the pages that entail the refutation of Copernicus. In those years, between 1543 and 1549, Reinhold was preparing a commentary on *De revolutionibus* and Ptolemy, which also included comments on the astronomical passages concerning planetary theory in Pliny's *Natural History*. In 1549 Reinhold also gave classes on Ptolemy.[48] The comments on Copernicus entail some hints that point toward the possibility of a geocentric translation of the planetary models of *De revolutionibus*. They emerge in the commentary on Jupiter's theory.[49]

The Wittenberg follower of Reinhold as professor of mathematics, Caspar Peucer (who was Melanchthon's son-in-law) followed in his footsteps and envisaged a geocentric transformation of Copernicus's theory of the precession of the equinoxes and the motion of the eighth sphere in the 'Ptolemaic-Copernican' work *Hypotheses astronomicae, seu theoriae planetarum ex Ptolemaei et aliorum veterum*

46 Claudius Ptolemaeus, *Mathematicae constructionis Liber primus graece et latine editus. Additae explications aliquot locorum ab Erasmo Rheinholt Salveldensi*, Wittenberg 1549, f. a8 r–v: "Itaque quod faustum et felix sit studiis publicis, incohavi editionem optimi operis Ptolemaei, in quo doctrina de motibus coelestibus universa ex primis fundamentis extructa est. Ac nunc edidi primum librum, ut haec initia fiant familiaria discentibus, quae aditum ad reliquos libros faciunt. Utilissimum autem esse deduci iuventutem ad hos doctrinae fontes, non dubium est. Et quia iuniores nondum adsuefacti sunt ad graecam lectionem, addidi et latinam interpreationem qualemcunque, de qua veniam ab eruditis peto; ac opto, ut aliqui publice utilitatis causa integram aliquando et luculentam interpretationem Ptolemaei edant. Illustravi et scholiis aliquot obscura membra, ut discentes adiuvarem. Totum hunc laborem spero et Deo gratum esse, et probaturos esse omnes sapientes. Nam hanc ob causam praecipue susceptus est, ut iuventus non inanem doctrinae umbram tantum appetat, sed ad mathemata et ad hanc doctrinam vitae hominum utilem et pacis nutricem adsuefiat." Here and in the following quotations from Latin, we have standardized the expressions and revised the punctuation and capital letters only where we deemed it useful for an easier reading of the passages.

47 Cf. Omodeo and Tupikova, "Post-Copernican Reception of Ptolemy" and "Visual and Verbal Commentaries in the European Renaissance: Erasmus Reinhold's Treatment of Classical Sources on Astronomy," in: *Philological Encounters* 3 (2018), pp. 1–43.

48 Copernicus *Gesamtausgabe* VIII/1, *Receptio Copernicana*, Berlin 2002, p. 590.

49 [Erasmus Reinhold], *Commentarius in opus Revolutionum Copernici*, *Staatsbibliothek zu Berlin*, collocation Ms. lat. fol. 391, f. 233 r. Cf. Aleksander Birkenmajer, "Le *Commentaire* Inédit d'Erasme Reinhold sur le *De revolutionibus* de Nicolas Copernic," in: *La Science au seizième siècle*, Paris 1960, pp. 171–177.

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doctrina ad observationes Nicolai Copernici, et canones motuum ab eo conditos accomodatae [Astronomical hypotheses, or planetary theory derived from Ptolemy and other ancient doctrines and accorded to Nicolaus Copernicus's observations and the canons of motions he composed] (Wittenberg 1571).[50] We could call Reinhold and Peucer's appropriation of Copernicus 'instrumental' only in the very limited sense that they aimed at using its methodology and models while inserting them in a familiar geocentric and geostatic framework. No confusion should be engendered though: they were by no means instrumental in the sense that they were conventionalists, if by "conventionalist" we want to say that they separated mathematics from physics. Quite the contrary, they searched for the harmonization of geometrical representation and causal explanation.

A scholarly tradition emerged from this institutional context due to the influence that Wittenberg had on other reformed universities in Germany and beyond. When Tycho Brahe devised his geoheliocentric system (with the Earth at the center of fixed stars, solar and lunar circles, and the Sun at the center of planetary circles) scholars who learned astronomy along the Melanchthon-Reinhold-Peucer line were not caught by surprise by Brahe's theory. To them it looked like a rather obvious post-Copernican geometrical transposition. Therefore, they could not understand Brahe's bold claim that he had discovered a new system of the world nor the battles he engaged in against 'plagiarizers' of *his* geo-heliocentric hypotheses. The immediate reaction of the court mathematician of Kassel Christoph Rothmann to Brahe's *De mundi aetherei recentioribus phaenomenis* [*On the Most Recent Phenomena in the Ethereal World*] (Uraniborg 1588) is telling:

> I did not consider this [geo-heliocentric theory] to be a new approach but precisely Copernicus's, apart from the fact that I could treat the matter in the reverse manner by bringing Copernicus's hypotheses back to the solar motion. Moreover, I assumed that Rheticus and Reinhold also took that same approach into consideration.[51]

In light of this dismissal of Brahe's originality, geo-heliocentric astronomy constitutes a development of the Wittenberg project to find a middle way between Ptolemy and Copernicus, as well as between Aristotelian physics and Copernican astronomy. This was a theology-led educational project which, however, was not yet 'confessional' in the sense that it intentionally marked a Protestant approach to astronomy as opposite to a Catholic one. The natural sciences and astronomy were not yet part of the confessional dispute. However, during the ongoing pro-

50 Caspar Peucer, *Hypotheses astronomicae*, Wittenberg 1571, pp. 592–593.

51 Tycho Brahe, *Opera Omnia*, ed. J.L.E. Dreyer, Amsterdam 1972, vol. 6, pp. 156–157. On Brahe and Rothmann, see Miguel Á. Granada, "Astronomy and Cosmology in Kassel: The Contribution of Christoph Rothmann and His Relationship to Tycho Brahe and Jean Pena," in: *Science in Contact at the Beginnig of the Scientific Revolution*, ed. J. Zamrzlová, Prague 2004, pp. 237–248 and idem, "Did Tycho Eliminate the Celestial Spheres before 1586?,"in: *Journal for the History of Astronomy* 37 (2006), pp. 125–145.

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cess of *Konfessionalisierung* the school of astronomical mathematics initiated by Melanchthon's circle became an important component of Protestant institutional (academic) culture.[52] Wittenberg scholars perceived astronomy as a strategic field of cultural politics, as Melanchthon's active support of the natural sciences testifies. Still, in his years, the political struggles over the status of astronomy remained enclosed within the evangelical camp. Given the humanistic background of Melanchthon's project, astronomical issues were still intra-confessional or super-confessional. The humanistic-cum-astrological approach, as opposed to the Scholastic one, had not yet become overloaded with confessional implications.

7 Conclusion

The paradoxes of the Wittenberg reception of Copernicus can be seen as linked to a limitedly instrumental but not necessarily conventionalist reading of *De revolutionibus*, if by "conventionalist" one implies the sharp separation between astronomical modeling and physical causality. Wittenberg realists rejected the motion of the Earth and the heliocentric system but did not reject Copernicus's work. Rather, they engaged with a transformation of its theories and a practical appropriation of its numerical results and geometrical devices. Their goal was to integrate, not to separate, modeling and causality (as well as revelation).

Melanchthon's attitude towards Copernicus changed during the time. He must have been influenced by discussions with his collaborators, in particular Reinhold. Conversely, he shaped Wittenberg scientific programs. We can imagine that for the passionate pupil of Copernicus, Rheticus, it must have been hard to witness the staunch opposition (and the insults at a personal level) that Melanchthon directed against his astronomical *praeceptor*. Melanchthon, who had supported Rheticus's career in Wittenberg, arguing that the latter was born for mathematics, did not trust his Copernican revision of physics. Eber and especially Reinhold—later Peucer and the geo-heliocentrists—wholeheartedly embraced Melanchthon's philosophical viewpoints and sought to inscribe the new astronomy in an Aristotelian natural philosophy. Their project meant to find a balance between, on the one hand, a defense against theological *skepsis* of the teaching of mathematical astronomy, and, on the other hand, a rejection of radical philosophical innovation.

Planetary hypotheses at the University of Wittenberg developed in accordance with its institutional and pedagogical constraints. They account for the specificity of the Wittenberg reception of Copernicus and the success of its developments. The *Wirkungsgeschichte* of the geocentric assimilation of Copernicus's planetary theory, as implemented in the Wittenberg research program, went far beyond the Protestant camp, as evidenced by the broad reception of Brahe's astronomy among Protestants as well as Catholics during the seventeenth century.

52 Pietro D. Omodeo, "Institutionalized Metaphysics of Astronomy at Early-Modern Melanchthonian Universities," in: *Wissen in Bewegung. Institution—Iteration—Transfer*, ed. Eva Cancik--Kirschbaum and Anita Traninger, Wiesbaden 2016, pp. 51–78.

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Appendix:

Philipp Melanchthon, "What is the motion of the world?"

Translation of "Quis est motus mundi" section from the 1549 edition of the *Initia doctrinae physicae* (book I, ff. 47 v–51 v). Reprinted in *Corpus Reformatorum*, vol. 13, pp. 216–220.[53] In Melanchthon's handwritten manuscript, this section runs from 178 v—194 r.

The parts of the world will be discussed in their place. The heavens will be discussed first. The heavens are moved according to circular motion, which is confirmed by the same arguments that were given conerning its shape. For circular motion is appropriate to spherical bodies. And the eyes are witness that the heavens are wheeled around in twenty-four hours.

But here there are some who either by love of novelty or to show off their cleverness have argued that the Earth is moved and reject the movement of the eighth sphere and the Sun, whereas they assign motion to other celestial spheres. They moreover put the Earth among the stars. Nor were these games recently devised. Archimedes' book on the *Counting of Sand* [*The Sand Reckoner*] exists to this day. In it he reports that Aristarchus of Samos taught this paradox, where the Sun stands immobile and the Earth revolves around the Sun.

Although subtle specialists inquire into many things in order to exercise their wits, it is not right to openly affirm such absurdities, and it sets a damaging example. It is right for the mind to reverentially embrace the truth shown by God, to be at peace therein, to thank God for kindling and preserving some light in the minds of men, and to consider how to be led toward God by this light and in what way life should be guided and aided by the knowledge of truth.

53 A partial translation in French of this chapter has been done by Michel-Pierre Lerner, in "Aux origines de la polémique anticopernicienne (II): Martin Luther, Andreas Osiander et Philipp Melanchthon," in: *Revue des sciences philosophiques et théologiques* (2006), pp. 409–452, pp. 437–440.

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Although some people mock the natural philosopher who cites divine testimony, we judge it correct that, wherever possible, philosophy consult with heavenly gospel and examine divine authority from within the deep fog of the human mind. Psalms most clearly affirms the Sun to be moved. [God] put the tabernacle in the Sun itself, and the bridegroom advancing through his nuptial bedchamber exults like the strong man running his course.[54] He sets out from one extreme of the heavens and revolves to the other extreme. Let us be satisfied with this clear testimony about the Sun.

Another Psalm speaks about the Earth. God established the Earth upon its stability [*stabilitatem*]. It will never be moved, always and eternally. And the first chapter of Ecclesiastes says: The Earth stands eternally; the Sun rises and sets, and returns to the place where it rises.[55] And it is considered a miracle among miracles, when God wished to make the Sun stop and even move back.[56] Encouraged by these divine testimonies, we should embrace the truth. Let us not be led astray by the deceptions of those who think it the glory of their cleverness to throw the arts into confusion.

And while physical arguments that show the Earth to be immobile can be shunned, let us nevertheless discuss some [such arguments] readily at hand that satisfy those who judge with moderation and love truth.

First, in the revolution of a circle, the center remains immobile. But the Earth is in the middle of the world and is, as it were, the center of the world. It is therefore immobile.

Macrobius also brought forward this argument [the above] taken from Cicero.[57] Moreover, there are many demonstrations of the minor premise [of the syllogism, i. e., the centrality of Earth] drawn from appearances, that is, from everyday observation of the stars, from the equinoxes, from the increments and decrements of days and nights, and from eclipses.

For if the Earth is not in the middle of the universe, it will necessarily occupy one of the following locations:

[I] First, it is located outside the axis of the world but is equidistant from both poles, such that it is in the equinoctial plane.
[II] Secondly, it is situated on the axis of the word but outside the equinoctial plane, that is, closer to one of the two poles.
[III] Thirdly, it is neither on the axis of the world nor in the equinoctial plane.

[I. Case] In this first [decentered] positioning [of the Earth], these absurdities would follow depending on the different positions of the Earth in one place or another of the equatorial plane:

54 Psalms 19:4–6 (KJV): "Their line is gone out through all the Earth, and their words to the end of the world. In them hath he set a tabernacle for the Sun, which is as a bridegroom coming out of his chamber, and rejoiceth as a strong man to run a race. His going forth is from the end of the heaven, and his circuit unto the ends of it: and there is nothing hid from the heat thereof."

55 Ecclesiastes 1:4–5.

56 Joshua 10:12–14.

57 From I.22 of Macrobius's *Commentary on the Dream of Scipio*, in Macrobius, *Commentary on the Dream of Scipio*, trans. William Harris Stahl, New York 1990, p. 181.

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[I.1] First. Equinox would never occur at "*sphaera recta*,"[58] because the horizon would never cut the Earth into two equal halves.

[I.2] Second. At "*sphaera obliqua*,"[59] at some places [on the Earth's surface] there would be no equinox while at others there would be, but not on the parallel at the mid-point between the Tropics, that is, not on the equinoctial circle, but on another minor parallel closer to one of the Tropical points.

[I.3] Third. The time from sunrise to midday would not equal the time from midday to sunset.

[I.4] Fourth. The stars' magnitudes and intervals in the east and west would not appear equal.

[II. Case] These absurdities would result from the second positioning, if the Earth were on the axis of the world but not in the middle:

[II.1] First. In every latitude [*clima*], the plane of an [observer's] horizon would cut the heavens into two unequal parts, except the places at "*sphaera recta*." Therefore, the zodiac would be divided into two unequal arcs, and thus at some places more and at other places fewer than six signs of the Zodiac would be seen above the horizon. This is contrary to all experience.

[II.2] Second. The shadows of the Sun's rising and setting at equinoxes would not agree such that they make one perfectly matching, straight line [*in una recta linea* ἑῷ εὐθείας]. Nor on the day of the summer solstice would the shadow of the rising Sun make a matching line with the shadow of the setting Sun at winter solstice, and *vice versa*.

[III. Case] In the third positioning, that is, neither on the axis of the world nor on the equinoctial plane, the same absurdities would follow as in the two cases above. [III.1] Generally, wherever the Earth might be placed outside the center, the equal ratio of increment and decrement, of days and of nights, would be thrown off. [III.2] Nor would lunar eclipses always take place when the Moon is diametrically opposite the Sun, because the Earth would not in be in the middle of the world and would not cast its shadow on the Moon.

These eight absurdities [I.1–III.2] prove clearly that the Earth cannot be in any other place except the center of the universe.

From this confirmation of the thesis, that the Earth is in the center of the world, it follows first that since it is at the center it does not move. From here arise several distinctions of motion. For circular motion is revolution about the center. And rectilinear motion is rectilinear insofar as it is carried from the center or middle, or to the center or middle. These distinctions would not exist if there were no established center or middle. From here, then, arise several arguments.

A simple body possesses only one motion.
The Earth is a simple body.

Therefore, only one unique motion applies to it. Downward, rectilinear motion, that is, motion toward the center, therefore applies to the parts of the Earth. Once at

58 This is the position of an observer at the equator.

59 This is the position of an observer at a latitude between the equator and one of the poles.

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the center, the parts are motionless. Therefore, circular motion does not apply to the Earth.

Secondly. Every heavy body strives downward to the center, and then would be necessarily motionless when it has arrived at the real center, because it is appropriate that the center be immobile. Therefore, when the parts of the Earth are fallen to that part which is the real center, they will necessarily be at rest on its surface. It follows that the universal mass [of the Earth] is at rest.

Thirdly. Nature is likewise composed of parts and wholes. All parts of the Earth, and every mixture in which earth is dominant, are carried downward to the surface of the Earth and are there at rest. Therefore the Earth as a whole is at rest.

The fourth argument is a physical conjecture. Extremely quick motion impedes agglomeration, which is necessary for every being that is generated. However, the Earth is like the womb for the birth of so many things. If everyday it were carried around with such great speed, which would be the case if it were moved, it would not be able to foster anything but would scatter its assembled parts. Thus, one should embrace and defend the argument that the Earth is in the center of the world and at rest.

It should also be known that, because of the Earth's smallness compared to the heavens, it is like a point, that is, it has no notable magnitude, as much clear evidence shows, because the horizon divides the heavens everywhere into two equal parts. And observed at the same time from any part of the Earth, the stars are always seen to hold the same relative distances. Gnomons and armillary spheres set at whatever place on the Earth behave as if they were all located at the actual center of the Earth. And equinoctial shadows of the rising and setting Sun make a single straight line, just as if they were cast into a plane cutting through the center of the Earth.

The reader is invited to observe a globe and [observe] that earth and water are joined [forming a unique sphere]. And although many distinguish between the center of magnitude [i. e., the center of the sphere] and of gravity, nevertheless there is in fact one center. The center of gravity and magnitude is the same,[60] as the recently discovered land [America] shows, and the earth is not as the ancients believed totally surrounded by ocean. That the globe of water is ten times greater than that of earth, because ten handfuls of water were thought to come from one handful of earth, this picture is not true. For spheres are in a triple ratio relative to their diameters.

60 Strangely, this clause is left out of the reprinting of the 1549 *Initia* in the *Corpus Reformatorum*, in *Corpus Reformatorum*, vol. XIII, ed. Carolus Gottlieb Bretschneider, Halle 1846, p. 219.

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Cosmology and Scholarship in Seventeenth-Century Helmstedt: The Baltic Mathematician and Scientific Mediator Nicolaus Andreae Granius (c. 1569–1631)*

Stefano Gulizia

This paper deals with the scientific culture of the University of Helmstedt at the beginning of the seventeenth century through a close consideration of the life, work, and cosmological views of the Swedish professor of physics Nicolaus Andreae Granius (*c.* 1569—1631). It focusses, in particular, on the documented impact he had on his cultural milieu. It also aims to account for the fact that the circulation of Peripatetic learning in Protestant schools—such as the *Academia Julia*—helps to reconstruct a mutual influence, both theoretical and curricular, of logic and natural philosophy at the close of the Renaissance. I believe that the current history of early modern natural philosophy has yet to fully appreciate this issue. My methodology combines the reception of Aristotle with a renewed study of academic mobility, including teachers, students, and their personal objects of knowledge. In this context, I suggest that Granius's *iter Germanicum* was akin to the peregrinations of British scholars on the continent like John Craig of Edinburgh and Duncan Liddel of Aberdeen,[1] and I further point out that the strong evidence left behind by these learned travelers invites a comprehensive reassessment of the interaction—via correspondence, oral exchange, and textual cross-checking—between individuals and their collective institutions, be they circles, households, or academies. Granius was one of those Renaissance mediators who had the ability to travel between movable peripheries.[2] And while Granius was not a protagonist or an innovative theoretician, his lifetime was marked by the lasting and profound upheavals that shook Melanchthonian education and

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1 Pietro Daniel Omodeo (ed.), in collaboration with Karen Friedrich, *Duncan Liddel (1561–1613): Networks of Polymathy and the Northern European Renaissance*, Leiden 2016.

2 Howard Hotson has written about spontaneous pedagogical phenomena at the frontier, *Commonplace Learning: Ramism and its German Ramifications, 1543–1630*, Oxford 2007, pp. 3–37; in Hotson's explanation, after the destruction of the German Reformed academic tradition in the 1620s, the model becomes one of center and periphery turned on its head.

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post-Keplerian science. The main primary source for this reconstruction are Granius' annotations and marginalia in the books he owned that are still preserved in the Herzog August Library. These constitute an important document of early modern note-taking practices in scholarly milieus as well as knowledge circulation at a Protestant university marked by Lutheran theology, late humanism, and methodological Aristotelianism.

1 From Prague to Northern Europe

In 1610, at the age of 42, the Baltic mathematician Nicolaus Andreae Granius was in Prague and spent twenty *creutzers* purchasing a logical treatise by the Dominican Chrysostomus Javellus, which was published in Lyon in 1579.[3] At this juncture, Granius was an itinerant fellow. In the Czech lands he was received as a Papal Scholar at the Collegium Nordicum in Olomouc;[4] previously, he had taught both publicly and privately in Rostock at the same university where he defended his doctorate, and at the Academia Julia in Helmstedt. Indeed, the Duke Heinrich Julius of Braunschweig-Wolfenbüttel was pushing to arrange a professorship for him, which would materialize in 1613 with Granius' appointment in physics.[5] In point of fact, throughout the entire life and career of this cultural traveler from Sweden the pedagogical and the geopolitical continued to play out like two sides of the same coin. And while Javellus, among other things, stood at one end of a theoretical rift with Zabarella concerning the role of experiential proofs and the role of merely probable premises in the construction of science,[6] Granius' interests were by no means confined to the epistemology of truth. Rather, as with many natural philosophers of his time who defended a larger jurisdiction of their philosophical pursuits, these interests encompassed logic, ethics,[7] computational astronomy, as well as political and cosmological debates. Granius approached his private library as something always in progress and requiring continual note-tak-

3 Granius registers a specific day, September 10, in his possession note. The copy is now housed at the Herzog August Bibliothek (hereafter HAB), with the shelf mark H: O 54.8° Helmst.

4 The Jesuits organized two *collegia*—one in Olomouc (Moravia) and another in Braunsberg (Royal Prussia)—specifically in order to educate future defenders of the Catholic faith in Scandinavia; although technically a lecturer, Granius was part of the second largest student body in that school: cf. Jaroslav Miller, *Urban Societies in East-Central Europe, 1500–1700*, Aldershot 2007, p. 64.

5 This is a post that Granius never abandoned, even after the King of Sweden, Gustav II Adolf, and the powerful Axel Oxenstierna tried to lure him back to Uppsala; for an overview of student mobility and intellectual exchanges between Sweden and the Helmstedt milieu, see Daniel Riches, *Protestant Cosmopolitanism and Diplomatic Culture: Brandenburg-Swedish Relations in the Seventeenth Century*, Leiden 2013, pp. 197–202, who reconstructs the courtly co-opting of academic Philippism in Germany as part of an anti-Catholic strategy based in high intellectual circles such as those of Georg Calixtus and Hermann Conring, to whom I return below.

6 Stefan Heßbrüggen-Walter, "Scientific Knowledge and the Metaphysics of Experience: The Debate in Early Modern Aristotelianism," in: *Studia Neoaristotelica* 10 (2013), pp. 134–154.

7 On this aspect, see my article "Ethics in the Cultural Debates of Seventeenth-Century Rostock and Helmstedt: The Case of Nicolaus Andreae Granius (1608–1617)," in: *History of Universities* 32 (2019), forthcoming.

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ing. As I argue in this essay, it was not the habit of collecting per se that played a significant role, but the owner's insistence on extending certain scribal methods of early modern scholarship (and readership), even to mathematical works.[8]

As for Prague, his return to the city was more than a mere backdrop to Granius' *peregrinatio academica*. First, it was the center of an empire. Second, it also set the stage for Granius' own confrontation with Kepler and Galileo, which he, as we will see, actually co-orchestrated.[9] And finally, as a courtly space within the international book trade, it also became the theater of accidental and uneasy negotiations around new scientific monographs, which seriously challenge the ethereal or unmovable characteristics of "print culture" seen as a technology that possesses key features of fixity and standardization.[10]

Take the example of Tycho Brahe. He clearly decided to use a specific book, the *Astronomiae instauratae mechanica*, in an attempt to secure imperial patronage. So he moved the book out of the domestic presses of Hven and successfully marketed it in Prague,[11] where it circulated, essentially, as a catalogue of prized astronomical instruments. But once there, the book suffered piracy and uneven standards due to commercial pressure. Rudolf II had to issue dire caveats against fraudulent imitations, which in turn prove two points: that Brahe's mechanics were read, simultaneously, by different readers with different goals, and that accreditation became more and more insecure as it moved outside the courtly matrix and the author's personal control.

One of these diverse readers was Granius himself, whose extended annotations of his books is a document of early modern reading and learning techniques. As if by design, he did not emphasize the artisanal aspects of knowledge-making in his private collection, even if he tirelessly recalculated astronomical tables and rehearsed the empirical data contained in the diagrams appended to the text.[12]

8 Cf. Elizabeth Yale, "Marginalia, Commonplaces, and Correspondence: Scribal Exchange in Early Modern Science," in: *Studies in History and Philosophy of Biological and Biomedical Sciences* 42 (2011), pp. 193–202, and Renée Raphael, *Reading Galileo: Scribal Technologies and the Two New Sciences*, Baltimore 2017, which makes the point that, for all the manufacturing of Galileo's fame, it is still useful to look at him as "entrenched in the world of the early modern scholar" (p. 62).

9 Otto Walde, "Nicolaus Granius, Galilei och Kepler," in: *Lychnos* 7 (1942), pp. 279–280.

10 Although 'classic' in their own right, the warnings of Adrian Johns, *The Nature of the Book: Print and Knowledge in the Making*, Chicago 1998, pp. 17–19, still have a valid purchase for early modern science; see also Matthew McLean and Sara Barker (eds.), *International Exchange in the Early Modern Book World*, Leiden 2016, esp. pp. 31–58, and 171–238.

11 I am relying here on the much more detailed account of John Robert Christianson, *On Tycho's Island: Tycho Brahe and His Assistants, 1570–1601*, Cambridge 2000, pp. 218–236, though my limited purpose is to sketch out the cultural context in which Granius functioned as a reader, sometimes responding to solicitations as a patron and sometimes as a fellow mathematician.

12 There are numerous examples of this scribal behavior. Some relevant instances of Granius' diagrammatic thinking are: 1) in his edition of Erasmus Reinhold's *Prutenicae Tabulae* (Tübingen 1562), marked as H: N 104.4° Helmst., in which he summarizes the causes that produce uniform circular motion or *aequatio* (f. 14 r), he worries about synchronizing chronologies (ff. 21 v—22 r), and he transforms the recipes for calculating the latitude into a diagram (ff. 40 r—v); 2) his copy of Reinhold's commented edition of the *Almagest*, printed in 1549 at

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He privileged the task of summarizing and extracting key opinions,[13] often by imposing extended headings on the superior margin of his printed editions,[14] including consolidated segments of the Aristotelian corpus, and overall he read books like accomplished humanists did,[15] that is, by giving the appearance of moving within the tenets of established *scientiae*.[16]

Indeed, while a growing number of scholars have shown interest in marginalia not only as a record of engagement with one text, but also as a trading zone where different traditions of scholarly practices came together,[17] it remains peculiar of a reader such as Granius—and, by extension, his entourage within the community at Helmstedt—that he preferred discipline-specific ways, treating the text he was working on as belonging to recognizable scientific genres, be they geometry and mixed mathematics, or something else.[18] It is arguable that Granius possessed a refined understanding of different levels of readership, for instance that of court-

Wittenberg, marked as H: N 7.8⁰ Helmst. (1), in which he concentrates on the Danube arc-chord problem (f. 52 v), writing *Danubius* over the AB chord of the diagram and underlining "altitudo convexitatis," but without correcting the calculation that is wrong. Cf. Pietro Daniel Omodeo and Irina Tupikova, "The Post-Copernican Reception of Ptolemy: Erasmus Reinhold's Commented Edition of the *Almagest*, Book One (Wittenberg, 1549)," in: *Journal for the History of Astronomy* 44 (2013), p. 242.

13 We need more research into the methods of the Collegium Nordicum at Olomouc to appreciate the similarities between Granius' acquired techniques and Scholastic adversarial activity.

14 Here, as well, examples are abundant: cf. "Caelum est globosum" in the Reinhold set of 1549, cited in note 10 (ff. 49 v—50 r), and "Sol est in centro mundi" in Granius' copy of Kepler's *Epitome astronomiae Copernicanae*, marked as H: N 89.8⁰ Helmst. (1) and printed at Linz in 1622 (cc. 446–447).

15 As an annotator, and albeit on a lower level of philological achievement, Granius' reading and note-taking methods resemble Casaubon's style, that is, a complex rather than cursory system, which relies on marginal and loose-leaf memoranda instead of copying passages out in a notebook: see Anthony Grafton and Joanna Weinberg, *"I have always loved the Holy Tongue:" Isaac Casaubon, the Jews, and a Forgotten Chapter in Renaissance Scholarship*, Cambridge 2011, and Id., "Kepler as a Reader," in: *Journal of the History of Ideas* 53 (1992), pp. 561–572.

16 Granius' interest in the disciplinary discourse is documented in the extensive set of notes added to H: Q 140.8° Helmst. (1), which contains a 1532 edition of Juan Luis Vives' *De Disciplinis*, and in his attention for the Aristotelian debate on the subordination of sciences in the margins of Pietro Catena's *Universa loca in logicam Aristotelis*, published by Francesco Marcolini (Venice 1556) and now housed as H: N 25.4° Helmst. (5).

17 While the precise intellectual benefit of the term 'trading zone' as a scholarly tool is often vague, at least in my opinion and because not every negotiation is a trade, a more innovative application of this strategy is tied to the study of genres in scientific knowledge, as shown by Richard L. Kremer, "Incunable Almanacs and *Practica* as Practical Knowledge Produced in Trading Zones," in: Matteo Valleriani (ed.), *The Structures of Practical Knowledge*, Berlin 2017, pp. 333–369.

18 This is how Raphael, *Reading Galileo*, p. 74, characterizes Viviani's strategy; she also follows an interesting procedure in the decades subsequent to Galileo according to which a quantitative, experimental finding is cited and discussed as a piece of bookish or textual evidence (p. 177). A good illustration of this point is found in Granius' annotated copy of William Gilbert's *De magnete* (Rostock 1628; M: Nc 4° 46); cf. Nick Wilding, *Galileo's Idol: Gianfrancesco Sagredo and the Politics of Knowledge*, Chicago 2014, pp. 33–35, for magnetism in the Galilean milieu.

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iers and craftsmen, and that in his early Czech years, in dialogue with Kepler, he came to grips with the "theorica" as a Renaissance genre with its audiences and technical challenges;[19] that said, he also read and copiously annotated the works of his fellow mathematician at Rostock, Heinrich Brucaeus,[20] who complained to Tycho Brahe that he could not get his head around the Copernican hypothesis using a diagram alone.[21] Within this context, it is therefore highly significant that in his copy of Brahe's *Astronomiae instauratae mechanica* Granius found absolutely nothing to say about the instruments, but instead annotated the letters of Giovanni Antonio Magini comprised in the edition: perhaps, the way in which Granius could capitalize on just what he wanted to find in a printed edition parallels what has been described as Magini's highly focused reception of Keplerian astronomy.[22]

2 A plurality of cosmological approaches

The historiographical literature on Helmstedt emphasizes the apex of three exemplary types—regional university, Lutheran theology and late humanism. This seems largely beyond question for the post-1620 period. Nevertheless, it tends to disregard a distinctiveness of earlier approaches to Aristotelian cosmology by Helmstedt professors that is perceived most acutely, perhaps, in those historical actors who were involved in academic mobility and came through key European intellectual crossroads, such as Breslau or Rostock itself. There is evidence—to which I briefly return below—that in the circle of Granius' friends and colleagues, Hermann Conring, the distinguished scholar of Aristotle's *Politics* and reader of Machiavelli, owned a copy of the 1615 edition of Giuseppe Biancani's *Aristotelis loca mathematica*.[23] And within this crucial Jesuit treatise, published in quarto, Conring annotated the sections pertaining to the fluidity of the heavens and the celestial locations of the comets. Conversely, Granius himself, who remained a true Peripatetic throughout his life, became interested in the work of the Venetian

19 Adam Mosley, "Objects of Knowledge: Mathematics and Models in Sixteenth-Century Cosmology and Astronomy," in Sachiko Kusukawa and Ian MacLean (eds.), *Transmitting Knowledge: Words, Images, and Instruments in Early Modern Europe*, Oxford 2006, pp. 193–216.

20 e. g. Brucaeus' *De motu primo* (Rostock 1585; H: N 84.8º Helmst.).

21 TBOO vii. 85: "Ob id desiderabam organum, quod mihi ob oculos obiiceret totam illam Copernici imaginationem, quam ego, ut verum fateat, ex simplici illa delineation nunquam plane assequi potui." The functioning of such instrumental machina mundi calls into question the thesis advanced by Pierre Duhem who labelled many early modern astronomers as entirely indifferent to the reality of the hypotheses utilized to describe the heavenly motions; cf. Peter Barker and Bernard R. Goldstein, "Realism and Instrumentalism in Sixteenth Century Astronomy: A Reappraisal," in: *Perspectives on Science* 6 (1998), pp. 232–258, who reformulated this issue in terms of indetermination rather than irrelevance, and from the point of view of the Aristotelian proof, and especially the ample discussion of Pietro Daniel Omodeo and Jonathan Regier in this volume.

22 James R. Voelkel and Owen Gingerich, "Giovanni Antonio Magini's "Keplerian" Tables of 1614 and Their Implications for the Reception of Keplerian Astronomy in the Seventeenth Century," in: *Journal for the History of Astronomy* 32 (2001), pp. 237–262.

23 It is H: N 6.4⁰ Helmst.; cf. Paul Raabe, "Die Bibliotheca Conringiana," in Michael Stolleis (ed.), *Hermann Conring (1606–1681)*, Berlin 1983, pp. 413–434.

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mathematician Giovanni Battista Benedetti, who was active at the Court of Savoy in Turin and combined an anti-conventionalist opinion with adherence to the Copernican system.[24] Indeed, one could further argue that in this context, and to the eyes of many Aristotelians, Tycho Brahe's geo-heliocentrism would have been understood as a singular culmination of the cosmological style of Wittenberg, with its emphasis on tabular calculation and geometric modelling. Certainly, religious motives played a role in the decision to be cautious. But it was because of its peculiar connection with the Aristotelian background that the well-established Protestant school of Helmstedt could avert a rupture with tradition, even if it was intrinsically able to criticize the Aristotelian cosmos based on its own shortcomings. This being the case, there is room for a fresh examination of Granius' copious marginal annotations as a gateway into how a Baltic polymath could maintain an anti-dogmatic stance, and occasionally even an anti-Aristotelian one, while still remaining within the Peripatetic system.[25]

Yet, being a Peripatetic natural philosopher at the beginning of the seventeenth century did not mean being a defender of all the points endorsed by Aristotle himself. There were some features in the Aristotelian formulation that were problematic to maintain, such as the forced symmetry between rivers and winds. In addition to these kind of difficulties, the Helmstedt professors who extensively annotated the printed editions of Biancani, Benedetti, Brahe, Reinhold or Kepler[26] had to deal with new issues. Granius remained a stable associate within the larger orbit of the Caseliani of Helmstedt, and this was a formidable intellectual group as well as one unafraid of moving in territories where support for Aristotle was difficult to find. What is typical of this knowledge community is the way they historicized the Aristotelian debates of sixteenth-century Italy. Just as their Paduan or Venetian predecessors relied on the unprecedented materials being published and pertaining to the Greek commentators, so, too, but by a curious inversion, Helmstedt natural philosophy often appears as a strategy to reframe early modern disciplines of knowledge by placing Nifo or Boccadiferro exactly in the position in which their previous generation would have put Simplicius or Philoponus.[27] Thus, for instance, we see Zabarella occupy one of the treatises of *De rebus naturalibus* with an extensive defense of Averroes and his notion of *formae fractae*, that is, the existence of intermediate passages between substantial and ac-

24 See below note 32.

25 Apart from the intellectual debate, there is a further dimension, both geopolitical and biographical, in which Granius defies the expectations one could have about his allegiances. During the tragic trial of Nicolaus Campanius, Granius is repeatedly scrutinized for his alleged sympathies for Roman Catholicism; see Oskar Garstein, *Rome and the Counter-Reformation in Scandinavia: The Age of Gustavus Adolphus and Queen Christina of Sweden, 1622–1656*, Leiden 1992, pp. 259–265.

26 Cf. the copy of *Astronomia nova* marked as H: N 29.2° Helmst. (2) at the HAB.

27 Charles Schmitt, "Philoponus' Commentary on Aristotle's *Physics* in the Sixteenth Century," in: Richard Sorabji (ed.), *Philoponus and the Rejection of Aristotelian Science*, Ithaca 1987, pp. 210–227.

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cidental phenomena such as colors, and on the other side of the transalpine book trade we have a physical dissertation about the natural elements presided over by Adam Luchten and printed at Helmstedt in 1605, which remains almost entirely unimpressive except for the last corollary where the author confronts Zabarella's idea of a cold region in the process of rain falling.

Granius' intellectual output is perfectly integrated within this habit of expounding public theses resulting from ongoing conversation and marginal annotations. The chosen topics might seem consciously traditional, but often their arrangement is inconsistent with the received theory, as I will soon show. Awareness of inner weaknesses in the Aristotelian cosmos generated an underappreciated sense of epistemic freedom. No one—as far as I am aware—dealt with the shocking discovery of Caselius writing in the margins of his own edition of Zabarella's *Opera logica*, printed by the Venetian Meietti in 1578, "telos ou gnosis alla praxis" (the goal is not knowledge but practice), which takes the opposite stance of what Zabarella argued in the chapter 1:2.[28] It is because of evidence such as this that we cannot take the risk of "black boxing" the plurality of the cosmological debates in Helmstedt, or of subscribing to the false teleology of the Galilean dialogue according to which there are only two chief planetary systems. Likewise, the friction inside this Aristotelian stronghold was made invisible, paradoxically, by its own success.

3 First notes on Granius' scientific problem-solving

As one of the Scandinavian itinerant faculty members at Helmstedt, Granius played a part in the construction of a 'cognitive ecology' of knowledge which had fundamental underpinnings of biological naturalism. This was on behalf of Caselius' close circle, with whom Granius also shared polemical targets (Ramus and his cohort of *novatores*, described as the ancient sophists), stylistic preferences (the georgic imagery of '*floreant paululum*' or '*reviviscunt*'), and, most importantly, the idea that only a theoretical account of *differentiae* (e. g. cartilage and bone being analogical or differing by more or less) could underwrite the correct 'starting point' of a scientific inquiry. Granius is acknowledged by his contemporaries Arnisaeus and Conring as one of the first Helmstedt Aristotelians to conclude publicly that virtues are acquired by habituation and teaching, and that they are states rather than natural capacities, a parallel that suggests how all aspects of cleverness—including the *zoon politikon*—emerge from natural roots shared with the beasts. In this exchange about political science, Granius also makes important reflections about a nest-building swallow who acts according to *dianoias akribeian*, or 'intelligent design'.[29] Granius was regularly engaged in presiding over public

28 Cf. Riccardo Pozzo, "Philosophy, Medicine and Aristotle's *De Anima* in Helmstedt at the Close of the Renaissance," in: Barbara Bauer (ed.), *Scientiae et artes: Die Vermittlung alten und neuen Wissens in Literatur, Kunst und Musik*, Wiesbaden 2004, pp. 831–841.

29 Aristotle's reference (from *Historia animalium*, 612b18–32; cf. 614b31–33) is part of numerous examples of the intentional activity of animals which reveal 'the precision of their intelligence'.

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debates, at least in the period between 1604 and 1608. His reputation as a bibliophile, however, must have accompanied him as well, and it is symptomatic that a Rostock treatise *De meteoris*, written in 1596 prior to his appointment in Helmstedt, was subsequently acquired by the Duke Heinrich Julius of Braunschweig and systematically annotated in its new library location. Apart from these ritualistic or academic sources, comparatively little is known about Granius' life.[30]

As we have seen, he was once a papal scholar at Olomouc, in the Czech lands, and he also wrote a letter to the Swedish archbishop of Uppsala on October 3, 1610, in which he expresses marvel at the discovery of astral bodies orbiting around Jupiter and also pointedly conflates the telescopic practice of Kepler and Galileo.[31] This well-known episode is interesting in itself, and for two additional reasons. First, in so far as it testifies to the rarified exchange across the Alps that the taciturn Galileo attended to in his Paduan years—Galilei being an anti-Hartlib type, the unresponsive kernel of a network of knowledge; and second, because it is not clear what Granius actually thought of Kepler's aprioristic cosmology. On the one hand, he almost certainly believed that astronomy ought to be part of natural philosophy; and he spent time, as I mentioned earlier, annotating the books of an alleged student of Tartaglia, Giovanni Battista Benedetti, who sometimes alluded to a Pythagorean and Archimedean philosophical inspiration, whose methodology was to approach practical as well as classical problems of natural philosophy using straight mathematical means, and who should be considered as engaged in

While, in itself, the Greek term *akribeia* refers to an important task of the historian, such as it was understood by Thucydides, the problem of skill and wisdom is also taken up in the tradition of Aristotelian metaphysics and moral responsibility (compare, in the commentary tradition, the position of Alexander of Aphrodisias in *Aristotelis Metaphysician Commentaria*, 5, 1–2); my thanks to Marco Sgarbi for alerting me to this point. For a discussion of this passage in light of Theophrastean and Peripatetic biological works see Georgia Tsouni, *Antiochus and Peripatetic Ethics*, Cambridge 2019, p. 190, and James G. Lennox, "Aristotle on the biological roots of virtue: the natural history of natural virtue," in: D. Henry and K.M. Nielsen (eds.), *Bridging the Gap between Aristotle's Science and Ethics*, Cambridge 2015, pp. 193–213.

30 The best study of Granius' collection is still O. Walde, *Bücher- und Bibliotheksgeschichtliche Forschungen in Ausländischen Bibliotheken* (Uppsala 1930), esp. pp. 142–148, but we also have an extended comparison between him, Casaubon, and the anonymous annotator of Jean Bodin in the 1597 Latin edition now in the house of the French scholar Jean Ceard by Ann Blair (*The Theater of Nature: Jean Bodin and Renaissance Science*, Princeton 1997, pp. 195–198). Among other useful observations, Blair calls Granius "more Ramist than Ramus himself," referring to a scheme appended to the printed edition despite a complaint that Bodin "unjustly carps against Aristotle." Blair's general argument that Renaissance natural philosophy was a bookish enterprise shaped by Scholastic and humanist practices does not apply to the Helmstedt entourage without some adjustment and limitations, but it is fitting for Granius' miscellaneous education, and it reinforces the necessity of looking at ordinary scholars and their working methods; see also her "The Rise of Note-Taking in Early Modern Europe," *Intellectual History Review* 20 (2010), pp. 303–316.

31 Massimo Bucciantini, *Galileo e Keplero: Filosofia, cosmologia e teologia nell'Età della Controriforma*, Turin 2000, p. 189.

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a program to mathematize physics.[32] On the other hand, Granius appears to have remained committed to the sort of conventionalism *ante litteram* that is traditionally, if anachronistically, ascribed to the Wittenberg tradition.[33]

There is a greater irony in the paradoxical behavior of this Aristotelian scholar as a note-taker. The case of Ramus, once again, is instructive beyond Granius' case. In the milieu of the Swedish mathematician it was customary to treat Ramus as a dangerous *homo novus* with slim philological understanding, or as a boastful theoretician. As Omodeo writes, the margins of Duncan Liddel's own copy of the *Scholae Mathematicae* leave no doubt about Liddel's negative opinions on Ramus' attempted reduction of astronomy to computational purity: "He mocks hypotheses," one annotation goes.[34] And this pattern has a larger epistemic force. Granius would have subscribed to the impossibility of an astronomy without hypotheses, and in his own margins he took sarcastic distance from Ramus on several occasions, except he also spent most of his energy as a commentator in drawing tables—some of which might be taken as a simple diagrammatic tool, but some of which are clearly following a dichotomous logic until its extreme end. I suggest that this anomalous, seemingly contradictory behavior is actually quite productive as a tool to study the historical context of Helmstedt Aristotelians. To give a concrete example, there is a fascinating paper insert between 29^{v} and 30^{r} of Granius' copy of Regiomontanus' *Tabulae Directionum*, which works essentially as a computational aid for calculations.[35] However, in the remaining, miscellaneous notes most of Granius' energy—as elsewhere[36]—is taken up with the question of where mathematics derives its certainty and evidence, or, to put it differently, whether or not it falls short of the rigor demanded by an 'Aristotelian science', such as it is described in the *Posterior Analytics*. This set of preoccupations is often referred to as the *quaestio de certitudine mathematicarum*. Giacobbe and Jardine have differently shown that the debate crossed its Italian boundaries and reached France, Portugal, and England; it can be demonstrated that there were also readers of the *quaestio* in seventeenth-century Helmstedt, one of whom was Granius himself. There is a scheme on the subordination of sciences in the

32 Cf. Pietro Daniel Omodeo, "La cosmologia infinitistica di Giovanni Battista Benedetti," *Bruniana et Campanelliana* 15 (2009), pp. 181–190, and Id., *Efemeridi e critica all'astrologia tra filosofia naturale ed etica: La contesa tra Benedetti e Altavilla nel tardo Rinascimento torinese*, Berlin 2014.

33 Take, for instance, the intense textual activity of Granius in Reinhold's 1549 edition of the *Almagest* (cited in note 12), which concentrates on the diagrams and includes (at f. 72 v) the longest mathematical annotation in this set. Given the large quantity of new evidence at the HAB, I am taking a fresh look at the post-Copernican reception in Helmstedt in another essay.

34 Omodeo, *Duncan Liddel (1561–1613): Networks of Polymathy* (as in note 1), p. 63; for the German observatory of Kassel as a good example for an astronomy that developed without hypotheses see Karsten Gaulke, "Perfect in Every Sense: Scientific Iconography on an Equation Clock by Jost Bürgi and the Self-Understanding of the Astronomers at the Kassel Court in the late 1580s," in: *Nuncius* 30 (2015), pp. 37–74.

35 This is the H: N 131.4° Helmst. copy.

36 Nicolaus Reimarus Ursus, *Fundamentum Astronomicum* (Strasbourg 1588); the annotated copy of Granius at the HAB is H: N 70.4° Helmst. (1).

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1556 copy of Catena, who was one of the main interlocutors in the mathematical debate, along with Barozzi, Piccolomini, and Pereyra.[37] Then again, one must be careful to respect the paradoxes of this annotator. On the one hand, given the Melanchthonian environment where he worked, Granius certainly sought to restore the higher epistemological status of mathematics, but this did not prevent him from scolding Paduan Aristotelians in the margins, or from adding nuggets of information and elliptical arguments that seem to come, by way of digression, from the opposite theoretical standpoint.

To properly switch from Granius' cosmological interest to his natural philosophy it is useful to take stock of his scholarly habitus as an adversarial reader. The Bodin volume at the HAB offers a good point of departure.[38] One can see how the meticulous clarifications far exceed Granius' contractual obligation to teach his students a course on Melanchthon's introductory manual in the field, the *Initia doctrinae physicae*. To Bodin Granius adds systematic, numbered outlines to explain the text, and dichotomous diagrams, for instance on the motions of the earth proposed by Copernicus, the laws of optics, the modes of generation in plants, or kinds of agent intellect. On a few occasions, he offers vernacular Swedish translations for technical terms. And Bodin's description of the birth of worms from excrement elicits this note from Granius, which exhibits an awareness of autoptic ideals: "worms that are born from rotten cheese similarly degenerate into flies. I myself have seen this in cheese placed in hot weather and in a hot and dry place." Granius was deeply committed to the study of natural phenomena, but there is more to this picture: he is one of the early modern scholars who have become increasingly interested in the relationship between Aristotle's "geometric style" of scientific demonstration and its practice in territories covered by Aristotelian physics. As Jim Lennox recently argued, the order and method for the investigation of nature that Aristotle presents in his *Physics* are governed by an understanding of "local" norms, that is, protocols for inquiry that are quite specific to an individual domain.[39] The situation is therefore twofold. Granius responds to the professional program traced by Cornelius Martini in his 1612 inaugural oration, now part of the HAB miscellanea Yx 31, in which he constructs the student of natural history as a spectator who marvels at the world (*inventum obstupescat*) and also wants deeply penetrate its mysteries (*naturae adyta penetrare*). At the same time, Granius also wants to capitalize on Aristotle's rhetorical advantage of dismissing his predecessors' best efforts by presenting them with mounting empirical data that they cannot face or account for; in short, Granius sees science as a cumulative group endeavor, but it is typical of him and his intellectual circle that one arrives at the complexity of physical and cosmological

37 See Guy Claessens, "Platonic Reminiscence or Aristotelian remembering? Pietro Catena's Philosophy of Mathematics," in: *Physics* 49 (2013), pp. 21–36.

38 I am referring to the Wechel edition of Bodin's *Universae Naturae Theatrum* (Frankfurt 1597), annotated by Granius, and now shelved as H: M 237.8^{0} Helmst.

39 James G. Lennox, "Aristotle on Norms of Inquiry," in: *Hopos* 1 (2011), pp. 23–46.

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inquiries not through a survey of *endoxa* but by reflecting—via *marginalia*—on a picture of problem-solving activity.[40]

Here I would like to briefly apply these findings to the study of a collection of four meteorological dissertations, which Granius printed in Rostock and brought with him to Helmstedt: the 1596 volume *De meteoris*. The first and the third are the most interesting, and they systematically pair a nominal definition with previous treatments in the School of Padua, for instance the theory of *aereum unctuosum* with Nifo, and the idea that *vapor est materia meteororum* with Boccadiferro. As it stands, Granius' way of proceeding may be Peripatetic, but certainly not quite Aristotelian in the strict sense, even if he sticks to Aristotle's guns throughout and avoids mentioning that the altitude of cometary activity, along with the parallax of Mars, have been the two most important reasons for geo-heliocentrism. If we look at *Meteorology* 1.6, a discussion of previous accounts of comets, we notice that Aristotle first sketches the views he deems worthy of notice—Democritus says comets are conjunctions of planets, and so on—and then proceeds to criticize the *endoxon* by way of empirical data. Granius, on the contrary, accepts an initial definition received by the commentary tradition (often, as I said before, by taking sixteenth-century Italian Aristotelians as avatars of the Alexandrian tradition), and then systematically breaks off the exposition with a pattern of short, puzzling questions that derive from the pseudo-Aristotelian *Problems*. Sometimes, in the course of *De meteoris*, the very questions are the same, such as the saltiness of the sea, or the visual trick in which the sea looks more transparent than fresh water, when in point of fact it is denser. Other times, it is the argumentative key which is borrowed, and the way Granius is able to do this is in itself a study in Peripatetic flexibility. The situation is quite clear in the case of his treatment of the winds, which responds to the statement *ventus non est naturalis motus* (wind is not a natural motion) and follows the exposition of Problems 26, and whatever of Theophrastus is preserved in there, rather than other doxographical materials of the Aristotelian corpus. In a manner of speaking, it is as if Granius utilizes a problem-style epistemology to bypass a vexed notion that derives from a singular aporetic moment in Aristotle's works, for, as Malcolm Wilson recently clarified, once Aristotle commits himself strongly to his systematic analogy between the rivers and the winds, he must spend vast amounts of energy to introduce an elaborate, radial apparatus in order to support it.

4 Interim conclusion and future research

It would be a mistake to use this abbreviated and, in some ways, preliminary survey of Granius' massive evidence preserved in Wolfenbüttel as a key to assess the originality of his project in the reception of Aristotelian natural philosophy in

40 The topic is too complex to be properly tackled here, but on this aspect of Aristotelian method cf. Cynthia A. Freeland, "Scientific Explanation and Empirical Data in Aristotle's *Meteorology*," in: *Oxford Studies in Ancient Philosophy* 8 (1990), pp. 67–102, and Joseph Karbowski, "*Endoxa*, facts, and the starting points of the *Nicomachean Ethics*," in: *Bridging the Gap* (cited at note 29), pp. 113–129.

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early modern Germany, although it is equally clear that Granius was a humanist of high caliber, and recognized as such within the community of Helmstedt. He had interests in many Peripatetic disciplines and discourses, and was in constant dialogue with colleagues operating in the fields of logic, ethic, and politics; he also read about rhetoric and religion, and was conversant with the humanist tradition of Vives and Erasmus.[41] That said, Granius did not lean on administrative tools like bookkeeping nor did he draw on commonplace books, despite his strong interest in Renaissance naturalists;[42] mostly what he left behind was a series of tests on paper or instructions, and what he did for the most part was to recombine different scribal techniques so as to arrive at the most fitting for his purposes. In this paper, I tried to reveal the ambition and complexity of Granius' scientific mediation by historicizing the epistemology and manipulability of the manuscript culture that he applied to his printed collection. Therefore, a first point that is most urgent to stress here is the multifaceted character of the scientific and philosophical debate that developed in a late-humanistic, Protestant university such as Helmstedt. As a field, cosmology is particularly well-suited to dispute a number of preconceived notions, chief among them the idea of the *Academia Julia* as an unfaltering bastion of Aristotelian doctrine. Moreover, the majority of Granius' books were annotated prior to his appointment as a professor of physics in 1613, so one could correctly say that *adversaria* and polycentric networks of learning are mutually reinforcing and that Granius' legacy simultaneously reflects certain trends of the Jesuit teaching he was nurtured by and anticipates a large, antiquarian tendency that characterizes the gradual shift from the Republic of Letters to the Enlightenment.[43]

Second, the recognizable impact of note-taking as a specific epistemic practice in early modern academia, documented by scores of adaptable folding, writing, and drawing techniques, partakes in a revisionist historiography which understands excerpting not as outdated and bookish, but as one of the main prototypes of the empirical method.[44] It is within this reconstruction that Granius provides

41 Despite Granius' interest for Erasmus, it would be wrong to see his marginal notes as aligned to the methods of amplification recommended in *De Copia*; they are often 'copious', but not to facilitate abundant style, nor are they overwhelmingly anxious about managing information either.

42 For the system of *loci* and the history of reading see Fabian Krämer, "Ulisse Aldrovandi's *Pandechion Epistemonicon* and the Use of Paper Technology in Renaissance Natural History," in: *Early Science and Medicine* 19 (2014), pp. 398–423.

43 Paul Nelles, "*Historia Litteraria* at Helmstedt: Books, professors and students in the early Enlightenment university," in: H. Zedelmaier and M. Mulsow (eds.), *Die Pratiken der Gelehrsamkeit in der Frühen Neuzeit*, Tübingen 2001, pp. 147–176, invokes a "quixotic" blend of traditions, didactic environments, and sociability to explain how a qualified register of historical Pyrrhonism crept into the teaching curriculum.

44 The bibliography on this theme is expanding rapidly: cf. Richard Yeo, *Notebooks, English Virtuosi, and Early Modern Science*, Chicago 2014, together with Dana Jalobeanu, "The Toolbox of the Early Modern Natural Historian: Note-Books, Commonplace-Books, and the Emergence of Laboratory Records," in: *JEMS* 4 (2015), pp. 107–123, Fabian Krämer, *Ein Zentaur in London. Lektüre und Beobachtung in der frühneuzeitlichen Naturforschung*, Affalterbach 2014, Helmut

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some exceptional clues, all of which must be reinforced by further research. In this essay, the most notable features that have emerged concern the eclectic reception in Helmstedt of Paduan Aristotelian sources from the south, often organized as a new cluster of *veteri* superseded by *novi*, the anti-dogmatic spirit that led to a careful assessment of innovative key texts (like Benedetti, Galileo, Kepler), even when they were at odds with traded conceptions, and finally an accentuation of conflicting opinions analyzed and resolved through scholarly cross-checking. A closer examination of Granius' *Nachlass* at the HAB is a desideratum of further research. This investigation should take into account the different philosophical foundations provided or underlined for natural inquiries, and explain what led Granius to his confrontation with encyclopedic systematizers such as Goclenius and Keckermann; it should also make sense of how Granius used the margins to transition in and out (topically) pre-structured books. It is very likely that intense scribal activity will continue to express and bolster a pluralistic attitude, and that once the polyphony of voices around Granius and his entourage is restored, we will see that even in a consolidated, Melanchthonian outpost like Helmstedt there was no standard Copernicanism and no simplified image of natural science.

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Attacks on Judicial Astrology, Religious Dissent and the Rise of Skepticism

Barbara Mahlmann-Bauer

The topic of my paper is astrological prediction based on comets. The question will be raised whether and how the improvement of mathematical and observational astronomy had an impact on astrological practice with regard to comets. My main questions concern negotiations between men of science (physicians, mathematicians, diplomats and theologians) about the validity of cosmological and genethlialogical, or general and individual astrology. My objective is to find out the intellectual roots of skepticism against astrological prognostications and to explain which arguments contributed to the decline of astrology. In the first part of my paper (chapters 1–5) my sources are calendars with forecasts of astronomical events (eclipses, conjunctions) and astrological prognostications, pamphlets on the occasion of comets as well as humanist editions of ancient astrological texts and textbooks. In the later part of this article (chapters 6–8) my answer focuses on a hitherto neglected aspect in the history of science: the impact of religious dissenters, mainly Anti-Trinitarians (also called Socinians after Fausto Sozzini), on the emergence of astronomy as a science and the decline of astrology. From the corpus of pamphlets in Latin and German dealing with the comets of 1577, 1618, 1663–1665 and 1680–1683 I will single out tracts by Andreas Dudith (1533–1589) and his circle of physicians,[1] whose severe critiques of astrology on the occasion of the comet of 1577 were reprinted, commented upon and quoted during the following century—long before cometary theory reached a new scientific level, thanks to Edmond Halley's findings and Newtonian theory. On one hand, Dudith's skepticism was associated with Epicureanism and atheism by defenders of astrology and in particular by authors of comet sermons (*Kometenpredigten*). On the other hand, followers of the new astronomy welcomed these amateur observers, with their bizarre religious ideas, as their allies. Moreover, their arguments against as-

1 Pierre Costil, *André Dudith, humaniste hongrois. Sa vie, son oeuvre et ses manuscrits grecs*, Paris 1935, première partie, ch. IV; deuxième partie, Ch. II; Cesare Vasoli, *I miti e gli astri*, Napoli 1977, pp. 351–387; Domenico Caccamo, *Eretici italiani in Moravia, Polonia, Transilvania (1548–1611). Studi e documenti*, Florence/ Chicago 1970, pp. 109–151; Gábor Amási, *The uses of humanism. Johannes Sambucus (1531–1584), Andreas Dudith (1533–1589) and the Republic of letters in East Central Europe*, Leiden 2009, pp. 239–327, here pp. 203–224; Luka Ilic, "Andreas Dudith und sein reformiertes Netzwerk in Breslau am Ende des 16. Jahrhunderts", in: Joachim Bahlcke/ Irene Dingel (eds.), *Die Reformierten in Schlesien vom 16. Jahrhundert bis zur Altpreußischen Union von 1817*, Göttingen 2016, pp. 53–64.

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trological superstition, which conditioned fear and terror among the uneducated, were shared by political reformers in the early Enlightenment.

The number of pamphlets and illustrated broadsheets showing and describing the comets of 1577, 1618/19, 1652–1654, 1664/65 and 1680–1682 increased during the century of scientific revolution.[2] The appearance of the comet of 1577 was described and analyzed in more than 200 tracts. Tycho de Brahe's description was the most famous, but it was not published before 1588. Three bright comets appeared after the Bohemian war had erupted.[3] The comets of 1664/65 and 1680/81 attracted even more of the attention of professional and lay observers.[4] Even in the second half of the 17th century, calendar writers admitted that due to their readers' expectations, they still felt obliged to add an astrological chapter about the significance of eclipses, major conjunctions or comets, which were supposed to be engendered by the vapors of planets. This supplementary chapter was entirely based on cosmological and judicial astrology, which was at that time already considered a dubious art.

Calendar writers and pamphlet authors were theologians, physicians or teachers of mathematics or medicine. There can be no doubt that pamphlets about comets introduced non-academic readers to new results and methods of physics and astronomy, since the names of Copernicus, Erasmus Reinhold, Brahe, Johannes Kepler and Johannes Hevelius were often cited in them as authorities. The main scientific issues of cometary theory were linked with the topics of the new astronomy and, like these, they were debated from a theological viewpoint in the pamphlets. If comets were objects above the moon and their orbits formed straight or slightly curved lines, their nature and origin could be described just

2 Philipp Carl, *Repertorium der Cometen-Astronomie*, Munich/Paris/London 1864; Volker Fritz Brüning, *Bibliographie der Kometenliteratur*, Stuttgart 2000; with respect to the medieval tradition of astrology cf. Sara Schechner Genuth, *Comets, Popular Culture and the Birth of Modern Cosmology*, Princeton 1997; Christoph Meinel (ed.), *Grenzgänger zwischen Himmel und Erde. Kometen in der Frühen Neuzeit*, Regensburg 2008; idem, "Kometenschriften des 17. Jahrhunderts in der Marienbibliothek zu Halle", in: Jutta Eckle (ed.), *Auf einer anderen Erde und unter einem anderen Himmel. Zu den Kalendern, Praktiken, Prognostiken und Kometenschriften aus der Frühen Neuzeit in der Marienbibliothek zu Halle an der Saale*, Halle (Saale) 2016, pp. 65–84; Rosmarie Zeller, "Wunderzeichen und Endzeitvorstellungen in der Frühen Neuzeit. Kometenschriften als Instrumente von Warnung und Prophezeiung", in: *Morgen-Glantz* 10 (2000), pp. 95–132, here 103–125. Also cf. my commentary to a series of illustrated broadsheets depicting comets in Wolfgang Harms/Michael Schilling/ Barbara Bauer/ Cornelia Kemp (eds.), *Illustrierte Flugblätter des 16. und 17. Jahrhunderts. Die Sammlung der Herzog August Bibliothek Wolfenbüttel*, vol. I, Tübingen 1985, nrs. 195–210; also nr. 194 with the comment by Hans Unterreitmeier.

3 C/1618 Q1 could be observed from August until September 1618, C/1618 V1 from November until the beginning of December, C/1618 W1 from the end of November 1618 until January 1619. Cf. Meinel, *Grenzgänger* (n. 2), p. 38.

4 C1/1664 W1 was detected in November and was visible until January 1665. C/1665 F1 appeared in April 1665. More than 100 pamphlets were devoted to both comets. C/1680 V1 was discovered by the astronomer Gottfried Kirch on November 14 and was visible until February 1681. More than 230 titles are manifests of the comet's publicity. Cf. Meinel, *Grenzgänger* (n. 2), p. 78 and 91; James Howard Robinson, *The great comet of 1680*, Northfield Minnesota 1916.

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like that of planets, although they passed the ecliptic at oblique angles, vanished from sight and finally disappeared in space.[5] In 1665 most of the pamphleteers had abandoned the Aristotelian doctrine of comets as *meteora*. In the way the pamphlet authors made their readers familiar with Aristotelian physics and cosmology, comparing the peripatetic theories with new astronomical knowledge, they also explained the planetary system and the constellations of the celestial globe, while their astrological prognostications stressed their theological purpose and stirred up fears of God's resentment. Astrological predictions based on major conjunctions of the three upper planets or on eclipses were usually confirmed by reference to Arabic astrologers, mainly Albumasar (Abu-Ma'shar).[6]

It is well known that Philipp Apian, Galileo Galilei, Johannes Kepler and Isaac Newton were readers of the Bible who made proper suggestions for how to interpret Holy Scripture and who refused to accept doctrines of the church that they found incompatible with their scientific method and their own discoveries. The traditional view of astrology was debated in pamphlets about comets in relation to Biblical prophecies until the end of the 17th century. Some Protestant theologians were concerned about the lack of orthodoxy in their congregations. They were convinced that their interpretation of comets in analogy with the celestial signs listed in Matthew 24 and Luke 21 as messengers of the Last Judgment would deter their flocks from dangerous libertinage. They looked at comets as signs in the book of nature, which were to be interpreted analogically with Holy Scripture.

It was well-known that Andreas Dudith and his protégé Marcellus Squarcialupus (1538– after 1592) were Anti-Trinitarians.[7] In the history of astrology, the particular role played by religious non-conformists, sympathizing with Anti-Trinitarian ideas and therefore facing the risk of prosecution, deserves our attention not less than the famous claims by Galilei and Kepler concerning how to interpret Scripture wherever it deals with the motion of the heaven and the central posi-

5 The interdependence between pamphlets about comets and the rise of empirical astronomy is evident, but will here only be incidentally considered; cf. Schechner Genuth, *Comets* (n. 2) and Meinel, *Grenzgänger* (n. 2); Robert S. Westman, *The Copernican Question. Prognostication, Skepticism and Celestial Order*, Berkeley/ Los Angeles/ London 2011, pp. 250–257.

6 Besides his treatise on major conjunctions and nativities, edited by Keji Yamamoto et al. cf. abu-Ma'shar, *The great introduction to the science of astrology, Facsimile*, Frankfurt am Main 1985; an example for an edition from the 16th century: Albumasar, *De magnis coniunctionibus […] octo continens tractatus*, Venice 1515.

7 This is the leitmotif of Stieff's biography of Andreas Dudith: Carl Benjamin Stieff, *Versuch einer ausführlichen und zuverläßigen Geschichte von Leben und Glaubens-Meynungen Andreas Dudiths Gewesenen Bischofs, wie auch dreier Kaiser Raths und Gesandten in Polen* […], Breslau 1757; Christoph Sandius, *Bibliotheca Anti-trinitariorum*, Freistadt 1684, pp. 61–64 and 81n. Claudio Madonia, "Marcello Squarcialupus", in: Gordon Kindler/Claudio Madonia (eds.), *Adumbrados of the Kingdom of Toledo, Jacob Acontius and Marcellus Squarcialupus*, Baden-Baden 1994, pp. 119–126; Martin Bundi, *Flüchtlingsschicksale am Alpensüdfuss im 16. Jahrhundert. Lebensbilder italienischer Glaubensflüchtlinge im Veltlin und in den Bündner Südtälern*, Chur 2015, pp. 46–48; idem, "Marcellus Squarcialupus, Flüchtling und Kosmopolit des 16. Jahrhunderts", in: *Schweizerische Zeitschrift für Geschichte* 56 (2006), pp. 435–445.

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tion of the Earth. Unorthodox approaches to the tradition of the Biblical text and the formation of Christian doctrine opened a new approach to cosmology and astrology as complex systems that, throughout Arabic transmission, scholastic learning and the revival of ancient texts and science by humanists, included a proper understanding of the Creator and his creation as *natura naturans* and *natura naturata*.[8] Giovanni Pico della Mirandola (1463–1494) had already raised the issue of terrifying and intimidating the ignorant crowd by astrological divination, which he found irresponsible and treacherous.[9] Andreas Dudith and Marcellus Squarcialupus derived their anti-astrological arguments from Pico's repertory. They fervently refuted the suspicion of impiety and turned this reproach back upon their enemies, who in their turn abused theology. The controversy about the validity of astrology interfered with the question of what true piety was and how truth in religion could be detected. Since Dudith and Squarcialupus were allies of famous Antitrinitarians (Giorgio Biandrata [1516–1588] was Squarcialupus' colleague, while Dudith supported Jacobus Palaeologus [1520–1585]), and both were correspondents of Fausto Sozzini (1539–1604), it seems worthwhile to investigate whether and how Antitrinitarianism paved the way to 'new science' 100 years before Isaac Newton.

Before I turn to the religious dissenters and their critique of astrology (in chapter 6), some preliminary remarks about the relationship between mathematical astronomy and astrology in early modern textbooks as well as about the ancient authorities might be useful: Aristotle, Ptolemy, Pliny and Seneca (chapters 1 and 2). Chapter 3 will explain who was authorized to predict the future—prophets in the Bible, trustworthy interpreters of the sacred text and astrologers confirming Biblical prognostications. Melanchthon tried to justify astrology with reference to God's attributes and human responsibility and thus was more open-minded than the Church of Rome and Calvin (Chapter 4). In order to understand the role of religious dissenters or Nicodemites in the controversy about the validity of astrological predictions, it has to be kept in mind that the doctrines of the three Christian denominations provided distinct frames for the acceptance of astrology (Chapter 5).

8 For the history of astrology as such a system of ideas which reconciled Neoplatonism with Aristotelianism, which formerly had been made compatible with the tenets of creational theology, cf. Thomas Leinkauf, *Grundriß Philosophie des Humanismus und der Renaissance (1350–1600)*, vol. 2, Hamburg 2016, pp. 1481–1498 and the chapter on Pietro Pomponazzi and his school pp. 1609–1630.

9 Giovanni Pico della Mirandola, *Disputationes adversus astrologiam divinatricem* (Bologna [1]1496), ed. by Eugenio Garin, Florence 1946–1952, vol. 1, pp. 126–128, 180–188 and 443–458; Thomas Leinkauf, *Grundriß* (n. 8), vol. 2, p. 1482.

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1 Astronomy and astrology—an intimate relationship from antiquity to early modern times

New discoveries and results of mathematical calculations and measurements by astronomers, the controversy about Copernicus' cosmology, Kepler's laws and a more precise description of both anomalies of planetary movements did not discredit cosmological and judicial astrology in early modern Europe. On the contrary: Cosmological and judicial astrology were by no means condemned as pure superstition, neither by Lutheran reformers nor by mathematicians in the century of the scientific revolution and before.

The respect for general (geographical and meteorological) or individual predictions from planetary aspects on entire regions as well as on individual complexion was widespread.[10] Iatromathematics is the doctrine dealing with the planetary influences at different positions within the zodiacal circle at a certain time on the human body. Parts of the body were linked with the planets, which were considered as determining the balance of the *humores*.[11] The reputation of astrology as a system with rules which linked celestial constellations to individual maintenance motivated early modern almanac writers to look for the most precise ephemerides in order to make their predictions more accurate. In the 16th century some almanac writers were already arguing that, thanks to Copernicus' exact calculations of the planetary orbs and a more precise calendar that was based on new ephemerides, astrological prognostics would be more reliable. In elementary text books used during the arts course at universities, the study of mathematical astronomy was recommended because it served as a secure base for judicial astrology, the casting of individual nativities and iatromathematics. One had to know the data of a major conjunction of the upper planets in order to measure their *influxus physicus* on places, regions and countries, as well as on men living there (general or cosmic astrology). Exact determination of daytime and precise localization of the planetary orbits in the annual course were crucial for plotting an individual horoscope. The twelve houses corresponded to twelve parts of heaven, measuring 30° each, at the time of the horoscope, that is, the stars rising above the horizon at one particular moment. Following Melanchthon Johannes Garcaeus (1530–1574), the reformer's younger colleague at the university of Wittenberg, considered planetary astronomy as fundamental for valid astrological prognostications.[12] Moreover, Garcaeus considered divination by the planets and the stars a legitimate means to become familiar with God's plans and

10 John D. North, "Celestial Influence—the Major Premiss of Astrology", in: Paola Zambelli (Ed.), *'Astrologi hallucinati'. Stars and the End of the World in Luther's Time*, Berlin/ New York 1986, pp. 45–100.

11 Wolf-Dieter Müller-Jahncke, *Astrologisch-magische Theorie und Praxis in der Heilkunde der frühen Neuzeit*, Wiesbaden 1985 (= Sudhoff's Archiv 25).

12 Johannes Garcaeus, *Astrologiae methodus, Basel in qua secundum doctrinam Ptolemaei, exactissima facillimaque Genituras qualescunue iudicandi ratio traditur,* Basel 1576. In his Iudicium Astrologicum of the Saxonian Duke (Kurfürst) Augustus Garcaeus proudly states: "Haec loca planetarum desumpta sunt ex calculo Copernici" (fol. 3 r).

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to praise his wisdom and majesty as creator of the cosmos, thus following Melanchthon's doctrine (see below, chapter 4).

With his *Practica* (1541), the calendar writer and physician Andreas Aurifaber (1514–1559) was one of the first promoters of Copernican theory, which he learned from Joachim Rheticus' *Narratio prima*[13] Like Aurifaber, Erasmus Reinhold and Victorinus Schönfeld, both Melanchthon's colleagues, praised the solidity of their annual almanacs by referring to the latest calculations by Copernicus. In fact, the latter provided the data for foretelling the effects of comets, eclipses and planetary conjunctions better than ever before.[14]

We may generalize: In the centuries of the scientific revolution, the reform of astronomy as a mathematical and physical science received major incentives from the needs of general and genethlialogical astrology. Therefore, the persistence of astrology until the 18th century is a good argument against a teleological construction of the history of natural science. The simultaneity of fairly heterogeneous ideas from multifarious traditions blurs the simple picture of the gradual progress of science by the abandonment of astrological superstition.

Ptolemy was regarded as an authority for both astronomy and astrology by humanists. Ptolemy's *Tetrabiblos* is a compendium about general and genethlialogical astrology. It starts from "the idea that the influences of the heavenly bodies are entirely physical", but ends up with rules for astrological prediction that were largely inherited from Babylonian predecessors.[15] Book II spells out cosmic influences on geography and the weather. Books III and IV present rules for how to predict matters of individual human life from the state of the heavens, without teaching the mathematics of casting a horoscope. The *Tetrabiblos* was commented upon by Arabic mathematicians and thus "acquired much extra astrological baggage on its voyage" through the centuries.[16] Ptolemy's astrological rules were still widely quoted by almanac writers in the 16th and 17th centuries. Among these Arab authorities Albumasar (Abu Ma'shar 786–886) was the most influential, because he used observational data from the ephemerides concerning major conjunctions of the superior planets as a base for rules that gave to astrological predictions a scientific ring.[17] The elements used for forecasting were eclipses of the sun and moon, as well as transits

13 Jonathan Green, "The first Copernican Astrologer, Aurifaber", in: Journal for the History of Astronomy 41 (2010), nr. 2, pp. 157–165; Richard L. Kremer, "Calculating with Andreas Aurifaber. A new source for Copernican astronomy in 1540", in: *Journal for the History of Astronomy* 122 (2010), pp. 484–502.

14 Barbara Bauer (Hg.), *Philipp Melanchthon und die Marburger Professoren*, Marburg ²2000, Erasmus Reinhold pp. 370–376 and Victorinus Schönfeld 417–424; eadem, "Sprüche in Prognostiken des 16. Jahrhunderts", in: Walter Haug/ Burghart Wachinger (eds.), *Kleinstformen der Literatur*, Tübingen 1994, 165–203, here 169.

15 John D. North, *Cosmos. An illustrated history of astronomy and cosmology*, London 2008, pp. 120–121, the quotation is from p. 121.

16 Ibid., p. 120.

17 Abu Ma'sar, *On Historical Astrology. The Book of Religions and Dynasties (On the Great Conjunctions)*, edited and translated by Keji Yamamoto and Charles Burnett, 2 vols. Leiden 2000.

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of the planets at their rising and stationary periods. These phenomena were analyzed to answer the following questions: Where will an event happen? When will it take place? What is its general nature? What is its specific nature?[18] Genethlialogy was established as a doctrine in Books III and IV of the *Tetrabiblos*. It is concerned with the history of an individual from his nativity, that is, the horoscope drawn up for the moment of his birth. Ptolemy regarded the configuration of the heavens at the time of an eclipse as analogous to that of drawing up a nativity (*Tetrabiblos*, II,6).[19] Parallels between general astrology and genethlialogical astrology served as a bridge between both halves of the *Tetrabiblos*. Early modern astrologers still were familiar with Ptolemy's rules and the Arabic tradition in casting horoscopes of extraordinary celestial events at the moment of their first appearances. Also the observation of a comet or the detection of a new star could give rise to horoscopes that referred to specific moments of their heavenly career.

Albumasar was particularly concerned with the lives of kings and rulers and major political events during their reigns. The doctrine of general astrology that was established in antiquity distinguished the houses of the planets, their exaltations, terms, domains and years. The zodiacal signs were divided in twelve parts and grouped into four triplicities (*trigones*). General astrology drew attention not only to the period of one year, distinguishing between sidereal and tropical year, but also to the rhythm and periodicity of the planets, as well as to their passages through the twelve zodiacal signs. According to Albumasar, it was significant for astrological prediction to note from the ephemerides when Saturn, which needed 29,5 years for a revolution of the Sun, and Jupiter, which accomplished the same revolution in 11,9 years, would meet again, approximately every 20 years. This event is called a major conjunction. Since each conjunction covered only two-thirds of the ecliptic circle in relation with the previous conjunction, four successive conjunctions usually were in the same triplicity. After twelve or 13 conjunctions, the meeting of the both upper planets would return to their points of departure in the first of the four triplicities.[20] Albumasar's impact on early modern almanac writers was enormous, for his "idea was that human institutions […] rise and fall according to a timetable set by certain types of conjunction of the planets Saturn, Jupiter and Mars."[21] Astrologers looked for correspondences between these planetary meetings, their horoscopes, their rhythms and terrestrial events such as the accession to the throne, the decline of reigns or the death of a king. In early modern almanacs and annual prognostics, frequent references to the *Tetrabiblos* and to the Arabs were intended to give weight to particular predictions.

Texts by Ptolemy, Pliny and Aratus dealing with astrology were edited and commented upon by humanists, e. g. by Philipp Melanchthon, Joachim Camer-

18 Ibid., vol. 1, p. 574.
19 Ibid., 1, p. 576.
20 Ibid., p. 582–584.
21 North, *Cosmos* (n. 15) p. 196.

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arius and Jacob Milichius.[22] The early modern doctrine of comets and their influence was based on Aristotle's meteorology, which was combined with the astrological doctrine in Ptolemy's *Tetrabiblos*. Almanacs with astrological prognostics of bad weather, warfare and epidemics were widespread until the end of the 17th century. As soon as a comet or an unknown celestial object like a nova appeared, astronomers tried to determine its position in relation to planets and stars that were under the same zodiacal sign. As soon as it was identified above the horizon in the sky, a horoscope was drawn up, where the position of the new star or the path of the comet was plotted at one particular moment before the background of the circle with the 12 houses. Speculations about the astrological significance of comets, their physical influence and their supposed divine origin terrified uneducated people in early modern Europe, no matter how the scientific knowledge about planetary movements and comets increased.

The critique of astrology, although it was not as old as the doctrine about the influences of the stars, has a honorable tradition in the Renaissance. It was mainly stimulated by theological arguments. Although the tenets of Babylonian 'Chaldaic' astrology, the planets as representatives of gods, were incompatible with Christian doctrine and the assumption of sidereal necessity threatened God's omnipotence and providence, as well as human freedom of action, it must be noted (and needs to be explained) that astrological interpretations of extraordinary celestial events like comets remained the domain of Protestant preachers until the end of the 17th century. Since the Renaissance, astrology as a doctrine of physical *influxus* transmitted by the stars, had been a part of natural philosophy. Astrologers were eager to make it compatible with Aristotelian cosmology and physics, as well as with creational theology.[23] Cosmic astrology, as part of natural philosophy and as a tool for medical therapy, was taught together with astronomy and mathematics in the liberal arts course, whereas judicial astrology served the purposes of everyday life and provided orientation and security, apart from the Christian doctrine of salvation and outside the university. The churches were hostile to judicial astrology (*astrologia divinatrix*) because in the Old Testament, prophecies other than those authorized by the Prophets themselves were condemned. The arguments against judicial astrology were summarized by Giovanni Pico della Mirandola and Girolamo Savonarola (1452–1498). Early modern intellectuals like Thomas Erastus (1524–1583), who ridiculed astrology and condemned it as a dangerous superstition that was mixed up with false theology, usually quoted Pico and Savonarola as their predecessors.

22 Claudij Ptolemaei, *de praedictionibus Astronomicis, cui titulum fecerunt Quadripartitum [i. e. Tetrabiblios]*, Graecè & Latinè, Libri IV. Philippo Melanchthone interprete, Basel 1553, pp. 104–106 and 119; *Liber II Caii Plinii* [secundi] *de mundi historia, cum commentariis Iacobi Milichii, diligenter conscriptis & recognitis*, Frankfurt 1543 (Wittenberg [1]1535), chapter 25.

23 Leinkauf, Grundriß (n. 8), vol. 2, pp. 1481–1498.

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2 Aristotle's cosmology and meteorology

Ancient writers regarded comets as omens heralding natural disasters. Only Aristotle envisaged a physical explanation for their apparition and for subsequent misfortune.[24] In the liberal arts courses at Protestant universities and Jesuit colleges alike, Aristotelian cosmology and meteorology provided a familiar frame for understanding heavenly phenomena and their movements. In 1277, Aristotelian physics and cosmology had been brought into harmony with creational theology.[25] According to Aristotle, only circular movements where no change could be remarked were appropriate for the superlunary spheres.. The regular planetary orbs in their crystalline spheres and the diurnal motion of the entire heaven served as examples to all observers. Meteorological phenomena belonged to the sublunary world, which was formed by the four elements and their mixtures. Water and earth tended by gravitational force downward to the center of the earth, while air and fire had the tendency to rise in a rectilinear line. Earthy phenomena were subject to decay, while in superlunary regions, planets and stars circulated in everlasting, eternal orbs. Only 300 years later, the principal distinction between sublunary atmosphere and superlunary spheres was called into question, due to Brahe's measurements of the supernova that appeared in the northern circumference in August 1572, as well as of the comet which he observed in 1577.[26]

In combination with the phenomena described in the second book of Caius Plinius Secundus' (23–79) *Naturalis Historia*, as well as with Book II of *Tetrabiblos*, Aristotle's *Meteorologica* provided the framework for conjectures about effects of comets and other *prodigia* such as northern lights, halos and parhelia.[27] While Aristotle explained comets as dry exhalations from the earth, and hence considered them as matter which therefore had physical effects, Pliny interpreted comets as prodigies and saw in their particular shape a clue to their significance, and these portentous meteors indicated civic disorders.[28]

It is noteworthy that only critiques of astrological predictions from comets favored Seneca's conjectures about their nature, origin and orbs. Seneca figured

24 Schechner, *Comets* (n. 2), pp. 17–26; Jane L. Jervis, *Cometary Theory in Fifteenth Century Europe*, Dordrecht/Boston/Lancaster 1974, pp.11–21.

25 Jan A. Aertsen/ Kent Emery Jr./ Andreas Speer (eds.), *After the Condemnation of 1277. Philosophy and Theology at the University of Paris in the last Quarter of the 13th Century. Studies and Texts*, Berlin/ New York 2001.

26 John L.E. Dreyer, Tycho Brahe. *Ein Bild wissenschaftlichen Lebens und Arbeitens im 16. Jahrhundert*, translated by M. Bruhns, with a preface by W. Valentiner, Karlsruhe 1894, Reprint 2005, pp. 165–174.

27 Aristotle, *Meteorologica*, with English translation ed. H.D.P. Lee, Cambridge/Mass 1977; Hans Strohm's introduction to his edition and German translation to Aristotele's *Meteorologica* and *De Mundo*, Darmstadt 1970, pp. 121–129. Quotations here are from Lee's translations;the pages are indicated in brackets.

28 Schechner, *Comets* (n. 2), p. 21n; Rudolf Wolf, *Handbuch der Astronomie, ihrer Geschichte und Litteratur*, Zurich 1890, Reprint Amsterdam 1970, p. 573n.

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that comets shared many properties with planets.[29] They belonged to "the eternal works of nature". Nobody ever observed that a comet would descend all the way down to the ground and vanish. Studying their paths might enable us to learn more about the universe. Seneca admitted that we would not even know why the planets do not transcend the ecliptic, whereas comets are not confined to the zodiac circle. But since comets were so rare, a single lifetime would not be enough to investigate their nature. Seneca is optimistic that their nature as celestial bodies will be explored sometime in the future.

In contrast, followers of Aristotle's *Meteorologica* were inclined to view comets as fiery meteors heralding winds, drought, storms, tidal waves and earthquakes. At the same time, they were interpreted as messengers of God's wrath. Although they were not mentioned in the Bible, they were supposed to be included in the class of signs announcing the end of time and the Last Judgment. Due to their shape, comets were interpreted as parts of a divine language written in the heavenly book of nature that announced God's resentment at incorrigible, corrupted sinners, all of them victims of the primordial Fall.

Meteora are phenomena consisting of elements and are generated by the circulation of the four elements below the surface or in the air. But for Aristotle, the space filled by the stars was immaterial and therefore free from change and decay, which are only characteristic of matter. While Plato considered all celestial bodies as divine, Aristotle distinguished between stars and planets moving in enormous distances above the earth in eternal, regular circles and irregular shooting stars, comets and galaxies. *Quinta essentia*, a subtle fluid substance, filled the enormous celestial space, instead of celestial fire, whereas material bodies were subject to decay and came into being from mixtures of elementary matter that was supposed to rise from the earth or fall down to it in rectilinear motions. Changes produced by the motion of matter, like weather phenomena, followed natural laws.

Shooting stars, so called torches and goats, are "due to the same cause […]. Their origin […] is as follows. The exhalations that arise from the earth when it is heated by the sun must be not, as some think, of a single kind, but of two kinds; one is more vaporous in character, the other more windy, the vapor arising from the water within and upon the earth, while the exhalations from the earth itself, which is dry, are more like smoke. The windy exhalation being hot rises to the top, the more watery exhalation being heavy sinks below it." (*Meteor.* I,4, 341b 5–13) The region underneath the circular celestial motion is seen as being filled with a warm, dry substance called fire which is subtler than air. The subsequent layer is air. The fiery substance surrounded the outside of the terrestrial sphere like a belt of inflammable material which would need only a little motion in order to burst into flames. Flames are produced by the boiling up of dry currents of air. Also celestial revolution is seen as setting this inflammable material into

29 L. Annaeus Seneca, *Naturales Quaestiones*, VII, c. 2 and 23–27, cf. the edition in 2 volumes by Thomas H. Corcoran, Cambridge/ Mass. 1971–1972 and Jervis, *Cometary theory* (n. 24), pp. 13–17.

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motion. The flames thus produced by frictional heat would differ according to position and quantity of the inflammable material. They appear as torches, goats and shooting stars (341b 15–36).

> When therefore formation takes place in the upper part of this region, the phenomenon is produced by combustion of the exhalation; when in the lower, by ejection consequent upon the condensation and cooling of the more humid exhalation which inclines downwards when it condenses and as it contracts propels the heat and cause it to be shot downwards.
> (I,4, 342a17–22)

Cold and humid exhalations thrust downward, causing the hot material to shoot down. The direction of the motion depends on the position of warm vapors.

> The material cause then of all these phenomena is the exhalation, the moving cause in some cases the celestial motion, in others the condensation of the air as it contracts. And all of them take place below the moon.
> (342a 28–31)

Here the ingredients of meteorological cometary theory are already clear: inflammable material, frictional heat and exhalations which can be dry or wet, cold or warm. Some early modern intellectuals (among them, Squarcialupus and Pierre Gassendi) found Aristotle's ideas about dry exhalations and wet vapors inconsistent. How can they rise at all, they asked, although this is contrary to the nature of the watery element? Aristotle figured that wet exhalations would not rise as high as dry vapors, which would then burst into flames (Meteor. I,6).

In Meteor. I.7, Aristotle explains how the earth is wrapped into an atmosphere which is formed by elementary matter, mostly air. Layers of dry and warm exhalations form the upper region of the atmosphere. They are set into motion by the revolution of the superlunary sphere directly above. If a dry exhalation rises to the upper layer underneath the rotation of the first superlunary sphere, frictional heat is produced which causes the dry matter to burst into flames. Thus a comet is produced (I,7, 344a 16–22). Its shape depends on the direction of the inflammable exhalation. The movement of a comet or a shooting star is explained by analogy with a flame of torch running across a string of chaff. In contrast, a dense heap of matter will burn out when it is inflamed, and the flame will be stationary. A comet can be formed by dry exhalation in the lower region (344a 34–35). According to Aristotle, a comet in the superlunary region can only be produced if the dry exhalation approaches the sphere in which a planet or a star is moving. In that case the motion of the planet will have an impact on the shape, color and path of the comet in its neighborhood. Aristotle explains the comet's tail as a kind of stellar halo, analogous to haloes of the sun and the moon produced by the air during their course.

It can be easily seen that Aristotle had no clear conception of the position and the path of a comet, nor is there any suggestion in his work of how to determine

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it by the help of instruments or by calculation. But comets had their place in his cosmology as *meteora*. They were not produced by planets or as a byproduct of their conjunctions. Neither were their head, coma and tail only reflections of light from other sources (the sun or stars). Their matter consisted of dry vapors rising from the earth and being warmed up on their way. Their material was inflamed as the comet hit the fringe where the sublunary world meets with the lowest superlunary sphere.

Aristotle assumed that comets were signs of coming wind and drought, for plentiful exhalation would make the air drier. The force of the wind depends on the quantity of warm evaporation (I,7, 344b 20–23). Although comets in his view mostly belong to sublunary phenomena, they can be subject to the influence of the planets, despite the enormous distance separating the sublunary sphere from the planetary orbs. The mixture out of which comets are formed is dissolved in the zodiac circle, due to the motion of the sun and the planets. Therefore, the majority of comets occur outside the tropics (I,8, 346a 12–14). Aristotle believed that the Milky Way with its multitude of bright and thick stars, was produced in the same way as comets. When the air, which is like fire, is disintegrated by motion, a mixture is produced which bursts into a fiery star surrounded by a halo (*Meteor* I,8, 345b-346a).

3 Eschatological fears

Fears that the Last Judgment was imminent and that heaven was full of signs announcing the end of the world pervaded the century following the Reformation.[30] Luther and Melanchthon identified the Pope with Antichrist, who in St. John's vision was to anticipate the arrival of the Savior and Judge at the end of time. In his sermon on the occasion of the Second Advent Sunday in 1522, Luther was looking for events and phenomena which could be interpreted as antecedents of the Last Judgment, as it is described by Luke 21:25–30. Only believers would be sensitive enough to adjust their lives to the terrible signs which the gospel announced (also Mark 13:24). In particular, Luther identified eclipses of the sun and the moon as well as shooting stars as fulfillments of Luke's prognostication. With regard to Johannes Lichtenberger's prophecy of a global deluge in 1524 and other pamphlets interpreting the major conjunction of the superior planets in the watery sign of Pisces beginning in February 1524, Luther moreover foretold that this forthcoming event, which astrologers had been predicting since 1488, would correspond with Luke's foretelling. He explicitly referred to doomsday forecast

30 Volker Leppin, *Antichrist und Jüngster Tag. Das Profil apokalyptischer Flugschriftenpublizistik im deutschen Luthertum 1548–1618*, Gütersloh 1999; Heike Talkenberger, "Prophetie und Zeitgeschehen. Texte und Holzschnitte astrologischer Flugschriften zur ‚Sintflutdebatte' 1520–1524", in: *Reformation und Revolution. Beiträge zum politischen Wandel und zu den sozialen Kräften. Festschrift zum 60. Geburtstag von Rainer Wohlfeil*, Stuttgart 1989, pp. 93–123; eadem, *Sintflut. Prophetie und Zeitgeschehen in Texten und Holzschnitten astrologischer Flugschriften 1488–1528*, Tübingen 1990.

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of astrologers with respect to "die grosse constellation der planeten, die ietzt eyntretten wirt ubir tzwey iar, denn die planeten sind gewißlich von der hymel krefften und scharen wol das furnemmist, und yhre wunderliche verrsamlung ist eyn groß gewiß tzeychen ubir die wellt. […] Darumb ich darauf stehe, das der hymlische scharen bewegung sey gewißlich die zukunfftige constellation der planeten, daruber die sternmeyster sagen es solle eyne syndflut bedeutten. Got gebe, das der iungst tag sey, wilchen sie gewißlich bedeuttet."[31]

This great conjunction could not be natural; however "es ist dennoch eyn tzeychen von Christo genennet." Earthquakes, epidemics, famines and wars were also interpreted as apocalyptic signs of the end.[32]

Five years later, Luther edited Lichtenberger's *Prognosticatio* with a preface emphasizing that extraordinary celestial events certainly are signs produced by God and his angels. Their message is to warn those who are less affected by the gospel than by irregular phenomena in nature and who are more easily intimidated by astrological predictions.

> Den grund der sternkunst halt ich fur recht/ aber die kunst vngewis/ das ist/ Die zeichen am hymel vnd auff erden feylen gewislich nicht/ Es sind Gotts vnd der Engel werck/ warnen vnd drewen den gottlosen herren vnd lendern/ bedeutten auch ettwas/ Aber kunst darauff zu machen ist nichts/ vnd ynn die sterne solchs zu fassen. […][33]

According to Luther, astrological *vaticinia* were not reliable because it is difficult to distinguish between God's markers and the interference of Satan.[34] Luther's skeptical view of astrological predictions from horoscopes is well known: Astrologers diminished the authority of the Bible and threatened God's majesty and omnipotence. Our sins may not be excused by reference to the stars or sidereal necessity.[35] To these theological reservations we may add what Aby Warburg has observed. Luca Gaurico cast Luther's nativity in 1524 by manipulating his factual birth date in order to demonize him. Thus astrology was instrumental in anti-Lutheran polemics.[36]

31 Martin Luther, "Predigten des Jahres 1522", in: *Martin Luthers Werke*, Weimarer Ausgabe, vol. X/2, Weimar 1925, pp. 93–120, here 107–108.

32 Luther, "Predigten des Jahres 1522", p. 108.

33 Luther, "Vorrede auff die weissagung des Johannis Lichtenbergers", Wittenberg 1527, in: Aby Warburg, *Heidnisch-antike Weissagung in Bild und Text zu Luthers Zeiten*, Heidelberg 1920, ed. by Dieter Wuttke, 1978, pp. 81–86.

34 Ibid., p. 85.

35 Ingetraut Ludolphy, "Luther und die Astrologie", in: Zambelli (ed.), 'Astrologi hallucinati' (n. 10), pp. 101–107.

36 Anselm Schubert, "Luther töten. Der jüdische Mordanschlag auf Martin Luther 1525", in: *Luther-Jahrbuch* 82 (2015), pp. 44–65, here 57; Zambelli, "Many Ends oft he World. Luca Gaurico instigator of the debate in Italy and Germany", in: eadem (ed.), 'Astrologi hallucinati' (n. 10), pp. 239–263; Anthony Grafton, *Cardanos Kosmos. Die Welten und Werke eines Renaissance-Astrologen*, translated from the American by Peter Knecht, Berlin 1999, pp. 144–147.

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Lutheran interpreters of the Bible, historians and almanac writers pointed to Daniel's prophecies in Daniel 2 and 7. The fourth monarchy was identified with the Roman Empire, whose days were approaching with the end of time. Philipp Melanchthon interpreted the political events (e. g. the Diet of Worms in 1529 and political disorders in Cologne in 1543) in the light of Daniel's prophecies in his commentaries from 1529 and 1543.[37]

Philipp Melanchthon frequently quoted the *vaticinium domus Eliae* from the Talmud which enabled historians and astrologers to interpret their present time within a larger scale and in correspondence with biblical chronology. God's creation would not last longer than 6000 years. 4000 years had passed before Jesus was born. The remaining 2000 years would probably not be fully come to pass, but rather the end of the world would occur earlier due to increasing chaos, turmoil and man-made disasters, manifesting moral corruption. Melanchthon placed this *vaticinium* in front of his edition of *Chronicon Carionis*.[38] Almanac writers at the end of the 16th century speculated whether the cycles of great conjunctions of the upper planets within the four trigons, which periodically followed one another would correspond with the three periods of the 6000 years *vaticinium*.

The end of the aforementioned period of apocalyptic fears is indicated by Johannes Kepler's *Discurs von der grossen Conjunction* (1623), where the mathematician defied speculations about the end of the world that had been provoked by the entrance of the conjunction of the upper planets into the fiery trigon after they had passed the three watery signs of the zodiac during the previous 200 years.[39] Kepler argued against astrological prognostications based on the great conjunction by recommending an examination of particular causes for ongoing warfare as man-made disaster, instead of a search for the most general and most remote causes in the sky. He certainly was not the first mathematician to protest against abuse of astrology, that is against false methods and practices, but he used the genre of almanacs and annual prognostics himself to enhance a better understanding of natural and social laws above and below the moon. For Kepler, astrology was a mathematical art which had to be restored. The influences of planets depended on the geometry of their motions in relation with the earth.[40] Kepler tried to calculate the distance and paths of the comets on the basis of heliocentric cosmology.

37 Cf. Bauer (Ed.), *Melanchthon und die Marburger Professoren* (n. 14), pp. 830–840

38 Leppin, *Antichrist* (n. 30), pp. 130–136; Bauer, *Melanchthon und die Marburger Professoren* (n. 14), pp. 206–228; the Chronicon Carionis is analyzed within its historical context in eadem, "Die *Chronica Carionis* von 1532, Melanchthons und Peucers Bearbeitung und ihre Wirkungsgeschichte", in: *Himmelszeichen und Erdenwege. Johannes Carion (1499–1537) und Sebastian Hornmold (1500–1581) in ihrer Zeit*, ed. by Kultur- und Sportamt der Stadt Bietigheim-Bissingen. Stadtmuseum Hornmoldhaus, Ubstadt-Weiher 1999, pp. 203–246.

39 Johannes Kepler, *Discurs von der grossen Conjunction […] des 1623. Jahrs* (1623), in: Johannes Kepler, *Opera omnia*, ed. by Max Frisch, 1867, vol. vII, pp. 678–713.

40 Johannes Kepler, *Warnung an die Gegner der Astrologie—Tertius Interveniens*, with introduction and commentary ed. by Fritz Kraft, München 1971; Fritz Kraft, "Tertius interveniens: Keplers Bemühungen um eine Reform der Astrologie", in: August Buck (ed.), *Okkulte Wissenschaften in*

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4 Philipp Melanchthon's authority and astrological eclecticism

General and judicial astrology in almanacs and annual prognostications flourished in territories where Luther's reformation was adopted and Melanchthon's disciples held university chairs or worked as court physicians and calendar writers.[41]

Philipp Melanchthon and his younger colleagues Jacob Milichius (1501–1559), Caspar Peucer (1525–1602) and Johannes Garcaeus adopted Aristotle's meteorology and his doctrine of the four elements in order to explain the nature and physical effects of comets.[42] In contrast they assumed that these irregular meteora that had other properties than stars and planets were *prodigia* that surpassed the order of nature. Their allegorical meaning could be revealed by the help of judicial astrology. It was the task of Christian scientists to search for their *causae efficientes* as well as their *causae finales*. The Wittenberg professors turned to two other authorities whose texts they commented on for their students, Ptolemy's *Tetrabiblos* and the second book of Pliny's *Naturalis historia*.[43] It was a challenge to integrate the ancient 'pagan' theories into creational theology and justify astrological prediction by the help of Ptolemaic rules, but within a Christian frame. The result is highly speculative, and they allowed for the possibility that a forecast on this basis might fail. Whenever the origin and matter of a comet cannot be explained, in their work, its character as a divine prodigy is emphasized. In case a prognosis is falsified, it is not the astrologer who is blamed, but rather the inescapable *imbecillitas mentis* after the fall.

Melanchthon deals with comets in his *Initia doctrinae physicae*.[44] Here and elsewhere in his prefaces to school manuals, Melanchthon justifies the practice of

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der Renaissance, Wiesbaden 1992, pp. 197–225; idem, *Was die Welt im Innersten zusammenhält. Antworten aus den Schriften von Johannes Kepler (Mysterium cosmographicum, Tertius interveniens, harmonices mundi) in deutscher Übersetzung mit Einleitung, Erläuterungen und Glossar*, Wiesbaden 2005, pp. 179–329; Barbara Bauer, "Die Rolle des Hofastrologen und Hofmathematicus als fürstlicher Berater", in: *Höfischer Humanismus*, ed. August Buck (Beiträge zur Humanismusforschung, hg. von der Kommission für Humanismusforschung der DFG) Weinheim 1989, pp. 93–117.

41 Stefano Caroti, "Melanchthon's Astrology", in: Zambelli (ed.), 'Astrologi hallucinati' (n. 10), pp. 109–121; Barbara Bauer, "Gott, Welt, Mensch und Sterne in Melanchthons Initia doctrinae physicae", in: Jürgen Leonhardt (ed.), *Philipp Melanchthon und das Lehrbuch des 16. Jahrhunderts*, Rostock 1997, pp. 149–174; Bauer (ed.), *Melanchthon und die Marburger Professoren* (n. 14), pp. 366–369 and 382–388.

42 *Doctrinae physicae elementa, sive initia, dictata in Academia Vuitebergensi: per Philippvm Melanthonem*, ex postrema autoris recognitione, Basel 1550 (second enlarged edition, first edition 1549); Caspar Peucer, *De praecipuis divinationum generibus […] recognitus et auctus […]*, Frankfurt 1594 [first edition: 1553]; Johannes Garcaeus, *Meteorologica*, Wittenberg 1568.

43 Liber II Caii Plinii [secundi] *de mundi historia, cum commentariis Iacobi Milichii, diligenter conscriptis & recognitis*, Frankfurt 1543 (Wittenberg [1]1535), here chapter 25; Claudij Ptolemaei, *de praedictionibus Astronomicis, cui titulum fecerunt Quadripartitum*, Graecè & Latinè, Libri IV. Philippo Melanchthone interprete, Basel 1553, here book II, pp. 104–106 and 119.

44 I here quote from the edition by Carolus Bretschneider: Philipp Melanchthon, *Initia doctrinae physicae*, Wittenberg 1549, in: Corpus Reformatorum vol. XIII, ed. by Carolus Bretschneider, Halle 1846, col. 350–354. See the German translation by Walther Ludwig: Philipp Melanchthon, *Initia Doctrinae Physicae—Die Anfänge der physikalischen Lehre*, Rahden 2008, pp. 195–199; Melanthone, *I libri di fisica*, ed. and commented by Dino Bellucci, Torino 2009.

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judicial astrology within the scope of Christian doctrine as an acceptable middle course which avoided two equally dangerous pitfalls: the assumption of Democritus and Epicure that the world and all phenomena, regular as well as irregular, are the products of accidental compositions and mixtures; and the worldview of the Stoa that natural events are eternally determined, leaving no room for human liberty.[45] According to Melanchthon, extraordinary *meteora* such as comets are testimonies that the world is ruled by divine providence. We are invited to study these phenomena in order to admire God's design as *opifex mundi*. In his *Initia doctrinae physicae,* Melanchthon defines *prodigia* as extraordinary phenomena which cannot be explained by laws of nature alone, but carry with them a secret message: "plerunque aliquid de humanis eventibus significant" (p. 351). Nature tends to uniformity and dislikes *monstra*, which are accidents, but have a supernatural meaning. Comets and shooting stars consist of matter which can be analyzed by the help of physics. Comets and other fiery *meteora* therefore have physical causes, since they are formed of venomous matter which is inflamed and combusted by the sun or by one of the planets (Saturn, Mars or Mercury) in the highest region of the terrestrial atmosphere. Comets have an influence on terrestrial climate and can do harm to the humoral system. Moreover, they have a significance as divine messengers, warning us to repent in time, for the Last Judgment may be close. Comets may be interpreted on the same level as major conjunctions, which can be mathematically determined, but they have an allegorical meaning as "similes operibus artificum", announcing natural disasters as well as political upheavals (pp. 351 and 353).

Melanchthon and his followers emphasized that there is good evidence for a causal connection between the appearance of a comet, its proximity or affinity to a planet or a planetary conjunction and terrestrial disasters, natural catastrophes or political turmoil and revolutions. In his prefaces and poems, Melanchthon preached that God wanted his believers to investigate the cosmic order, where his traces are manifest, and to study irregular celestial events as signs of a divine language.[46] Astrological prognostications from comets and other celestial events, however, are not reliable, because God's hidden plans cannot be fully recognized since the fall of our first parents. Also, demons may intervene, trying to hamper God's plans, disturb his creation and lead his believers astray.

Garcaeus and Peucer combined Aristotle's doctrine of comets as fiery *meteora* and Ptolemaic astrology, with its tenets of Christian doctrine, namely divine providence, the order of salvation and the expectation of the Last Judgment. Moreover, the impact of Arabic iatromathematics and astrology—how major conjunctions affect the weather and human temper, and why kings are particularly subject to cometary influence—is manifest in Peucer's classification of di-

45 Melanchthon, Initia doctrinae physicae, lib. I, "Quid est physica doctrina?", p. 180–181.

46 Barbara Bauer, "Philipp Melanchthons Gedichte astronomischen Inhalts im Kontext der natur- und himmelskundlichen Lehrbücher", in: Stefan Rhein/Heinz Scheible (eds.): *Melanchthon und die Naturwissenschaften seiner Zeit*, Sigmaringen 1998 (= Melanchthon-Schriften der Stadt Bretten 4), pp. 137–181.

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vinations and in Garcaeus' systematic efforts, but is never explicitly admitted. Aristotle contributed an explanation for why comets could have meteorological effects and produce anomalies of nature; Ptolemy provided astrological rules for analyzing the significance of a comet in relation to planetary positions and the Zodiac. Arabic theory of major conjunctions and their astrological rhythm helped to relate political upheavals and dynastic changes with extraordinary celestial signs. Thus "seditiones, bella, mutationes imperiorum, Regum & Heroum interitus, vastitates" are listed among the consequences of a comet, engendered by a major conjunction.[47] This eclectic mixture of doctrines was bolstered by verses of ancient poets such as Claudianus that were quoted over and over again: *Et caelo nunquam spectatum impune Cometen* (p. 351).[48] Catalogues of apparitions and ensuing misfortunes in the realms of nature and politics were published to verify astrological predictions.[49]

In order to determine the effects and significance of a comet one has to (1) analyze its nature; (2) find its place in the Zodiac and its position in relation with the planetary orbits; (3) describe where its tail or its coma point to; (4) consider how long it could be observed; and (5) interpret its color in relation to those characteristics of the known planets.[50]

The growth and enormous rise of a comet are described by Garcaeus like a spectacle. Near the Earth the comet is tiny, then grows in size, accumulating more and more matter on its way up until it is struck by the fiery substance in the neighborhood of the planetary spheres, which sets it afire. The flames burn until the matter is consumed and then the comet vanishes.[51] The following causal explanation manifests the eclectic combination of ancient and medieval traditions:

> Causa specialis efficiens est, tetra aliqua siderum maleficorum coniunctio, vel eorundem atroces aspectus, vel etiam Eclipsis aliqua in signis infaustis. Maleficae enim stellae Saturninae cum Saturno, sua vi lumine motu, occulta quaedam virtute retentiua, constringunt poros terrae, ac colligunt

47 Garcaeus, *Meteorologica* (n. 42), fol. 24 v.

48 Claudius Claudianus, De bello Getico, v. 243. Garcaeus refers to verses by Aratos, Jovianus Pontanus and Joachim Camerarius in his *Meteorologica* (n. 42), fol. 24 r-25 v.

49 Ibid., fol. 25 v-26 r. To give an example I here translate the title page of the catalogue by Georg Caesius, calendar writer of the Markgrave of Baden: "Catalogue of all comets never seen before, in chronological order, beginning with the year of the deluge [1656 a.Chr.] until the present comet in 1579, together with wonders or annotations of events and the effects of the comets in each sign of the Zodiac, whereby a smart reader can easily make up his mind about every Comet, etc., from writings by philosophers, astronomers whose names are mentioned in the preface, to be kept in mind, and with regard to other multifarious uses, most eagerly collected thanks to most careful research, with a judgment about the recent comet the past year." (Nürnberg 1579)

50 Garcaeus, *Meteorologica* (n. 42), fol. 28 r.

51 Ibid., fol. 19 r-v.

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> in ea noxios ac superfluos vapores, qui cum non habent exitum in terra, conclusi putrescunt.[52]

Their theological purpose is to induce the reader to pray to God, begging Him to prevent the evil announced by the celestial messenger and promising Him to live righteously according to His commandments. God's wrath may be mitigated by acts of piety. Therefore the misfortune announced by a comet is not an inevitable fate, as the Stoics thought. Comets may be interpreted as indications of grace for those who are able to decipher them as signs of a divine language.

5 Astrology viewed by three main churches

To fully appreciate the role played by Anti-Trinitarians in the demystification of astrology, one has to keep in mind that the teaching of astronomy and astrology varied with respect to the confession and church doctrine in post-Reformation Europe. In schools where Melanchthon's influence was dominant, astrological divination was a branch of natural philosophy, just like cosmology, and justified as a means to admire the cosmic order and thereby apprehend the Creator's evidence.

The Pope and Jean Calvin were equally hostile towards genethlialogic astrology. The Church carefully defended the monopoly of spending sacraments and saving souls. Genethlialogic astrology and particular therapies based on iatromathematics were not tolerated, but were rather discriminated against as erroneous doctrines by false prophets leading believers astray.[53] One of the first decrees issued by Pope Sixtus V was his 1585 Bull "contra exercentes artem astrologiae iudiciariae", which drew from the anti-astrological tradition of Pico and Savonarola, and which Thomas Erastus also recommended to his superstitious patients in Protestant Germany.[54] Manuals of astrology and other occult arts were placed on the Roman *Index librorum prohibitorum* beginning in 1559. The Bull forbid the teaching of astrology, but did not specify criteria for how to distinguish between fair predictions based on natural laws and false or demonic prognostics that conjured occult forces. Authors of books dealing with natural magic, as well as with astrology, such as Agrippa von Nettesheim (1486–1535), Pietro Pomponazzi (1462–1525), Girolamo Cardano and Giambattista della Porta (1535–1615) were, however, not explicity condemned by the Papal Bull. The policy of putting books

52 Ibid., fol. 19 v.

53 Ugo Baldini, "The Roman Inquisition's condemnation of astrology in the 16th century; antecedents, reasons and consequences", in: Gigliola Fragnito (ed.), *Church, Censorship and Culture in Early Modern Italy*, Cambridge 2001, pp. 79–110.

54 Constitvtio S. D. N. D. Sixti Papae Qvinti contra Exercentes Astrologiae Iudiciariae Artem. Et alia quaecunque diuinationum genera, librosque de eis legentes, ac tenentes, Roma 1586; Barbara Mahlmann-Bauer, "Die Bulle contra astrologiam iudiciariam von Sixtus V., das astrologische Schrifttum protestantischer Autoren und die Astrologiekritik der Jesuiten. Thesen über einen vermuteten Zusammenhang", in: *Zukunftsvoraussagen in der Renaissance*, ed. by Klaus Bergdolt and Walther Ludwig, Wiesbaden 2005 (Wolfenbütteler Abhandlungen zur Renaissanceforschung 23), pp. 143–222.

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on the *Index librorum prohibitorum* presupposed clear conceptions of orthodoxy in faith, but was rather vague in distinguishing between fair, sober science and false, treacherous and demonic arts.[55] In Renaissance natural philosophy, astrology—the doctrines of planetary *influxus*, cosmic irradiation and secret correspondences between stars and parts of human body—was intimately tied up with natural magic. There was no agreement about where to draw distinctions between white magic (*magia naturalis*) and demonic black magic. *Magia naturalis* was widely tolerated in Padua, Naples and elsewhere on the Italian peninsula; competent manipulation of natural forces for the benefit of kings was rewarded by nominations to university chairs and famous courts. Despite Sixtus' Bull against judicial astrology, literature about *magia naturalis* continue to flourish, although magical practices included astrology. Controversies during the last decades of the 16th century about how to distinguish between *magia naturalis* and demonic magic and discussions about witchcraft,[56] however, did not affect debates about the nature and origins of comets and the dangerous effects of astrological predictions based on comets.

Calvin's *Advertissement contre l'astrologie qu'on appelle judiciare et autres curiosités qui règnent aujourd'hui au monde* was a reply to an anonymous defense of judicial astrology by Mellin Saint Gelais (*Advertissement sur les jugements d'Astrologie*, Lyon 1546). Calvin's aim was to convince clients of astrologers that the Gospel alone promised the way to salvation.[57] Calvin's attack on judicial astrology was directed to the simple folk and was not meant as an erudite refutation on the level of Pico's *Disputationes*. But his methodological advice for an appropriate investigation of nature is remarkable. His first argument against judicial astrology is that it is more reasonable to ask for *causes naturelles ou inférieures* than to head for the most general causes. Therefore, it would, for example, make more sense to ask what happens in the moment of conception, instead of casting a horoscope immediately after the birth. He argues that the disposition of a child is more dependent on the temper and character (*complexion*) of the parents than on sidereal influence.[58] In addition, God has the power to effect his *grace speciale*, which nobody can ever calculate.[59] Astrologers trying to predict individual fate from

55 Ugo Baldini, "Die römischen Kongregationen der Inquisition und des Index und der wissenschaftliche Fortschritt im 16. bis 18. Jahrhundert. Anmerkungen zur Chronologie und zur Logik ihres Verhältnisses", in: Hubert Wolf (ed.), *Inquisition, Index, Zensur. Wissenskulturen der Neuzeit im Widerstreit*, Paderborn/Munich et al. [2]2003, pp. 229–278

56 Leinkauf, *Grundriß* (n. 8), vol. 2, pp. 1498–1530; Barbara Mahlmann-Bauer, "Wagnerbuch", in: Wilhelm Kühlmann/ Jan-Dirk Müller/ Michael Schilling/ Johann Anselm Steiger/ Friedrich Vollhardt (eds.), *Frühe Neuzeit in Deutschland 1520–1620. Literaturwissenschaftliches Verfasserlexikon*, vol. 6, Berlin/ Boston 2017, pp. 423–433; eadem, "Magie und neue Wissenschaften im Wagnerbuch (1593)", in: Kaspar von Greyerz et al. (eds.), *Religion und Naturwissenschaften im 15. und 17. Jahrhundert*, Heidelberg 2010, pp. 141–185.

57 Jean Calvin, *Advertissement contre l'astrologie judiciare* ([1]1549), ed. by Olivier Millet, Genève 1985, Millet's introduction on p. 52.

58 Ibid., pp. 58–60.

59 Ibid., p. 60.

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the influence of the planets are suspected of interfering with theologians and of annihilating the doctrine of predestination, which is based on God's inconceivable council.[60] The claims of astrologers to be able to foretell the future by studying sidereal influences violated His majesty and were blasphemous. Zacharias Ursinus (1534–1583), one of the authors of the Heidelberg catechism, exclaimed: It is "vanitas vanitatum" to believe in Venus' benevolent inclinations and to be afraid of Saturn's maleficent influence. [61] Ursinus explains why God's actions are incalculable and why his plans have to be accepted. Because of His omnipotence, God can prevent evil, but He is not willing to exempt His creatures from their responsibility. He may prevent us from committing evil, but it was not in accord with Providence to confuse or destroy what He created.[62] Astrology would therefore annihilate the doctrine of twofold predestination. Magic, divination and all kinds of conjuring demons are inspired by the Devil, who wants to seduce man to idolatry. The church is the only refuge of the elected. David Pareus (1584–1622) and Quirinus Reuter (1558–1613), one of Dudith's pedagogical advisors and his biographer, edited Ursinus' commentary to the Heidelberg Catechism and thus ensured that the condemnation of astrology remained a prerequisite in the defense of divine predestination.[63] It must be noted, however, that meteorological astrology—the doctrine of physical *influxus* from the planets, inherited from Aristotle and partly from Ptolemy and bolstered by Neoplatonism—was unanimously accepted by natural philosophers of the three main churches. Therefore, the attacks by Dudith and his circle were interpreted as an assault on ecclesiastical authority.

6 Reformed theology, antitrinitarianism and the decline of astrological divination—the impact of Andreas Dudith's circle

6.1 The comet of 1577

Thaddaeus Hagecius ab Hagek might have introduced his friend Andreas Dudith to Brahe's research, thereby drawing the attention of his correspondent to his own astrological practice in Prague. Brahe mentioned, in a letter to Bartholomaeus Scultetus of August 17, 1588, that he had sent Dudith a copy of his privately

60 Ibid., p. 60–61.

61 Zacharius Ursinus, *Paranaesis ad S. theologicae catecheticaeque doctrinae studium*, ed. by Quirinus Reuter, Heidelberg 1602, to questions no. 27–27, 94–95; Zacharias Ursinus, "Loci theologici traditi in Academia Heidelbergensis", in: idem, *Opera theological tributa in tomos tres*, pp. 570–605.

62 *Corpus Doctrinae Orthodoxae sive Catecheticarvm explicationum D. Zachariae Ursini. Opus absolutum D. Davidis Parei Opera extrema recognitum*, Nunc autem emendatius & auctius […] Heidelberg 1592, p. 57.

63 An assault on astrological prediction is implicit in the widespread Heidelberg Catechism, Ursinus was one of its authors. Cf. Barbara Mahlmann-Bauer, "Astrologiekritik und reformierte Theologie in Heidelberg", in: Karla Apperloo-Boersma/ Herman J. Selderhuis (eds.): *Macht des Glaubens. 450 Jahre Heidelberger Katechismus*, Göttingen 2013, pp. 147–162; an English version may be consulted: Mahlmann-Bauer, "Reformed Theology and Criticism of Astrology in Heidelberg", in: Apperloo-Boersma/Selderhuis (eds.), *450 years Heidelberg Catechism*, Göttingen 2013, pp. 179–187.

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published book *De mundi aetherei recentioribus phenomenis* and was eager to hear what Dudith thought of Brahe's research about comets and his threefold classification of pamphlets describing the comet of 1577.[64]

The comet which appeared five years after the supernova in Cassiopeia (August 1572) could be seen from October 1577 until the end of January 1578. The white pale coma with a splendid curved tail covering 25° of a circle stimulated professional and lay observers to wonder about its origin, probable effects and divine purpose. For the first time, letters were exchanged which enabled observers to compare what they saw and to examine their own measurements in relation to others. This lively communication by mathematical observers was crucial in abolishing Aristotelian cosmology. Brahe provided the most accurate data from 10th November and communicated them to colleagues like Hagecius in Prague and Michael Maestlin in Tübingen, before he published his findings in a private publication in 1588. [65] Brahe had already located the nova far above the moon, namely in the (supposed) eighth sphere, for it lacked a parallax and therefore he assumed it must be a star. He applied the same method to measure the height of the comet in 1577 and concluded that it probably was a celestial object in the region of Venus. Observations by astronomers elsewhere convinced him that the comet was seen in the same position from any position on Earth. Brahe tried to plot its path, assuming that its speed was regular and its motion had the form of a partial parabola. The comet crossed the ecliptic in an oblique arc and its motion was independent of planetary orbs. Brahe assumed the existence of celestial bodies different from stars and planets that traveled through a permeable interstellar medium, thus falsifying Aristotelian cosmology, as well as Aristotle's meteorological cometary theory. The direction of the tail, which (he thought) was lightened by the sun rays, was always opposed to the sun. It therefore was improbable that cometary matter was inflamed, for flames vanished when the inflammable matter was consumed, but the comet just disappeared from sight on its way through cosmic space. In his Latin publication, Brahe described what he had seen and measured. He also evaluated publications by other observers and classified them according to their mathematical exactness.[66]

64 Lynn Thorndike, *History of Magic and Experimental Science*, vol. 6, New York 1941, pp. 183–187.

65 Tycho de Brahe, *De Mundi aetherei recentioribus phaenomenis, liber secundus qui est de illustri stella caudata ab elapso fere triente Novembris anno 1577 usque in finem Januarii sequentis conspecta* (Uraniborg 1588), Prag 1603, in: Tycho de Brahe, *Opera omnia*, vol. IV, Frankfurt a. Main 1648, Reprint Hildesheim 2001, pp. 5–377, a nice description of its appearance on p. 5; cf. Jürgen Mittelstrass (Ed.), *Enzyklopädie Philosophie Wissenschaftstheorie*, Vol. 1, Berlin 2005, p. 524; Doris Hellman, *The Comet of 1577. Its place in the history of astronomy*, New York 1944, pp. 118–137; Dreyer, *Tycho Brahe*, pp. 165–194; Westman, *The Copernican Question* (n. 5), pp. 250–257.

66 Brahe, *De Mundi aetherei recentioribus phaenomenis* (n. 65), caput X. The following pamphlet authors were critically examined: on p. 135: Michael Mästlin, p. 146: Cornelius Gemma Frisius, p. 152: Elisaeus Roeslin; p. 156: Thaddaeus Hageccius [!], p. 175: Bartholomaeus Scultetus; p. 196: Andreas Nolthius; pp. 102: Nicolaus Winckler; p. 206: Johannes Praetorius; p. 207: Marcellus Squaricalupus. As to Erastus' judgment see below, note 103.

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Only in a German treatise that he never published did Brahe take pains to speculate about the astrological meaning of the comet. There he regarded comets as "a great wonderwork of God and a miracle of nature".[67] Brahe was not exempt from traditional belief in astrology: Although divine plans were hidden from men, he maintained that some clues about the significance of the comet could be gained from old astrological writings.

Consensus among scientific experts and theologians gave way to disagreement about the height and the path of the comet and its function as a divine messenger. Generally, comets were supposed to announce God's wrath at disobedient mankind, and it was thought that they would disappear as soon as this function had been fulfilled. Brahe suggested in his German tract that the significance of the comet was to be interpreted as the aftermath of the nova in 1572. The comet announced war in those regions over which it passed, according to Ptolemy's doctrine, in particular to the Spaniards, the Italians, the French and Belgians. Brahe assumed that some celestial events forecast good as well as evil, depending on the faith of the observers. The pious would bow to their secret significance and commend themselves to God.[68]

Thaddaeus Hagecius, a professor of mathematics at the Collegium Carolinum and a physician, also published his observation of the comet above Prague, but due to incorrect measurements of a parallax of 5°, he still located it beneath the moon. In a later publication he corrected his error, which Brahe had pointed out to him.[69] With regard to its divine significance, Brahe was more cautious than Hagecius. Since comets had been observed ever since the beginning of the world, the new comet could not be interpreted as a sign announcing the end of the world.

Efforts to prevent epidemics and to develop therapies against the plague encouraged Dudith's circle of non-conformist humanists to scrutinize the widespread doctrine of comets as meteora that were supposed to infect human bodies by their noxious vapors and to endanger the life of princes and kings, persons with delicate constitutions. Andreas Dudith (1533–1589), counselor of the Emperor, Thomas Erastus (1524–1583), physician and theologian in Heidelberg and Basel, Marcellus Squarcialupus (1525– after 1592), a refugee from Piombino and for a few years court physician at Alba Julia (Transylvania) and Simon Grynaeus (1539–1583), a former student of Erastus, professor of medicine in Heidelberg and from 1580 professor of ethics at the University of Basel,[70] initiated a debate about the Aristotelian *meteora*-theory in combination with the astrological doctrine of comets. Their anti-astrological arguments remained current until 1681, when a spectacular comet triggered the old debate about its nature and possible effects

67 Hellman, *The Comet of 1577* (n. 65), p. 132 and pp. 338n. Brahe's German pamphlet hat a Latin title: *De Cometa anni 1577*, was written in 1578 and published for the first time in 1922.

68 Hellman, *The Comet of 1577* (n. 65), p. 202–203.

69 Thaddaeus Hagecius ab Hayck, *Descriptio Cometae qui apparuit Anno Domini 1577 […]*, Prague 1578; Hellman, *The Comet of 1577* (n. 65), pp. 188–203 and p. 369n.

70 Urs Leo Gantenbein, article "Grynaeus, Simon", in: *Historisches Lexikon der Schweiz*, online.

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anew. Pierre Bayle's *Pensées diverses sur la comète* presented the old critique of *astrologia judiciaria* in a wider framework, as one outstanding example of superstition nurtured by the Church, by placing the arguments of the heterodox humanists in the context of anthropology, natural law and political theory.[71]

6.2 Andreas Dudith's career

Andreas Dudith (1533–1589), a nobleman of Hungarian and Italian origin, a member of the Catholic reform circle, Bishop of Pecz, later convert, ambassador and counselor of Maximilian II and of his successor Rudolph II, was interested in science and owned a humanist library.[72] His alienation from the Church of Rome was a gradual process. As a member of the Padua circle of Cardinal Reginald Pole (1500–1558), he believed in the need for an adjustment of the Catholic Church to the new challenges of the Reformation. As a delegate at the Council of Trent representing Hungary, Dudith did not manage to gain support for the lay chalice and other reforms in 1562. In November 1563 he was named Bishop of Pecz and endowed with the title of Hungarian counselor to Ferdinand I. When he decided to marry a noblewoman in 1567, he justified this step in a letter to Maximilian II, pleading that the celibacy of the clergy was against divine and natural law. He moreover complained that his intervention at the Council was completely in vain, due to the plenipotentiary prerogative of the Pope.[73] Domenico Caccamo suggested that Dudith remained a Nicodemite during his mature life, at Padua and Trent as well as in his later functions as counselor of Maximilian II and Rudolph II. On demand, Dudith generously offered good reasons for his dissimulation in his Letter to the Polish nobleman Jan Lasicius (1534–1599), as will be seen later.[74] Dudith's early sympathies were with the reformed church. Dudith exchanged letters with Theodor Beza as well as with Fausto Sozzini. He maintained a good relationship with the Moravian brethren, while enjoying religious tolerance at Pascov (Moravia). The Jesuits were equally appreciated by him as good pedagogues. Not only his friends were aware that Dudith inclined towards Socinianism, for he did not hesitate to defend his Anti-Trinitarian ideas. He was used to make up his mind independently, but eager not to lose the favor of his patron, the Emperor. When

71 Pierre Bayle, *Pensées diverses sur la comète*, 2 vols., ed. by A. Prat, nouvelle edition préparée par Pierre Rétat, Paris 1984; Caccano, *Eretici* (n. 1), p. 127.

72 Costil, *Dudith* (n. 1), pp. 170–195 (the years at Paskow and Wroclaw), pp. 195–221 (humanist circle in Wroclaw); Caccamo, *Eretici* (n. 1), pp. 109–151; Amási, *The uses of humanism* (n. 1), here pp. 203–224; Ilic, „Andreas Dudith und sein reformiertes Netzwerk" (n. 1), pp. 53–64; Vasoli, *I miti e gli astri* (n. 1), pp. 350–387; Lech Szscucki (ed.), *Entre orthodoxie et nicodémisme. André Dudith au concile de Trente*, Paris 1984.

73 Caccamo, *Eretici* (n.1), p. 115; Andreas Dudith, "Excusatio ad […] Maximilianum II. In qua ratione adfert, quamobrem episcopate Quinque ecclesiensi et aliis honoribus abdicates, uxorem duxerit", in: idem, *Orationes in concilio Tridentino habitae*, ed. by Quirinus Reuter, Offenbach 1610, pp. 32–51.

74 *Epistola Andreae Dudithii Sac. Caes. M.[aiesta]tis consiliarii, ad Joannem Lasicium equitem Polonum, In qua de divina trinitate*, [s. l.] 1590, here last page; Dudith, Letter to Maximilian, 9 April 1568, quoted by Caccamo, *Eretici* (n. 1), p. 117, note 22.

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the comet appeared in the autumn of 1577, Dudith was living in Pascov, Moravia, was concerned about the health and education of his children and was always eager to learn from foreign visitors, physicians, historians and theologians. He had studied Aristotle's meteorology; he had copied Ptolemy's *Tetrabiblos* and was familiar with ideas by Girolamo Cardano, Pietro Pomponazzi and his followers at the University of Padua. Dudith turned to his medical friends, Johannes Crato von Krafftheim (1519–1585) and Thomas Erastus, two experts in therapies against the plague and its prevention, for he was eager to know their judgment about the celestial phenomenon.[75] Erastus sent him in turn a detailed analysis of comets in general, according to peripatetic theory, and explained to him why any reasonable man should only reckon with salubrious effects. Eight years before Tycho de Brahe's most accurate description of the comet, which had not yet been published, Dudith's host, the historian Giovanni Michele Bruto (1517–1592), edited Erastus' letter and Dudith's *Commentariolus* about the comet addressed to Crato.[76] The three friends and Dudith's host Brutus refuted in *unisono* astrological predictions. They considered them ill-founded and dangerous, because forecasts of catastrophes easily promoted panic among the common people.[77]

After the anti-astrological preface by Bruto, which is dated at Cracow, September 1579, Dudith's letter to Johannes Crato covers pages 13–50. It is followed by Erastus's statement (pp. 51–68) which however had previously occasioned Dudith's own considerations.

Erastus edited Dudith's letter to Crato a second time, again in Basel, suppressing Brutus' preface, but with five additional texts.[78]

The texts are arranged in the following order:

1 Thomas Erastus, Judgment of comets ("De Cometarum significationibus iudicium", pp. 1–21),
2 Dudith's Letter to Erastus demanding his comment with regard to Squarcialupus' manuscript (Dudithius … Erasto, Kal. Februarij 1579, pp. 22–26),
3 Marcellus Squarcialupus, Reply to Erastus about comets (De cometa in universum, atque de illo qui anno 1577 visus est, opinio, Pascovii […] 1578, pp. 27–97),

75 Thorndike, *History of magic and experimental science*, vol. 6 (n. 64), pp. 183–187; Hellman, The Comet (n. 65), p. 192, 352n.; Costil, André Dudith (n. 1), pp. 371–395; Vasoli, I miti e gli astir (n. 1), pp. 350–387.

76 Andreas Dudith, *De cometarum significatione commentariolus, in quo non minus eleganter quam docte et vere mathematicorum quorundam in ea re vanitas refutatur. Addidimus D. Thomae Erasti eadem de re sententiam*, Basel: Petrus Perna 1579.

77 In 1577/78 Erastus must have convinced Dudith that astrology, even though it was practiced by the ancients, was a treacherous art. During his first years at Paskov Dudith still had sympathies for astrology, because its tradition went back to antiquity. He copied Ptolemaios' *Tetrabiblos* and paraphrased an astrological text by Proclos; cf. Costil, Dudith, pp. 290–295.

78 *De cometis dissertationes novae clarissimorum virorum Thomae Erasti, Andreae Dudithii, Marcelli Squarcialupi, Symonis Grynaei*, ed. Thomas Erastus, [s. l., i. e. Basel] 1580.

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4 Erastus, letter to Dudith about the nature of comets and refutation of Squarcialupus' arguments and defense of the Aristotelian meteorology (De cometarum ortu, natura […], pp. 105–123; "Declaratio et probatio Sententiae Aristotelicae […] contra D. Marcellum Squarcialupum", pp. 124–166),
5 Dudith's Letter about comets to Johannes Crato, which was formerly published as *Commentariolus* ("Dudith Ioanni Cratoni s., Pascovia, Kal. Mart. 1578", pp. 167–196),
6 Simon Grynaeus, Two treatises about fiery meteora and the causes of comets ("Commentarii duo de ignitis meteoris unus: alter de cometarum causis atque significationibus", pp. 1–88).[79]

The readers are informed that Dudith had asked Erastus to publish Squarcialupus' text together with his former opinion, the *Commentariolus*. Erastus inserted Dudith's original letter to Crato between his own "defensio" against Squarcialupus and the tract by Grynaeus. Squarcialupus' text outweighs the others by its length and extravagance.

Apparently Brahe read the *Dissertationes novae* (Basel 1580). In his review of pamphlets about the comet in 1577 Erastus is listed among the authors whose speculations lacked an empirical basis: Erastus had just uncritically adopted Aristotelian meteorology, in spite of his ambitious claim that comets are salubrious. Brahe treats Marcellus Squarcialupus with greater respect, because the Italian physician abandoned the Peripatetic meteora-theory and in consequence rejected astrological predictions based on the physical impact of comets. Andreas Dudith's *Commentariolus* is not mentioned at all, for Dudith was not a scientific observer equipped with astronomical instruments. His approach to the extraordinary appearance was based on what others wrote about it and on the evaluation of cometary theories from antiquity and Ptolemy's *Tetrabiblos*. Sober reasoning induced him to undermine the principles of astrology,[80] and his protégé Marcellus Squarcialupus added new ideas, confirming Dudith's skepticism.

6.3 Junius Michael Brutus' sympathies with the credulous victims of fraudulent astrologers

The first editor of Erastus' treatise and Dudith's *Commentariolus*, Giovanni Michele Brutus, a convert and religious refugee like Squarcialupus, [81] dedicated the booklet with Dudith's and Erastus' texts to Nicolaus Mielecki, governor (Woi-

79 Grynaeus does not contribute new arguments to the anti-astrological debate and was not mentioned in Tycho de Brahe's review at all. Grynaeus' prolix text will therefore be not further considered.
80 Hellman, *The Comet of 1577* (n. 65), p. 310.
81 Giovanni Michele Bruto's career is summarized by Domenico Caccamo, *Eretici* (n.1), pp. 145–1152. Ernst Gustav Vogel, *Nachrichten von dem Leben und den Schriften des Geschichtsschreibers Johann Michael Brutus*, Meißen 1864, in particular pp. 44n, and 50. Before travelling to Dudith Brutus had contacts with Mino Celsi and Celio Secondo Curione in Basel, like Squarcialu-

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wode) of Podolia. Brutus agrees with Dudith's rejection of astrological divination and adds some critical remarks of his own, suggesting that astrologers ought to be punished as irresponsible agitators. He is the first to suggest their punishment for the sake of public order and peace, an argument which we will encounter again only in 1681. [82] The Italian historian takes advantage of his dedicatory letter to look back at his peaceful stay in Dudith's house. At the end of the preface, Brutus not only portrays Dudith as a *vir doctus atque eloquens*, but gives a lively impression of his entire way of thinking and living, his family and his household. He deserves such a eulogy because he perfectly matches the Horatian ideal of *beatus ille procul negotiis*, thanks to his Epicurean frugality and modesty (pp. 8–9).

In his preface, Brutus vituperates against presumptuous astrologers who unsettle the illiterate people with bold conjectures about God's threatening punishments. Brutus is upset that astrologers frighten the ignorant crowd with threatening predictions arising from the appearance of a comet, namely bad weather, famine, war, epidemics, political turmoil etc. These they interpret as divine punishment, an event that is reserved to the Last Judgment. Astrologers predict events, the occurrences of which are supposed necessary, and which therefore can by no means be prevented, unless they belong to the *futura contingentia*. Their warnings, he contends, that people would have to endure inevitable suffering with patience, are futile, because these poor people would not be able to protect themselves against contingent evil. There is no use investigating the stars in order to foretell what must necessarily occur and what wise men can foresee from past experience. .Brutus argues, moreover, that it is useless to frighten the poor, who are not at all responsible for their misery and have no power to change it, by predicting bad crops, shortage of food, famine, etc. Once intimidated by astrologers, the poor live in anguish, as though they see a sword dangling above their heads without knowing whether or not they will be struck. This kind of fear paralyzes the poor and ignorant, but does not help them to protect themselves against mischief. a man who knows his individual birth horoscope lives in constant fear without being able to prevent the evil which the astrologer has predicted. His entire family suffers with him, especially if he suspects that the predicted evil might come from his siblings or friends. Brutus describes psychotic fear as *semper animorum crudelis carnifex* (p. 5). This type of anguish cannot be extinguished by reasonable action, for there is no way to know how to prevent the presumably inevitable disasters one fears or how to protect oneself and one's family against unknown dangers predicted by an astrologer. This is particularly distressing for uneducated people, but even the erudite (*mediocriter prudens*) do

pus. Cf. Delio Cantimori, *Italienische Häretiker der Spätrenaissance*, translated from Italian by Werner Kaegi, Basel 1949, p. 289 and 322n.

82 Dudith, "Commentariolus" (n. 76), pp. 3–12, with the date at the end: X. Kalend. Sept. 1579 Cracoviae. About Brutus' stay in Dudith's home at Paskov and his relationship to Niccolo Mielecki cf. Costil, *Dudith* (n. 1), p. 170n. and 175; Vasoli, *I miti e gli astri*, pp. 363–365. In the following the page numbers in brackets refer to Brutus' edition of 1579.

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not know how to cope with revelations by an astrological soothsayer. A man who knows his nativity can no longer enjoy innocent pleasures, being appalled by a supposedly dreadful future which he has no power to avoid. Usually those who argue against the soothsayers and try to reassure the terrified souls are unjustly suspected of impiety and treachery, while the astrologers are honored as trustworthy authorities and pious men. In any case, astrologers who abuse theology should be accused of hypocrisy.

Therefore, Brutus resumes, Dudith deserves reader's gratitude for tackling the issue of astrology in combination with cometary theory. Brutus praises his way of reasoning, as well as his style. If there is anything in his speech which may wound it is the reproach that astrologers take advantage of illiterate people's credulity and greedily look for their own profit (p. 7). It is difficult to convince those who have been imbued with judicial astrology since their childhood that divination is pure superstition. Dudith does not offend his reader, but solicits his attention by suggesting how this futile superstition can be eradicated.

6.4 Erastus, De cometarum significationibus iudicium[83]

Erastus' anti-astrological treatise triggered the debate *de cometarum significatione*. It was not his first battle against astrologers. As a physician, he had come across colleagues and patients in Germany and in Italy as well who believed in astrology.[84] He was appalled by the credulity of illiterate and erudite people alike, who consulted astrologers as soon as they had to make up their minds before taking action. Erastus complained that the astrologers' *deliria* were repugnant to Christian piety. Their "greuliche Gotslesterung" is the Devil's work. Therefore, Erastus reedited Girolamo Savonarola's treatise against astrologers, a confirmation of Pico della Mirandola's arguments, and translated it into German, for the benefit of those he considered the simple folk.[85] In his earlier works, Erastus argued as a theologian and philosopher. His judgment in 1578 was not only occasioned by the new comet, but also influenced by what he had experienced in Italy and Germany as a physician who fought against the plague. Reason and experience , he writes, are our tools for the investigation of nature and for the management of our lives. We are able to construct theories or build models for the explanation of distant phenomena, and then put the theoretical assumptions to an empirical test.[86] Erastus implores his readers not to believe the forecasts of astrologers, who predict

83 In: *De cometis dissertationes novae* (n. 78), pp. 1–21.

84 Thomas Erastus, *De astrologia divinatrice*, ed. by Johann Jacob Grynaeus, Basel 1580, preface to the reader, dated: *Heidelbergae 1564*; Erastus' edition and translation of Savonarola's treatise has the title: *ASTROLOGIA CONFVTATA. Ain warhafte Gegründte Vnwidersprechliche Confutation/ der falschen Astrologei oder abgottischen warsagung aus des himels vnd der gestirnen lauff/ der warheit zu steuer/ vnnd dem gemeinen man zur warnung/ aus welscher vnd Lateinischer sprach/ wie volgend zu sehen/ von neuen ins deutsch gebracht*. […] Heidelberg 1557, cf. here „Der inhalt dieses Buches" and the dedicatory letter to his patrons, Fürsten von Henneberg.

85 Erastus, *Astrologia confutata* (n. 84), Der Inhalt; Vorred.

86 Erastus, "Ad candidum lectorem Epistola", in: *De cometis dissertationes novae* (n. 78), before p. 1.

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all kinds of evil from the appearance of a comet, without solid reasons. Erastus still clings to Aristotle's cometary theory, but he dissociates the analysis of exhalations and their effects from astrological divination, for the latter is incompatible with the tenets of the *meteora*-theory. Since comets are formed by dry and hot exhalations which burst into flames in the upper atmosphere, they cannot carry with them germs that trigger epidemics, for putrefaction is a result of humidity. Therefore, according to Aristotle, comets are salubrious, for they purify the air. Hence they may serve as antidotes against the plague.

6.5 Dudith's Commentariolus

Johannes Crato's research concerns the prevention of the plague and its perceived cause, putrefaction of the air.[87] Dudith's letter to Crato (28 February 1578) is a response to Erastus' considerations.[88] Actually, Dudith's approach is ethical: by a sober investigation and rational arguments, he aims at the destruction of a fraudulent practice. A variety of opinions about comets is current at this time. Dissenters from the traditional opinion (Aristotle's *meteora*-theory) and popular astrological divination are viewed with the suspicion of impiety. This is what happened to Dudith, because some of his friends interpreted his skepticism as heterodoxy. Therefore Dudith at first thought it wiser to keep silent and ask Crato, the expert, for his advice. But Dudith is worried by serious doubts about Aristotle's *meteora*-doctrine. Johannes Praetorius, a former teacher of Dudith's sons who was later nominated to the Altdorff academy to teach astronomy, believed that comets were dry exhalations from the earth, but he followed Peter Apian's observation that the comet's tail always pointed away from the sun. Therefore, it seemed probable that the recent comet's coma was illuminated by the sun's rays and that the comet approached the sun. Paulus Fabricius, *Medicus Caesareus & Mathematicus* (1529–1589), therefore preferred to adopt Seneca's conjecture that comets are stars with an unknown divine mission.[89] Cardanus also assumed that comets were celestial bodies, thereby concluding that heaven is not immutable. Dudith concludes: as long as we ignore the nature and matter of the comet, it does not make sense to predict from that phenomenon. But even if we knew more, it

87 Johannes Crato von Krafftheim, *Ordnung der Praeservation/ Wie man sich zu Zeit der Jnfection verwahren […] Bresslaw im Jar 1553 […] Jetzo aber […] new vbersehen vnd corrigiert*, Frankfurt a. M. 1585.

88 Dudith's letter is here quoted from its first edition (1579), the page numbers are added in brackets within the text. The original version is also published in the critical edition of Dudith's Epistulae, ed. by Lech Szczucki and Tiburtius Szepessy, vol. 6: 1577–1580, ed. Nicolaus Szymánski and commented by him and Lech Szczucki, Budapest 2002, Nr. 904, pp. 108–133. Additions and variants of Dudith's letter will be analyzed later, following the 1580 reprint of *De cometis dissertationes* novae (n. 78).

89 The reference alludes to Fabricius, *Dialexis de novae et privs incognitae stellae invsitatae magnitvdinis & splendidissimi luminis apparitione, & de eiusdem stellae vero loco constituendo. Adiuncta est ibidem ratio inuestigandae pa"rallaxeos cuiuscunque Phaenomeni […] nunc primum conscripta et edita*, per Thaddaeum Hagecium ab Hayck, Aulae Caesareae Maiestatis Medicum. Accesserunt aliorum quoque doctissimorum virorum de eadem stella scripta […], Frankfurt am Main 1574.

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would not be allowed to foretell evil or propitious events from the mere apparition, which may be an illusion. Dudith knows the ancient verses about comets heralding all kinds of misfortune (p. 19). But there were many comets which were not followed by wars or epidemics and the death of princes. Dudith also lists the disasters of the present time, horrible wars, brutal invasions, slaughter and floods of blood. All these innumerable misfortunes beset mankind, although there had been no comets announcing them. According to Scaliger's *Exotericae exercitationes,* it is ridiculous and irrational to predict the death of a prince or other *mortalium pernicies* from comets (p. 21).[90] It is more realistic to look for *proximas praesentesque causas* of wars, epidemics and other natural or man-made disasters, instead of attributing them to the hair, the beard or the tail of a comet, hence to *remotas illas coelestes, vniuersalesque… causas* (p. 22). The list of dreadful events, like the civil wars in France and the Low Countries and the occupation and devastation of Hungary, cruelties committed by the intruders from Turkey, prisoners of war and crimes committed by soldiers who slaughtered innocent people, shows another aspect of Dudith's *Commentariolus*. Apparently the Imperial Counselor was frustrated by the failure of politics—at home and abroad in foreign countries –, which was not able to prevent cruelties and miseries caused by wars and occupations. Who would be silly enough to declare that comets in the past, or the recent barbed star, were messengers of these terrible events, or causes of the death of two emperors well-known for their piety, e. g. *Divus Ferdinandus Caesar* and his son *Divus Maximilianus*? Dudith remembers three Kings of France whose death followed within a few years: Henry II, France II and Charles IX (pp. 25–26). It would likewise be insane to connect accidents, illnesses and other misfortune with bad weather and thunderstorms that only happened to accompany them, claiming that these events acted as causes and were somehow concatenated with terrestrial affairs. In contrast, in times of peace and prosperity we would never welcome the appearance of a comet as a savior. Therefore astrological divination is futile. This is manifest in the quarrels and controversies among astrologers who cast nativities with contradictory and inconsistent predictions. Dudith blames a Venetian astrologer for his dreadful and false predictions (p. 29–30). Superstition and credulity based on the oracles, dreams and other *deliramenta* of poets, rather than historians, are threats to Christian piety and undermine common sense and sane reasoning. Belief in occult forces exerted by heavenly objects, *spiritus* in the air and water comes close to magic. Dudith likewise dismisses the *meteora*-theory and its supplement, Ptolemaic astrology. The prognosis of dreadful terrestrial consequences of dry exhalations inflamed in the upper regions is futile, for a natural connection of causes and effects according to well-known laws of nature cannot be established (p. 32). Thunderstorms can regularly be observed with frightening effects, but since people are

90 Julius Caesar Scaliger, *Exotericarum exercitationum liber quintus decimus, de subtilitate, ad Hieronymum Cardanum*, Frankfurt am Main 1582 [1st edition: Paris 1557], *exercitatio LXXIX de comete*, pp. 294–297.

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used to them, they are not seen as miracles. Many extraordinary celestial events, such as eclipses, halos or parhelia, can also be explained by natural laws and calculated, like the rising and setting of the sun or the motions of stars and planets (p. 34). Nevertheless, major conjunctions of the three upper planets are interpreted as threatening spectacles mirroring the meeting of earthly rulers, which is ridiculous. Only the rarity of such events and the ignorance of their origins give rise to superstition and scare the gullible (p. 35). Again and again Dudith emphasizes:

> These phenomena occur and will occur, as long as Nature, the most beautiful architecture of the universe, will exist, by natural order and law […]. Therefore divination has derived from superstition and childish fear, neither from nature herself nor by any discipline, whether sacred or profane, which however is based on firm and true principles.[91]

In the Bible, Dudith argues, divination from the stars of evil or beneficial events is severely reprimanded. God alone is omniscient and omnipotent; who may boast of sitting in his council? Who was present as an eye-witness of His plans so that he is able to foresee long before the event takes place what is going to happen? (ibid.) Comets and other extraordinary celestial events are neither causes nor even supernatural signs. If these objects can be naturally explained and foretold by the application of physical laws, then they are not prodigies (*portenta, ostenta*) to frighten us with occult forces, for prodigies are against the order of nature, sent by God for unknown reasons, and announced to mankind by His legitimate prophets or angels (p. 37). If there ever were prodigies in the sky, divination by *vaticinia* based on them would be impossible, because these events were a priori exempt from the natural order. We must admit that we are ignorant of future events, "nam est nescia mens hominum fati, fortisque futurae". Only if soothsayers working from comets were legitimated by God as prophets would Dudith believe them. Otherwise, they must justify their claims to know God's wrath and the connection between divine considerations and the celestial event. If sins make God angry whenever would there be an occasion for him not to be angry? Dudith mocks the logic of *cometomantices*: "Non igitur Cometae, sed peccata Deum irasci significant. At irae Dei grauioris signa sunt Cometae: quia peccata etiam grauia sunt." (p. 39)

Not from comets as divine messengers, but from sacred revelation in the Bible, does man come to know moral laws and to learn about eternal punishments. In the version of the letter reprinted by Erastus in 1580, Dudith is even more explicit about the distinctions between science and theology, and between human intelligence and the authority of Holy Scripture.

91 "Fiunt autem ista, & dum natura, pulcherrimaque huius universitatis compages stabit, fient, suo quodam naturali ordine ac lege […]. Quocirca ex superstitione, puerilique metu profecta est omnis haec diuinatio, non ex rei ipsius natura, non disciplina vlla, vel sacra, vel prophana: quae quidem firmis ac veris nitatur fundamentis." Cf. Dudith, "Commentariolus" (n. 76), p. 36."

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> Here somebody might raise an objection against me: you have to reason from the principles of each art [that is, from physics and astronomy]. I however do not worry about these distinctions, but have violated them by transgressing the borderlines, since I am fighting against astrologastros from the domain of theology[92]. But tell me: why do astrologers intrude into theology and try to confirm their fictions (*commenta sua*) by sacred prophecies? They believe that they are entitled to the justification of their absurdities and vanities to abuse theology, and they will not allow us to go back to the source of truth in order to prove our assertions? […] Surely it is allowed to take refuge in a superior discipline, in cases where disciplines provide contradictory results, so that the quarrel may be settled. God's word, which has come down to us by prophets and apostles, must be our norm, like a Lesbian rule (*regula Lesbia*), according to which truth should be examined.[93]

In the later version of his letter, Dudith is alluding to the chapter about equity (epieikeia) in Aristotle's *Ethica Nicomachaea* (V, 14, 1137b 30). Aristotle compares the challenge of applying a general law to a specific case that can only roughly be subsumed to it, because the legislators never thought of this particular case, to the Lesbians' method of building a house with uneven, rough stones (*Lésbia oikodomía*). Since a straight measuring stick could not be applied to irregular stones, the Lesbians used as *kanon* a flexible piece of lead which could be applied to a wall with uneven stones so that it was possible for them to dress it straight.[94] In his *Adages* Erasmus explains the *regula Lesbia* as follows: Whenever a rule is adjusted to the facts or a law is accommodated with the customs and not the other way around, we may say that we apply a *regula Lesbia*.[95] The *dogmata Christi* would, however, be spoilt, if they were adjusted according to our corrupted habits in the way of a *regula Lesbia*.[96] Among theologians, comparisons of Holy Scripture with a *regula Lesbia* proved to be extremely controversial. Therefore Dudith's reference

92 which according to the objection is not at all Dudith's profession.

93 "Hinc mihi illud obijci posse uideo: ex proprijs cuiusque artis principijs agendum esse, me autem finibus uiolatis genus transcendere, cùm ex theologia contra astrologastros pugnem. Sed cur illi, quaeso, ex sua arte in alienam irruunt, & commenta sua sacris oraculis stabilire conantur? Sibine in re absurd & uana comprobanda licere Theologia abuti putabunt, nobis in ueritate asserenda ad ueritatis fontem recurrere non putabunt? Praeclaram sane legem & authoribus suis non indignam. Licet profecto licet, sicubi artes ac disciplinae inter se pugnant, ut lis omnis dirimatur, ad certiorem eamque superiorem confugere. Dei nimirum per Prophetas & Apostolos traditum uerbum norma nobis esse debet, ac quaedam quasi Lesbia regula ad quam ueritas omnis examinetur." *De cometis dissertationes novae*, pp. 185–186. This passage of Dudith's text is absent in the 1579 edition.

94 E. Büchsel, "Regula Lesbia", in: *Historisches Wörterbuch der Philosophie*, vol. 8, Darmstadt 1992, col. 489n.

95 Erasmus of Rotterdam, *Adagia* (Venice 1500), chilias I, 5, 93, quoted by Büchsel, Art. "Regula Lesbia" (n. 93), col. 489n.

96 Erasmus of Rotterdam, *Ratio verae theologiae* (1519), p. 89, quoted by Büchsel, "Regula Lesbia" (n. 93), col. 490.

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to the *regula Lesbia* has implications for his biblical hermeneutics. By comparing moral laws in the Holy Scripture with a measuring stick used in cases where uneven, rough stones were piled up to form a wall, Dudith indirectly admits that there are cases where the biblical text may be, or even must be, adjusted in order to serve as a proper *regula vitae*.[97] Evidently the Bible does not offer appropriate advice for the solution of scientific problems; it only provides (by parables and exempla) clues for what is right or wrong, but not at all for astrological prediction. This kind of abuse woud have been considered blasphemous. Dudith's warning, which is directed to hypocritical *astrologastri*, is not far from Galilei's recommendation to abandon the literal meaning of the Bible where it is obviously contrary to celestial phenomena which can be scientifically explored.

After this digression in the text of 1580, Dudith sums up his argument: Divination from comets and stars is vain superstition. Events following them are not linked to heavenly apparitions, neither by necessity nor even by the faintest probability (p. 40). False science and true religion are mutually exclusive.

The apparent terrestrial origin of comets of dry and hot exhalations can never be responsible for epidemics. Pestilence is engendered by putrefaction (*putredo*); decay is the consequence of corruption of matter by humidity. Therefore, Erastus was right in attributing to comets which originated from dry and hot exhalations (according to Aristotelian theory) rather salubrious effects, which he illustrated by the comets of 1556 and 1558 and events following their appearance (p. 41). Explanations of how the delicate temper of kings and princes or their organs are more easily affected by the venomous air than their hardworking subjects are pseudoscience and deserve being ridiculed or even despised. Comets are neither causes nor signs of the birth and death of rulers: "Nihil coelo cum imperatoribus et regibus negotii est" (p. 48). Heaven is a universal cause, which thanks to motion and light is responsible for alteration, coming into being and corruption, but the heavenly region is indifferent to what happens on Earth as a result of natural effects (p. 49). Dudith's epilogue is addressed to Crato, who he hopes will be a critical reader. Also Crato might be able to elucidate what Erastus wrote about putrefaction and illness, because Crato treated this matter in one of his most recent books and it is to be hoped that he will write more, for the benefit of students of philosophy and medicine (p. 50).

In his letter to Erastus, which was inserted in the *Dissertationes novae,* Dudith was no longer sure that the Aristotelian paradigm could be correctly applied to comets. He disagrees with Erastus' praise of Aristotle, declaring that ancient authorities are not exempt from error, not even ristotle, whose errors had already been listed by theologians in the 13th century. Dudith rather trusts his own senses and encourages his readers to investigate nature without prejudice:

97 The Lutheran Johann Jacob Müller comments that he could not believe his eyes when he hit upon Dudith's comparison of Holy Scripture with a Lesbian rule. Cf. below, n. 136.

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> Step down to the admirable, most beautiful theater of the universe: look at nature with your own, not with foreign eyes. Apply your senses [to prove] what others may pretend: listen however, but only trust words if they are in agreement with reason and nature. If, however, they report strange things, reject them, as frankly and easily as they were expressed by others […] This is not the school of the Pythagoreans or theologians where authority instead of reason must be admitted. We only venerate theology in so far as we accept that what springs from sacred monuments as sacrosanct and unshakeable truth without any doubt.[98]

Therefore we may imitate Aristotle by superseding him, as Aristotle diverged from Plato's doctrines and the Pre-Socratics, whose ideas he summarized in his doxographies. The search for truth, Dudith argues, is the only guide to progress. If our ancestors had blindly trusted the authority of their teachers, there would have been no progress in science. Knowledge in theology, physics, medicine and jurisprudence has increased; the sciences are reformed. Therefore Dudith feels Erastus deserves his particular praise, for Erastus dared to enlarge and correct accepted doctrines by new research and by his own investigations. Likewise, Erastus will certainly appreciate Squarcialupus' treatise, which he will receive as a manuscript. Dudith admires Squarcialupus for having demonstrated the flaws of Aristotle's meteorological theory about comets and having reached the conclusion that divination from the stars is pure superstition. Dudith frankly admits that Squarcialupus' investigation is more accurate and subtle than his own *Commentariolus*. Moreover, it is written in a beautiful, elegant style. Nevertheless, Dudith is proud of being Squarcialupus' patron, for the latter's ingenious treatise was written during his stay in Dudith's house at Paskov, and therefore Dudith urges Erastus to get it published. As a sceptic, Squarcialupus will not obstinately insist his own opinion, especially when he feels insecure about his conjectures.

6.6 Squarcialupus attacking astrologers and blaming theologians

In his letter to Crato Dudith on the occasion of the comet suggests that he was, like Erastus, but unlike Squarcialupus, not yet ready to abandon Aristotelian meteorology in 1579. Squarcialupus' opinion "De Cometa" is more radical than Dudith's treatise and it prompted the physician to a detailed refutation. Squarcialupus rejects the Aristotelian view of comets as *meteora*, produced by terrestrial exhalations, because he finds it inconsistent and puzzling. The Italian physician

98 "[…] descende tu quoque in admirandum hoc est pulcherrimum quod dixi orbis theatrum: tuis oculis non alienis naturam intuere: tuos sensus adhibe, quid alij affirment: audi quidem, ita tamen verbis fidem adiunge, si rationi, si naturae consentanea loquantur. Sin autem aliena adferant, eadem libertate ac facilitate, qua ab illis dantur, tu reijce … Non haec Pythagoreorum est schola, non Theologorum, in quibus autoritas pro ratione admitti debeat. Soli hunc Theologiae honorem habemus, ut quid ex sacris monumentis profert, id nos sine ulla dubitatione pro sacrosancta et firma veritate recipiamus." Cf. *De cometis dissertationes novae* (n. 78), p. 23n.

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equally dismisses Ptolemaic astrology as unscientific, for it claimed that there is a connection between planetary conjunction, the emergence of a comet and the noxious effects supposedly transmitted to terrestrial beings through the atmosphere. Squarcialupus bluntly denied causal connections between the appearance of a comet and unfavorable climate (storms, rainfall, droughts) or an outbreak of epidemics. He favored the idea that comets may be celestial objects like planets.His treatise deserved mention by Brahe in the latter's critical review of pamphlets about the comet of 1577. As Brahe emphasizes, Squarcialupus at least contributed valid arguments against Aristotle, although he might have done better to demonstrate his conjectures by mathematical reasoning.[99]

Like the historian Bruto, Squarcialupi was a religious refugee from Piombino. He received his degree as *doctor medicinae* from Pisa in 1538 and published a tract about therapies against the plague in 1562. After his emigration, he came to know Theodor Zwinger in Basel and probably Crato von Krafftheim in Vienna. Before he met Dudith and enjoyed his hospitality in Dudith's Moravian home, Squarcialupus became familiar with the Moravian brethren.[100] Squarcialupus arrived at Paskov by the end of February 1578 and stayed until the beginning of May. After that, he returned to the Grisons and emigrated with his family to Poland. In August he visited Paskov again. From there he travelled to Breslau, hoping to meet Crato. In September 1578 Squarcialupus lived in Cracow. From there he sent his opinion *de Cometa* to Dudith. In Cracow, Squarcialupus also edited Pliny the Younger with a dedication to Rudolph II and planned an edition of Hippocrates. Thanks to recommendations by Giorgio Biandrata, Squarcialupus was named court physician by the new duke of Transylvania and moved to Alba Julia in December 1579. During the following years he wrote medical treatises that were published in Claudiopoli (Cluj). The following six years apparently were the happiest of his life. In Transylvania the parliament (*Landtag*) had granted free practice to five Christian denominations in 1568 and 1571. In a letter of 15th September 1581, Squarcialupus implored Sozzini to temper his controversies with religious adversaries, pleading for tolerance.[101] In December 1585 he returned to the Grisons, where the religious situation had completely changed since the sixties in favor of orthodoxy and confessional control. In 1588 he moved again to Transylvania with his sons.[102]

99 Brahe, *De mundi aetherei recentioribus et phaenomenis pars secunda* (n. 65), De cometa anni 1577, p. 207.

100 Madonia, "Marcello Squarcialupus" (n. 7), pp. 119–126; Bundi, *Flüchtlingsschicksale* (n. 7), pp. 46–48; idem, Squarcialupus (2006, see n. 7), p. 435–438.

101 *Fausti Socini Senensis ad amicos Epistolae […], De novo accesserunt quaedam A. Dudithii Epistolae*, ed. Fratres Polonici, Irenopoli 1656, p. 359n. and Fausto Sozzinis answer, Cracow, 20 November 1581, pp. 361–368.

102 In his medical and balneological tracts Squarcialupus draws from his own experience. Cf. Bundi, *Flüchtlingsschicksale* (nr. 7), pp. 47n. For a summary of his ideas cf. Caccamo, *Eretici* (n. 1), pp. 128–131; Vasoli, *I miti e gli astri*, pp. 375–382.

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Squarcialupus was encouraged by Dudith and his friends to to attack Aristotle and the treacherous astrologers.[103] Squarcialupus' treatise is divided into three parts. First he assails "ineptos Astrologos". Second, he launches his criticism against the Peripatetics and their inappropriate paradigm. In the third part, he mocks those pseudo-theologians who characterize comets as wonders of nature (monstra horrenda). Like Dudith, he admits that the nature of comets is totally unknown, and therefore *vaticina* based on their appearance are ill founded. Astrologers, physicians and some theologians vainly claim that comets are accompanied by the plague, wars and death. But to be afraid without being able to say what makes one afraid is stupid. It is the task of enlightened men to investigate the comet's nature, and this exactly is what Squarcialupus sees as his task. He states that Ptolemy's rules about comets and ensuing misfortune are not based on observation. To judge from the color of a celestial appearance that it may be engendered by a planet with the same outlook is an illusion. Squarcialupus finds more flaws in Ptolemy's reasoning, when he quotes Prolemy's prediction that a comet appearing in the sign of Scorpio may cause heavy rains in the west, but elsewhere may foretell a drought. How can one and the same object have opposite effects? Ptolemy does not explain why comets in Capricorn are likely to stir up quarrels, whereas in Sagittarius they are supposed to endanger pregnant women. It is meaningless to predict certain types of evil, since all kinds of misfortune affect individuals as well as nations, whether they be attributed to fate, physical laws or accidents (p. 33). Squarcialupus wonders why people are afraid of the new comet, for astrologers are cautious enough to give assurances that man is not subject to the stars and that God's omnipotence is superior to sidereal necessity. Ptolemy's advice is contrary to Christian piety, when he recommends prayer to God as a preventative of evil consequences from a comet that appears close to a conjunction of Jupiter with the Moon (p. 34). It is ridiculous to choose days and hours for actions and enterprises according to planetary constellations, as though the planets and stars formed a senate analogous to Earthly committees of politicians. is It is contradictory to foretell that a comet will be harmful to certain regions and countries, but helpful to others because different parts of the Earth may be associated with particular signs of the zodiac, for how can one and the same object cause opposite effects in different regions where it is exactly seen in the same position? There are constant changes in the world and various weather phenomena which create different conditions for agriculture. Some countries suffer from warfare, invasion and occupation by enemies. The conditions for making one's living differ from country to country and from time to time. These changes cannot be reduced to universal causes. There is no sound basis for assuming that the appearance of a comet is linked with terrestrial misfortune. Since the arts and sciences have been restored and the original Christian faith has been reestablished

103 *Dissertationes novae* (nr. 78), p. 38. In the following quotations from Squarcialupus' text always are from this edition.

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by the reformers, Squarcialupus maintains, piety and erudition have enormously increased among European nations. There is no reason to be afraid of comets or to associate them with God's wrath. In addition, the persistence of the dreadful effects of comets or planetary constellations cannot be predicted. Squarcialupus particularly ridicules Caspar Peucer's *De divinationum generibus* because of the author's astrological prejudices. Peucer's conviction that not only comets, but also thunderstorms ,were prodigies sent by God is not acceptable for theological reasons. Peucer assumes that, by analogy, floods are prodigies which warn people of warfare. But how can his argument stand,since there is no direct physical relation between a deluge or an earthquake, a comet and the outbreak of wars? Unusual phenomena frighten us, but Peucer does not explain why they threaten us, for how can inanimate events transmit threatening messages? He is not able to name criteria which would allow us to distinguish between evil announced by angels, demons or God (p. 39). Peucer confused fatal necessity and free will. He is unable to distinguish between the celestial realm and terrestrial mutability, between *Dei decreta* and *fortunae mobilitas*. Obscure prognostications produce a mixture of hope and fear. They threaten humans with God's resentment because they suggest that it may be transmitted by a comet and that God will only mitigate his wrath if he is soothed by prayers. No matter how events things develop, these presumably pious writers always have, with respect to fairly vague divinations, an excuse for why their dire predictions may have failed (p. 40). There is a diversity of opinion among famous philosophers and mathematicians as to how long the effects of a comet or another extraordinary event will last. Since Peucer takes into account the shape of a celestial appearance which is reminiscent of an eagle or a dragon, he is inclined to interpret the celestial event as a product of a demon or of the Devil himself, who wants to frighten the pious. Peucer and his school (that is, Melanchthon's legacy) give no explanation for the particular force of a comet (p. 40–41).

Comets and other celestial phenomena, whose height we cannot exactly determine, present themselves under various aspects, depending on the nature of the atmosphere and the weather. Therefore, Squarcialupus concludes, predictions from observation without closer examination and measurement are without value. How can we talk about future effects, if we have no idea about the origin and nature of a celestial phenomenon? There is no independent position on Earth which makes it possible to plot the entire orbit of a comet. Observations of the comet have to be corroborated to be reliable, because they vary depending on viewpoint and weather conditions. In addition, observers disagree about when a comet was seen for the first time and when it finally disappeared. Casting a horoscope at the precise moment of the birth of the comet is difficult, for the exact moment of stars rising above the horizon is relevant for determining the twelve houses, as everybody knows. Hence astrologers' judgments about the impact of the comet will be different, depending on when and where its position is analyzed, whether at the beginning of its course or when it reaches its peak and its utmost brilliance. It is futile to base forecasts of definite events on such shaky

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ground, as there are different appearances of one and the same object and various observations never cover the entire course of it (p. 48).

The second chapter is devoted to Aristotle's doctrine. Once it is shattered, he argues, the doctrines and glory of astrologers will vanish completely (p. 49). Followers of Aristotle differ from astrologers because the former predict only natural disasters, while the latter also foretell man-made disasters such as wars. Squarcialupus shows by common sense arguments why it is unlikely that comets are formed by terrestrial exhalations, which are supposed to be inflamed in the upper region of the sky; hence, their effects, namely droughts and storms, are improbable as well,. Dry exhalations rising from the earth cool down on their way up, until their original heat disappears and the matter vanishes in the air. The enormous motion of the upper spheres is not responsible for the inflammation of a comet, for what kind of fire can there be? It is not identical with fire on earth or fiery matter erupting from a volcano. The frictional heat caused by the motion of the upper sphere of the moon depends on the matter thus set in motion and its speed. After its long way up, there may only remain a tiny remainder of Earthly exhalations, condensed to a small globe. This will not be ignited by friction. The doctrine of cometary matter which is inflamed by frictional heat thus does not make sense, according to the physical nature of smoke and of the atmosphere. If comets consisted of smoky matter which burst into flames by friction, their appearance would be different: they would have the shape of a mountain of combustible matter; they would immediately burst into flames; and the flames would absorb the matter entirely until it was consumed. Hence the appearance of a comet, its shape and path, are not consistent with Aristotle's theory. Once the matter is consumed in the upper air, there must be a further supply of smoke that arises and nurtures the flames anew. How the earthy heat is preserved in the upper atmosphere cannot be explained. Flames are upright, like pyramids, and they have the shape of a torch, whereas comets stretch out in length. The brilliance of the coma does not resemble a flame; it is stainless and has no shadows. The comet's head has the brightest shine. The brilliance diminishes from coma to tail. Apparently the recent comet, Squarcialupus observes, is more like a star illuminated by the sun, for it receives its light from the sun nearby, like the moon. Its path is similar to a planetary orb, although it crosses the ecliptic at an oblique angle. Like all other comets, it participates in the first motion of the fixed stars. Why do we not sense the heat that is presumably fostered by the comet? After the comet had disappeared, the summer in 1578 was not particularly hot and dry. On the contrary, due to moderate temperatures, there was a plentiful harvest. Neither storms nor earthquakes were registered that might have produced a sufficiency of vapors necessary to produce a comet.

Squarcialupus points to another inconsistency of Aristotelian doctrine: once the combustible matter is consumed, from whence can heavy winds be engendered? Squarcialupus assumes that a furnace served as a model for the Aristotelian theory, but this model is not appropriate. In a furnace, the flames consist of smoke

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burning down. Vapors and smoke burn down rapidly, if the fire is strong enough. But once the matter which was produced by exhalations is burnt down, storms and droughts can no longer develop (p. 56). If one assumes that some smoke remains after the extinction of the comet, an explanation is needed for why winds are engendered by this smoke in the upper region, and how the heat in that region can be transmitted to the lower atmosphere? How can the smoke reach the lower spheres, by the help of light, rays or the rapid motion of the sphere, since it is the nature of the original exhalations from cavities in the Earth to rise quickly, especially when they are heated up in the upper region? The followers of Aristotle are unable to defend his theory. For if they pretend that, after the comet's extinction, smoke remains and heat is produced, they must explain these effects by the help of physics. But the present comet produced no heat; on the contrary, it was extremely cold when Squarcialupus observed its course.

If *cometomantices* take refuge in the influence of the planets and their aspects in order to explain the emergence of storms that would then be able to set free new exhalations, they only further undermine themselves by explaining the unknown by the even less familiar (p. 58). Unlike other material, the matter of the comet burning down is never transformed into ashes. Therefore the furnace model has to be dismissed. By another thought experiment, the physician from Piombino demonstrates the absurdity of the assumption that comets are formed from Earthly exhalations. If that were the case, they would be ready to engender a new comet after their extinction. Once the comet vanished and the matter was partly extinguished, hot smoke would remain, or some steamy vapor. Comets are formed by smoke rising upward. Smoke is engendered inside the Earth by aridity (and heat), but the burning comet makes the atmosphere dry again, engendering droughts and storms which will generate more dry, inflammable matter. Therefore, it would be plausible to assume that a new comet is produced by the heat of a prior comet. The *reductio ad absurdum* is an indirect proof of the contrary assumption that comets are celestial objects similar to planets. Erastus' opinion that the heat is developed inside the Earth, and this causes the matter to rise rapidly, is refuted in the same way, by analogy with observations on Earth: The sun is the major source of life, sanity and growth. Animals are equipped with inborn heat which keeps them alive, but their residence, the Earth, is cold and dry. Erastus' conjecture of heat inside the Earth that defeats the humidity and thus is responsible for the purification of the air by rising cometary matter, cannot be verified. Squarcialupus concludes that phenomena on Earth and in the sky cannot be explained by the help of Aristotelian meteorology and cosmology.[104] Squarcialupus suggests dropping Aristotle's division between immutable heavenly spheres and the terrestrial realm, where generation and corruption take place, by relying sole-

104 Squarcialupus here mocks Antoine Mizauld, the author of a *Cometographia crinitarum stellarum* and a *Meteorologia* from 1540 and 1538 as "Mizaldus ineptus"; cf. Hellman, *The Comet of 1577* (n. 65), p. 104–105.

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ly on proper sense perception and arguing by analogy that the same natural laws are valid on Earth and in the sky (p. 63).

The third part deals with the assumptions shared by astrologers and some theologians (e. g. Melanchthon's followers). Astrologers enter the domain of theology, claiming presumptuously that their predictions from the stars are in accord with God's decrees. But God's will is inaccessible. It can by no means be explored by assuming occult forces or secret knowledge. Squarcialupus ridicules theologians who take refuge in miracles whenever they meet phenomena that they cannot explain in terms of nature. There are many phenomena whose origins and effects are unknown to us. Nevertheless, it would be erroneous to conclude that they are supernatural or unnatural or that God uses them as vehicles for the expression of His wrath. Squarcialupus introduces a new thought experiment. An Egyptian who never saw heavy rainfalls would surely be surprised by masses of rain causing floods, and would be even more frightened by thunderstorms. They might make him believe that the beautiful *machina mundi* will collapse. An Italian farmer, however, would laugh at the foreigner, for he knows all this is natural and not at all unusual.

The effects of all things we observe are caused either by the Creator, by nature, by man or by accident (*a caeca fortuna*). In contrast, *creatio ex nihilo*, the genesis of an individual soul, Christ's incarnation and the resurrection of the dead are miracles. Nature presents two classes of phenomena that are both admirable: the ordinary, regular growth of plants and ripening of fruits, and the coming into being of animals. In addition, there are *generis naturae peccata*, namely hybrid species, *monstra* among plants and animals and even horribly immoral men, like Catilina and Nero. Man is responsible for what is produced by reason and judgment, and the virtuous can be distinguished from the vicious. Accidents may happen ex fortuito, but these do not contradict God's providence. Still, one has to be cautious not to declare something as a miracle prematurely, for "multa enim sunt a natura, et ab humanis etiam uiribus quae superant intelligentiam nostram." If we assume that one and the same phenomenon acts as cause and as sign, we must admit that we are ignoring its nature, since nature acts from unknown causes. This is inconsistent (p. 66). *Portenta* and *monstra* have hidden natural causes, but we are not entitled to assign them divine messages, for what appears to us as their extraordinary character is only due to our ignorance.

There are many events which either follow from natural laws, are the outcome of human decisions or happen as mere accidents. These events occur, even when no comet is seen. A philosopher who is not frightened by an extraordinary celestial event or object will certainly investigate its nature, which does not prevent him from honoring the Creator and respecting His order of salvation.

Melanchthon stated that celestial objects were created in order to direct our attention to God, and that God wanted us to regard these objects as messengers which announced His will and temper. Squarcialupus wonders where the sacred text legitimates astrology or advises astrologers to speculate about future events.

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God has nowhere encouraged astrologers to renounce the use of reason (p. 75–76). Soothsayers pretend to have a knowledge which nobody else has, which is beyond human capability. *Mali vates—mali theologi:* They ignore true wisdom and frighten the credulous people with their futile speculations. If comets really were divine threats, God's benevolence and grace would be absent, but this would be contrary to what Holy Scripture tells us. If a comet were created as a messenger to warn us, the pious would pray to God to prevent the evil, but the comet would still be visible. In that case, it would apparently have been created in vain, and God would be amusing himself by scaring us with no purpose.

Comets are surely created by God; they have natural causes which are still unknown to us. Nevertheless, we are not minimizing them if we assume they are just as natural as lightning and thunder. We admire the works of nature as parts of God's creation and try to induce from our observations the laws of nature. Astrologers, however, behave like false priests, who show their contempt for God's omnipotence and omniscience and who cheat the uneducated. Irrational fear fosters credulity and superstition. Disasters that occurred after a comet happens to have been observed may not be attributed to it.

The epilogue presents a list of unbearable miseries and slaughters caused by warfare and other man-made disasters in the recent past. Death is a natural consequence of violence. The victims of violence and brutality deserve pity; the death of a king (unless he is killed) is not frightening at all, for there are laws which guarantee a legitimate successor and heir to the throne. *Cometomantices* may deplore the death of three kings in France, while elsewhere 30,000 people have just died of the plague and innocent citizens were victims of cruel warfare—events which were surely not announced by a comet, but can be analyzed by the study of human behavior.

Divine prophets never received their dreadful prognostics from heavenly signs. They never mentioned comets, but they pointed to divine justice. It is no offence to religion to deny the authority of astrologers and defy their judgments as treacherous. Astrology is a pseudo-art that seduces the pious, leading them away from the Bible and God's commandments. Only if this treacherous pseudo-art is unmasked, can piety, charity and justice be preserved (p. 97).

6.7 Erastus' vain attempts to save the meteora-*theory*

Although Erastus, Dudith and Squarcialupus all agree that astrology is a pseudo-science and interferes with theology, Erastus was not at all pleased with Squarcialupus' arguments. Whereas Squarcialupus tried to show the inconsistencies of peripatetic theory about comets, and noted the many questions that it left unsolved (such as the nature of the earthy exhalations), Erastus still believed that Aristotle's theory accounted for the phenomena far better than Seneca, for example, when he wonders about comets in his *Naturales quaestiones*. Erastus considers the problem of hot exhalations rising from the Earth, which presumably provide matter for the production of comets. He distinguishes vapors and exha-

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lations, assuming that other airy *meteora* are composed from humid vapors and dry exhalations in various mixtures.

Erastus completely ignores what Squarcialupus had to say about the place of comets far above the moon, right next to the planetary spheres. Apparently, they both did not bother about measuring the distance of the comet and its place in comparison with the moon and other planets. The method of measuring the parallax of new celestial objects in relation to the moon and the planets was obviously unknown to all three of them. Therefore Erastus' ideas about the comet seemed of little or no value to Brahe, for the impact of Erastus' critique of judicial astrology is hampered by his obstinate defense of Aristotle's *meteora* theory.[105]

6.8 Dudith's conception of science and scientific method according to his later correspondence

Dudith complained of hostile reactions by his friends Peter Monau (1551–1588), Court Physician of Rudolph II, Nicolaus Rhediger (1525–1587) and Thaddaeus Hagecius, only because he had tried to prove that astrological prognostics abused Christian doctrine. Dudith's firm denial of any connection between a comet and disastrous events might have upset Hagecius, for this astronomer neatly distinguished between causes and signs, and defended Melanchthon's view that comets were divine messengers communicating God's wrath. This is evident from the title of Hagecius' pamphlet, published in Görlitz in 1580: *Epistula ad Martinum Mylium, in qua examinatur sententia Michaelis Maestlini et Helisaei Roeslini de cometa anni 1577 ac simul pie asseritur contra profanas et Epicureas quorundam opiniones, qui cometas nihil significare contendunt*.[106] Dudith protested against Hagecius' suspicion that people like him and Squarcialupus belonged to the Epicureans, a class of *hominum nimirum ethnicorum et in Deum contumeliosorum*.[107] At first Dudith modestly recommended Hagecius to consider Erastus' arguments, which he said were more convincing than what he, Dudith, had only written down in a hurry. His aim had been simply to provoke a discussion about scientific method, rather than to start a quarrel or to urge others to agree with his opinion. But when Hagecius insisted on his suspicions, Dudith revealed the source of his own anti-astrological arguments in the *Commentariolus*, namely Julius Caesar Scaliger, Giovanni

105 Brahe, *De mundi aetherei recentioribus et phaenomenis pars secunda*, De cometa anni 1577 (n. 65), p. 207. Erastus must be blamed for his unconvincing, though rather sophisticated manoeuvres to save peripatetic theory. "Unum saltem hoc loco libere dicam; si Erastus Astrologiae & Paracelso obstrepens, non veriora in medium protulit, quam in hac Cometarum materia, dum Aristotelis de Generatione eorum doctrinam non saltem probabilem esse sentit, sed certiorem, quam refelli veris rationibus ab aliquos possit […] equidem nullum est periculum, ut vel Astrologi, vel Paracelsista suam professionem ab illo labefactatum iri pertimescant."

106 Dudith, *Epistulae*, vol. 6 (n. 88), p. 343; cf. Hellman, *The Comet of 1577* (n. 65), p. 370, nr. 49.

107 Dudith to Hagecius, 11 December 1579, in: Dudith, *Epistulae*, vol. 6 (n. 88), nr. 981, pp. 274–275; Dudith to Hagecius, 20 February 1580, ibid., nr. 993, p. 297–300; Dudith to Hagecius, 3rd August 1580, ibid., Nr. 1013, p. 345–350.

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Pico della Mirandola and Girolamo Savonarola. Undoubtedly they were pious men. Astronomy is a science because eclipses can be mathematically predicted, whereas according to Dudith astrology "is a treacherous art, in opposition with God's word and [natural] philosophy. […] [Astrology] is not ordained by God, but [is] a profanation and abuse of his commands. For the stars are not created by God as messengers of future events, the knowledge of which He has reserved to himself."[108] The sun and the planets operate as universal causes. They are prerequisites for the growth of plants and guarantee that every species can develop its proper characteristics. But knowing a general precondition of life does not permit one to predict particular effects.[109] To know the character of a child, we must be aware of all the factors that determine it: heredity, environment, social conditions, the nature of the mother's milk, etc. Dudith learned from Erastus that divination of *contingentia futura* is false and repugnant to God. Human knowledge is based only on sense perception: "Omnis nostra notitia, omnis cognitio a sensibus est. In sensus autem nostros non incurrunt adhuc res, quae nondum sunt aut ne esse quidem coeperunt."[110] Astrologers not only deliver erroneous prognostics from nativities, but they use a treacherous, fallacious method: "ostendo non posse eam non errare, cum de futuris contingentibus blaterat."[111]

Dudith was familiar with the scientific tradition taught in Padua and Paris.[112] He distinguished among three orders. As an ambassador, he was involved in the order of human affairs, politics and warfare and knew about the responsibilities of rulers and their loyal servants. As a reader of the Bible who exchanged letters with Theodore de Bèze and other orthodox Calvinists, Dudith was aware of a divine order following the creator's hidden plans, which were beyond our grasp and had to be humbly revered rather than understood. Religious controversies, wars and the prosecution of dissenters contradicted Jesus' teaching and his commandments. They were consequences of a gradual formation of Christian doctrine in the fourth century which transformed the teaching of the gospel by introducing unbiblical notions and scholastic subtleties that were beyond the grasp of the common people. Finally, the order of nature encompassed observable events on Earth as well as distant phenomena in the sky and followed rules which scientists were able to explore, although many phenomena which seemed to be irregular still had to be explained by natural laws as yet unknown. By induction more general laws could be abstracted from observations of particular instances and

108 "[Astrologiam […] fallaciam Dei verbo et philosophiae placitis adversariam esse contendo. […] Non igitur Dei ordinatio est, sed Dei ordinationis profanatio atque abusus. Non enim astra in hunc finem ordinata a Deo sunt, ut nobis futuros casus denuntient, quorum, ut saepe dixi, scientiam sibi soli Deus retinuit". Cf. Dudith, Letter to Hageck, 26 September 1580, in: *Epistulae*, vol. 6 (N. 88), p. 367; cf. Costil, *Dudith* (n. 1), p. 356.

109 Ibid., p. 369.

110 Ibid., p. 366.

111 Ibid., p. 371.

112 Ibid., pp. 60–96 and 366; Caccamo, *Eretici* (n. 1), p. 111 and 127; Vasoli, *I miti e gli astri* (n. 1), pp. 366–369.

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events. Human epistemology was restricted to realms accessible to sense perception and logical reasoning from given data. Dudith doubted whether there were miracles *kata physin* at all. Phenomena which were beyond understanding had to be patiently investigated until their secrets were unraveled.

With regard to cometary theory as well as pharmacology, Dudith was dependent on experts' knowledge. He was not a scientific observer. After Hagecius had corrected his earlier measurement of the comet and admitted that the comet had a smaller parallax than the moon, which was in harmony with Brahe's discoveries, Dudith was at once persuaded to abandon Aristotelian meteorology. Comets had to be celestial objects far above the moon, and therefore it was impossible that they derived from smoky exhalations, since these would never reach the planetary spheres. But if comets traverse the ecliptic above the moon, then the assumption about the immutability of the heavens must be abandoned.[113] A generation before Kepler, Dudith believed that he could be a pious reader of the Bible, with due respect for God's omnipotence and omniscience, by humbly restricting himself to exploring phenomena that were accessible to sense perception. He was skeptical, but contemporary research about the location of the comet of 1577 convinced him that progress in scientific method was possible and that therefore more riddles of nature would be solved in the future.

As a reader of the Bible, Dudith drew analogous conclusions. He preferred to trust his own reasoning and he frowned at ancient authorities when their doctrines disagreed with the literal meaning of the sacred text. He dared to publicly sympathize with the Moravian Brethren, when their pedagogy convinced him. He also backed Jacobus Palaeologus when the latter was charged with heresy, and he wrote to Fausto Sozzini that it was of no use to get involved in theological controversies and polemics.[114]

Dudith's letter of 1570 to the Polish nobleman and historian[115] Jan Lasicki (Lasicius, 1534–1602) concerning the Trinity has a similar structure similar to that of his *Commentariolus*. Since it spells out an original confession of antitrinitarian faith, it was published only after Dudith's death.

Dudith does not approach questions of religion as a diplomat, but addresses Lasicius as a friend whom he can trust. Religion and questions of faith require a deep personal commitment. Dudith's efforts to reach a better understanding of God and the divine revelation that promised salvation to believers can be compared with his search for certainty about extraordinary celestial events as parts of nature. In both cases, his motivation to deviate from accepted opinions is the

113 Dudith, letter to Hagecius, 19th January 1581, cf. Costil, *Dudith* (n. 1), p. 358.

114 About Dudith's sympathies with antitrinitarianism cf. Caccamo, *Eretici* (n. 1) pp. 119–125.

115 Karol Karski, Art. "Lasicki, Jan", in: Traugott and Wilhelm Bautz (eds.), *Bio-bibliographisches Kirchenlexikon*, vol. 4, Herzberg 1992, p. 1191n. Lasicius' *Historia […] fratrum Bohemicorum* was published as a fragment (book VIII with summaries of the other parts) in 1660. Lasicius studied in Basel, Geneva, Zurich, Strasbourg and Heidelberg and was involved in polemics against antitrinitarians.

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same. Dudith is amazed by Lasicius' lack of tolerance, as he is surprised seven years later that people are willing to accept Aristotle's theories in combination with Ptolemaic astrology without serious examination. Who will prescribe what he, the ex-bishop, is to believe? Lasicius must accept that Dudith's conversion from Roman Catholicism was a step which required serious investigation, for why else should Dudith have preferred to leave the splendor of courtly life? If it had been sufficient to conceal his personal convictions and simply feign an agreement with the majority, it would not have been necessary to change his entire life. To behave like a sophist or a sceptic and to dispute about religion without personal commitment was not appropriate in serious matters of religion, when salvation was at stake.

> You must know, Lasicius, that if I had been willing or if I were still willing to listen with foreign ears or not to use my own eyes, to agree with the Pope, how easily I would have got all those things which, according to the simple folk, people are usually eagerly striving for, but which only a happy few can ever reach.[116]

Dudith was also not willing to accept astrological interpretations of a comet as a symbol of God's particular communication with His church, for the astrologers thereby abused theology to intimidate the simple folk and to lead believers away from the Biblical text.

Dudith's *captatio benevolentiae* leaves no doubt to the reader that the issue of true belief and its justification are serious matters. Faith is not what remains when the faculties of reason and sense fail, but it is, like scientific certainty, the result and consequence of sober consideration and examination. Science and faith rely on the same tools.

The *narratio* begins with a fundamental critique of church doctrine (fol. A 2 v). In Dudith's eyes, it has degenerated to a vain ideology and consists of riddles which nobody is able understand, not even experts who had never come to a consensus about the definition of the *divinae personae*. The consequence of the tiresome effort throughout the history of Christianity to deduce a doctrine about God and his properties from the sacred text has been constant quarrel and mutual suspicion of heresy. Dudith starts an analysis of central notions of the Athanasian *Symbolum* by declaring his reservation about its authorship (fol. A 3 r). He refuses to accept Athanasius as a promulgator of a Christian doctrine which rather resembles a muddy pool, in comparison with a limpid source such as the sacred text itself. Dudith's deconstruction of necessarily inadequate attempts to

116 *Epistola Andreae Dudithii Sac. Caes. M.[aiesta]tis consiliarii, ad Joannem Lasicium equitem Polonum, In qua de divina trinitate*, [s.l.] 1590, fol. A 3 r, the pages of the following quotations are given in brackets in the text. "Non nescis, Lasici, si alienis auribus audire, si non meis oculis cernere, si Papae assentari voluissem, aut nunc quoque vellem, quam iis rebus omnibus abundare potuissem, quas vulgo homines magno studio consectantur, nec tamen, nisi pauci, consequuntur."

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define the divine personae might have offended pious ears because of his sublime satirical talent. The Trinity is a riddle, a bugbear without a basis in the Biblical text. The relationship among Father, Son and Holy Spirit is not at all clear, because the three *personae* who are supposed to be identical with only one and the same God form a fictitious entity, a pure abstraction. This verbal *monstrum* gives birth to others and comes close to blasphemy. For, from the identity of three *divinae personae,* it follows that if God is incarnated in Christ, the Father and the Holy Spirit must likewise be incarnations of the same nature, for the Deity cannot be divided or dissociated. Hence Trinity itself must be allowed the attribute of being incarnated—a monstrous idea (fol. B 3 r). Especially when one turns to the Virgin Mary, one would have to admit that the *Theotokos* gave birth to a hybrid, *immane monstrum*, namely to the Trinity and (allegorically) to the Church. The *Missale* of 1538 that was used in Polish churches requires from believers an extraordinary veneration of the Holy Virgin, because the Trinity was born from her (fol. B4 r-v). Dudith's exclamation, "O seclum insipiens & infacetum", is similar to his comments with regard to astrologers' explanations of how a comet can bring forth misfortune and be responsible for bad weather, as well as for man-made disaster.

Even Luther's dissociation from the Church of Rome and his neglect of Patristic tradition were not radical enough, in Dudith's view, since he asserted that Christ suffered *secundum utramque naturam*, which implies that together with Christ the Creator of the universe had also been slaughtered by the hands of wicked men. "Quid potest fingi magis portentosum?" (fol. Cv)

Dudith's analysis of notions without a clear denotation and of sentences where subject and predicate do not match and that therefore lack a truth value, ends with a demystification. After that, Dudith starts with the more edifying part of his letter. Christ has more weight than the church and church authorities, for individual salvation relies on Christ and His message (fol. C 2 r). If we try to follow Calvin, who declared that the *Symbolum* upon which the representatives at Nicaea agreed is a solid, trustworthy *fundamentum fidei*, we must admit that even the *Symbolum Nicaeanum* has lyrical expressions devoid of denotation which are more appropriate in a poem than in a confession of faith, where not a single syllable may be changed.

> 'God from God, light from light, true God from true God'. What's the use of this repetition? Does it give a special emphasis or is the expression more forceful? Thus you realize, that it is a poem, more appropriate for being sung, than a confession of faith, in which it is absurd to change a single syllable.[117]

117 "Deum de Deo, lumen de lumine, Deum verum de deo vero. Quorsum ista repetitio? An vel emphasim habet vllam, vel maiorem expressionem? Vides ergo, carmen esse magis cantillando aptum, quam formulam confessionis, in qua syllabam vnam abundare, absurdum est." (fol. C 2 v)

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Neither Luther's exegetical sermons nor the *Symbolum Nicaeanum* nor Calvin's commentary provided solid norms for a true confession. Dudith thereafter forms his own confession by quoting from the New Testament and naming the exact source (fol. C 4 r-C 5 v). Jesus is a man, born by a woman and expressing his ideas by conversing with His disciples. He was sent as a mediator by his Father, who alone deserves full veneration as omnipotent Creator. The Holy Spirit belongs both to the Father and the Son and is transmitted by them to the believers, but He is neither a persona nor a deity, and therefore needs no adoration by prayers. Dudith's advice to Lasicius to get rid of false doctrines, to free himself from prejudice and finally to become familiar with Christ by studying the sacred text, may be extended to the believers in astrology and the *cometomantices*. Whoever declares that Dudith is a dangerous heretic because *of* his unorthodox belief, and that his fellowbelievers have to be protected against this dangerous wolf, falls prey to noxious prejudices by pseudo-theologians. "I am talking about different faiths. Keep your own opinion, leave my own to me. Nobody should explore the conscience of others with curiosity and impudence. Never assume the part of the judge."[118]

By analogy, nobody is entitled to read God's will from the stars, as though by means of the stars He tried to warn his believers. Alluding to Matthew 13:24–30, Dudith concludes that it is up to Christ to judge who belongs to His flock. The distinction between divine omniscience and restricted human knowledge is justified with reference to Jesus' famous parable of the tares. The same attitude is characteristic of the sceptic, who has no reason to believe what astrologers predict.

7 The reception of Dudith's and Squarcialupus' anti-astrological treatises

Elias Maior (1587–1669), director of the famous Gymnasium Elisabethanum in Wroclaw, reprinted Dudith's and Erastus' treatises when a series of three comets appeared at the beginning of the Bohemian War.[119] Maior explains in his dedicatory preface to his patrons—members of the magistracy—why it is worthwhile to reprint *Dudithi & Erasti de cometis Commentariolum*.[120] A group of intellectuals found that they had to address the mater of the comet which was observed in the winter of 1618 and therefore published their opinions about its significance. Maior is made desperate by astrological superstition, which can hardly be erad-

118 "De diuersa fide loquor. Vos vestram sententiam retinete, mihi meuam relinquite. Ne curiose & impudenter alter in alterius conscientiam inquirat. Ne sumamus nobis Iudicis partes." Ibid., last page. Mino Celsi also added letters by Dudith to his pamphlet against the prosecution of heretics, because he appreciated him as his ally in pleading for religious tolerance. Cf. Mino Celsi, *In haereticis coercendis quatenus progredi liceat*; Poems and Correspondences, ed. Peter G. Bietenholz, Napoli/ Chicago 1982, pp. 603–612.

119 *De cometarum significatione cl. virorum Andreae Dudithii commentarius, & D. Thomae Erasti sententia, Elias Maior Vratislaviensis denuo edidit, & adjecit […]*. Breslau: Baumann, David Müller 1619. The booklet is dedicated to Christoph Hentscher, Pro-Chancellor of the Diocesis Breslau; cf. Werner Taegert, "Major, Elias", in: *Killy Literaturlexikon*, enlarged second edition, ed. by Wilhelm Kühlmann et al., vol. 7, Berlin/ New York 2010, p. 627n.

120 Maior, *De cometarum significatione* (n. 119).

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icated once it has been disseminated. Following Scaliger's reservation about astrological and physiological *influxus* from stars to parts of human bodies, Maior repeats Dudith's arguments for why comets are not prodigies and hence their influence on the birth and death of rulers cannot be verified. Reference to experience does not render the view of a causal connection between heaven and human bodies more plausible. While the death of a king is a deplorable loss, the birth of a prince is a joyful gain. Maior cites passages from ancient chronicles indicating that frequently the birth of an heir to the throne was accompanied by the appearance of a comet. Astrological nativities of princes of the Habsburg dynasty have always been presented as eulogies. Loyal authors often enhanced their glamor by reference to a comet in connection with the joyful event of the birth of a successor. When the death of a ruler whose birth had once been happily announced by a comet is equally connected with a later comet's dire appearance, what then was the use of the previous comet, when its happy message would be annihilated by the later? Maior presents tiresome lists of kings and dukes who were born and who had died. He praises their efforts to negotiate peace treaties that proved to be crucial for the survival of Lutheran faith in Silesia, remarking that there were quite a few comets that had accompanied or preceded these political events. The same is true of the history of the church and the Lutheran faith, which Maior summarises. The chain of events that led Emperor Matthias to issue his *Epistula maiestatis* in 1609, which granted Protestants their religious liberties, is completely independent of the appearance of comets, no matter whether astrologers argued to the contrary. Apparently, the Silesian schoolman invokes agreements, treaties and imperial grants as pillars of peace, desperately wishing that their commemoration would turn out to be a self-fulfilling prophecy on the eve of the election of the Bohemian king. As Maior notes, Justus Lipsius, who once seemed to be impressed by traditional soothsaying with comets, admitted that he was converted to a more reasonable opinion by Dudith's *Commentariolus*. His epitaph which can still be seen inside the Elisabeth Church in Wroclaw today was donated by the widow and is quoted by Maior in full. The epitaph praises Dudith's excellence, his humanist interest in science, his fluency in many languages, his loyalty to two emperors, his successful negotiations with foreign potencies and his role as pater familias and husband. The citation of the epitaph emphasizes the legacy of Dudith's intellectual standing and his religious tolerance, without any mention of his heterodoxy. Maybe Maior hereby wanted to remind the Habsburg party of the outstanding qualities of their loyal Counsellor, despite his religious dissent.

On the occasion of the comets in 1664 and 1665, Johann Andreas Bose (1626–1674), professor of theology at Wittenberg, published a new edition of the letters by Erastus, Dudithius, Squarcialupus and Simon Grynaeus, adding a preface of his own and some more recent remarks by contemporary observers.[121] Bose testifies

121 Johann Andreas Bose (ed.), *De significatv cometarvm dissertationes et ivdicia doctorvm hominvm: collecta, emendate, & cometomanticae nostri temporis opposita*, Jena 1665. In his table of

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that the two comets that appeared in 1664 and 1665 provoked terror and frightened the *vulgus […] ac simpliciores* as well as *docti prudentesque*. He remembers (quoting from Jacques-Auguste de Thou's *Historiae sui temporis*[122]) that the frightening aspect of a comet in 1556 intimidated Charles V so much that he decided to retire. When the Wittenberg professor looked for an authority who would be able to stop cometary fears and refute astrological superstition, he came across the *Dissertationes novae* from 1580. He found it worthwhile to reprint the texts *de significatione Cometarum*, because the weight of their argument and the beautiful style were as convincing in 1665 as they had been more than 80 years earlier. Dudith and his allies once and for all vanquished astrological superstition. Since up to now, it was argued, the nature of comets and their origins are unknown, nobody is entitled to predict their effects or speculate on their significance (fol.):(3 r). The Lutheran professor, is cautious enough, however, to emphasize that he does not want to interfere with theologians who still interpret comets as divine messengers. Bose's biographical details do not conceal that Dudith started his career as a bishop and Hungarian representative at the Council of Trent. His *Orationes* were published by Quirinus Reuter, professor of theology in Heidelberg. Squarcialupus was a religious refugee from Italy who spent his later years in Poland. Although little is known about his career, he also deserves being remembered, and therefore Bose quotes Dudith's eulogy: "nihil in hoc genere eruditius, acutius, elegantius siue a nostris, siue a veteribus scriptum esse existimaret".[123] The catalogue of more recent men of science (mostly astronomers), who all agree with Dudith and his circle in denouncing astrological superstition and defeating erroneous doctrines, names authorities who are affiliated with three different churches: Julius Caesar Scaliger, Benedictus Pererius SJ, Johann Baptista Riccioli SJ, Pierre Gassendi as well as Philipp Müller (1585–1659), professor of physics and mathematics at Leipzig, whose classes Bose had attended.

8 Stanislas Lubienietzki's *Theatrum Cometicum*

Stanislaw Lubieniecki (1623–1675) acknowledges that the battle against astrological soothsaying from comets, to which he contributed his *Theatrum Cometicum*, began with Erastus, Dudith and Squarcialupus. Lubienietzki, son of a Polish nobleman who had served as a Unitarian pastor in Rákow, studied law, accompa-

content he listed *De significatu Cometarum JUDICIA […] Julii Caesaris Scaligeri* p. 133, *Benedicti Pererii* p. 134, *Simonis Grynaei* and *Philippi Mulleri* p. 154, *Thomae Fieni* p. 159, *Johannis Baptistae Riccioli* p. 173, *Petri Gassendi* p. 174 and *Jacobi Primerosii* p. 177. Cf. Christian Gottlieb Jöcher, *Compendiöses Gelehrten-Lexicon*, Leipzig 1733 (3 rd edition), art. "Bose, Johann Andreas" in column 493.

122 Jacobus Augustus Thuanus, *Historiarum sui temporis opera*, Offenbach 1609, ad annum 1556, p. 370 A: "Iam antea pridie Non. Mart. Ingens & lucidum sidus sinuoso flexu flammiferum crinem trahens in octauo Librae gradu per XII dies continuos arsit; quo viso Caesar mortem sibi portendi ratus omnia ad profectionem necessaria comparari iusserat[…]. "

123 Dudith, Letter to Erastus, in: *De cometis dissertationes novae*, p. 29.

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nied a young Polish nobleman during his studies to Amsterdam, Orléans, Saumur, Angers, Paris and Leiden, became a Unitarian pastor and tried to make his living by collecting political news which he offered to the Kings of Sweden, Denmark and Poland as a journalist. He had to flee from Poland during the war with Sweden, and he implored the King of Denmark for refuge. After short residences in Stettin, Copenhagen and Altona, Lubienietzki finally settled in Hamburg. Wherever he lived, he tried to negotiate religious tolerance for the members of the Unitarian congregation, for which he felt responsible, but he was persecuted and condemned by Lutheran theologians as soon as he began discussions about religious topics. He was convinced of the superiority of his faith, which he praised as truly and literally catholic. Queen Christina of Sweden was interested in debating with the versatile nobleman. He temporarily served as a secretary to the Danish and Polish Kings, collecting news from European courts and intellectuals, but was never their ambassador, as he seemed to pretend to be, in order to maintain his residence as a refugee.[124]

He observed the comet of 1664 from his house in Hamburg and wrote down his observations, which he sent to other noblemen and mathematicians, no matter whether they were Roman Catholics, Lutherans or Calvinists, among them Ismael Bouilleau (1605–1694), who converted to Roman Catholicism in 1631, Athanasius Kircher SJ (1602–1680), Johannes Hevelius (1611–1687) and Henry Oldenburg (1618/19–1677). His letters were published and richly illustrated in the first volume of his *Theatrum Cometicum*.[125] Five copies are preserved in the Royal Library at Copenhagen, three of them with handwritten dedications to King Frederic II, Duke of Gottorp, to Christian Albrecht and to Queen Christina of Sweden, whom he tried to win as his patrons.[126]

In the second volume, Lubienietzki presented a catalogue of all the comets since the Biblical Deluge. He intended to present all the available sources about each comet and was particularly interested in exact descriptions of their positions and courses. He devotes three chapters to each comet, beginning with its description, then quoting eyewitnesses who drew their own conclusions as to its presumed significance, and ending with a summary of his own, listing political events which he thought might be associated with the appearance. Thanks to an

124 Kai Eduard Jordt-Jörgensen, *Stanislaw Lubieniecki—zum Weg des Unitarismus von Ost nach West im 17. Jahrhundert*, Göttingen 1968, pp. 21–102; Michal Choptiany, “The theater of cosmic and human history”, in: *Chronologia Universalis. Research-project Calendars and chronology in the intellectual culture of Early Modern Europe, funded by the Polish National Excellence Center*, January 2014, Web address: chronologiauniversalis. Wordpress.com/tag/theatrum-cometicum (opened Dec. 18, 2018).

125 Stanislaus Lubienietzki, *Theatrum cometicum in tres tomos distinctum,* Amsterdam 1667. The three volumes have separate frontispieces. I: *Communicationes de cometis a. 1664 & 1665 cum viris per Europam cl. habitas […]*, II: *sive historia cometarum a diluvio ad a. 1665 […]*, III: *Theatri Cometici Exitus, de significationibus cometarum […]*; cf. Christoph Sandius, *Bibliotheca Antitrinitariorum* (n. 7), pp. 165–168.

126 Jordt-Jörgensen, *Lubieniecki*, (n. 121) pp. 92–94.

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increasing number of astronomical publications, the mathematical data provided by professional observers of the comets of 1606, 1618/1619, 1653 and 1661 are particularly rich and accurate. The enumeration of single, sometimes petty historical events which were not presented as a coherent narrative, but supposedly preceded, accompanied or followed the appearance of a comet, is puzzling, if any conclusion can be drawn from this overwhelmingly 'baroque' list of heterogeneous news at all. Lubienietzki does not explicitly deny that heavenly appearances and terrestrial events—whether they were happy or unhappy—are linked, but tries hard to show how the mass of collected historical data can be related with the unusual celestial phenomenon. Four narrative principles can be recognized which, however, give no answer to the purposes of divine providence: a) fortunate events may follow from unfortunate events and vice versa; b) the judgment of what is awful and what is comforting depends on the geographic position and the viewpoint of the eyewitness. Thus wars, for example, are always dreadful for victims, but promising for those who want to enlarge their territories. Likewise, the death of an emperor certainly afflicts his subjects, but also gives rise to promising new initiatives. c) Events which are dreadful for some who suffer from them are outweighed by events which promise a better future. Thus in 1618, the afflictions caused by wars and other inconveniences is counterbalanced by hope elicited by weddings of kings and princes or the birth of a successor to the throne.[127] d) A chain of unhappy events does not start as soon as a comet appears, but can also precede it. The merely superficial connection between heavenly appearance and events on earth suggests that guidelines for writing history cannot be gathered from astronomical observations or astrological speculations. Events which matter in politics and society have more to do with ethics and generally with anthropology. The course of history has a complexity which cannot be simplified by telling the facts as a quasi-causal sequence of occurrences. Lubienietzki's enormous effort to mirror the simultaneity of what happened in one single year in Europe under the more or less accidental impression of a comet makes it impossible to describe the single events according to any political logic or as a psychological sequence. In many cases, Lubienietzki's arrangement of historical facts gives the impression that history is a mere chaos, whose sense can only be guessed subsequently when we know the outcome and may judge what is just or unjust, good or evil about it from a down-to-earth perspective. In any case, interpretations are avoided which could make the reader believe in a causal relationship between a comet and political history. Lubienietzki's way of relating single events and telling history is meant to disprove traditional opinions about comets as messengers of evil. The enormous mass of historical evidence can be independently read as an annalistic chronicle.

127 Lubienietzki, *Theatrum cometicum* (n. 122), p. 436: "Non deerunt huic tempestati laeta hymenaeorum & natalium Principum solemnia, quae bellorum aliorumque incommodorum tristitiam dispungebant."

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A third volume of the *Theatrum cometicum* dealt with the astrological significance of comets. In the "Exitus" of the work, the question of God's purpose in creating comets is negotiated in a series of letters which were exchanged between Hamburg and Amsterdam. The arguments that we know from the Dudith circle are repeated; hence, skepticism is recommended as an appropriate attitude, given our present knowledge, for the nature of comets is still unknown. The traditional opinion that comets are messengers of evil, announcing God's punishments, is ridiculed as superstition. There is an emphasis on the ethical consequences of astrology, for as Lubienietzki suggests to his Dutch colleague Franciscus Cuperus (Kuypers), there is common agreement that neither God nor man is subject to sidereal influence, there is no necessary fate determining the course of human affairs, and the Creator's plans are inaccessible to believers. The opinion that comets have a supernatural significance is not rejected directly, but receives an ethical turn.

Apparently Nicodemism, a pragmatic assimilation to the religious customs of the majority of Lutherans in Hamburg and Denmark, was an attitude which Lubienietzki recommended in the case of scientific questions that had the tendency to interfere with theology. A kind of scientific Nicodemism is manifest in the dialogue between Lubienietzki and Cuperus. The catalogue of past comets and the history of nations and governments had the purpose of falsifying the ancient saying that there is no comet without ensuing evil. Given the experience of past comets, which shows that comets are accompanied and followed by as many positive as negative events, we must admit that a comet is a Janus-faced *portentum:* a threat to the wicked and a messenger of favorable events to the righteous and pious people. It can happen that one and the same event may be reduced to various causes and the other way around, that two diverse effects derive from one and the same cause. Therefore, a comet has different meanings, depending on who looks at it and where the observer is located. Whoever agrees with this opinion ought to abandon altogether the traditional view of the conjunction between comets and terrestrial events, since no causal connection can be established between the celestial body and any one particular event.

Whoever expresses fear of comets is admitting that he has reasons to be afraid of the future or of God's Last Judgment. Superstitious fear because of the apparition of a comet surely indicates an uneasy conscience. The question of astrological relevance and the significance of extraordinary celestial objects vanishes, once Lubienietzki's psychological analysis is accepted. Presumably the Nicodemite[128] ridicules—with due caution as a refugee who was viewed with suspicions—any effort to defend astrological predictions from comets by the intriguing claim that people who do not care about them have no religion.

128 Christoph Sandius mentions a book written by Lubienietzki incognito with the following title: *Paraenesis ad Nicodemitas, sub nomine Timothei Christiani* (manuscript); cf. Christoph Sandius, *Bibliotheca Antitrinitariorum*, (n. 7), p. 168.

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In his correspondence with Cuperus, Lubienietzki remembers that the battle against cometomantices began with Erastus and Dudithius, to whom famous contemporary astronomers like Riccioli, Hevelius and Bullialdus can be added.[129] Meanwhile, peripatetic theory has been replaced by the conviction that comets are celestial bodies with paths similar to planetary orbs (although not parallel with them). Squarcialupus had already concluded that they are too distant to influence the atmosphere. In the manner of Dudith and Squarcialupus, Lubienietzki abstains from irritating people who conjecture that comets transmit a dreadful message. He rather agrees with Squarcialupus, who suggested a wide sense of "portenta" as extraordinary, unusual phenomena which, however, follow from natural laws partly unknown. In this sense, comets may be named portenta just as halos or parhelia are. This may appear as a play on words. It is important to emphasize that the freedom of action is not hampered by any fatal necessity determined by comets. The signs mentioned in the gospel that are to announce the end of the world do not refer to comets. This is why, he says, the Jews ignored them. Thus comets may signify propitious events to good people and evil to the wicked. In an *Apotelesma* Lubienietzki quotes Biblical verdicts against astrological divination, which was forbidden to the Jews in the Pentateuch. "Utinam verò omnes libero corde serviamus Domino, cujus in manu omnia nostra sit!"[130] Comets are a kind of joker, reminding the believers of an incomprehensible divine justice signaled by extraordinary celestial phenomena. Lubienietzki assures his readers that comets have at last a *significatio ethica*: comets, like other extraordinary phenomena in nature, rather mirror the state of the observer's conscience.

9 The aftermath of cometary skepticism—Johann Jacob Müller's defense of the traditional view—a lost battle

In 1665 comets were regarded as objects the nature of which was still unknown. In any case, there was no more reason to be afraid of a comet's physical effects. Squarcialupus' conjecture that a comet was too far from the earth to exert physical influence on events was the accepted view by the middle of the 17th century. Since Kepler's observations of the comet in 1607, observers had tried to find out whether its path was straight or curved. Its presumable orbit, which only presents itself in parts to observers at different places, became the dominant topic in cometary discourse. The association of its shape and color with the properties of a planet nearby was furthermore dismissed as pagan astrology, which had attributed to the planets the properties of the gods whose names they had.

In November 1680, a bright comet appeared with an impressive fan-like tail. It changed its direction abruptly, after it had passed its perihelion on the 18th of December. To scientific observers who had studied Kepler, Descartes, Gassendi and

129 Lubienietzki, *Theatrum cometicum* (n. 122), pars III: Theatri Cometici Exitus, p. 9 (separate pagination).
130 Ibid., p. 11.

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Hevelius, it seemed more likely that the apparition in the winter sky was rather one celestial object that followed a steep elliptic or parabolic path than that two different comets had appeared which were heading in opposite directions.[131] Johann Christoph Sturm (1635–1703), professor of physics and mathematics at Altdorf, described the celestial object in the light of Descartes' vortex cosmology, examining thereby the theories of Hevelius and Pierre Petit as well, but he completely disregarded questions about its function as a divine messenger.[132] Erhard Weigel (1625–1699), Professor of Mathematics at Jena and calendar writer, considered the comet with respect to the tradition as an extraordinary preacher sent by God.[133]

Dudith and Squarcialupus had suggested that investigations of cometary theories and observations of a comet ought to be dissociated from the theological bias that astrological predictions usually encouraged. They see conjectures that God had sent a comet to warn his believers and announce his wrath, etc., as an assault on piety. Their *furor anti-astrologicus* suggests that religious non-conformists were more willing to surrender traditional views of nature than Lutheran theologians. But the claim of both Antitrinitarians, that only the Bible comprised God's revelation, was still regarded as an offense by some Protestant comet preachers in 1681.

Sermons on the occasion of a comet (*Kometenpredigten*) were in 1680/81 still a popular genre in Protestant popular literature. Some Lutheran preachers were eager to make their readers familiar with the opinions of contemporary astronomers, thereby adding edifying observations about physico- or astrotheology.[134] The shape, color and course of a comet inspired them to interpret it as an allegorical sign in the book of nature. More conservative theologians thought it expedient to draw the attention of their flock to what they saw as divine messengers, as a means of increasing their piety. On the occasion of the spectacular apparition, they thought it worthwhile to admonished their flock to keep their distance from epicureanism and atheism. From the viewpoint of more enlightened colleagues,

131 Meinel, *Grenzgänger* (n. 2), pp. 92–101; idem, "Kometenflugschriften" (n. 2), pp. 78–80, 230 brochures (most of them in German) were devoted to the comet. A summary of the controversy about the winter comet in 1680 is presented in my commentaries on two illustrated broadsheets of this phenomenon. Cf. Harms et al. (eds.), *Illustrierte Flugblätter*, vol. I (n. 2), nrs. 209–210.

132 Johann Christoph Sturm, *Cometarum natura, motus et origo […]*, Altdorf 1681; cf. Meinel, *Grenzgänger*, pp. 92–94.

133 Erhard Weigel, *Himmels-Zeiger der Bedeutung bey Erscheinung des ungemeinen Cometen, Anno 1680 vom 5. November an beobachtet*, Jena 1681; cf. Meinel, Grenzgänger, p. 97n.; idem, Kometenflugschriften, p. 79.

134 A few examples: *Gespräch zwischen einem Naturkündiger, Politico und Geistlichen*, Nürnberg 1681; Caspar Neumann, *Des Noah Regenbogen/ Und der itzt Brennende Comet*, Breslau 1681; Simon Bornmeister, *Christlich/ Vernünfftige Cometen-Betrachtung*, Nürnberg 1681; Georg Samuel Dörffel, *Astronomische Betrachtung des Grossen Cometen […] Nebenst etlichen sonderlichen sonderbahren Fragen und neuen Denckwürdigkeiten/ sonderlich von Verbesserung der Hevelischen Theoriae cometarum*, Plauen 1681; Barbara Mahlmann-Bauer, article "Dörffel, Georg Samuel", in *Killy Literaturlexikon*, second enlarged edition by Wilhelm Kühlmann et al, vol. 3, Berlin/ New York 2008, pp. 68–70; Meinel, „Kometenflugschriften" (n. 2).

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these preachers were continuing to propagate a childish superstition when they assumed that comets implicitly belonged to the Biblical signs announcing the Last Judgment and that they conveyed an allegorical meaning which—like the rainbow as a symbol of God's peace after the Deluge (Genesis 9:16)—may be deciphered by simple folk and by men of science alike.

Following Melanchthon's tradition, Lutheran preachers warned that Epicurean contempt for comets, as well as pre-Christian superstition, were pitfalls on both sides of a recommended middle road.[135] Caspar Neumann (1648–1715), a Silesian preacher who was also well trained in astronomy, thought it worthwhile to introduce his readers and listeners to cometary theory, still emphasizing that comets function as extraordinary preachers to those who do not care for the Biblical message.[136] He argued that biblical revelation and reason cannot be contradictory, since they rise from the same divine source. God entrusted the keys to His heavenly kingdom to the preachers of His word, who moreover had access to the keys of natural wisdom by studying astronomy. After his clear-cut demarcation between the domains of astronomy and theology, Neumann explained that comets had a supernatural meaning, like the rainbow for Noah. Comets were like other extraordinary works of creation and wonders of nature in witnessing God's omnipotence. Nevertheless, the conviction that comets have an allegorical meaning which served as a moral guideline apart from the Bible had nothing to do with astrological superstition.

A few years before comets were finally identified by Dörffel, Edmond Halley and Isaac Newton as celestial objects with orbits that could be calculated, references to Dudith, Squarcialupus and Brutus were still up to date in comet tracts, because they accused the boldness and insolence of comet preachers who abused theology to intimidate their believers. Alarming comet sermons were a case for magistrates, who were concerned to maintain public order and therefore were interested in preventing panic due to frightening heavenly events like the appearance of comets. Stirring horror from the apparition of a comet was deemed irresponsible. Irrational fear raised by a childish superstition might promote panic reactions.[137] Preachers who spread frightening messages should not be tolerated,

135 Johann Mayer, *Vorstellung Deß jüngst-erschienenen Cometen […]*, Ulm 1681.

136 Caspar Neumann, *Des Noah Regenbogen und der itzt brennende Comet*, Breslau 1681, pp. 7–9, 19–24, 32n. and 35n; Barbara Bauer, Art. „Neumann, Caspar", in: *Killy Literaturlexikon*, vol. 8, Gütersloh 1990, p. 364 and 373.

137 Here is a short list of titles which criticize comet sermons as using pia fraus: *Anti-Scepticus. Verwerffung des Cometen-Gespötts*, [s.l.] 1681; *Unmaßgebliches Bedencken/ Ob die Kometen zukünfftige Unglücks-Fälle […] verkündigen. Aus Veranlassung des jüngsthin neu-erschienenen Cometen*, [s.l.] 1681; *Wiederholtes vnd vertheidigtes ohnmaßgebliches Bedencken von der Cometen-Bedeutung/ wider die bey einer vnter dem Namen Zettel-Schreyer/ vor wenig Tagen außgegangenen Cometen-Predigt*, [s.l.] 1681; *Fax mira non dira: Das ist/ Strobel-Schwantz-Stern/ Bart-Cometen/ Seynd nicht böse Straf-Propheten. Oder Auß der H Schrifft/ der Natur und Erfahrung gezogener Bericht und Beweißthum/ daß die Cometen Nach gemeinen und irrigen Wahn keine Unglücks-Sterne seyen* [s.l.] 1681; Simon Bornmeister, *Christlich-vernünfftige Cometen-Betrachtung*, Nürn-

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but reprimanded as mischief makers. When they discredited themselves and abused the Gospel by their unbiblical interpretation of celestial phenomena that astronomers hoped to explain naturally, the magistrate should be entitled to suspend them from their ministry. Thus the misconduct of theologians who used comets as a means to increase piety by intimidation was a common topic in German pamphlets that were issued only few years before Pierre Bayle argued that, compared with the noxious effects of superstition, a society of enlightened atheists would be a lesser evil than a collection of superstitious Christians. The burden of proof with regard to religious orthodoxy was no longer on those who sympathized with the Antitrinitarian intellectuals of the 16th century, but rather, it was now the turn of comet preachers to justify themselves for declaring a comet supernatural.

Enlightened followers of Dudith, Erastus and Squarcialupus were eager to demonstrate that true Christians had the task of distinguishing between God's commandments, and natural phenomena on Earth that could be scientifically explored by reference to natural laws.

> Thomas Erastus und Marcellus Scarcia-Lupus [!], Hochgelehrte Männer/ [haben] den Cometen das Schmachkleid allerdings abgezogen/ und mit sattem grund bewisen/ daß solche keines/ weder gemeinen noch sonderbaren Jamers Zeichen/ weniger eine Vrsach weren/ wider die Cometschreier (Cometomanticeis). Mich/ der ich zwaren vormals anderst gesinnet war/ haben sie jedoch mit etwas zwang auch auf ihre Seiten gebracht/ und gelehrt/ mit dapferkeit die Vernunft brauchen (fortiter philosophari) das ist/ ob mich in geringsten [nicht] bestürzen zu lassen.[138]

Johann Jacob Müller's *Theologisches Bedencken* is an answer to an anonymous pamphlet (Scarteck), in which ministers were suspected of abusing their office and were accused of misunderstanding Holy Scripture by teaching what Müller deemed simply his duty: "die ausser-ordentliche Himmels-Zeichen/ als die Cometen sind/ seyen Göttliche Schröckzeichen/ darzu geordnet/ dass sie die sichere Welt aus jhrem Schlaff zur Buss aufmahnen und wecken."[139]

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berg 1681; Johann c. Burggrav, *Wolgemeinter und Nicht weniger warhaffter Discours, Von den Prognosticis und Deutung der Cometen*, Frankfurt a. M. 1681.

138 [Anonymous] *Philologischer Discurs über der Cometen Bedeutung*, Zürich 1665, p. 12, with reference to Matthias Bernegger; cf. Rudolf Wolf, "Notizen zur Geschichte der Mathematik und Physik in der Schweiz", in: *Mitteilungen der naturforschenden Gesellschaft in Bern* 87–166 (1847–1849), pp. 101–108. Although Anonymous agrees with Squarcialupus' critique of judicial astrology and prefers Seneca's opinion (in *Naturales quaestiones* VII,28) to the peripatetic comet theory, he does not reject the opinion, "daß die Wunderzeichen Gottes uns einzig und allein zu Gott und seinem Wort weisen und leiten" (p. 3 and 32).

139 *Theologisches Bedencken/ über das Jüngsthin ohne Anzeig deß Auctoris, Zeit und Orts in Druck gegebene also genante Einfältige Bedencken von Cometen Als fälschlich eingebildeten/ und ohne Grund der Schrifft außgeruffenen Buß=Predigern/ zusampt einem Lateinischen Anhang wider Marcell. Squarcialupum und Andream Dudithium. Gestellet durch M. Jo. Jacob Müllern/ Ulmens. Deß Ehrwürdigen Ministerii zu Augspurg Seniorem und Pfarrern der Evangelischen Kirchen zu Parfüssern genandt*, Frankfurt 1681, An den Christlichen Leser. The anti-astrological *Scar-*

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Müller was indignant because the anonymous pamphleteer, obviously a lay person, dared to teach him how to use Holy Scripture correctly. The pamphleteer denounced the supposed duties of comet preachers by pretending that ministers ought to explain the Bible instead of interpreting comets as divine messengers, even though the Bible does not mention them at all. Müller took pains to show that the prophesies in Matthew 24 and Luke 24 could be extended to the evil significance of comets. Müller continues by analyzing the anonymous objections sentence by sentence, searching for appropriate passages about all kinds of heavenly signs in the Holy Scripture. He distinguishes between articles of faith that may be deduced from the Bible, and other issues which cannot be directly derived from the teaching of Jesus and the prophets, but only implicitly linked to them.

Physicotheology provides arguments from scientific observations of nature in favor of God's existence, His omnipotence and His omniscience as the benign Creator. "Gottes aber in seinen Wercken preisen/ ist ein Gottesdienst" (p. 6). God not only manifests his omnipotence by anomalies of nature; his ingenuity can be detected by scientists who try to trace the laws of nature according to which God acts. Thus, the properties of a magnet may be praised because they manifest the subtle wisdom of God, although these are ignored by the sacred authors, but *these qualitates occultae* can also be scientifically investigated.. The attractive forces inside the magnet call for an allegorical interpretation. The same is true of comets. Holy Scripture teaches us how to admire the works of Creation and to make use of them in order to gain a better understanding of God. *Deus & natura nihil facient frustra*: therefore we may expect that extraordinary phenomena such as comets have a divine purpose, which can be guessed from their shape and color. They are "ein Anzeig/ daß der Herr in seiner Ruhe verstöret/ sich auffgemachet habe zu drohen/ zu richten und zu straffen." (p. 9) It is Müller's ambition to demonstrate that he is an expert in the hermeneutics of the Bible as well as in the teaching of orthodox faith. He also quotes famous astronomers of his time in favor of the supernatural significance of comets. Gianbattista Riccioli SJ had defended the central position of an immobile Earth in a cosmos where the fixed stars rotated at an enormous speed. Properties of celestial objects which transcend our imagination were particularly appropriate to inspire our admiration of God's omnipotence, for the plans of his Providence were far beyond the laws of nature that scientists were able to deduce. Therefore Riccioli also recommended that his readers look at comets as divine messengers urging us to repentance (p. 55). If comets were of elementary matter and were objects in the atmosphere, they might still have lasting physical effects. If, however, comets were made of heavenly matter, they would be closer to God and have the task of warning us

teck can be identified: *Vnmaßgebliches Bedencken/ Ob die Cometen zukünfftige Vnglücksfälle/ als Krieg/ Theurung/ Pestilentz/ grosser Herrn Todt etc. verkündigen. Auß Veranlassung des jüngsthin neu-erschienenen Cometen/ Auff vielfältiges Begehren und Anhalten kürtzlich eylfertig/ und einfältig entworfen. […]* 1681.

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to be aware of His majesty and Providence, in which case their effects would be even more fundamental and general.

The *spiritus rector* lurking behind the anonymous author of the *Scarteck* was still identified with Squarcialupus, whose mockery of theologians offended Müller in particular. In his "Opinion von Cometen" Squarcialupus "eifert und gaifert wider die Theologen/ so die Cometen für himmlische Zorn-Zeichen ansehen" (Müller, Vorrede). He and Dudith are the precursors of contemporaries who ridicule theologians („unserer heutigen Verächter berühmter Vorgänger"). Müller rebuffed the suspicion of manipulating his flock by *pia fraus*. Conscientious theologians would never apply bad means in order to achieve something beneficent; otherwise they would be defying God's commandments (p. 66n). Müller is aware that the suspicion of pia fraus undermines the authority of theologians and rather encourages dissenters to mockery: "indem man den Spöttern Anlas zu sagen gibet: sihe/ die Priester braucht man nur/ daß sie sollen den gemeinen Mann im Zwang halten/ vnd ihm von der Hölle sagen/ wann er zu muthig wird/ und vom Himmel/ wann er zu sehr betrübt ist." (p. 67) If this were true, the effect of a comet sermon would be just the opposite of what the preacher intended. Hopefully, the mockers are not atheists themselves. But mockers of this kind denying the arrival of the Last Judgment had already been named by Peter in his second letter (2 Peter 3:3–4). Müller protested against the impression evoked by the reformed historian Jacques-Auguste de Thou (1553–1617) that Charles V had fallen prey to comet preachers, evidenced by his deciding to retire, because he was afraid of the threatening consequences of the comet in 1556.[140] Actually, the Emperor was prompted to abdicate for other reasons.

The most intriguing mocker, however, is Squarcialupus. His *opinio de Cometa* inspired Müller to write a detailed refutation in Latin which covers 45 pages. But what means does Müller have to justify himself and save his reputation? He comes up with traditional polemics: Jesuits recommend pia fraus, surely not Lutherans! (p. 6–9) Squarcialupus is not able to produce scholarly syllogisms. His reasoning is deficient: "arguatur argutiolam illam frivolam & vulgarem, nullum fore cometarum finem, totumque semper coelum incendijs arsurum, si propter peccata cometae ex alto incendantur" (p. 40). Squarcialupus here talks about sins in general, although he does not take into account crimes which provoke God's particular indignation. When the Italian physician is doubtful about the means of divine Providence and suggests that there were less ambivalent ways for God to threaten than by comets that do not just vanish as soon as His intention is fulfilled, Müller launches Paul's *admonitio* to his enemy (Romans 9:20): Who are you that you dare to prescribe to your Creator which means are the most appropriate for Him? (Appendix, p. 5) There is good evidence for the conjecture that comets were included among the signs that announce the Last Judgment (according to Matthew 24 and Luke 21). In his *Historia belli Judaici,* Flavius Josephus mentioned

140 Cf. above, note 119. Thuanus, *Historiarum sui temporis opera*, p. 370 A.

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among the miraculous omina a comet which had the shape of a sword and anticipated the ruin of the temple as well as the surrender of Jerusalem to the Roman enemies[141] (p. 17). There are other testimonies from antiquity confirming that in the year 72 the comet which looked like a celestial sword dangling above Jerusalem was extraordinary and supernatural. Objections that the apparition could not have been a comet, for it was stationary, hanging and quivering (*libravit, vibravit*) in the sky for one year, were destroyed by Riccioli (p. 19). At last Müller pulls an argument against the adversary *ab auctoritate ecclesiae* from his quiver, owing to a lack of further scientific arguments to defend his case: Anyway, Antitrinitarians are not trustworthy and are no experts in interpreting the Bible. Dudith succumbed to Squarcialupus' bad influence when he characterized Holy Scripture as a *regula Lesbia*, which Müller finds scandalous (p. 41). He quotes at length Gisbert Voetius dealing with Squarcialupus and his allies Lelio and Fausto Sozzini and Valentino Gentile in his *Exercitatio de prognosticis Cometarum*. They were refugees who were freely admitted by the Protestant church, where they propagated their blasphemies without hindrance (p. 42). Likewise, Dudith wrote a blasphemous letter to Jan Lasicki, in which the notion of the Trinity is reduced to absurdity (p. 43). Müller blamed Antitrinitarians for not being trustworthy as theologians. The argument exactly mirrors Dudith's and Squarcialupus' apprehension that they might be accused of impiety because they did not accept the authority of theological soothsayers. While both may be credited with paving the way to new science by arguing from experience and common sense, Müller's defense of the supernatural significance of comets ignores Dudith's and Squarcialupus' advice not to interfere with God's secret council, but to focus merely on phenomena which were accessible to reason and to the senses. These tools served equally to analyze the sacred text and the book of nature. Dudith and Squarcialupus defied the doctrine of the Church as an illegitimate abstraction from the Biblical text. Their critical attitude and quest for knowledge based on experience and solid reasoning moved the two intellectuals to publicly defeat the *astrologastri* and their blasphemous theology.

The debate about comets and astrological predictions of catastophes following them was instigated by Dudith and his circle. They rigorously denied the theological framework of astrology that Melanchthon and his followers had constructed. Dudith and his circle initiated a controversy that was still current when Pierre Bayle published his *Pensées diverses sur la comète*. I assume that Bayle was aware that his reasoning against the Aristotelian theory and against the conjecture that comets are signs of a divine message took advantage of anti-astrological arguments by radical Protestants.[142] Bayle argues that if God had created comets

141 Flavius Josephus, "Von den jüdischen Kriegen", book VI, ch. 31, in Conrad Lauterbach's German translation *Flauij Josephi […] Historien vnd Bücher: Von alten jüdischen Geschichten* […], Strasbourg 1574, p. 547.

142 Bayle, *Pensées diverses sur la comète* (n. 71), vol. 1, §§ 57 and 75, vol. 2, § 11, 146, §§ 227–230; cf. Yves Bizeul, "Pierre Bayles Kritik des Aberglaubens und Plädoyer für die Toleranz", in:

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with the purpose of stimulating piety, he might be blamed for having supported idolatry. The God of the *Cometomantices* is a heathen deity. Bayle provides a subtle caricature of the way theologians like Müller defended the popular belief in comets as prodigies. Bayle's famous argument that astrological superstition, a legacy from pre-Christian times, is more harmful to a society than the reasoning of atheists who are aware of their moral responsibility, is also reminiscent of Dudith's and Squarcialupus' reasoning that astrologers who accuse their more enlightened enemies of impiety in fact abuse theology themselves to defend superstition.[143]

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143 I am very grateful to Dr. Eric Mace-Tessier (Berne) who corrected my English writing.

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Celestial Phenomena in Early Modernity: The Integrated Image of Comets*

Anna Jerratsch

1 Introduction

In the early modern age, comets were regarded as frightening, near-inexplicable phenomena sent by God. They became the condensation core of experiments in knowledge production and interpretation of the world. At a time in which the debate about nature evolved within a novel form of communications culture and public domain, particularly in the German-speaking areas, the developing scientific and cultural relevance of comets was expressed in media and literature by a bevy of small German-language publications. The chart below strikingly illustrates how the number of these writings grew between around 1530 and 1682 to an unprecedented peak that was never achieved again.[1]

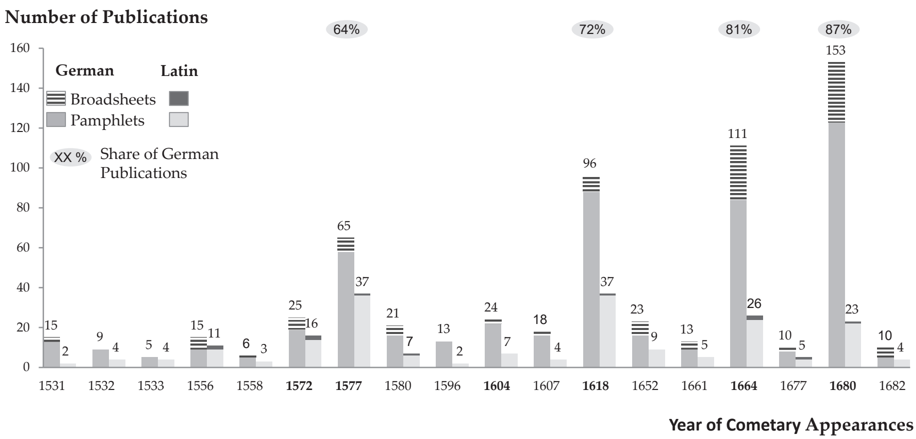

Fig. 1.1: Overview of source material.

* This paper is loosely based on a chapter of the dissertation *Der frühneuzeitliche Kometendiskurs im Spiegel deutschsprachiger Flugschriften*, submitted in 2017 at the Humboldt University in Berlin. English translation by Karen Margolis.

1 In this period, aside from several bright and impressive yet smaller comets, the four Great Comets of 1577, 1618, 1664/65 and 1680 appeared, as well as two supernovae (1572 and 1604);

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It was the specific historical situation of an era when religious and political instabilities and the crumbling of social and intellectual orders made people insecure, and the need to explain nature and cope with daily life was expressed with reference to the celestial sphere and its inexplicable phenomena. At that time, moreover, technical, theoretical and practical methods of observation, and mathematical and physical description, made it possible to research comets empirically in a previously unknown way. In the sixteenth century this led to the discovery of the law that the comet's tail always points away from the sun, and the superlunary characteristics of comets. The first discovery was made in the context of the comets of 1530, and the second in relation to the Great Comet of 1577.

Such observational results, which could not be explained altogether satisfactorily, made comets *challenging objects*.[2] With the background of the fruitful intellectual renewal brought by the Renaissance and humanism—influenced by the re-emergence of diverse ancient knowledge stocks and traditions—comets aroused interest as objects of theoretical conceptualization and symbolic interpretation, inspiring scholars to revisit and revise traditional explanatory and interpretative models and to ask and answer old questions in new ways. This paper focusses mainly on the second half of the sixteenth century, which is marked by the formation and consolidation of what is known as the integrated image of comets. This image of comets has two essential pillars, first, the theologized natural philosophy of Philipp Melanchthon, and second, the augmented theory of comets that forms the basis of the theoretical description of comets and represents a link between Aristotelian meteorology, Stoic philosophy, and astrological prognostics. This created a dual cometary concept that closely linked the view of comets as causally operative and symbolically meaningful, as well as their causal explicability, with their astrological and theological interpretability.

Two important events, and their consequences, significantly influenced the discourse about comets as seen in the small publications: the invention of printing and the Reformation. In particular, their reciprocal stimulation made them culturally relevant. Whereas people in the Middle Ages largely engaged in cometomancy, in the Renaissance cometology became popular.[3] A systematic prognostics with its causal underpinning in the form of meteorological theory could be more easily integrated into the contemporary attempt to promote the establishment of an obser-

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these appearances were described and interpreted in a growing number of German-language pamphlets.

2 For the topic of *challenging object*, see Jochen Büttner, "The Pendulum as a Challenging Object in Early—Modern Mechanics," in: *Mechanics and Natural Philosophy Before the Scientific Revolution*, eds. Walter Roy Laird and Sophie Roux, Dordrecht 2008, pp. 225–239; Jürgen Renn/Peter Damerow/Simone Rieger, "Hunting the White Elephant: When and How did Galileo Discover the Law of Fall?," in: *Science in Context* 13/3–4 (2000), pp. 229–419 and Domenico Bertoloni Meli, *Thinking with Objects. The Transformation of Mechanics in the Seventeenth Century*, Baltimore 2006.

3 Viktor Stegemann, "Komet," in: *Handwörterbuch des deutschen Aberglaubens 5*, eds. Hanns Bächtold-Stäubli and Eduard Hoffmann-Krayer, Berlin 1932/33, Col. 89–170, Col. 114.

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vation-based epistemology and the scientific study of the arts. At the same time, the Protestant Reformation led to the flourishing of the prodigy system, which Tabitta van Nouhuys characterizes as the comeback of the teratological tradition which linked the divine with the natural and directed the focus towards the symbolic dimension of comets.[4] The Protestant doctrine spread primarily through the medium of the sermon, but also through minor literature such as broadsheets and pamphlets with their own developing market and readership. The authors had a corresponding consumers' circle that became bigger and more heterogenous, opening up entirely new possibilities of influence for them and their writings.[5] The socio-cultural event of the Reformation consequently created a need for information and communication, which signaled the breakthrough of the printing technology that had already existed for several decades.[6]

This communications revolution was an important structural factor in the discourse about comets—not least because it helped to disseminate and securely establish astrological practice in the consciousness of a wider public. In this process, the aforementioned boom in astrology was reflected in functional literature on astrology for lay readers as well as in scholarly treatises. Important works on astrology, which was a well-established science at the universities, include Johannes Schöner's *De iudiciis nativitatum libri tres* (1545), Girolamo Cardano's *Commentaria* (1554), and Francesco Giuntini's *Speculum astrologiae* (1573).[7] This academic astrology as a self-evident part of the educational sphere in early modern Europe was also connected with humanism, for instance, as shown by the well-researched examples of Joseph Grünpeck (1473–1532) and Georg Tannstetter (1482–1535).[8] The second main pillar of this form of astrology was concerned with politics: many scholars with a good knowledge of astrology had close links with ruling families as court advisers, among them Johannes Carion (1499–1537), Johannes Lichtenberger (ca. 1440–1503), Georg Peurbach (1423–1461), the aforementioned

4 Tabitta van Nouhuys, *The Age of TwoFaced Janus. The Comets of 1577 and 1618 and the Decline of the Aristotelian View in the Netherlands*, Leiden 1998 (Brill's Studies in Intellectual History 89), pp. 415–417.

5 Silvia S. Tschopp, "Review of Talkenberger, Heike, *Sintflut. Prophetie und Zeitgeschehen in Texten und Holzschnitten astrologischer Flugschriften 1488–1528*," Tübingen 1990 (Studien und Texte zur Sozialgeschichte der Literatur 26), in: *Zeitschrift für Kirchengeschichte* 104/XLII (1993), pp. 120–123.

6 See Holger Flachmann, *Martin Luther und das Buch: Eine historische Studie zur Bedeutung des Buches im Handeln und Denken des Reformators,* Tübingen 1996 (Spätmittelalter und Reformation. Neue Reihe 8), and the literature mentioned in this study.

7 Cf. Marion Gindhart, "Astrologie," in: *Höfe und Residenzen im spätmittelalterlichen Reich. Bilder und Begriffe. Vol. 1: Begriffe*, ed. Werner Paravicini, Ostfildern 2005 (Residenzenforschung 15 II/1), pp. 235–238, p. 235.

8 See Sarah Slattery, "Astrologie, Wunderzeichen und Propaganda. Die Flugschriften des Humanisten Joseph Grünpeck," in: *Zukunftsvoraussagen in der Renaissance*, eds. Klaus Bergdolt and Walther Ludwig, Wiesbaden 2005 (Wolfenbütteler Abhandlungen zur Renaissanceforschung 23), pp. 329–347. For Tannstetter, see Franz Graf-Stuhlhofer, *Humanismus zwischen Hof und Universität. Georg Tannstetter (Collimitius) und sein wissenschaftliches Umfeld im Wien des frühen 16. Jahrhunderts*, Vienna 1996 (Schriftenreihe des Universitätsarchivs 8), pp. 128–144.

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Georg Tannstetter, Peter Apian (1495–1552), Cyprian von Leowitz (1524–1574), and later, Heinrich Rantzau (1526–1598), Christoph Rothmann (ca. 1555–1601), Tycho Brahe (1546–1601), Johannes Kepler (1571–1630), and Galileo Galilei (1564–1641).[9]

The court astrologers, who sometimes also doubled as personal or municipal physicians, drew up astrological tables, astronomical ephemerides, and calendars and prognostic works such as practical manuals and almanacs. This list shows how narrow the distinction was between the academic and scholarly form of astrology and the popular or lay version, at least in terms of the media involved. While it was already customary to publish an almanac for the coming year in Italian universities in the fourteenth century, European universities began following suit in the fifteenth century: in time, almanacs grew to become prestige objects of the universities.[10] As the calendars had to be recalculated every year, the profession of calendar calculators gradually developed. Initially they were highly respected and could practice their profession alongside or as part of their work as university professors.[11] Combined with the media revolution linked with letterpress printing, aids such as ephemerides, oracle spread charts, and charts for calculating the solar cycles increasingly obviated the need to make one's own calculations and contributed to taking astrology out of the experts' study chambers and bringing it into the streets and markets. This made astrology a matter for public discussion, which it then helped to constitute.[12] The academic-scientific and the profane form of astrology were also combined in the pamphlets on comets, helping to concretize the astrological significance of the celestial phenomenon. In this context, astrology was, on the one hand, part of the natural history explanation of cometary origins and effects and, on the other hand, it referred

9 For details, see Günther Oestmann, *Heinrich Rantzau und die Astrologie: Ein Beitrag zur Kulturgeschichte des 16. Jahrhunderts*, Braunschweig 2004 (Disquisitiones Historiae Scientiarum: Braunschweiger Beiträge zur Wissenschaftsgeschichte 2); John R. Christianson et al. (eds.) *Tycho Brahe and Prague. Crossroads of European Science*, Frankfurt am Main 2002 (Acta Historica Astronomiae 16); Gadi Algazi, "Keplers Apologie. Wissensproduktion, Selbstdarstellung und die Geschlechterordnung," in: *Wissen, maßgeschneidert. Experten und Expertenkulturen im Europa der Vormoderne*, eds. Björn Reich, Frank Rexroth, and Matthias Roick, Munich 2012, pp. 214–248; Mario Biagioli, *Galileo Courtier: The Practice of Science in the Culture of Absolutism*, Chicago 1993; *Johann Carion (1499–1537). Der erste Berliner Astronom*, eds. Dietmar Fürst and Jürgen Hamel, Berlin 1988 (Archenhold-Sternwarte Vorträge und Schriften 67); Dietrich Kurze, "Popular Astrology and Prophecy in the Fifteenth and Sixteenth Centuries: Johannes Lichtenberger," in: *'Astrologi hallucinati'. Stars and the End of the World in Luther's Time*, ed. Paola Zambelli, Berlin 1986, pp. 177–194. On the political role of medieval astrology, see Gerd Mentgen, *Astrologie und Öffentlichkeit im Mittelalter*, Stuttgart 2005 (Monographien zur Geschichte des Mittelalters 53).

10 Cf. Christoph Schöner, "Peter Apian und die Universität Ingolstadt. Aushängeschild oder Außenseiter," in: *Peter Apian. Astronomie, Kosmographie und Mathematik am Beginn der Neuzeit*, ed. Karl Röttel, Eichstätt 1995, pp. 39–46, p. 41.

11 Cf. Joseph H. Biller, "Die Wandkalender Peter Apians," in: *Peter Apian*, ed. Karl Röttel, Eichstätt 1995, pp. 147–152, p. 147.

12 In this context, Stuckrad refers to a "new formatting of the astrological discourse;" cf. Kocku von Stuckrad, *Geschichte der Astrologie. Von den Anfängen bis zur Gegenwart*, Munich 2003, p. 242.

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to the symbolic character of the celestial apparition because it represented its primary instrument of interpretation. It was these two founding contexts of astrological prognostics, astronomy and the apocalyptic or, in more general terms, natural history and theology, that Melanchthon referred to when he extrapolated astrology into a universal hermeneutic art.[13]

1 Melanchthon's Theologized Natural Philosophy

Interpreting the comets as divine symbols is an element of a Christian theology and a perspective on nature that took different forms according to religious confession in the aftermath of the Reformation. Instead of the Catholic miracles of the saints, Protestants interpreted highly unusual natural phenomena as miraculous signs.[14] Enthusiasm for prodigies was a largely Protestant phenomenon, particularly in German-speaking regions.[15] However, the boom in literature on prodigies from the mid-sixteenth century was a European-wide event on a comprehensive scale. It occurred both in Latin treatises and in vernacular writings, drew sources from ancient philosophy as well as from contemporary occasional literature, and was equally at home in humanist-influenced elite culture and in popular folk culture.[16] It arose from a combination of the compilation style of the times with a "condensation of communication" following the establishment of letterpress printing, and was thus an "artifact of the printing press," with its success based on its function of overcoming social distress and religious uncertainty.[17] It is not enough to point to the masses' appetite for sensations or the

13 See Walter Sparn, "Astrologie im frühneuzeitlichen Luthertum. Theoretische Begründung und lebenspraktische Bedeutung," in: *Himmelsspektakel. Astronomie im Protestantismus der Frühen Neuzeit* eds. Sascha Salatowsky and Karl-Heinz Lotze, Gotha 2015 (Publication No. 52 from the Forschungsbibliothek Gotha 52), pp. 39–47, and Claudia Brosseder, *Im Bann der Sterne. Caspar Peucer, Philipp Melanchthon und andere Wittenberger Astrologen*, Berlin 2004, pp. 99–109.

14 Anna Mańko-Matysiak, *Das Teufelsmotiv in der schlesischen Wunderzeichenliteratur der Frühen Neuzeit*, Marburg 1999 (Schriftenreihe der Kommission für deutsche und osteuropäische Volkskunde in der Deutschen Gesellschaft für Volkskunde e.V. 79), p. 81.

15 For details, see Philip M. Soergel, *Miracles and the Protestant Imagination: The Evangelical Wonder Book in Reformation Germany*, Oxford 2012. Conversely, French literature on prodigies seems to have been largely Catholic-influenced: see Rudolf Schenda, *Die französische Prodigienliteratur in der zweiten Hälfte des 16. Jahrhunderts*, Munich 1961 (Münchener romanistische Arbeiten 16), and Martin Döring, "Von der Wundergeschichte zum 'fait divers'. Untersuchungen zur Berichterstattung über Kometen in französischen canards an der Wende vom 16. zum 17. Jahrhundert," in: *Vom Flugblatt zum Feuilleton. Mediengebrauch und ästhetische Anthropologie in historischer Perspektive*, eds. Wolfram Nitsch and Bernhard Teuber, Tübingen 2002, pp. 129–146. The most comprehensive contemporary compendium on miracles was written by the Jesuit Caspar Schott—see Dietrich Unverzagt, *Philosophia, Historia, Technica. Caspar Schotts Magia Universalis*, Berlin 2000.

16 Rudolf Schenda, "Die deutschen Prodigiensammlungen des 16. und 17. Jahrhunderts," in: *Archiv für Geschichte des Buchwesens 4* (1963), Col. 637–710.

17 Franz Mauelshagen, "Die 'portenta et ostenta mines lieben herren unsers säligen … ', Nachlassdokumente Bullingers im 13. Buch der Wickiana," in: *Zwingliana XXVIII* (2001), pp. 73–117, p. 77. For the process of condensation of communication, see also Brendan Dooley, "Die Entstehung von Gleichzeitigkeit im europäischen Bewusstsein auf der Grundlage

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possibility of polemicizing and instrumentalizing as the main motivating factors for literature about prodigies, because it is entangled with more complex communicative contexts: for example, the writings often contained a sober, descriptive account, which was, above all, open to interpretation, and was part of the communication—including the political discourse—of an educated elite, from whence it often found its way into publications and historiography.[18]

An important factor in the Protestant enthusiasm for prodigies was the location of divine symbols in a framework of apocalyptic interpretation.[19] Another European phenomenon, the eschatological world view, was spread particularly by Lutherans in the period from the mid-sixteenth century to the beginning of the Thirty Years' War. They gave meaning to the experience of the crisis-ridden present by interpreting all kinds of events as apocalyptic—for example, extraordinary natural and celestial phenomena such as appearances of comets or haloes, parhelions (sundogs), and blood moons or other *meteora*, as well as blood rain, malformed animals and monstrous births.[20] The theological legitimation for this was based on the aforementioned Bible passages, which Luther understood literally and interpreted as political polemic, for example, describing the papacy as a personification of the Antichrist.[21] This perspective on the Apocalypse was additionally underpinned by the concept of living in periods with particular eschatological connotations. For instance, various calculations of the age of the world were based on the Bible, and additionally referred to astronomic cyclicity and its astrological implications. For the year 1524, for example, a flood disaster was forecast; or the year 1588, which occurred at the end of the "fiery trigon" conjunction, was expected to be a year of great miracles and cataclysmic changes.[22] Prognoses like this, which created uproar in the population and were hotly debated in schol-

der politischen Nachrichtenpresse," in: *Presse und Geschichte. Leistungen und Perspektiven der historischen Presseforschung*, eds. Astrid Blome and Holger Böning, Bremen 2008, pp. 49–66.

18 Cf. Mauelshagen, "Die 'portenta et ostenta mines lieben herren unsers säligen … '," pp. 92–95.

19 For a principal source, see Robin B. Barnes, *Prophecy and Gnosis. Apocalypticism in the Wake of the Lutheran Reformation*, Stanford 1988.

20 See Volker Leppin, *Antichrist und Jüngster Tag. Das Profil apokalyptischer Flugschriftenpublizistik im deutschen Luthertum 1548–1618*, Heidelberg 1999 (Quellen und Forschungen zur Reformationsgeschichte 69).

21 See Hans-Georg Kemper, *Deutsche Lyrik der Frühen Neuzeit*, Vol. 2: *Konfessionalismus*. Tübingen 1987, p. 34.

22 The prognosis originated from the astronomer Johannes Stoeffler, who interpreted 20 planetary conjunctions—sixteen of them in water signs – as portents of an impending great flood; cf. Reiner Reisinger, *Historische Horoskopie. Das iudicium magnum des Johannes Carion für Albrecht Dürers Patenkind*, Wiesbaden 1997 (Gratia 32) [simultaneously a dissertation from Bamberg University 1995], p. 248. For the miraculous year 1588, see Matthias Pohlig, *Zwischen Gelehrsamkeit und konfessioneller Identitätsstiftung. Lutherische Kirchen- und Universalgeschichtsschreibung 1546–1617*, Tübingen 2007 (Spätmittelalter und Reformation, Neue Reihe 37), pp. 207–223. For a general view of this kind of celestial prophesy, see Germana Ernst, "From the Watery Trigon to the Fiery Trigon: Celestial Signs, Prophecies and History," in: *'Astrologi hallucinati'. Stars and the End of the World in Luther's Time*, ed. Paola Zambelli, Berlin 1986, pp. 265–280.

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arly circles, developed their social impact through numerous broadsheets and give a vivid picture of the connection between Christian and astrological ideas.[23]

The symbolic character of comets and their sudden, frightening appearance predestined them for eschatological interpretation. This type of interpretation of comets can virtually be seen as a theological special case in astrology, based on the comets being integrated into a specific form of Christian religiosity rooted in an extreme consciousness of sin.[24] Authors like Leppin have shown in detail how eschatological and astrological explanations mutually inspired each other in this process.[25] The interpretive method based on the analogy principle corresponds to an emblematic process of interpretation that was not seen as an arbitrary, allegorical presentation of readings but as the consequence of given factors in nature.[26] The more the apocalyptic-eschatological aspect was suppressed by prognosticative astrology in the transition to the seventeenth century, the more the usual interpretation of comets as signs of warning and repentance came to the fore.[27] In this context, comets served a dual function, first, by warning against continuing along the path of sinfulness, and second, by representing the negative effects, as it were, the punishment for the impenitent.[28] Admonition and warning was an integrative component of the normative system of a theology of repentance and punishment that formed the basis of the social world that people inhabited, secured it, and guaranteed its future. For this reason, comets were instrumentalized in this function, in sermons, for example.[29] These comet sermons were a special subsidiary form of the comet pamphlet, which could vary considerably in content, style, and ambition. Whereas some comet sermons were simply written versions of oral sermons and are typified by the flow of oral delivery and corresponding brevity, others expanded into extensive treatises with long digressions consisting of theological discussions or polemical debates about confessions.

The idea of comets as penitentiary warnings, which Franz Mauelshagen has described as "the most important paradigm of religious thought,"[30] in the early modern age, is a product of the Christianization of comet-based astrological prognostications combined with ideas of popular superstition that had already

23 For details, see Heike Talkenberger, *Sintflut. Prophetie und Zeitgeschehen in Texten und Holzschnitten astrologischer Flugschriften 1488–1528*, Tübingen 1990 (Studien und Texte zur Sozialgeschichte der Literatur 26).
24 Stegemann, "Komet," Col. 113.
25 Leppin, *Antichrist und Jüngster Tag*.
26 Cf. Kemper, *Deutsche Lyrik der Frühen Neuzeit*, pp. 42–43.
27 Ibid., p. 41.
28 Cf. Sabine Holtz, *Theologie und Alltag. Lehre und Leben in den Predigten der Tübinger Theologen 1550–1750*, Tübingen 1993 (Spätmittelalter und Reformation. Neue Reihe 3), pp. 270–271.
29 Sabine Holtz, "Predigt. Religiöser Transfer über Postillen," in: *Europäische Geschichte Online (EGO)*, Mainz 2011 (http://www.ieg-ego.eu/holtzs-2011–de, accessed 6.9.2014).
30 Franz Mauelshagen, "Review of *Um Himmels Willen. Religion in Katastrophenzeiten*, ed. Manfred Jakubowski-Tiessen and Hartmut Lehmann, Göttingen 2003," in: *H-Soz-Kult, 2004* (http://hsozkult.geschichte.hu-berlin.de/rezensionen/2004–3–004, accessed 2.3.2015).

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appeared in the fourteenth century, long before the Reformation.[31] The concept of symbolic interpretation of comets was extended in the sense that the comets became divine media of communication with a revelatory character.[32] What lay behind this metaphysically conceptualized communication was the topos of the Book of Nature, with the miraculous signs of the Almighty elevated to the level of a holy scripture.[33] The call to penitence and return to God embodied in the comets severed the connection between human sin and God's divine judgment by giving human beings an option to act. The cosmic communication space between God and humans was consequently transformed into a space for interaction as soon as the addressees reacted to God's wrath and began taking action themselves, issuing mandates, practicing repentance, holding supplicatory processions and praying to the Almighty.[34]

In this context, the deciphering of the divine message becomes a Christian duty because God reveals himself in Nature and wants be recognized through Nature: in Melanchthon's doctrine, the Lutheran theology of the word of God is countered by a theology of Nature, and the interpretation of the "Theater of Nature" complements the interpretation of God's word as a hermeneutic process.[35] For Melanchthon, astrology was the effective instrument of this interpretation, because God created Nature in such a way that humans, by exploring it, could make an image of the plan of creation and of divine attributes.[36] In this form of a Christian theology, people interpreted the arrangement of the celestial spheres, the planetary aspects and other sidereal constellations as signs of a language by which God gave his Church instructions on its future behavior.[37] This concept of astrology preserved both human freedom of will and divine omnipotence, offering a way out of the old dilemma of the incompatibility of deterministic stargazing and Christian theology.[38] Melanchthon solved the problem by stating that natural occurrences and human dispositions are formally conditioned by the influence of planetary constellations, but that these cannot be understood in

31 Stegemann, "Komet," Col. 111.

32 Döring describes it as "a container of the divine act of speech," cf. Döring, *Von der Wundergeschichte zum 'fait divers'*, pp. 133–135.

33 Franz Mauelshagen, "Verbreitung von Wundernachrichten als christliche Pflicht. Das Weltbild legitimiert das Medium," in: *Medien und Weltbilder im Wandel der Frühen Neuzeit*, eds. Franz Mauelshagen and Benedikt Mauer, Augsburg 2000 (Documenta Augustana 5), pp. 133–154, p. 152.

34 Ibid., p. 153.

35 Volkhard Wels, *Manifestationen des Geistes*. Frömmigkeit, Spiritualismus und Dichtung in der Frühen Neuzeit, Göttingen 2014 (Berliner Mittelalter- und Frühneuzeitforschung 17), p. 106.

36 Barbara Mahlmann-Bauer, "Die Bulle 'contra astrologiam iudicariam' von Sixtus V., das astrologische Schrifttum protestantischer Autoren und die Astrologiekritik der Jesuiten. Thesen über einen vermuteten Zusammenhang," in: *Zukunftsvoraussagen in der Renaissance*, eds. Klaus Bergdolt and Walther Ludwig, Wiesbaden 2005 (Wolfenbütteler Abhandlungen zur Renaissanceforschung 23), pp. 143–222, p. 178–179.

37 Mahlmann-Bauer, "Die Bulle 'contra astrologiam iudicariam' von Sixtus V.," pp. 145–146.

38 Cf. Gindhart, "Astrologie," p. 238.

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terms of an actual total causality, which is basically a distinction that corresponds exactly to the borderline between *astrologia naturalis* and *astrologia iudicaria*.[39] Melanchthon believed that the use of his theologized natural philosophy enabled him to overcome this very border. In this context, moreover, it is possible to explain miraculous signs in terms of natural causes.

Although Melanchthon did not invent this kind of natural theology, he was the person who implemented it in the Protestant tradition and, in doing, so, opened Protestantism to the natural sciences.[40] The compensatory shift of *miracula* as a Catholic domain to a miracle of nature in the context of the Reformation's enthusiasm for prodigies was reflected in a changed definition of wonders: comets as miracles were no longer required, at least in principle, to be explicable by natural causes, while comets as prodigies virtually demanded explanation, in several respects: first, because God was not the sole cause of the occurrence, and second, because his message incorporated in the natural process required decoding. God communicated himself to humans through a series of hierarchically tiered media.[41] This ranking corresponded simultaneously to a hierarchy of the First and Second Causes, which is the basis of the duality of the natural and divine dimension of the description of Nature, that often combined quite harmoniously into an integrated explanatory model of extraordinary natural events.[42] The primacy of theology, which commanded the services of natural philosophy and astrology, was not questioned: natural causes as physically explicable were interposed, as it were; but their cause, in turn, was God, who deployed them and therefore no longer worked indirectly, but directly.[43] The recourse to natural explanations that is virtually postulated by this in the Protestant understanding of nature and God's image resulted in a gradual naturalization of the image of comets, although a secularization through rationalization did not occur: "There is no linear development of the 'modern natural sciences' in which the increase of empirical knowledge implies the decrease of theological and metaphysical ideas."[44]

The conception of comets as miraculous signs is the starting point for a historical way of arguing, because the prodigies occupied an intermediate position between an *Historia hominum* and an *Historia naturalis*, which is why they are relevant both in terms of historiography and natural history.[45] Belief in prodigies is thus an early stage of a historiography that is ultimately oriented toward the history

39 Sebastian Lalla, "Über den Nutzen der Astrologie. Melanchthons Vorwort zum 'Liber de sphaera,'" in: *Fragmenta Melanchthoniana 2. Gedenken und Rezeption. 100 Jahre Melanchthonhaus*, eds. Günter Frank and Sebastian Lalla, Heidelberg 2003, pp. 147–160, p. 158.

40 Cf. Wels, *Manifestationen des Geistes*, p. 106.

41 Mauelshagen, *Verbreitung von Wundernachrichten als christliche Pflicht*, p. 153.

42 Ibid., p. 189.

43 Volkhard Wels convincingly describes this for Melanchthon's perspective on natural philosophy, medicine and astrology in his chapter "causae naturales: naturphilosophische versus theologische Erklärung." See Wels, *Manifestationen des Geistes*, pp. 99–127.

44 Wels, *Manifestationen des Geistes*, p. 128.

45 Mauelshagen, "Die portenta et ostenta mines lieben herren unsers säligen … ," p. 92.

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of salvation. Together, the world of nature and human society form a divine and divinely ordained order; the beginning of the world process with the Creation is also the beginning of the event of salvation. This is why, in Lutheran theology, there is an identity between world history and Church history, and the purpose of all history is established by the relationship to a history of salvation understood in eschatological terms.[46] The historical interpretation of comets is founded on a cyclic and natural conception of history inspired by the cyclicity of astronomical events; this relationship between the history of Nature, the world, and humankind is the reason why past events are meaningful and provide evidence for those of the present and future.[47] If only in retrospect, history documents the divine providence expressed by symbols, which is why studying them offers an empirical basis for astrology by compiling more or less statistically relevant data.[48] Likewise, cometography, which was based on evaluating one's own observations and those of others, occurred in the epistemological mode of *historia*.[49] This is less a discipline than a rhetorical and epistemological instrument established in the literature of the early modern age that was used to link natural objects and events with human and social destinies, and to place them in qualitative contexts of meaning.[50] The historical interpretation of a comet allowed its meaning to be retrospective attributed by declaring specific events as its consequence and therefore as a divine act. At the same time it offered a prospective glimpse of the future. This is how, in Melanchthon's natural philosophy, foundations were laid both for interpreting the past and for prophetic prognostications on a rationalistic basis—in other words, defined by and dependent on experience.[51]

2 The Augmented Cometary Theory

Over the centuries, the astrologization and Christianization of cometary theory described above gave rise to augmented meteorological theory as the dominant paradigm in the Early Modern Age for explaining and interpreting these celestial apparitions. These characterizing descriptions show that augmented meteorological theory based on Aristotle was still the starting point of interpretation of comets. Yet this theory was decisively extended in several respects. The link

46 For the connection between eschatology, theology, and historiography as the grounds for historical argumentation, see Holtz, *Theologie und Alltag.* pp. 52–59.

47 Cf. Kemper, *Deutsche Lyrik der Frühen Neuzeit*, p. 51.

48 Cf. Wels, *Manifestationen des Geistes*, p. 105–106.

49 Michael Weichenhan, "Neugier und Furcht. Blicke auf Kometen in der frühen Neuzeit," in: *Himmelsspektakel. Astronomie im Protestantismus der Frühen Neuzeit*, eds. Sascha Salatowsky and Karl-Heinz Lotze, Gotha 2015 (Veröffentlichungen der Forschungsbibliothek Gotha 52), pp. 59–71, p. 63.

50 See also Adam Mosley, "The History and Historiography of Early Modern Comets," in: *Christoph Rothmann's Discourse on the Comet of 1585. An Edition and Translation with Accompanying Essays*, eds. Miguel Á. Granada, Adam Mosley, and Nicholas Jardine, Leiden 2014 (History of Science and Medicine Library. Medieval and Modern Science 22), pp. 282–325.

51 Brosseder, *Im Bann der Sterne*, p. 111.

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with the Ptolemaic doctrine had made the comets into prognosticable objects that could now be comprehensively interpreted and could even be predicted from specific astral occurrences. The negative consequences attributed to the comets, which could be astrologically specified, were understood as their effects. Like the celestial apparitions themselves, these effects had causes that were as natural as the *meteora* created by earthly exhalations, whose existence implied specific consequences that were understandable in meteorological terms. The theological incorporation of these ideas declared the connection between the emergence, appearance, and meaning of comets as divinely intentional action. Human sinfulness enraged a God who expressed himself symbolically in Nature as his creation and used the celestial phenomenon as a medium of communication that urged repentance and warned of punishment that could, however, be avoided through the return to God and behavior pleasing to God. The view of the past revealed in chronicles and documents underpins the relation of appearances of comets and effects of comets as a causal relationship between previously committed sins and the ensuing punishment by God, with a significance for future events derived from this historicity.

This contemporary, and largely accepted, image of the comets reflects the synthesis of natural-historical formation of theory, astrological augmentation, and theological interpretation. It is the interplay between these three areas that made the image of comets so convincing, because the individual elements mutually supported each other and filled in wherever "gaps" or discrepancies appeared to originate from a single contextual field alone. Weichenhan accordingly characterizes these *opinio communis* as a compromise solution that united disparate elements and was open on many sides—a solution that could be used to neutralize hidden problems in the authentic Aristotelian doctrine. For example, the result of the astrologization of the comets was that, despite their sublunarity, they were brought ontologically closer to stars and planets. This meant that they actually achieved their entry into the scope of astrology, and not only that—it could be stated, for instance, that they not only move in straight lines, as Aristotelian teaching insisted.[52] The causality of the Ptolemaic worldview was transferred to the epistemological status of astrology and augmented meteorological causality. This enabled the problem of the origin of comets to be solved, as the original cause that engendered them was also shifted to the area of celestial bodies concerned with astrology, and therefore natural history. Consequently, through the theological incorporation of the image of the comet, it was not the *causa efficiens* but the *causa finalis* that was attested with a divine act.[53] The conceptualization of celestial apparitions as purposeful messages from God formed the essential driving force of their decipherment by explanations from natural history and astrological interpretation.

52 Cf. Michael Weichenhan, *"Ergo perit coelum … ." Die Supernova des Jahres 1572 und die Überwindung der aristotelischen Kosmologie*, Stuttgart 2004 (Boethius 49), pp. 402–408.
53 Weichenhan, *"Ergo perit coelum … ,"* p. 403.

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The augmented meteorological theory of comets is therefore a productive model responding to different audience interests. On the one hand, there was the need for description and explanation of the frightening phenomenon of the comet through factual information and rational explanation of the event. On the other hand, there was the meaningful classification of the comet in the concrete context of individuals' lived experience as part of a collective supratemporal destiny.[54] Both aspects helped to overcome contingencies and fears, as comet broadsheets explained contemporary crises through natural causes, with the abstract notion of the *comet* as a vehicle that simultaneously transmitted knowledge and carried meaning.[55] The comets acted as a projection surface for content, information, and interpretation, with their perception and representation based on a specific interpretation of reality.[56] The meaning and explanation attributed to celestial phenomena were "the product of a meaningful work" reflecting diverse practices of knowledge culture above and beyond the narrow area of natural history research on comets.[57]

The complex image of comets deriving from different disciplinary approaches was accompanied by a plurality of methods in approaching the phenomenon and involved different coexisting ways of interpreting, as an extremely diverse array of ancient and medieval theories was constantly intermingled with new traditions of interpretation.[58] Due to parameters that sometimes had to be considered interdependently, even a relatively simple model of astrological interpretation of a comet had a degree of complexity that should not be underestimated. A common model originating from the works of Ptolemy and Pliny was expanded as it was handed down over the generations, with the result that a relatively fixed canon emerged, with ten points consisting of observable characteristics of comets: size, color, form, shine, place, and motion, together with tail direction, the comet's position relative to the sun, the projection of the comet's trajectory on the

54 For a historical investigation of the concept of destiny, see Franziska Rehlinghaus, *Semantik des Schicksals. Zur Relevanz des Unverfügbaren zwischen Aufklärung und Erstem Weltkrieg*, Göttingen 2015 (Historische Semantik 22).

55 Döring, "Von der Wundergeschichte zum 'fait divers,'" p. 143. See also Michael Kempe, "Von 'lechzenden Flammen,' 'geflügelten Drachen' und anderen 'LuftGeschichten.' Zur Neutralisierung der Naturfurcht in populärwissenschaftlichen Druckmedien der Frühaufklärung," in: *Medien und Weltbilder im Wandel der Frühen Neuzeit*, eds. Franz Mauelshagen and Benedikt Mauer, Augsburg 2000 (Documenta Augustana 5), pp. 155–178.

56 Cf. Franz Mauelshagen, "Illustrierte Kometenflugblätter in wahrnehmungsgeschichtlicher Perspektive," in: *Das illustrierte Flugblatt in der Kultur der Frühen Neuzeit*, eds. Wolfgang Harms and Michael Schilling, Frankfurt am Main 1998, pp. 101–136.

57 See also the article by Rebekka Habermas, which argues that descriptions of this kind are *meaning production*, in other words, the occurrences in the pamphlets on comets are not an interpretation but are actually based on and organized and produced by a reality; cf. Rebekka Habermas, "Wunder, Wunderliches, Wunderbares. Zur Profanisierung eines Deutungsmusters in der frühen Neuzeit," in: *Armut, Liebe, Ehre. Studien zur historischen Kulturforschung*, ed. Richard Dülmen, Frankfurt am Main 1988, pp. 38–66, p. 41.

58 Döring, "Von der Wundergeschichte zum 'fait divers,'" p. 132.

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earth, and the duration of the appearance.[59] In detailed astrological interpretation these parameters were used to differentiate the negative effects associated with comets.[60] It could be deduced from the color, for example, which specific effects were associated with the dominant planet, such as a red comet being ascribed to Mars and denoting war, unrest, tempest, murder and tyranny, while yellow meteors were Venusian in nature and signified adultery and incest.[61] Similarly, the form of a comet was connected with specific consequences and also linked to the nature of a specific planet. The degree of impact or the extent of the negative consequences of comets was often assessed as proportional to the comet's size or the intensity of its glow, while the comet's tail indicated, on the one hand, the region where negative effects—such as a hostile army—could be expected, or the direction from which these effects would come. The duration of the comet's appearance indicated the length of time of the effects; a rapid motion, for example, meant that the consequences would begin quickly. Similarly, the kind of motion of the comet, for instance whether it was in harmony with or retrograde to the zodiac sign, had specific results, while the comet's position in relation to the sun demarcated the beginning of its effect.

The comet's location and its related course, and the associated projection of this course onto the Earth offered a wide variety of interpretative options. They involved situating the comet within the signs of the zodiac or relative to the surrounding fixed stars or planets, as well as the zodiac signs, astrological houses and constellations it traversed. For example, specific regions or groups of people

59 See also Marion Gindhart, *Das Kometenjahr 1618. Antikes und zeitgenössisches Wissen in der frühneuzeitlichen Kometenliteratur des deutschsprachigen Raumes*, Wiesbaden 2006 (Wissensliteratur im Mittelalter 44), pp. 139–155. This catalog of parameters went on to become a major structural element of cometary literature. Some works treated some of the points we have mentioned in bundles, while others, for example, presented interpretations of the relative position of the comets in relation to other planets and fixed stars or of its course in specific chapters.

60 Hartmut Lehmann emphasizes that this exclusively negative viewpoint first became evident since the Middle Ages, and is especially evident in the sixteenth and seventeenth centuries; cf. Hartmut Lehmann, *Die Kometenflugschriften des 17. Jahrhunderts als historische Quellen: Literatur und Volk im 17. Jahrhundert. Probleme populärer Kultur in Deutschland,* Part II, Wiesbaden 1985 (Wolfenbütteler Arbeiten zur Barockforschung 13), pp. 683–701, p. 692. Ancient traditions also primarily emphasized the negative effects. One exception in Christian-influenced historiography is the Star of Bethlehem; for details, see Sara J. Schechner, *Comets, Popular Culture, and the Birth of Modern Cosmology*, Princeton 1999, pp. 38–45.

61 Cf. [S2] Johann Georg Schinbain, *Sternen oder Cometen Buch, in welchem die fürnemsten Cometen, deren bey 180. so hin und her, vor und nach Christi Geburt, an dem Firmament erschienen, sampt andern Meteorologicis so sich in Lüfften zugetragen: was auch gleich in jedem Jar besunder für Effect oder Würckung darauff gefolget*, Ingolstadt 1578 (VD16 S 2843), fol. T 2 r–T 3 r. The different qualities of the comet are by no means always interpreted in the same way. Another text on comets from 1577 attributed "falling damp and arthritic frailty / and heavy fever / heretical riots / and rebellious princes" to Venusian comets; see [S1] Theodor Graminaeus, *Weltspiegel oder algemeiner Widerwertigkeit deß fünfften Kirchen Alters, kürtze Verzeignuß. Darinnen deß Cometen oder außgereckter Rüthen, so im Jar Christi 1577 den 11. Novembris, am hohen Himmel vernomen Stand, Lauff, und Bedrewung zuersehen, so physice, astrologice, metaphysicae, oder aber formaliter erklert und außgelagt wirt*, Cologne 1578 (VD16 G 2809), fol. I 3 r.

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were associated with particular zodiac signs and the houses, such as areas of human life, or institutions.[62] A comet in the ninth house might have posed an ominous threat to the Church or the clergy, whereas a comet in the eighth house signified the death of a ruler. Moreover, planets had their own houses and complexions depending on aspects that determined their nature: according to the doctrine of the elements, Saturn, for example, was thought to be cold and dry, and to have a melancholy nature.[63] Particular social groups such as craftsmen, scholars, clerics, or doctors were associated with specific signs of the zodiac, as were entire national groups.[64] The zodiac signs continued to be attributed with specific qualities, and were divided into Earth, Water and Air signs. If a comet were located in such a sign, or passed through it, for an Earth sign this could portend an impending earthquake, while for a Water sign it could mean drought or floods.

Even these few remarks give an idea of the great detail and extent involved in an astrological interpretation of the comets. Moreover, the re-interpretation and extension of the traditional rules of astrological readings and the reference to different sources led to a coexistence of different interpretative systems that were sourced eclectically. This enormous complexity created a flexibility, allowing the interpretations of comets to proceed in a variety of directions. On the one hand they could be general and transferable, and on the other hand individual and structurally adaptable to current conditions. They could be linked to political, biblical, or mythical interpretations and viewed in relation to topical events, and were therefore open to instrumentalization for theological edification, social discipline, confessional polemics, or even political propaganda. The result was the emergence of regular interpretive narratives that could be widely different for one and the same cometary appearance. This meant that the authors of comet pamphlets had to legitimize their methodical approach and prove their competence, which created a pressure toward exact and extensive observation, because astronomical observation provided necessary material data for the interpretation.

In other words, the desire for interpretation of the frightening phenomenon motivated people to record it by description. This led, first, to astronomical observation methods and mathematical procedures being tailored to fit the treatment

62 For a comprehensible overview of basic astrological terms and techniques, see Monica Azzolini, *The Duke and the Stars. Astrology and Politics in Renaissance Milan*, Cambridge 2013 (I Tatti Studies in Italian Renaissance History), pp. 53–64.

63 Cf. John C. Eade, *The Forgotten Sky. A Guide to Astrology in English Literature*, Oxford 1984, p. 66.

64 For example, Johann Gottfried Taust reported that a comet in the zodiac sign of Sagittarius was threatening Arabia, Tyrrhenian, Spain, France, England, Germany, Dalmatia, Slavonia, Hungary and Moravia. Taust listed further cities at risk: Toledo, Modena, Avignon, Cologne, Stuttgart, Rothenburg, and Buda, cf. [S3] Johann Gottfried Taust, *Cometa redivivus das ist der aus der Aschen viel entsetzlicher als zuvor hervorflammende und aufs Neue sich unserm Gesichte präsentirende Unglücks Prophete oder der nach gemeiner Art Genannte Comet und Schwantz Stern welcher seinen Curs und Lauff geändert und nach dem er unter der Sonnen Strahlen 3 Wochen verdecket gewesen nun mehr des Abends alsbald nach der Sonnen Untergang sich sehn lässet*, Halle 1681 (VD17 14: 073221Z), fol. E 3 v–E 4 r.

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of comets, or developed to that effect, and second, the phenomenon being understood as a natural process that required explanation and which could be imposed on questions of natural philosophy. Consequently, the interpretation brought together description, explanation, and interpretation of comets, with the result that is was often impossible to separate purely astrological and purely natural-historical approaches to the problem in a meaningful way. Instead, elements of both these contextual areas were closely entangled with each other in the image of the comets and were used for mutual legitimation. This is shown concretely, for example, in the typologizing of comets briefly described above: Aristotle regarded the distinction between different types of comets as resulting from the different kinds of meteorological creation of the comets from terrestrial exhalations. In other words, the classification originated from the way of looking at the problem in natural philosophy by describing the origin and specific qualities of the celestial phenomenon in an explanatory model. The tradition of typologizing deriving from Pliny and others combined things that were phenomenologically perceivable with historical experience to develop a classification scheme from the diagnosed regularity. The relevance of this scheme relied solely on the context of astrological interpretation. It was not a matter of understanding how a horned comet acquired its form, for instance, but which astrological significance was peculiar to this kind of comet. The augmented theory of comets bundles and links the epistemological modi behind these typologizations and the potentials of natural history and astrology they are based on—symbolized by the two names, Aristotle and Ptolemy.

3 The Integrated Image of Comets as a Synthesis

While the claim to causality of the natural-historical explanation upgraded the epistemological status of stargazing, the astrological techniques of prognostics provided the tool for establishing the meaning of the theoretically understood natural phenomenon, which significantly deepened its explanation. In fact, it is actually a major achievement of astrology to combine the abstract theoretical discipline of mathematical astronomy, which concerns description and demonstration, with a natural philosophy based on a theoretical reflection of empirical experience and concerned with the qualitative explanation in terms of causes.[65] This integratory function of astrology is particularly clear in the description of comets. Moreover, the need to interpret comets, which lay at the basis of astrological interpretation, offered a connection point for theology, which also made reference to the symbolic nature of comets.

That the two disciplines, with their shared ambition to interpret the world, did not compete but actually complemented each other harmoniously, was due to the particular historical situation of the post-Reformation era. In the context of Melanchthon's natural philosophy, which viewed the comets as signs of natural

65 See also Darrel H. Rutkin, "Astrology", in: *The Cambridge History of Science, Vol. 3: Early Modern Science*, eds. Lorraine Daston and Katherine Park, Cambridge 2006, pp. 541–561.

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wonders from God, the rivalry between meteorological-causal astrology and divinatory teratology almost hides the fact that a theologized form of astrology was being practiced in the context of natural research that was aimed toward the theological sphere as well.[66] In Melanchthon's doctrine, astrology had the status of a natural philosophy that was based on the synthesis of Aristotelian and Ptolemaic thought and offered insight into Nature's relationships of causality, whereas astronomy, seen as applied geometry, provided the data and described things in terms of theoretical models but did not offer any explanation of Nature.[67] Caspar Peucer saw astrology as the key to Nature understood as divine creation, and believed that it offered the possibility of explaining miracles in terms of natural philosophy.[68] In fact, astrology was an instrument in two respects: one, for interpretation to help in spelling out the symbolically expressed divine will, and one for explication as a component of the causal explanation of natural processes. In this way astrology presented the relationship between the approach to nature through natural history and theology, and the interpretative context.

Aside from this integrative function of astrology, the reference to the causality creates a synthesis between three contextual areas. Natural history based on Aristotle explained all events through natural causes. The meteorology based on this provided the physical explanation of comets, and the related idea of symbolic quality was also causally conceived because the comets, as natural signs, were linked with the things they indicated. The Ptolemaic astrology of the *Tetrabiblos*, and thus the whole idea of prognostics—whether generally as a basis for stargazing or specifically related to the forecast of a comet and its effects—was based on the concept of natural causes. For this reason, the disciplines of astrology and medicine were understood as empirical sciences that served knowledge of nature just as much as knowledge of divine providence, while history retrospectively documented this providence in Nature as divine creation.[69] This is how the *historia* argumentation functioned as an interpretive approach linking theology and astrology. Moreover, through the time-based interpretation of comets it provided an empirical underpinning of the relationship between cometary origin, appearance, and effect.

This relationship should be conceived as a twofold one in which the duality corresponds to the dual nature of comets as symbols and causes. On the one hand this concerns a metaphysical-symbolic relation which is theologically charged in the context of theology of repentance and punishment. Humans are the root cause of the evil in the world through their sin seen as human wrongdoing, which corresponds to a disruption of the personal relationship between the individual and God that can be restored through penitent atonement. In this view, the sins

66 See also Christoph Meinel, "Certa Deus toti impressit vestigia mundo. Melanchthons Naturphilosophie", in: *Der Humanist als Reformator. Über Leben, Werk und Wirkung Philipp Melanchthons*, Fricke, eds. Michael Fricke and Matthias Heesch, Leipzig 2011, pp. 229–251.

67 Brosseder, *Im Bann der Sterne*, p. 202.

68 Ibid., pp. 165–172.

69 Wels, *Manifestationen des Geistes*, p. 105.

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are part of a causal relationship of human acts and consequences in which humans' evil deeds represent the cause of divine judgment.[70] The comet is simultaneously an indicative sign of divine punishment and part of the punishment itself by way of its negative effects. This prodigious image of comets is less an element of a superstitious world view than part of a causal conceptualization of celestial phenomena through a pious and educated elite.[71] In this context, the interpretation in terms of the theology of retribution can be seen itself as a kind of rationalization by which suppressed fears are channeled and confronted with a meaningful interpretation or a promise of pardon incorporated in the prodigious symbols.[72] The parallel nature of the process of events caused by actions and warning signs that occurred naturally and were simultaneously prodigious was retrospectively underpinned and rounded out by the meteorological causality, and by making an astrological interpretation plausible. The causal relationship between the appearance of comets and the effect of comets in meteorological theory was based on this metaphysical connection between the cometary appearance and aftermath in their conceptualization as prodigies. In this context, the consequences associated with comets were causally described as effects, with the astrological interpretation not only enabling a corresponding prognosis but also allowing topical events and the adversities of earthly life to be retrospectively recognized as cometary effects.

4 Conclusion

In the image of comets in the early modern age, in the sixteenth century, through the combination of Melanchthon's theologized natural philosophy and the augmented cometary theory, interpretations from natural history, astrology, and theology coincided and enabled the dual—and at first glance seemingly paradoxical—conception of comets as symbols and causes. These connections only applied to the relationship between comets and the negative events attributed to them, and not the cause of the comets themselves, that is, the question of whether their appearance derived from natural causes or divine workings. Again, there is no clear answer to this question, and here, too, the different dimensions of comets could blend harmoniously. This harmony was an essential part of the integrated image of comets.

To sum up, we can say that the combination of different methods of interpretation, interpretive traditions and, finally, different epistemological approaches and aspirations incorporated into this image of comets, represents a compromise solution that is not unproblematic. A germ of inconsistency lurks in the coexistence of symbolic and causal conceptions of the comets and the underlying philosophical ideas. The disciplines of theology and astrology, which are concerned

70 Holtz, *Theologie und Alltag*, pp. 270–271.

71 Cf. Mosley, *The History and Historiography of Early Modern Comets*, pp. 291–292.

72 Rienk Vermij has pointed this out in relation to the perception and interpretation of earthquakes in the Early Modern Age; see Rienk Vermij, "Erschütterung und Bewältigung. Erdbebenkatastrophen in der Frühen Neuzeit", in: *Um Himmels Willen. Religion in Katastrophenzeiten*, eds. Manfred Jakubowski-Tiessen and Hartmut Lehmann, Göttingen 2003, pp. 235–252.

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with the interpretive dimensions of comets and are tied into the integrated image of comets, are classically seen in a competitive relationship over the prerogative of interpretation about natural phenomena, and as a source of strategies for dealing with negative cometary effects by edification, assignment of meaning, and conquest of the future. The achievement of the integrated image of comets consists precisely in concealing these incompatibilities to the extent that the explanatory gaps of the one disciplinary field would be filled by elements of the other to produce a reciprocal legitimation. What is revealed here is not just the processual character of the origin of knowledge but of knowledge itself. Where which kind of knowledge was relevant, and which function and claims to validity were linked to the images of this knowledge, was the result of collective-dynamic negotiating processes in which the integrated image of comets represented a metastable state as the temporarily successful and accepted result of these processes.

Another factor is the ambivalent character of astrology, whose integrative achievement was the main foundation for the image of comets in the Early Modern Age. Questioning its legitimacy raised doubts about its associated knowledge claims and images. Particularly problematic here is the dual nature of astrology, which regarded itself as responsible both for the spiritual and meaningful area of human existence and for the causal-rational aspect of the sciences.

Both these aspects received critical attention in the seventeenth century. In the long term, astrology lost its legitimacy, if only because of an increasing separation of qualitative and quantitative aspects of knowledge traditions in the Early Modern Age. As concerns the explanation and interpretation of frightening celestial phenomena, this development was finally manifested in the dissolution of the integrated image of comets.

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[S2] Schinbain, Johann Georg, *Sternen oder Cometen Buch, in welchem die fürnemsten Cometen, deren bey 180. so hin und her, vor und nach Christi Geburt, an dem Firmament erschienen, sampt andern Meteorologicis so sich in Lüfften zugetragen: was auch gleich in jedem Jar besunder für Effect oder Würckung darauff gefolget*, Ingolstadt 1578 (VD16 S 2843).

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Bartholomaeus Keckermann and Christoph Hunichius on Novas and Comets at the Beginning of the 17th Century: Two Opposing Views on the Relation Between Natural Philosophy and Mathematics*

Miguel A. Granada

It is known that Melanchthon promoted the study of mathematics at the University of Wittenberg with the establishment in 1536 of two chairs (inferior and superior mathematics), for which Georg Joachim Rheticus and Erasmus Reinhold were appointed. Melanchthon's initiative was followed at other Protestant universities across Germany, thus granting the mathematical disciplines greater visibility and prestige than they had enjoyed customarily. Relying on Plato (*Phaedrus*, 246c), Melanchthon praised arithmetic and geometry as the two *wings of the soul* enabling man to ascend to the heavens and, as a consequence, purify the human soul through contact with the superior celestial realm and approach divinity.[1] In particular, the mathematical science of astronomy enabled man to demonstrate God's creation of

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1 Cf. Melanchthon, *Preface to arithmetic* (1536; the oration was held by Rheticus as a prelude to his course on arithmetic): "The wings of the human mind are arithmetic and geometry. If someone endowed with an intellect that is not mean attached these to himself, he would easily enter heaven and would wander freely in the heavenly company, and enjoy that light and wisdom" (in: Melanchthon, *Orations on Philosophy and Education*, ed. by Sachiko Kusukawa, transl. by Cristine Salazar, Cambridge 1999, p. 93); *Preface to Johannes Vogelin's 'Book on the Elements of Geometry' (1536)*: "[Geometry] took flight to the heavens, and raised human minds, having cast off the earth, back to that heavenly abode, and showed us the wonderful construction and regulation of the world. Furthermore, it led exiled minds to their homeland and to acquaintance with the heavens, and even to the recognition of God. For that very teaching, in which the construction and the ruling of the world are beheld, has great power in strengthening worthy beliefs about God in the hearts of men", ibid., p. 99. See also Sachiko Kusukawa, *The Transformation of Natural Philosophy: The Case of Philip Melanchthon*, Cambridge 1995, especially Chapter 4 ("The Providence of God"), and Nicholas Jardine and Alain-Philippe Segonds, *La guerre des astronomes: La querelle au sujet de l'origine du système géo-héliocentrique à la fin du XVI*e *siècle,* Paris 2008, vol. I, pp. 263–271 (Appendice: "Sur l'expression *Geometria et Arithmetica Alae Astronomiae*").

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the world and divine providence against Epicurean impiety, by showing that the perfectly ordained celestial motions could not be the product of chance.[2]

These different attitudes and evaluations of the mathematical disciplines (which we also find later in the Catholic schools, for example in the tensions within the Jesuit order between the mathematical school of Christopher Clavius and the supporters of Aristotelian natural philosophy and metaphysics) brought about a great debate throughout Europe, including German universities, during the period of the scientific revolution.

In what follows I intend to focus on a particular instance, which, in my opinion, perfectly represents the confrontation between Aristotelianism and the emerging ambitions of the mathematical disciplines—in our case, astronomy—to contribute to knowledge about the true essence of nature (to natural science or better *natural philosophy*, to employ the standard term around 1600). Mathematicians increasingly opposed the Aristotelian appraisal of the so-called *middle sciences* or *mixed mathematics* (astronomy, optics, acustics, perspective, mechanics), as merely yielding knowledge of accidents, different and inferior to knowledge of the essence of things claimed by the metaphysicians and natural philosophers through their proper methods. Beyond purely theoretical issues, the debate involved individual and institutional components of the academic rank and status of the mathematical disciplines as well as the salaries of mathematicians compared with those of the *pure* philosophers. The confrontation resulted in the emergence of the modest mixed science of *mechanics* as the true and proper *natural philosophy*, expressed in mathematical language, as we know it today.[3] As a result, there materialized the very menace that Andreas Osiander had conjured in his "Letter to the Reader" added to Copernicus' *De revolutionibus*, namely 'that the liberal arts, which were established long ago on a sound basis, should be thrown into confusion'.[4]

The particular subject of my inquiry is, on the one hand, the Danzig professor of philosophy Bartholomaeus Keckermann and his criticism of the pretensions of contemporary mathematicians (especially astronomers) to reject Aristotelian natural philosophy through a new cometary theory founded on the detection and geometrical measurement of parallax and the rejection of celestial immutability assumed by Aristotelianism. On the other hand, I intend to examine the responses of mathematicians (astronomers) throughout Germany, who before and

2 See Melanchthon, *Preface to 'On the Sphere'* (1531): "Only those among the philosophers who spurned astronomy were professedly ungodly (*atheoi*); having done away with providence, they also removed the immortality of our souls. If they had reached this knowledge, they would have perceived the manifest traces of God in nature, and having noticed them, they would have been forced to acknowledge that the universe is made and governed by a mind", in *Orations*, pp. 106f.

3 On this process, see the illuminating considerations by Peter Dear in *Revolutionizing the Sciences: European Knowledge and its Ambitions, 1500–1700,* Houndmills, Basingstoke 2001, pp. 17f., 72f., 104f.

4 Nicholas Copernicus, *On the Revolutions*, translation and commentary by Edward Rosen, Baltimore and London 1992, p. xx.

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after the comet of 1618 not only argued for the celestial location of comets and the ensuing mutability of the heavens, but also defended (regardless of whether they were Copernicans or Tychonians) the ability of geometry and astronomy to reach sound cosmological conclusions and claimed a new relationship between the disciplines with a higher appreciation for mathematics. Among the critics of Keckermann, we can count, in the vicinity of Danzig and before the comet of 1618, Christophorus Hunichius, mathematician at the Gymnasium in Stettin; later, in 1619 and at various sites across Germany, Michael Maestlin in Tübingen,[5] Isaac Habrecht in Strasbourg, Philip Müller in Leipzig, Johannes Döling in Greifswald, and Peter Crüger in Danzig as well. For reasons of space, however, I will limit my enquiry to Keckermann's arguments and, beyond a few passing references to Maestlin and Crüger, to the response by Hunichius, so that the importance of this secondary and quite unknown philosopher and mathematician may be stressed. In fact, Hunichius' relevance concerns both the issue of comets as well as his sympathetic assessment of Copernicus' heliocentrism, which has so far (at least, as far as I know) eluded the attention of the scholars.

1 Bartholomaeus Keckermann

Bartholomaeus Keckermann (ca. 1572–1609) was born in Danzig to a Calvinist family.[6] He first attended the Academic Gymnasium in his native town from 1587 and next the Universities of Wittenberg (1590) and Leipzig (1592). When life in Saxony became difficult for Calvinist students following the death of Prince-Elector Christian I in 1591 and the ensuing obligation to subscribe to the Formula of Concord, Keckermann joined many Calvinist exiles to the University of Heidelberg in 1592. There, he received his Master of Arts in 1595 and was later appointed as professor of Hebrew. In 1602, after receiving his licentiate of theology degree in Heidelberg, Keckermann returned to Danzig, where he was appointed professor and rector of the local Gymnasium. He taught a three-year philosophy course at this famous Calvinist Gymnasium, which bore the character of a proper university, until his untimely death in 1609.

Keckermann wrote many works on the entire philosophy course from a strictly Aristotelian point of view with some elements of Ramism.[7] These works were printed during his years of teaching in Danzig and after his death, enjoying wide diffusion and influence throughout Germany as well as in other Protestant places such as Geneva and England. As a consequence, Keckermann greatly influenced

5 We may include with Maestlin the younger Wilhelm Schickard, a pupil of Maestlin at the University of Tübingen. Schickard did not mention Keckermann in his manuscript treatise on the 1618 comet, but he adopted the same position as Maestlin.

6 For Keckermann's biography, see Joseph S. Freedman, "The Career and Writings of Bartholomew Keckermann (d. 1609)", in: *Proceedings of the American Philosophical Society* 141 (1997), pp. 305–364 (here pp. 306ff.).

7 See Walter J. Ong, *Ramus: Method and the Decay of Dialogue: From the Art of Discourse to the Art of Reason*, Chicago and London 2004, pp. 298–300; Neal W. Gilbert, *Renaissance Concepts of Method*, New York 1960, pp. 214–220, mainly relying on Keckermann's logical work.

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the teaching of philosophy across Protestant Europe, practically in every discipline making up the course, from a faithful Aristotelian outlook.[8]

In Keckermann's teaching and works, natural philosophy as well as astronomy and cosmology (the nature of novas and comets in particular) held a significant position. He was well informed about contemporary debates and expressed great admiration for Copernicus (as a mathematician, taking heliocentrism only as a hypothesis without cosmological import, in accordance with the so-called *Wittenberg interpretation* promoted by Melanchthon and Reinhold),[9] as well as for Tycho Brahe, both as an observer and a mathematical astronomer. Despite his high regard, however, Keckermann accepted neither the fluidity of the heavens nor the geoheliocentric system postulated by Tycho from 1588.

Keckermann published in 1606 a large volume of *Disputationes philosophicae, Physicae praesertim*.[10] Among them was a *disputatio extraordinaria*, titled 'Theoremata exegetica De Cometis in genere; et in specie de tribus illis mirabilibus facibus, quae anno 1572. et denique anno praeterito 1604 apparuerunt', with his pupil Peter Crüger acting as respondent. To the text of this disputation was appended a 'Diaskepsis De observationibus cometarum per instrumenta Astronomica, atque adeo etiam eius, qui apparuit Anno praecedenti 1604, Octobri, Novembri et Decembri mensibus'. The above work was also printed posthumously, in 1611, as well as two others by Keckermann: a *Systema Astronomiae compendiosum*[11] and a *Systema Physicum, septem libris adornatum*, whose sixth book deals with 'De meteoris' and features in the fifth chapter a long discussion 'De cometis'.[12]

1.1 Keckermann's Aristotelian cosmos and the status of astronomy

Keckermann's world is the old cosmos of the Aristotelian tradition in the Christianized version proper to medieval philosophy and the Melanchthonian tradition in Protestant countries. We can see this from an academic disputation held in 1605 'On the World' (*De mundo*), where the world is defined in Aristotelian and Melanchthonian terms as 'systema or assemblage formed by heaven and earth and by all the natural beings contained in them, originally joined together in the best order and most beautifully by God'.[13] In this disputation, Keckermann concedes

8 See Siegfried Wollgast, *Philosophie in Deutschland zwischen Reformation und Aufklärung 1550–1700*, Berlin 1988, pp. 169–173.

9 See Robert S. Westman, "The Melanchthon Circle, Rheticus and the Wittenberg Interpretation of the Copernican Theory", in: *Isis*, 66 (1975), pp. 165–193.

10 Bartholomaeus Keckermann, *Disputationes philosophicae, Physicae praesertim, quae in Gymnasio Dantiscano ad Lectionum Philosophicarum cursum paulo plus biennio publicè institutae et habitae sunt, sub praesidio Bartholomaei Keckermanni*, Apud Guilielmum Antonium, Hanoviae, 1606.

11 Bartholomaeus Keckermann, *Systema Astronomiae compendiosum Gymnasio Dantiscano olim praelectum et 2. libris adornatum*, Apud haeredes Guilielmi Antonii, Hanoviae 1611.

12 Bartholomaeus Keckermann, *Systema Physicum, septem libris adornatum, Et Anno Christi M–CVII. publice propositum in Gymnasio Dantiscano*, Apud Guilielmum Antonium, Hanoviae 1610. It was reissued in 1612, 1617 and 1623 (we quote from this last edition).

13 *Cursus Philosophici Disputatio XX. De mundo*, in Keckermann, *Disputationes philosophicae*, thesis 4, pp. 563f.: "systema sive compages caelo, terra et quae his continentur naturalibus cor-

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to the world the properties (*affectiones*) of unicity (*unitas*),[14] connection of its parts (*connexio partium* or rejection of void)[15] and sphericity (*configuratio*).[16] Needless to say, the distinction in the definition between the heavens and the earth implies the traditional cosmological dualism between the supralunary and sublunary or elementary regions, each with its own kind of matter and physics. A previous disputation in 1603 'On the Heavens' (*De caelo*) stated this clearly, with the resulting immutability of the heavens, subject only to the perpetual circular motion of the ethereal spheres. As the first four 'physical theses on the heavens' declare:

> 1. The celestial body has its matter as well as its inner form. 2. But the celestial matter is not elementary, and therefore it is neither fiery, nor airy, nor aqueous, but a different [matter] and devoid of any elementary condition, such as certainly agrees with a body that is first in place as well as in worth and virtue among all bodies in the world. 3. But just as the heavens did not begin from a natural generation, they will not cease through a natural corruption, since they are certainly free from such natural changes as alteration, augmentation and diminution. 4. It revolves with the most simple and perfect local motion, namely circular motion.[17]

Marginalia refer the reader to the second book of Keckermann's *Systema Physicum*, where, besides affirming the different, more divine and prior matter of the heavens,[18] it concedes the following four *qualities*: subtility or purity, solidity, immutability, sphaericity.[19] As for immutability, Keckermann clarifies that the heavens are not *absolutely* immutable, since this property belongs exclusively to God (against

poribus à Deo primitus ordinatissimè ac pulcherrimè concinnata". This definition, coming from the pseudoaristotelian *De mundo* (391b 9–10), had been adopted by Melanchthon in his *Initia doctrinae physicae* in: *Corpus Reformatorum*, ed. Karl Gottlieb Bretschneider, vol. 13, C.A. Schwetschke and Sohn, Halle 1846, col 214, and passed to the cosmological literature in Germany.

14 *Cursus Philosophici Disputatio XX. De mundo*, in Keckermann, *Disputationes philosophicae*, thesis 26, p. 568: "Unitas est mundi affectio, per quam nec extra se alios [mundos] habet, nec ex se alios producere potest".

15 Ibid., thesis 27: "connexio partium seu fuga vacui est arctissima unio […] per quam corpus à corpore separari non potest nec ullus in mundo angulus dari, in quo non sit necessariò aliquod corpus".

16 Ibid., thesis 28: "configuratio est affectio mundi, per quam corpora mundi […] vergunt in rotunditatem". Cf. ibid., p. 585, problem 13: "Mundus est omnino rotundus, circularis, atque adeo sphaerico terminatur et concluditur ambitu".

17 *Cursus Philosophici Disputatio tertia, […] De caelo,* in Keckermann, *Disputationes philosophicae*, pp. 26f.: "1. Habet omnino caeleste corpus suam ut materiam, ita formam quoque internam. 2. Sed [coelestis] materia elementaris non est; atque adeo nec ignea, nec aerea, nec aquea; sed diversa quaedam, ac libera ab omni elementari conditione; qualis nimirum conveniebat corpori, ut loco, ita dignitate et efficacia, inter omnia mundi corpora primo. 3. Sicut autem generatione naturali Caelum non coepit, ita nec desinet naturali corruptione: expers nimirum eiusmodi naturalium mutationum, ut est alteratio, incrementum et decrementum. 4. Motu locali circumagitur simplicissimo et perfectissimo, id est circulari".

18 Keckermann, *Systema Physicum*, liber secundus, De coelo et elementis, p. 93, first theorem.

19 Ibid., p. 98.

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the absolute immutability conceded to the heavens by Aristotle, Keckermann, a pious Christian, draws on the scholastic distinction between God's absolute and His ordained power, equal to the natural order and freely imposed by Him on the creation).[20] The heavens are *respectively* or *naturally* immutable, in that they cannot suffer or be changed by any other natural body.[21] Keckermann was thus a staunch supporter of celestial immutability at the beginning of the seventeenth century.

In addition, even if he was well informed of recent developments affirming the fluidity of the heavens and rejecting the solidity and impenetrability of the celestial spheres,[22] Keckermann remained faithful to the traditional doctrine of their solidity and impenetrability. As he would say in the *Systema Astronomiae compendiosum* (1611), although famous contemporary *artifices* (that is, mathematicians or astronomers) state that celestial bodies move through a fluid medium like birds in the air or fishes in the water, they still admit that astronomy necessarily presupposes, in order to account for celestial motion, celestial spheres and orbs, for whose existence probable reasons could also be adduced. 'Therefore', Keckermann concluded, 'we retain in this astronomical system this diversity of celestial orbs'.[23]

20 This distinction was of fundamental significance for Keckermann in order to explain why the appearance of novelties in the heavens (the new stars or novas of 1572 and 1604) was not in contradiction with their natural immutability.

21 Ibid., pp. 102f.: "Immutabilis duplex est: quaedam absoluta, qua res quae immutabilis dicitur, a nulla causa quaecunque tandem illa sit, pati et mutari potest. Et hoc modo solus Deus est immutabilis […]. Alia vero est immutabilitas respectiva et restricta, quando aliquid pati et mutari non potest a certo causae et agentium genere. Et hoc modo caelum dicitur immutabile. Coelum enim dicitur immutabile et impatibile non eo respectu, quasi nihil pati possit simpliciter; nam et pati et corrumpi a Deo, qui ex nihilo coelum creavit, imo etiam ab angelis, potest. Sed dicitur immutabile et impatibile respectu corporum naturalium, ita ut sensus sit, nullum esse in mundo corpus à quo coeleste corpus alterationem aut corruptionem pati queat, sive quod possit agere in coelum".

22 Keckermann knew and frequently cited Tycho Brahe's works as well as other earlier and contemporary authors supporting the fluidity of celestial matter, including Jean Pena, Johannes Kepler and Konrad Aslachus; ibid., pp. 100–102. The Danzig rector even rejected the argument of opponents that refraction of light from the stars would necesssarily be produced if it should pass through media of different density like the solid spheres of ether and the fluid air. See ibid., p. 102.

23 Keckermann, *Systema Astronomiae compendiosum*, pp. 3–4: "Corpus coeleste stellatum conspiciendum est suis quibusdam sphaeris et orbibus distinctum, idque melioris et plenioris cognitionis gratia. […]. Hinc nimirum est quod praestantissimi nostri seculi *artifices* statuant, non esse eiusmodi distinctas concamerationes coeli, sed esse coelum continuum aliquod et fluidum corpus, non secus ac est aer et aqua, ac idcirco sidera et stellas non circumrapi à distinctis quibusdam sphaeris, seu orbibus et cameris coeli, sed ita libere et per se moveri in corpore coelesti, prout videmus *aves* volare in aere, aut pisces natare in aqua. Verum quoniam ipsi artifices fatentur diversitatem et apparentias motuum coelestium non posse discentibus explicari, nec posse construi ullam scientiam Astronomicam, nisi praesupponantur ista Principia, Praecognita, et Hypotheses de distinctione coelestium camerarum et sphaerarum, et quia etiam probabiles rationes dari possunt quibus ista coelestium orbium diversitas, probetur, Idcirco eam in hoc systemate Astronomico retinebimus". It must be said, however, that after Kepler's *Astronomia nova* (published in 1609) and the elliptical trajectories of planets, this argument by Keckermann hardly functions.

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Previously, Keckermann had distinguished the three sciences dealing with the heavens: physics, astronomy and astrology. Leaving aside astrology as dealing with the effects of the motion and positions of the stars, astronomy is defined as 'a concrete mathematical science', that is, not dealing abstractly (*absolute et abstracte*) with quantity, like geometry and arithmetic, but concretely (*in concreto*) or inasmuch as the quantity it deals with inheres in a substance, namely the celestial bodies.[24] In other words, astronomy is a *middle science* or *mixed mathematics,* since it applies mathematics to the study of quantitative aspects of the celestial substance. But inasmuch as quantity is a mere accident of substance, it follows that astronomy does not touch the very substance or essence of the celestial bodies and, as a consequence, is an inferior science, subordinate to the first science dealing with the heavens, that is, physics (or celestial physics as opposed to sublunary physics, which deals with a totally different natural substance, namely elementary bodies): '[1]. Physics deals with the heavens insofar as it is a substance, that is, with its matter and form; 2. insofar as it has a quality, namely light. 3. insofar as its relation to these inferior, elementary bodies. Astronomy, however, deals with the heavens as quantity, insofar as [it concerns] measurement of place and motion'.[25]

Thus, Keckermann was truly representative of the traditional dissociation and inferiority of the middle science of astronomy with respect to physics; as a result, only the natural philosopher or *physicus* is to be considered able or competent to make assertions on the cosmological structure and configuration of the world in general and of the celestial realm in particular. The mathematician and the astronomer dealing only with quantitative aspects of the heavens must be aware of their subordinate status and not transgress this limit lest an upheaval or improper overturning of the sciences occurs. Academically, it implies—as we indicated at the start—that the astronomer ought not pretend to rise to the higher status and remuneration of the Aristotelian natural philosopher. In what follows, we will show how Keckermann expressed a sense of jealousy toward this inherited concept and relation between the disciplines.

1.2 Keckermann's reaction to the novas and comets that appeared from 1572

Keckermann was perfectly aware of the succession of novas and comets that occurred in this period. He commented extensively on the novas of 1572 and 1604, and mentioned only once, and cursorily, the nova of 1600 in Cygnus. Though he did not entirely exclude that they were actually comets, even endowed with a

24 Keckermann, ibid., p. 1: "Diximus […] quod Astronomia sit scientia mathematica concreta, quia non docet absolute et abstractè de quantitate, sive de trina dimensione aut de numero, quod facit Geometria et Arithmetica, sed docet de quantitate, seu mensura et numero in concreto, quatenus nimirum inhaeret certae substantiae, nempe coelesti corpori et lucidissimis his quae videmus sideribus".

25 Ibid., p. 2: "In Physica tractatur, de coelo quoad *substantiam*, id est, materiam et formam eius, 2. quoad qualitatem nempe lucem, 3. quoad relationem ad haec Elementaria inferiora corpora. Astronomia verò de coelo tractat quoad quantitatem, quoad mensuram situs et motus".

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proper motion (giving credit to some inaccurate observers, such as Johann Krabbe on the nova of 1604),[26] he ultimately accepted them as new stars. As for comets, he referred only to those of 1577 and 1607. Keckermann was surely aware that the most competent *artifices* or mathematicians were increasingly passing from the initial interpretation of the nova of 1572 and the comet of 1577 as celestial phenomena incompatible with Aristotelian physics and its dogma of celestial immutability (and consequently as miracles of God's omnipotence and providence endowed with an eschatological significance), to an explanation of them as natural phenomena displaying the natural mutability of the heavens and therefore challenging the cosmological dualism of Aristotelian cosmology, without ever refusing to see them as related in some way to God's providence.

Against this threat to both the inherited cosmology and the established subordination of mathematical astronomy to natural philosophy (once astronomers had introduced comets and novas into the heavens by measuring their distances from the earth by means of the geometrical technique of calculating parallax), Keckermann wrote two special works: in 1605 his 'Theoremata exegetica De Cometis in genere; et in specie de tribus illis mirabilibus facibus, quae anno 1572. et denique anno praeterito 1604 apparuerunt', followed by a 'Diaskepsis De observationibus cometarum per instrumenta Astronomica, atque adeo etiam eius, qui apparuit Anno praecedenti 1604, Octobri, Novembri et Decembri mensibus', both published in 1606 in the above mentioned *Disputationes philosophicae*; in 1607 the sixth book *De meteori*s (with a large Chapter 5 'De cometis') from his bulky *Systema physicum*, published in 1610.

Keckermann's response to the challenge (cosmological and epistemological, as well as professional) was twofold. As for the novas, and inasmuch as they were not assumed to be comets but truly new stars located in the eighth sphere and lacking any proper motion, he found that this opinion could be tolerated:

> insofar as it neither overturns nor undermines meteorological doctrine nor any other part of physical science. For it does not follow that, [since] new stars have appeared in the heavens, therefore the doctrine conveyed by Aristotle and other natural philosophers concerning comets and their generation, as well as the purity and perpetuity of celestial bodies, can no longer be maintained as true. New bodies may indeed be produced in the heavens by the miraculous power of God, without removing any of the ordinary principles, forces or ways of acting in nature. […] Certainly Aristotle never denied that the first cause can act without secondary causes, nor in a different way than the secondary; it has never been denied that God can produce something new. It does not follow that, [since] God often acts extraordinarily, apart from nature, therefore he does not act ordinarily

26 On Johann Krabbe (1553–1616) and his works as well as the criticism of him by Kepler, see Patrick J. Boner, "Celestial Novelty and the Science of the Stars: Kepler vs. Krabbe on accuracy and authority in Early Modern Germany", forthcoming.

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> with nature. Nor does it then follow that, [since] God often makes miracles, therefore the foundations of natural science and the principles of celestial nature, and of the generation of meteors, are overthrown. Miracles are beyond nature, but they do not oppose or overturn nature.[27]

Accordingly, novas overthrow neither the received view of physical science nor celestial immutability once they are interpreted as miracles of God's absolute power, which extends beyond the limits of ordained power or the established law of nature. Although there certainly was the problem that, according to Scripture, God had ceased to create on the sixth day, Keckermann was persuaded that this difficulty could be avoided if it was assumed that God either had created these stars at the beginning with much less light and increased their illumination at precise moments in accordance with His providential design,[28] or the inborn light of these old stars was increased by the differing density of the ethereal medium.[29]

Comets seemed more problematic, since their celestial location was in evident contradiction not only with Aristotelian doctrine, but also with the dogma of

27 "Diaskepsis De observationibus cometarum", in: Keckermann, *Disputationes philosophicae,* thesis 37, pp. 399f.: "eorum ego sententiam et tolerarim libentius, et non impugnarim temere, utpote quae nec doctrinam Meteorologicam, nec ullam aliam scientiae Physicae partem labefactat aut evertit. Neque enim consequens est: Apparuerunt in caelo novae stellae; Ergo, doctrina, quae ab Aristotele, et aliis Physicis tradita est de cometis et eorum generatione, itemque de caelestis corporis puritate et perpetuitate, veritatem suam amplius tueri nequit. Possunt namque in caelo nova corpora produci per miraculosam Dei potentiam, ut tamen nihil interea ordinariis naturae principiis, viribus, et agendi modis decedat. […] Nusquam sane negavit Aristoteles, primam causam posse agere sine secundis, et aliter quam secundas; nusquam inficiatus est, Deum posse aliquid novi producere; nec sequitur, Deus saepe absque natura agit extraordinarie, ergo cum natura non agit ordinarie; Nec denique sequitur, Deus saepe facit miracula, ergo evertuntur Physicae scientiae principia et praecepta de natura caeli, deque generatione Meteororum. Sunt supra naturam miracula, nec tamen naturam oppugnant aut evertunt". For this account of Keckermann's criticism, we refer to Miguel A. Granada, "Michael Maestlin and the Comet of 1618", in: *Unifying Heaven and Earth: Studies in the History of Early Modern Cosmology*, eds. Miguel A. Granada, Patrick J. Boner and Dario Tessicini, Barcelona 2016, pp. 239–290 (here pp. 260–266). See also Marion Gindhart, *Das Kometenjahr 1618: Antikes und zeitgenössisches Wissen in der frühneuzeitlichen Kometenliteratur des deutschsprachigen Raumes*, Wiesbaden 2016, pp. 250–252.

28 Keckermann ascribed this interpretation to "some very learned men" (*doctissimis viris*, Keckermann, "Diaskepsis De observationibus cometarum", theses 38 and 39, p. 401). This coincides with the explanation proposed by David Fabricius in his treatises on the nova of 1604 and on *Mira Ceti*, discovered by him in 1596. See Miguel A. Granada, "Johannes Kepler and David Fabricius: Their Discussion on the Nova of 1604", in: *Change and Continuity in Early Modern Cosmology*, ed. Patrick J. Boner, Dordrecht, 2011 pp. 67–92.

29 "Diaskepsis De observationibus cometarum", in: Keckermann, *Disputationes philosophicae*, theses 40 and 41. In this case, Keckermann attributed the explanation to the Spanish physician Francisco Vallés in his famous *De iis, quae scripta sunt physice in libris sacris, sive de sacra philosophia*, apud haeredem Nicolai Beuilaquae, Augustae Taurinorum 1587. Valles had been severely criticized by Tycho Brahe in his *Astronomiae Instauratae Progymnasmata* (Tycho Brahe, *Opera omnia*, ed. J. L. E. Dreyer, vol. 2, Copenhague 1915, pp. 87–93), and his opinion would also be rejected by Schickard in 1619 in his *Cometen Beschreibung* (see ref. 48 below), pp. 25f.

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natural celestial immutability, inasmuch as they were increasingly explained as natural productions. As stated above, Keckermann limited his commentaries to the comets of 1577 and 1607. He defended the strict Aristotelian concept of comets as warm and dry exhalations (mixed, he added, with humid and cold vapors) that rose to and were inflamed in the superior region of the air.[30] Keckermann did not even admit the optical theory of comets, increasingy accepted over the sixteenth century, and remained faithful to the Aristotelian concept of comets as conflagrations: 'It remains, therefore, that comets are sublunary bodies, and certainly hot and viscous exhalations, drawn out to the highest region of the air by the force of the stars and there not illuminated by the refracted rays of the Sun, but truly inflamed and burnt'.[31]

Keckermann thus intended to save the natural immutability of the heavens, but he also knew perfectly well that the strength of the innovators resided in the presumed accuracy of their observations and in the necessary conclusions derived from the geometrical measurement of parallax. In addition, he believed that the celestial location of comets, conceived as natural phenomena, wholly undermined Aristotelian cosmology[32] and implied the destruction of natural science as taught in the schools:

> Concerning the place and location, as well as the distance of this Torch [nova of 1604] from the earth, an anxious and apprehensive meditation torments me; and even more since I see that in the last 33 years observations of some comets have, from the very same foundations, led to overthrowing the principal part of natural science so well established in the schools regarding the immutability, constancy and purity of the celestial body (so different in nature from the remaining lower bodies), as well as the doctrine concerning the element of fire, air and, at the same time, almost all of Meteorology.[33]

30 See "De cometis", in *Systema physicum*, p. 679: "Materia ergo cometae est halitu ex fumo et vapore mixtus, id est, partim calidus, partim frigidus, partim humidus, partim siccus".

31 "Theoremata exegetica De Cometis", in: Keckermann, *Disputationes philosophicae*, theorem 12, p. 349: "Relinquitur ergo, cometas esse corpora sublunaria, et quidem exhalationes calidas et viscosas, virtute astrorum in supremam regionis aeris extractas, ibidemque non a Sole *κατ' ανάκλασιν* illustratas, sed revere accensas et flagrantes".

32 Cf. *Systema physicum*, pp. 693f.: "Valde periculosa est ista sententia, utpote quae non parum labefactet totam doctrinam de ordine ac distinctione partium mundi, deque distinctione corporis coelestis a corporibus elementaribus. Si enim in ipsam usque substantiam coeli fumus aliquis sulphureus delatus fuit, ibique incensus, utique ipsa coeli substantia mutata et alterata fuit".

33 "Diaskepsis De observationibus cometarum", in: Keckermann, *Disputationes philosophicae*, thesis 4, pp. 378f.: De loco tamen et situ, atque adeo distantia istius Facis [nova of 1604] a terra, sollicita me sane et anxia torquet cogitatio; idque eo magis, quod videam, ab annis nunc 33. cometarum aliquot observationes eo pertinuisse, ut bene constituta in Scholis scientiae naturalis pars princeps de caelestis corporis immutabilitate, constantia, puritate, atque adeo a reliquis corporibus inferioribus naturae distinctione, itemque doctrina de elemento ignis, aeris, simulque universa pene Meteorologia ex ipsis usque fundamentis labe-

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In order to prevent this painful development, Keckermann endeavoured to discredit both the astronomical observations and the parallactic demonstrations. The former, he argued, lacked credibility for three main reasons: 1) the inaccuracy of the instruments of observation;[34] 2) the refraction of the rays coming from the cometary phenomena when they passed through fire and air, the result being that 'those celestial bodies cannot be observed in their proper places';[35] 3) the eccentricity of our place of observation on the earth's surface.[36] As a consequence, the geometrical determination of distance by parallactic measurement could be neither accurate nor precise: 'But if they were not able to observe correctly through astronomical instruments, assuredly nothing certain and beyond doubt can be affirmed about their [comets'] parallax. But it is in the observation of parallax where the first foundation, as it were, of this observation is placed through which comets are declared to be generated and located in the ethereal region'.[37]

For all these reasons, observing comets could produce an error of 'many German miles' in determining their distance.[38] Nevertheless, in order to avoid the total discredit of astronomy, Keckermann declared himself ready to accept that this criticism did not affect the observation of real heavenly bodies (stars and planets), but only the *lights* (*faces*) seen from 1572, which, as they were merely comets, they were not primary celestial bodies, perfectly round and moving uniformly.[39]

The many profound discrepancies among astronomers in their observations and parallactic measurements of these phenomena (indeed, some placed them in the stellar sphere, others in the planetary region and still others in the sublunary region) encouraged Keckermann to consider the parallactic method as unreliable when applied to comets: 'Doubtless, heavenly bodies are observable with mathematical instruments. Regarding comets, however, we are allowed for still be-

factetur". Cf. also ibid., thesis 7, p. 380: "[…] unde verendum fuerit, ne pro Systemate scientiae naturalis, opinionum variarum ac dubiarum Chaos in scholis simus habituri".

34 Ibid., thesis 11, p. 382: "Haec ergo sententiae meae summa est: Nullius omnino proprie et vere dicti cometae situm et motum per instrumenta Astronomica sic observari potuisse hactenus, aut posse adhuc, ut ex observatione ista concludi firmiter et demonstrari queat, cometalem ullum fumum ad aethera usque evectum esse, ibique accensum".

35 Ibid., thesis 15, p. 383: "idcirco sidera non posse in propriis et veris locis per instrumenta observari".

36 Ibid., thesis 16, p. 384: "neque enim videri possit erroris expers observatio, quae centrum mundi cum centro instrumenti confundit; exactissima nempe observatio, ea tantum futura est, quae fit per instrumentum et oculum observatoris, collocatum in ipso mundi centro, utpote cum ex caelo, tamquam ex circumferentia radii caelestes, tamquam lineae, ad ipsum istius circuli centrum convenienter terminentur".

37 Ibid., thesis 36, pp. 398f.: "Quod si autem observari recte per instrumenta astronomica non potuerunt, utique nec de eorum [comets] parallaxi certi quicquam et indubitati potest pronunciari, in cuius tamen parallaxeos observatione primum quasi fundamentum positum est eius observationis, qua feruntur cometae in ipsa aetherea regione generati esse et haesisse". Cf. *Systema physicum*, pp. 719f.

38 *Diaskepsis*, thesis 24, p. 389.

39 Ibid., theses 17–22, pp. 385ff.

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lieving, persuaded by many and great reasons, that they cannot be properly observed even through those so exquisite and ample instruments of Tycho Brahe'.[40]

Keckermann did not even contemplate the possibility that comets could be celestial bodies. Discrepancies of observational accuracy and observers' differing competence as mathematicians were sufficient for him to discredit their claims. Rather, he took for granted the traditional view concerning the immutability of the heavens and concluded from it that comets were necessarily natural phenomena in the sublunary region and therefore unsuitable objects for astronomical study. The differences among astronomers were thus seen as simply the result of applying to comets a method suitable for a very different class of objects.

Keckermann concluded with an appeal to re-establishing concord between astronomy and natural philosophy, a relationship that had been deplorably destroyed, with ensuing disaster, by conflicting interpretations of the recent extraordinary phenomena.[41] Restoration of concord and the integrity of natural science, however, could not be gained by completely subverting the inherited science (that is, by means of a revolution in science). Astronomers should cease to deal with comets and limit themselves to the proper task of calculating celestial motions in their *mixed mathematics*, relegating the study of comets to the *physici*, their rightful investigators: 'comets are not astronomical, but physical bodies; and they will not be properly investigated by the astronomer, but by the natural philosopher'.[42] Otherwise, as Keckermann had previously threatened, this subversive doctrine of astronomers, mingling mathematics with physics should be banished from the schools:

> For this reason, I strongly prefer that this opinion about smokes carried up to the very aether, mingled with that most pure celestial body, and set on fire in the very same place, would either be plainly ignored or spread only among the schools of philosophers with this solemn formula: IT IS NOT EVIDENT; since it is not as easy to restore good disciplines as it is to destroy them.[43]

40 Ibid., thesis 32, p. 394: "Nimirum corpora coelestia sunt instrumentis Mathematicis observabilia: De cometis autem venia nobis datur, si multis et magnis rationibus adhuc persuasi ita credamus, eos nequidem per Tychonis Brahei illa tam exquisita tamque ampla instrumenta observari unquam recte potuisse". Cf. *Systema physicum*, pp. 720f.

41 *Diaskepsis,* thesis 56, pp. 414f., where Keckermann expresses his affliction: "dolorem meum, quo me sentio affici, cum animadverto […] viam sterni ad committendas inter se duas illas plane sororia necessitudine devinctas scienctias, Physicam et Astronomiam […]; venia detur iusto dolori, et meo pro naturalis scientiae integritate sive zelo, sive voto".

42 Ibid., p. 417: "neque enim Astronomica corpora Cometae sunt, sed Physica; nec de cometis Astronomus, qua Astronomus, legitime tractabit, sed physicus".

43 Ibid., thesis 9, p. 381: "Quocirca vehementer optem, istam de fumis ad ipsum usque aethera evectis, cumque purissimo illo corpore caelesti confusis, ibidemque accensis, opinionem vel non audiri plane, vel ampliari saltem in Philosophorum scholis cum illa solenni formula: NON LIQUET; neque enim tam facile restaurantur bonae disciplinae, quam convelluntur".

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2 Christophorus Hunichius on Copernicus and his response to Keckermann

Ten years after the comet of 1607 (a transit of Halley's comet), the appearance of a bright new comet at the end of 1618 occasioned the publication of many treatises throughout Germany. Several advocates of the celestial location of comets—all mathematicians—reacted in print against Keckermann's stance. In her significant contribution to the current literature,[44] Marion Gindhart has described three such responses–those of Philip Müller, a professor of mathematics at Leipzig,[45] Johannes Döling in a disputation at the University of Greifswald,[46] and Isaac Habrecht at Strasbourg.[47] We have recently examined a significant reaction to Keckermann in the unpublished manuscript treatise by Michael Maestlin: *Astronomischer Discurs von dem Cometen, so in Anno 1618, im Nouembri zu erscheinen angefangen und bis inn Februar dis 1619 Jars am Himmel noch gesehen wirt*.[48]

There was, however, an earlier reaction to Keckermann's criticism, almost immediately after the publication in 1606 of his 'Theoremata exegetica De Cometis' and 'Diaskepsis De observationibus cometarum per instrumenta Astronomica' which deserves special attention. The author was Christophorus Hunichius (Hunnich), philosopher and mathematician in the *Paedagogium illustre* at Stettin, near Danzig.[49]

Our information about Hunichius' life is rather scant. Unfortunately, there are no biographical entries in the *Allgemeine Deutsche Biographie* or the *Neue Deutsche Biographie*. Hunichius died in Stettin on 15 August 1623, but his year of birth is unknown. The frontispiece of a disputation chaired by Hunichius (*De caelo et caelestibus corporibus. Nec non aliis quibusdam philosophicis problematibus Disputatio,* Leipzig 1592) refers to him as Christophorus Hunichius Dipoldisylvanus. The Latin toponym 'Dipoldisylvanus' indicates that Hunichius's birthplace was Dippoldiswalde,[50] a small town in the southern region of Saxony, close to Bohe-

44 Gindhart, *Das Kometenjahr 1618*.

45 Philip Müller, *De cometa Anni M. DC.XVIII. Commentatio PhysicoMathematica specialis et generalis*, Typis Grossianis, Leipzig 1619.

46 Johannes Döling, *Discursus Mathematico-Physicus in quo De Cometis contra Aristotelicos, imprimis vero Bartholomaeum Keckermannum Dantiscanum pro Nobilissimo Tychone Braheo, nostro seculi Atlante […] disseritur*, Typis Johannis Albini, Greifswald 1619.

47 Isaac Habrecht, *Kurtze und gründliche Beschreibung Eines Newen ungewohnlichen Sterns oder Cometen […] im November und December diß 1618. Jahr erschienen*, Johann Carolus, Strasbourg 1618. On these three works, see also Granada, "Michael Maestlin and the Comet of 1618".

48 Michael Maestlin, Ms. Cod math. 15b8, Württembergische Landesbibliothek Stuttgart. See our study in Granada, "Michael Maestlin and the Comet of 1618"; we are currently preparing a critical edition of this significant manuscript. As indicated, the young Tübingen scholar Wilhelm Schickard, also a disciple of Maestlin, may be added. Though he did not explicitly mention Keckermann in his *Cometen Beschreibung In zwen underschidliche Partes abgetheilt, deren Erster Von denselbigen ins gemein: der Ander Von allen Insonderheit, sonderlich aber denen drey Jüngsten, In abgeloffenen 1618 Jahr erschienen, aussführlich handelt* (Ms. Cod. math. qt. 43, Württembergische Landesbibliothek Stuttgart; http://digital.wlb-stuttgart. de/purl/bsz307044173), Schickard reacted according to the same lines.

49 See Granada, "Michael Maestlin and the Comet of 1618", Appendix 2.

50 I owe to Patrick Boner this suggestion, which has proven right.

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mia. This could explain why he studied at the University of Leipzig, closer to his birthplace than that of Wittenberg.[51]

As far as I know, Hunichius began teaching in Leipzig at least from 1590, where he published from that year several smaller works dealing with mathematical and cosmological matters: a poem in Greek entitled *De miraculis mathematicorum carmen,* in which the mathematical disciplines were extolled,[52] the already mentioned disputation *De caelo et caelestibus corporibus*,[53] and in 1593 an academic disputation over which he presided on Archimedes' *Sand Reckoner* (*Arenarius*).[54] In the disputation *De caelo et caelestibus corporibus* (from thesis 41), Hunichius deals with the most important cosmological and astronomical opinions, both ancient and modern, successively presenting those of the 1) Chaldeans and Egyptians, 2) Eudoxus, Calippus and Aristotle, 3) Ptolemy, 4) Thabit ibn Qurra and the Alphonsine astronomers, 5) Copernicus, and 6) Fracastoro. Hunichius' representation of Copernicus is rather sympathetic and positive, although he does not hesitate to mention the opposition to the Bible implied by the attribution of a threefold motion to the simple body of the Earth. This position, significantly antecipates by nine years the more extensive and more positive appraisal of heliocentrism in the disputation *De Situ Quiete Figura et Magnitudine Globi terrestris*.[55]

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51 An inspection of the book of enrolments at the University of Leipzig (carried out online through the digital copy from the University of Düsseldorf) confirms this hypothesis. Cf. *Die Iüngere Matrikel der Universität Leipzig 1559–1809: Als Personen- und Ortsregister bearbeitet und durch Nachträge aus den Promotionslisten ergänzt,* ed. Georg Erler, vol. I, Leipzig 1909, where the Index of names registers "Hunichin Christoph. Dippolswald" (p. 203) and indicates the dates of 1580 (entrance), 1583 (Bachelor of Arts) and 1586 (Master of Arts). In addition, Hunichius is listed in 1602 as Dean (p. CVI) and in 1605 as Vice Chancellor (ibidem).

52 *De miraculis mathematicorum carmen, quod in laudem mathematicarum disciplinarum […] conscripsit et misit M. Christoph Hunichius,* Haeredes Uihannis Steinmanni, Leipzig 1590.

53 *De caelo et caelestibus corporibus. Nec non aliis quibusdam philosophicis problematibus Disputatio, Qua cùm ea, quae ad naturam caelestium corporum et eorundem contemplationem Physicam pertinent, tùm alia nonnulla explicantur. Instituta in celebri Academia Lipsiensi die 14. Octobr. Anno Christi M.D. XCII. Praeside M. Christophoro Hunichio Dipoldisylvano,* Abraham Lamberg, Leipzig 1592.

54 *Archimedis opinio de arenæ nvmero explicata […] disputabitur ad 21. apr. […] præside Christoph. Hvnichio*, Leipzig 1593. According to the World Catalogue, there is only one extant copy of this publication, preserved in the National Library of Sweden, Stockholm.

55 See *De caelo et caelestibus corporibus*: "[thesis] XLVI. Nicol. Copernicus vir acutissimus ingenio, edoctus accuratis et propriis observationibus reiecit & ipse Alphonsinam caeli divisionem: utque ab errore omni vindicaret Astronomiam: imitatus non Nicetam Syracis. [...] sed Philolaum Pythagoricum, Aristarch. Samium asseverantes τὴν γῆν ἕν τῶν ἄστρων οὖσαν κύκλῳ φερομένην περὶ τὸ μέσον, tale caelorum systema labore plusquam Herculeo descriptum nobis reliquit. Extremo loco ponit octavam sphaeram immobilem; sequenti Saturni. 3. Iovis. 4. Martis. 5. Orbis magni deferentis terram triplici motu mobilem: quam circundat Lunae caelum. 6. Veneris. 7 Mercurii. In mundi medio Sol haeret immotus. Asciscit sibi & quaevis sphaera plures orbes pro motuum varietate. XLVII. *Etsi autem quae vulgò contra situm & motum terrae Copernici agitantur rationes, nihil evincunt: eius tamen divisionem ab ingenio profectam potius, quam à natura edoctam haec ostendunt: quòd scripturae sacrae adversetur: quòd simplici terrae corpori tres motus tribuit: quod cum recentioribus observationibus non concordet*. Quamvis ab eruditis (ne sua quoque laude spolietur) hoc consecutus est testimonium, exquisitius eum ex falsis vera, quàm Alphonsini ex veris demonstrasse", p. B4^{v}. Interestingly,

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Hunichius taught at the University of Leipzig until 1606, when he was summoned to Stettin. Until that time, he presided over several academic disputations: in 1601 a disputation on *De Situ Quiete Figura Et Magnitudine Globi terrestris*,[56] and in the following year another on *De Magnitudine Stellarum*.[57] In 1606 Hunichius was active as rector of the *Paedagogium Illustre* at Stettin. There he published *Cosmographia seu Disputatio Physico-Mathematica De Mundo Eivsq[ue] Praecipuis Partibus*.[58] Hunichius published further disputations in Stettin, two on ethical issues,[59] as well as the disputations on comets that will be my concern. The above studies illustrate his prestige as both a mathematician and a philosopher. However, before examining his disputations on comets and the criticism of Keckermann's views they contained, it is worth noting Hunichius' disputations *De mundo* and, especially, *De Situ Quiete Figura Et Magnitudine Globi terrestris.*

Both disputations show that Hunichius was independent in his judgement and well-informed concerning contemporary debates about cosmology, meteorology and astronomy. This is especially clear in the theses regarding the location of the Earth in the 1601 disputation. Here, in the first and larger section, covering theses 1–127 and dealing with the location and possible motion of the Earth, Hunichius tests the validity of the Copernican hypothesis and shows himself to be quite conversant with the recent writings of the leading 'modernizers' of the late sixteenth century: Tycho Brahe, Maestlin and Kepler. He affirms that Copernicus' doctrine on the location and motion of the Earth has not been refuted with solid physical reasons.[60] In addition, Hunichius acknowledges the plausibility of the arguments adduced by Copernicus in favor of the centrality of the Sun: his doctrine of gravity (theses 21–29); the nobility of the Sun (thesis 33); the incommensu-

Hunichius adds (thesis XLVIII- XLIX) that this "paradox" of Copernicus provoked the wits of many other astronomers (among them Fracastoro, whose proposal was rejected by Copernicus as inadequate and dubious), avid to snatch away the palm of glory for this great a man, but all of whom were ultimately defeated in battle.

56 *De Situ Quiete Figura Et Magnitudine Globi terrestris, Capita disputationis ordinariae, Instituendae in Schola Philosophica celebris Academiae Lipsicae, Ad 14. Calend. Maii. Praeside M. Christoph. Hunichio. Respondente, Georgio Wildeno, Artium bacul. Anno Christi M.DCI*, Lembergus, Leipzig 1601. I quote from the copy at the Universitäts- und Forschungsbibliothek Erfurt / Gotha, accessible online.

57 *De Magnitudine Stellarum, Capita Disputationis publicae, Habendae in Schola Philosophica Academiae Lipsiensis, Ad diem 13. Novembris, Anno 1602. Praeside M. Christoph. Hunichio. Respondente Christoph. Spitzmachero Rochlicense, opt. art. baculario*, Lembergus, Leipig 1602.

58 *Cosmographia seu Disputatio Physico-Mathematica De Mundo Eivsq[ue] Praecipuis Partibus,* Typis Duberianis, Stettin 1606.

59 *Quaestionum Ethicarum Decas prima*, Typis Rhetianis, Stettin, 1608; *Quaestionum Ethicarum Decas secunda*, Typis Rhetianis, Stettin 1608.

60 *De Situ Quiete Figura Et Magnitudine Globi terrestris,* thesis 5: "[…] Copernici astronomiam, quam plerique alto supercilio, nulloque tamen ferè ipsius merito despiciunt: non pauci falsè derident, in eo quo de loco et motu terrae à recepta opinione discessit, nec ita certis naturalis iudicii rationibus labefactam hactenus fuisse"; thesis 18: the centrality of the Earth has not been affirmed by its supporters "rationibus, sive è naturae obscuritate eruantur, vel ex Astronomia promantur, non ita firmis, ut Copernici dogma infringant".

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rability of the Earth-Sun distance with respect to the height or magnitude of the stellar sphere (thesis 39).[61] This is evidence that the arguments of the modernizers were beginning to be noticed in the universities.

As for the motion of the Earth, Hunnichius did not regard the arguments traditionally adduced against it as irrefutable.[62] This applies to Ptolemy's arguments of the disruptive consequences of the diurnal motion and the motion of clouds, as well as to the Aristotelian objection derived from the perpendicular fall of heavy bodies (theses 79, 84, 86). To sum up: Hunichius accepts the arguments presented by Copernicus in favor of the motion of the Earth: the rejection of the Aristotelian *axiom* that each element can only have one simple motion (theses 91, 92), the optical relativity of motion (thesis 100). Accordingly, traditional arguments against the Earth's motion, 'even if they seem probable, nevertheless lack compulsory faith'.[63] Hunichius further adds some recent discoveries and results: the discovery by Brahe that Mars, when at opposition, is closer to the Earth than the Sun,[64] the calculations by Maestlin of the implausible speed of the diurnal motion in the equator of the stellar sphere,[65] and the polyhedral hypothesis proposed by Kepler in support of the symmetry between motions and magnitudes in the Copernican cosmos.[66]

It therefore seems that Hunichius accepts, from a purely astronomical and cosmological perspective, that the Copernican cosmos is arguably true: 'Thus, it seems that Copernicus' opinion about the place and motion of the Earth is corroborated along with his thus far not invalid arguments; and on that account, if we have to contend only with the reasons of human judgment, this opinion should not be condemned'.[67] This conclusion is also reinforced by the fact that those who oppose Copernicus 'tacitly presuppose the motion of the Sun in the middle of the planets'.[68] Accordingly, as far as one considers the issue according to observations and reason, heliocentrism and the motion of the Earth hold up perfectly.

61 Cf. the conclusion of this set of theses: "Ita constat non invictum esse robur argumentorum, quae in Copernicum hactenus, propter locum terrae disputata fuerunt" (thesis 57).

62 Ibid., thesis 58: "Nec multo firmiora sunt pleraque, quae contra illius [the Earth] motum […] in medium vulgo producuntur".

63 Ibid., thesis 102. "Atque hinc apparet, multo iam usu inveteratis eiusmodi rationibus, quibus Copernici de loco et motu sententia impugnatur, non nimiam, quantumvis probabiles videantur, fidem habendam esse".

64 Ibid., thesis 105.

65 Ibid., theses 109–110.

66 Ibid., theses 113–114.

67 Ibid., thesis 119: "Ita apparet et Copernici sententiam de loco et motu terrae, suis adeoque non invalidis argumentis corroborari: et iccirco si rationibus tantùm iudicii humani pugnandum sit, non tantopere contemnendam esse".

68 Ibid., thesis 120: "motum et situm terrae Copernicanum impugnantes, nihilominus solem, etc moveri et suo loco (ex veterum sententia) inter planetas medium versari tacitè supponunt". The middle position of the Sun among the planets refers to the Chaldean order of planets, adopted by Ptolemy, where the Sun is placed between the inferior (Moon, Mercury, Venus) and the superior (Mars, Jupiter, Saturn) planets.

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Can we conclude from all this that Hunichius was convinced of the truth of the Copernican planetary order and his name should be included among the few 'realists' from the second half of the sixteenth century? The few theses that conclude this first and most important section of the disputation introduce, quite unexpectedly, a change of perspective: 'in any case, we must affirm that the Earth remains at rest and occupies the centre of this universe'.[69]

What is the reason for this apparent recantation? Only the biblical passages commonly adduced by Melanchthon and his followers and referred to by Hunichius in the margin: 'and this not so much from the strength and force of the arguments sought until now by human reason than from the authority of Sacred Scripture'.[70] Since this hypothesis (geocentrism, as sustained by God's revealed word) cannot fail or deceive, we find in it firm ground for explaining all phenomena.[71] There is no hint of the possibility of interpreting Biblical passages as an *accommodation* of God's word to common sense or vulgar understanding, as proposed, for example, by Christoph Rothmann in his correspondence with Brahe, already published in 1596.[72]

This is not the place to give a full account of this final and astonishing recantation after so many theses defending the plausibility of the physical reality of heliocentrism. Surely, we must not suspect a hidden Copernicanism in Hunichius and it is probable that we encounter a perfectly prepared dialectical exercise. In any case, the situation is similar to the one that Kepler and Maestlin encountered at Tübingen in the previous decade and it suggests at the early date of 1601 Hunichius' courage to confront established authority in the sciences and theological authority in the university. It is this same courage and bold assertion of his views that Hunichius shows toward Bartholomaeus Keckermann's strong Aristotelianism on the issue of comets in neighboring Danzig.

Hunichius chaired a disputation at Stettin on *De Cometarum ortu*, published near the end of October 1607. Though Keckermann is never mentioned in these theses, their entire content seeks to refute the tenets of the famous and influential Danzig rector. Moreover, theses 55 ('Those who deny that the art of observing can be applied to comets revolve in the greatest error, most pernicious

69 Ibid., thesis 121: "At quo se cunque modo res habeat, statuendum tamen est, terram et medium in hoc universo tenere, et immotam quiescere".

70 Ibid., thesis 122: "Idque non tam argumentorum, quae humana ratio hucusque pervestigavit, pondere et vi, quàm sacrosanctae scripturae autoritatae". Cf. the earlier judgement on Copernicus in *De caelo et caelestibus corporibus* (quoted above, note 55), where a physical argument (the attribution of a threefold motion to the simple body of the Earth) had been added.

71 Ibid., thesis 126: "Hac quae fallere nequit hypothesi tutius innitimur: ad quam etiam quaecunque oculis obversantur phaenomena […] referri posse putamus".

72 On this see Miguel A. Granada, "Il problema astronomico-cosmologico e le Sacre Scritture dopo Copernico: Christoph Rothmann e la 'teoria dell'accomodazione'", in: *Rivista di storia della filosofía*, 51 (1996), pp. 789–828; idem, "Tycho Brahe, Caspar Peucer, and Christoph Rothmann on Cosmology and the Bible", in: *Nature and Scripture in the Abrahamic Religions, vol. l.: Up to 1700*, eds. Jitse van der Meer and Scott Mandelbrote, vol. 2, Leiden, 2008, pp. 563–583.

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besides to astronomy')[73] and 56 ('Inasmuch as they call in question the certainty of geometrical demonstrations, approved and received by the calculation of everyone')[74] literally describe Keckermann's objections. In addition, Hunichius prepared in 1608 an edition entitled *De Cometis Disputationes duae. Prior de eorum ortu, Posterior de significationibus: Habitae in illustri Paedagogio Stetinensi. His Praemissae sunt ad* διάσκεψιν *viri cujusdam clarissimi* [i. e. Keckermann] *de Astronomicis Cometarum observationibus ADVERSARIA, quibus earundem veritas ab erroribus obiectis vindicatur*. The first of these disputations coincides with the one printed in 1607. They were listed, however, as a printed edition by Ernst Zinner.[75] Unfortunately, we have not found any trace of a printed copy, but there does exist a manuscript copy (Ms. 0377 at the Universitäts-Bibliothek Leipzig), in which the *Adversaria*, that is, arguments against Keckermann extend over seventeen pages. We may add that later, in 1619, the mathematician at the Danzig Gymnasium, Peter Crüger, who as a young scholar had served as the respondent in the 1605 disputation on comets presided over by Keckermann, declared in his *Uranodromus Cometicus*[76] that Hunichius in his *Adversaria* had refuted Keckermann's 'Diascepsin solidè et sufficienter'. However, since these *Adversaria* 'were not *in promptu*' (not accessible; perhaps not printed?), whereas Keckermann's texts were 'in omnium manibus' (i. e., in everyone's hands), he decided to intervene by making public the responses of Hunichius, with some additions of his own. In this way, he would defend astronomy and the geometrical conclusions against what he regarded as Keckermann's unfounded and prejudicial criticism, which entailed the ruin of astronomy. Crüger did this in Chapter 16,[77] to which he added a further chapter in which he replied to Keckermann's arguments in his *Systema physicum*.[78] I will thus close my presentation with a succint summary of Hunichius' reply to the 'Vir clarissimus [Keckermann]', along with some later considerations by Peter Crüger.

73 Christoph Hunichius, *De cometarum ortu disputatio*, Typis Rhetianis, Stetini 1607: "Qui enim artem τῶν τηρήσεων Cometis applicari posse negant, in maximo, eoque Astronomiae perniciosissimo errore versantur".

74 Ibid., "Utpotè Geometricarum demonstrationum certitudinem omnium calculo comprobatam et receptam in dubium vocant".

75 Ernst Zinner, *Geschichte und Bibliographie der astronomischen Literatur in Deutschland zur Zeit der Renaissance*, Anton Hirsemann, Stuttgart 1964, nº 4181.

76 Peter Crüger, *Uranodromus Cometicus: Ein außführlicher Tractat Vom grossen Cometen deß 1618 Jahrs/ Darinnen seine erscheinung und Lauff/ seine Höhe von der erden und andere daraus folgende sachen durch Astronomische rechnung dargethan/ und seine bedeutungen durch gebührliche muthmassung gesucht werden*, Andreas Hünefeldt, Danzig 1619. In this work Crüger adhered to the supralunarist and optical theory of comets.

77 'Anacephalaeosis Διασκέψεως Keckermanni de Observationibus Cometarum Astronomicis; et ad eam Adversariorum Hunichii', pp. 98–108.

78 Chapter XVII: 'Responsio ad argumenta Keckermanni de Cometis in Systemate Physico residua', pp. 108–113.

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Crüger calls Hunichius his only teacher in mathematics, whereas Keckermann had taught him the several philosophical disciplines.[79] At the same time, he refers to Hunichius as 'Philosophus et Mathematicus ingeniosissimus'.[80] This double label must not be taken in the same sense as Galileo, who obtained in 1610 the title of 'Philosopher and Mathematician' to the Grand Duke of Tuscany. For Galileo, it meant that both designations indicated one and the same thing, namely 'physico-mathematics' or the mathematical pursuit of natural philosophy;[81] for Hunichius, natural philosophy and mathematics (astronomy as *mixed mathematics*) were still two separate disciplines, each with its own method and deserving to be credited within its own domain, in allusion to the old proverb: 'an expert should be believed in his own art'.[82] According to Hunichius, this means that the mathematician (the astronomer, in the case of celestial bodies) determines the location and motion of bodies (sublunary or celestial) with the help of his own devices: observations, instruments and the geometrical technique of calculating parallax in order to find the distance of the observed object:

> The astronomer observes the position and location of this phenomenon [the nova of 1604] or other similar things, and so he does what is proper to his profession […]. But when the natural philosopher, relying on either reason alone or erring sense, ascribes to himself the exact [study] of the positions of the meteors or their distance, he claims for himself some right proper to mathematics or astronomy. As a consequence, he hears that an expert should be believed only in his own art. But a natural philosopher, when he argues about the true place and location of the celestial phenomena and related matters, should not be believed, since he is not able to advance in his science beyond the distance apparent to the senses, where, if the distance is too great, he goes astray, inasmuch as he is deprived of the means of establishing the true dimension and observation.[83]

79 Ibid., p. 100: "Praeceptor mihi fuit Keckermannus in Logicis, Physicis, Ethicis, Praeceptor Hunichius in Mathematicis, et quidem unicus: uterque sempiterna gratitudine colendus."

80 Ibid., p. 99.

81 See Dear, *Revolutionizing the Sciences*, pp. 72f.

82 Hunichius, *De Cometis Disputationes duae*, *Adversaria*, ad [Thesem] 4, sig. A2 v: "Artifici in sua *tantum* arte credendum esse" (note the limitation of authority to the art). The numbering refers to Keckermann's Theses in his *Diaskepsis*.

83 Ibidem: "Locum verò et situm cum huius [nova of 1604] vel similis φαινομένου observat Astronomus, facit quod sui est officii […]. Physicus autem, cum accuratum de locis meteororum, seu distantia vel soli rationi vel sensui hallucinanti confisus sibi ascribit, ius ad se aliquod Mathematicae vel Astronomiae proprium rapit; itaque audit hoc: Artifici in sua tantum arte credendum esse; Physico autem, qua talis est, de vero situ et loco φαινομένων caelestium et quae huius affinia sunt disserenti, fidem haberi non debere, cum ultra apparentem sensui distantiam, in qua ille, si nimia sit, aberrat, utpote verae dimensionis et observationis adminiculis destitutus in Scientia sua progredi nequeat". Cf. *adversaria* ad [Theses] 30 and 31, sig. B4 v. See also Hunichius, *De cometarum ortu disputatio*, theses 50, 52, 53, 54, 74.

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Thus, contrary to the errors committed by philosophers, including Aristotle, when they locate comets below the moon, deprived as they are of the geometrical technique of measuring parallax (unknown to antiquity),[84] mathematicians (astronomers) have established in modern times, with the absolute certainty of mathematical demonstrations, that all comets observed since 1577 are located in the heavens:

> Thus, it has been fully examined under the watchfulness of other most excellent authors, but chiefly by Tycho Brahe, the European Atlas, that all comets that appeared in previous years were located in the ethereal region. […] Hence, it can be argued as follows: as many comets as those that have been observed by astronomers through careful study and most accurate instruments have shown either no parallax or one smaller than that of the Moon. Nor could a different example be given. Therefore, all comets are higher than the Moon.[85]

Accordingly, any discussion among natural philosophers on the generation of comets must necessarily depart from this proven conclusion: 'One cannot even discuss the generation of new stars and comets, unless something certain has been formerly established about their location'.[86] Therefore, when natural philosophers question the natural location of comets by arguing that no sublunary exhalations can provide enough matter for such a great and enduring cometary body, they presuppose the truth of the Aristotelian theory of the generation of comets. But in fact they should rather proceed in the opposite manner and consider that mathematical astronomy has demonstrated from the celestial location of comets that they are not caused by sublunary exhalations rising to the heavens and there inflamed: 'To invert the argument, because the globe of the Earth cannot supply so huge a mass of comet with enough matter, the comet cannot then actually have an elementary nature'.[87]

84 In fact, Hunichius does not affirm that it was unknown in ancient times, but only that very scant information about celestial comets has come to us from ancient sources; see Hunichius, *De cometarum ortu disputatio*, theses 60–62. Instead, Maestlin explicitly affirms that antiquity, and as a consequence Aristotle, ignored this technique, only discovered and applied in modern times by Regiomontanus. On this, see Granada, "Michael Maestlin and the Comet of 1618", pp. 268–272.

85 Hunichius, *De cometarum ortu disputatio*, theses 67 and 70: "Itaque, tum aliorum praestantissimorum vigilantia virorum, tum imprimis Tychonis Brahaei, Atlantis Europei opera pervestigatum [est], Cometas, qui superioribus annis exorti sunt, omnes in aetheris regione haesisse. […] Hinc ita argumentari licet: Quotquot Cometae ab Astronomis accuratiori studio et accuratioribus instrumentis observati sunt, vel nullam, vel Luna minorem *παράλλαξιν* habuerunt. Nec dissimile exemplum dari potuit: Ergo omnes Cometae Luna sunt altiores".

86 Hunichius, *De Cometis Disputationes duae*, *Adversaria*, ad [Thesem] 37, sig. C1 v: "De generatione enim novarum stellarum et Cometarum disseri nequit, nisi de loco eorundem prius certi aliquid definitum fuerit".

87 Ibid., *Adversaria*, ad [Thesem] 34, sig. C1 v: "inverti argumentum, quia tantae moli Cometae

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The mathematician thus arrives at the exclusion of a physical theory of comets through solid (mathematical) reasons. Once he does this, however, he proposes another theory about the generation of comets, acting, according to Hunichius, as a natural philosopher (*physicus*): 'Further, it seems that an injustice is done to astronomers when they are charged with seizing upon and attacking the principles of physics; since 1. when they deal with the location of comets, they do it as astronomers, because they are the only ones who can judge the matter. If, at the same time, they touch upon the cause of generation, they do it as natural philosophers, as has been stated previously'.[88]

Hunichius maintains the distinction and separation between physics and mathematics. But as a *physicus* relying on mathematical conclusions, he argues for a new explanation of the generation of comets. They are not extraordinary miracles produced by the absolute power of God (as Keckermann argued for the novas [for him perhaps comets] of 1572 and 1604),[89] but ordinary effects of nature demanding a natural explanation: 'Here a new question arises: whether [Comets] are produced by God extraordinarily, out of nothing; or whether they take their origin from natural causes and beginnings. We are persuaded that there is no need to take refuge in a new Creation, since it has been found that all [comets] are produced and perish in one and the same way. […] And so we stand by the opinion of those who affirm that the birth of comets is natural'.[90]

Hunichius also expressed his preference for the contemporary *optical theory*[91] in the form it had recently acquired and presented it as an *accomodation* to the old Aristotelian theory. Indeed, if according to the Stagirite, the celestial ether can vary in density, exemplified by the celestial bodies themselves, as the 'denser part of their orbs',[92] Hunichius for his part conceived of comets as a *transient* condensation of

terrae globus sufficientem materiam preabere nequit, ideo Cometam quoque elementaris naturae haud existere". Cf. also Crüger, *Uranodromus Cometicus*, p. 108.

88 Ibid., *Adversaria*, ad [Thesem] 17, sig. A4 v: "Astronomis praeterea videtur iniuria fieri; dum iis imputatur, quod in physica principia involent, eaque oppugnent; Nam 1. de loco Cometarum cum agunt, faciunt id, qua Astronomi, de eo etiam soli iudicare possunt: si rationem generationis unà attingunt, faciunt id, sicut antea dictum, quà Physici". Cf. Keckermann, *Diaskepsis*, Thesis 56, p. 417 (quoted above on ref. 42). Like Keckermann, Hunichius also grants to the *physicus* the discourse on comets, but his natural philosopher departs from the sound conclusions attained by astronomers on the celestial location of comets.

89 Ibid., *Adversaria*, ad [Thesem] 33, sig. C1 r, where Hunichius opposes any escape into the miraculous through allegiance to natural limits by adducing the old proverb "Ne extra oleas" (Not beyond the limits).

90 Hunichius, *De cometarum ortu disputatio*, theses 34 (erroneously given as 33), 35 and 37: "At hic nova succedit quaestio, an praeter ordinem a DEO ex nihilo producantur; an ex naturalibus initiis atque causis originem ducant. Non opus esse putamus hic ad novam Creationem confugere, cum uno eodemque modo omnes fieri et interire deprehensi sunt. […] Itaque stemus ab illorum partibus qui Cometarum ortum naturalem esse autumant".

91 For the genesis and development of this conception of comets, see Peter Barker, "The Optical Theory of Comets from Apian to Kepler", in: *Physis*, 30 (1993), pp. 1–25.

92 Hunichius, *De cometarum ortu disputatio*, theses 96 and 97, with quotation of *De caelo*, II, 7, 289 a 13ff.

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the ether[93] and, in accordance with their proper motion, he substituted the concept of solid ethereal spheres for the celestial fluid postulated by Brahe and other contemporary astronomers and philosophers (Christoph Rothmann, Giordano Bruno among others).[94] Hunichius further claimed that solar illumination explains the brightness of comets: 'With the matter of comets established in this way, it follows that their form […] is neither fire nor a glowing flame, but an image or the light of the Sun collected in the denser parts, as we ascertained previously from the precise position of comets with respect to the Sun or from the projection of their tail'.[95]

Like Maestlin in his manuscript treatise on the comet of 1618, Hunichius, in his theses from 1607 and his *Adversaria* from 1608, rejected every argument adduced by Keckermann against the reliability of astronomical observations. Several years before Maestlin wrote on these matters, Hunichius argued that astronomical science would be impossible if (1) astronomical instruments supply results that lack reliability due to the different data they provide, (2) astronomical observations are unreliable because of the refraction of light rays that pass through fire and air, and (3) because of the eccentricity of the point of observation with respect to the center of the earth.[96]

Keckermann, however, was aware of this pernicious implication and reacted by weakening his claim: comets are irregular, elementary bodies unsuitable to astronomical observation. This sort of recantation[97] seemed to Hunichius to rest on a desperate attempt to save Aristotelian celestial incorruptibility; accordingly, he argued that all bodies are indifferently subject to the geometrical rules of the determination of distance.[98] In his objection, Hunichius imputed to these Aristotelians what Aristotle had ascribed (Hunichius quoted in Greek *De caelo*, III, 7, 306b 6–9) to the Platonists: 'they find themselves, in a discussion about phenom-

93 Ibid., thesis 99: "Atque sic, ut coitione partium densiore stellae productae sunt ita ψευδοάστερες [that is, cometae] per condensationem partium adhuc fieri possunt".

94 Ibid., thesis 98: "Neque enim existimandum est, coeli substantiam duram et solidam esse, siquidem corporibus quae moventur cedere potest, ut Cometae testantur: sed liquidam tenuem sive mollem existere admodum probabile est".

95 "Constituta hoc modo materia Cometarum, sequitur formam […] non esse ignem vel flammam ardentem, sed ἔμφασιν, sive lumen solare in densioribus partibus collectum: id quod antea ex positu Cometarum ad solem definito vel caudae proiectione comprobavimus", ibidem, thesis 102, with reference to theses 86–89. According to thesis 104, the ether condensed in the comet produces a peculiar light, much weaker than that borrowed from the sun.

96 Hunichius, *De Cometis Disputationes duae*, *Adversaria* ad [Theses] 12–16, sig. A3 v-A4 r: "Eodem argumento videtur astronomicarum observationum veritas in universum […] tolli; quod cavendum ne fiat in tam praeclarae et nobilis disciplinae despectum".

97 Ibid., Ad [thesem] 17, sig. A4 r: "Videtur in hoc theoremate affirmari ἀντικείμενον ἐν τῷ προσκειμένῳ".

98 Ibidem: "Si enim Astronomicis observationibus nihil derogatur, qui ergo impugnantur astronomicae observationes Cometarum vel novarum stellarum, quarum eadem forma est, principia et certitudo, quae siderum? […] Quid verò iterum Astronomiae immerenti obiicitur, eam, quia certa Cometarum loca in aetherea regione definit, ideo doctrinas de caelesti corpore, eiusque puritate, perpetuitate et distinctione à corporibus inferioribus, itemque de elementis et corporibus in sublime generatis oppugnare? Abusata sunt ista".

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ena, making statements with which the phenomena conflict. This is because they have a wrong conception of primary principles, and try to bring everything into line with hard-and-fast theories'.[99]

In a standard rebuke to the Aristotelians of his own time, Hunichius invoked (again anticipating Maestlin in his reply to Keckermann) the moderate stance of Aristotle himself in his *Meteorology*, where the Stagirite had conceded that his cometary theory (Book I, Chapter 7) was merely incomplete, conjectural and probable in character, founded more on abstract reasons than on observations.[100] Were he alive, Aristotle would retract his own views and adopt those reached by Brahe and other celestial practitioners on the basis of their novel observations and the certainty of geometrical demonstration.[101] And this all the more so as, contrary to what Keckermann feared, amending Aristotelian cometary theory did not entail the destruction of natural science as a whole, but only the replacement of an erroneous conception by another more closely in line with observations: 'For I still do not understand why, if we act this way, the body of natural science shall not remain for us safe and sound, since the astronomical observation of the location of comets is not the general principle of physical science; nor, if it is a particular principle regarding only the galaxy, comets and new stars, that it immediately brings the downfall of all other doctrines in this science'.[102]

It may be asked whether Hunichius was completely sincere when he claimed that the new elements of the cometary theory he was proposing were really in accordance with the philosophy of Aristotle.[103] I cannot exclude an affirmative response, since, when he considered himself both a philosopher and a mathematician, he did not conceive (natural) philosophy in the same way as Galileo. This was

99 Ibidem.

100 Ibid., Ad [thesim] 6, sig. A3 r: "Quod si Aristoteles ipse Meteorologiam suam imperfectam agnoscit, in qua tantum aliqua se scribit attigisse, de nonnullis adhuc dubitare, 1 Meteor. c. 1. et de Cometis tantum rationi non sensui, atque idcirco non observationi consentanea tradere affirmat 7. capite lib. 1 Meteor: [...]". Cf. Hunichius, *De cometarum ortu disputatio*, thesis 44: "In tractatione de Cometis cap. 7 testatur qualemcunque tantum, probabilem scilicet rationem ortus cometarum à se proponi". For Maestlin, see Granada, "Michael Maestlin and the Comet of 1618", pp. 270f.

101 Hunichius, *De cometarum ortu disputatio*, thesis 41: "Sed hîc procul dubio aequiorem longè Aristotelem (si in vivis adhuc esset) haberemus, quam ex credula eius posteritate nonnullos, qui hic ne latum unguem à sententia Aristotelis discedendum esse opinantur"; thesis 42: "Primò enim proprio exemplo et verbis quoque admonuit amicos nobis esse debere praeceptores, at amiciorem veritatem".

102 Hunichius, *De Cometis Disputationes duae*, *Adversaria*, ad [Theses] 7 et 8: "Nondum enim intelligo, cur hoc si faciamus, ideo integrum et salvum nobis mansurum non sit Scientiae naturalis corpus: non enim de loco Cometarum observatio astronomica, principium est Scientiae naturalis generale: neque, si speciale est, quod tantum Galaxiam, cometas, stellas novas spectat, continuò secum trahit ruinam reliquarum omnium in ista scientia doctrinarum". Similarly in Maestlin; see Granada, "Michael Maestlin and the Comet of 1618", p. 273.

103 Hunichius, *De cometarum ortu disputatio*, thesis 122: "Atque hucusque probabilis ratio generationis Cometarum aetheriorum accommodata principiis Aristotelicae Philosophiae reddita fuisse videtur".

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certainly the case with Maestlin as well. As a consequence, neither Hunichius nor Maestlin thought that Keckermann was right to fear that from the collapse of the Aristotelian cometary theory the principle of celestial immutability and the ruin of natural science would inevitably follow. For both Hunichius and Maestlin, this supposed ruin affected only an incorrect portion of physical science. However, the ultimate result of this protracted discussion, to which many other issues contributed, was the complete collapse of Aristotelian physics. Its gravedigger was precisely the new *physico-mathematics*, only partially anticipated by Hunichius, Maestlin [104] and many other *mathematicians* who reacted to Keckermann's strict Aristotelianism.

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104 Recall however Maestlin's resistence to Kepler's project of a *celestial physics* as finally presented in Kepler's *Astronomia nova (*1609).

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Defending Aristotle, Constructing *Chymia:* Libavius, Logic, and the German Schools*

Bruce T. Moran

The Jesuit teacher, philosopher, and Ramist scholar, Walter Ong (1912–2003), expressively noted that 'there is no time when method and system are more valued than when one is faced with utter chaos.' How, he asked, was one to organize learning in the late Renaissance when developments in knowledge were outgrowing the traditional liberal disciplines? How were new disciplines to be defined when what we think of today as a particular "subject" was not often, if at all, clearly described and the notion of an "art" was rooted in a structure of learning linked to grammar, rhetoric, and dialectic?[1] In this regard, creating a definition for a new branch of learning like *chymia* (chymistry) required first deciding if a "subject" existed and then determining what kind of subject it was. The Peripatetic categories of *scientia* (causal knowledge) as well as *historia* (descriptions of what Aristotelians would call accidents) were relevant to doing both. However, to decide the essence of a subject meant also to identify those characteristics that inhered to it alone (what was called its *proprium* (its peculiar properties). Here too, Aristotelian logic was ready to hand, and one person very eager to employ that reasoning to define the subject of *chymia*, and to introduce that subject as a discipline within the liberal arts, was the school teacher, physician, and alchemist, Andreas Libavius (c. 1555–1616).[2]

Libavius spent most of his professional life, when he was not writing about practical alchemy and denouncing Paracelsian medical cosmology, as a supervisor of public education, what Aristotle called a *paedonomus* (παιδονόμος). In

* My thanks to J. Mark Sugars who years ago helped crucially in reading difficult passages in Libavian texts.

1 Walter J. Ong, "Ramist Method and the Commercial Mind," in: *Studies in the Renaissance*, 8 (1961), pp. 155–172, here pp. 170–171; Walter J. Ong, *Ramus, Method, and the Decay of Dialogue*, Cambridge 1958.

2 For a general discussion of the cultural shift in writing about *alchemia* and *chymia* inspired in great part by Libavius and his attention to pedagogy see Bruce Moran, *Andreas Libavius and the Transformation of Alchemy: Separating Chemical Cultures with Polemical Fire*, Sagamore Beach 2007; also, "Axioms, Essences, and Mostly Clean Hands: Preparing to Teach Chemistry with Libavius and Aristotle," in: *Science and Education*, 15 (2006), pp. 173–187; and "Eloquence in the Marketplace: Erudition and Pragmatic Humanism in the Restoration of Chymia," in: *Chemical Knowledge in the Early Modern World*, ed. Eddy, Mauskopf, Newman (*Osiris*, 29), pp. 49–62; also, Owen Hannaway, *The Chemists and the Word: the Didactic Origins of Modern Chemistry*, Baltimore, London 1975.

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the *Politics* Aristotle described the superintendence of shared public education as the means by which vulgar things (those things useless for the actions of virtue) could be separated from what was useful, and the republic thus preserve a single, virtuous purpose.[3] Libavius took the role of superintendence seriously and in his capacity as *paedonomus* at a small school in Rothenberg ob der Tauber emphasized two responsibilities that students needed to learn for the sake of personal piety and the public good. The first was a responsibility to learn Latin and Greek, so that they were able to interpret 'tongues with tongues in turn.' By then students should also have been introduced to a second obligation, namely, learning how to make 'reasoned judgments concerning controversial matters,' and Libavius was very clear about how this should be done. Proper instruction concerning logic required students to take part in 'established disputative skirmishing' [*institutis velitationibus disputatoriis*] guided by 'reasoning methods from the Lyceum of Aristotle as illustrated by Petrus Ramus' (1515–1572).[4]

Ramist scholars have noted the crucial role played by German publishers in the spread of Ramist dialectics and rhetoric. They have also observed that the institutional dynamic in applying and broadcasting Ramist methods of teaching was a bottom up, rather than a top down, process. Ramist pedagogy, with its various Aristotelian blends (sometimes called semi-Ramism or Philippo-Ramism) and its emphasis upon what was efficient and useful, spread within both Lutheran and Reformed schools not from universities to gymnasia, but from secondary schools, from Latin gymnasia, *schola publica*, and academies, into university curricula. In doing so it prompted pedagogical changes in teaching Aristotelian philosophy while challenging the role of humanist philology within the arts.[5] What became known as Ramism was in large part an attempt to reorganize knowledge for the sake of "youthful beginners." By means of a process, or method, that connected the most general with the most particular, anything (a subject, an artifact, an activity) could be assigned an easy-to-remember visual place on a spatial map of learning. Ramist method was intended to be practical and pedagogically useful, and what worked for subjects and activities worked for arguments and judgments a well.[6] To the *paedonomus* at Rothenburg there were obvious advantages to setting aside cloudy metaphysics and teaching clear principles of inference and deduction. 'No one will ever persuade me,' Libavius wrote, 'that someone can judge well who has learned improper precepts for judging.' 'Ramus,' he explained, had 'put aside the commentary and interpretations' associated with

3 1337b4ff. *Politics*, transl. H. Rackham, Cambridge 1932, p. 637ff.

4 *Epistolarum chymicarum epistolica forma […] liber tertius* […], Francofurti: in officina typographica Ioannis Lechlerri, impensis Petri Kopffij, 1599, Epistola XXX, pp. 245–253. *Non abest rationes ex Aristotelis Lyceo per P. Ramum illustrato facultas* […]

5 Howard Hotson, *Commonplace learning: Ramism and its German Ramifications, 1543–1630*, Oxford 2007. Joseph S. Freedman, "The Diffusion of the Writings of Petrus Ramus in Central Europe, c. 1570–c. 1630," in: *Renaissance Quarterly* 46 (1993), pp. 98–152.

6 For the place of Ramus in Renaissance traditions of logic see Peter Mack, *Renaissance Argument: Valla and Agricola in the Tradition of Rhetoric and Dialectic*, Leiden 1993.

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Aristotle's logic and had extracted the most useful axioms and the clearest rules for a system of judgment.[7]

Ramist methods helped determine what information, processes, and objects belonged to which sets of things, and helped establish categories for placing questions and making rational arguments. As such, Aristotle as well as Ramus (and many others who took part in debating the contours of Renaissance reasoning) provided key intellectual tools related to definition and explicit comparison. Students learned to divide areas of learning and to distribute and differentiate the parts that made them up.[8] Crucially, what emerged was a clearly expressed logical statement of what was homogeneous and what was heterogeneous in a given subject. For Libavius, the very same tools of logic used to instruct boys in their responsibility to judge well, became the means by which he pursued another goal, a personal threefold mission to discover the precepts of *chymia*, to accommodate them 'to the form of the perfect sciences,' and to explain them, as he says, 'by means of the Aristotelian constitution of the arts and the Ramist method.'[9]

Here is an example of how such logical division worked. In a small text that he called *An Outline of the Art of Medicine*, Libavius ventured a definition of the medical art, and did so, as he says, while 'hiding behind Apelles's canvas' so that he could find out how the various medical factions would respond. His intention, however, went well beyond stimulating discussion, and at the very beginning of his text he tells us what his purpose really is. 'We must not only be judges of the opinions and works of others, but also confessors and asserters of what is true, so that from the straight it may be apparent how much the oblique declines away from it.' What was true about medicine was ancient and tied to Galen. What was oblique was the system advocated by Paracelsus and his followers. There was no middle ground. In trying to find it, one only found ridicule. 'In truth the opposed sides were so filled with mutual bitterness against each other, that there was no

7 *Rerum chymicarum epistolica forma […] liber secundus*, Francofurti: excudebat Ioannes Saurius, impensis Petri Koffij, 1595, Epistola LXXXVI, pp. 521–529; pp. 526–527: 'Necesse itaque est chymicum bonum esse logicum et quidem logicum non vulgariter didicisse, sed emendate, quo pacto hodie praecepta a Petro Ramo elaborata circum feruntur. Nemo mihi persuadebit unquam bene iudicare posse eum, qui iudicii praua didicit praecepta. Multi Aristoteleam iacant logicam; sed ea praecepta cum commentariis exhibit, nec facile est agnoscere, quidam tandem pro comprobato certoque sit ponendum. Aristoteles quorundam se inuentorem iactat. At unius autoritas artem non constituit. Petrus Ramus commentarium et interpretamenta seposuit; genuina usuque optimo spectata axiomata excerpsit, ut iam pateant regulae ad iudicium rationis genericum syncerae.'

8 Ramus, *Dialecticae libri duo*, ed. Sebastian Lalla and Karlheinz Hülser, Stuttgart-Bad Cannstatt 2011.

9 *Rerum chymicarum epistolica forma […] liber primus*, Dedicatio: 'Sed quo amplius eam verso, eo arridet magis adeo, ut ad formam perfectarum scientiarum accommodare praecepta eius, et Aristotelea artium constitutione methodoque Ramaea illustrare animum induxerim.'

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way that one who put himself in the middle could avoid offending both sides, and be met by hostility from each.'[10]

At first, his definition of medicine does not appear adventurous at all. The idea was, in fact, ancient. Medicine, he says, is the art of healing well [*Medicina est ars bene medendi*]. Who could disagree with that? Its subject was the living human body, 'insofar as it is sick or is able to become sick,' and also 'by a system of prophylaxis and preservation in its undamaged state even insofar as it [the body] is healthy.' And yet, what pertained to this art required careful division. All healing came from God, but miracles were not part of the art of medicine. Neither was magic. What was procured through angels, or occurred through evil genii with the permission of God, did not come under the power of the physician. Neither were the things done through magical incantations. This was not a denial that the body might be afflicted by means of magic. Someone affected by magic, however, must not be sent to the physician, but to God, for only God 'can command created spirits.' When injured by means of enchantments the first cause must be removed, and this is done not by medicine but by God and through theological help. Another sort of distinction separates the rational medical art from random experience. The physician who is aligned with the true art of medicine, and in whom science and praxis have been conjoined, acts skillfully by means of a definite system of principles that inform experience itself. a physician's *praxis*, in other words, depends upon a knowledge of principles. 'For there cannot be, in an art, any experience of that of which no scientific principle exists, since it [an art] is a sort of comprehension and token of theory and praxis at the same time […]. Where there are no principles, there is no rational *praxis*.'[11]

Libavius's divisions establish what is part of, or homogeneous, and what is not part of, or heterogeneous, in the art of medicine. Diseases ordained as divine in origin are heterogeneous to the art. Relief, in this case, is in the hands of God. What Paracelsus claimed concerning a certain variety of disease, the *ens dei*,[12] that came from God and yet could be cured by the physician was, then, logically false. Magic and enchantment may cause disease, but the cure is not by means of medicine. Neither is experience alone enough to establish homogeneity with the medical art.

10 "Delineatio constitutionis artis medicae, qualem his temporibus desiderant Hippocratici, Hermetici, servatis veterum inventis," in: *Appendix necessaria Syntagmatis arcanorum chymicorum* […], Francofurti: exudebat Nicolaus Hoffmannus, impensis Peri Kopffij, 1615, pp. 118–129; p. 118: 'Non iudices tantum alienarum opinionum et operum esse debemus, sed et verorum confessores, assertoresque, ut ex recto appareat, quantum ab eo declinaverit obliquum […] Duae nostris temporibus factiones inter se contendunt, una est Galenica, alterea Paracelsica […] Tentata est media quaedam ratio, qua ex utriusque contendentibus eligeretur, id quod probum est et genuinum […] Ita vero exacerbatae sunt in se mutuo partes adversae, ut fieri non possit, quin is qui se medium interiecerit, utrinque offendat, et ab utrisque male excipiatur.'

11 "Delineatio constitutionis artis medicae […]," p. 119: 'Neque enim experientia potest, cuius nullum extat principium scientificum, cum sit complexio quaedam et symbolum theoriae et praxeos simul […]. Ubi itaque non sunt principia, ibi praxis rationalis est nulla.'

12 Paracelsus, *Volumen medicinae paramirum*, transl. Kurt F. Leidecker, Baltimore 1949, pp. 56–63.

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Most significantly, illnesses and treatments related to celestial influence,[13] a key Paracelsian position, were also outside, and oblique to, the true medical art.

In defining *chymia*, the same method of distinguishing homogeneity from heterogeneity is at work. Paracelsians had used the term *chymia* to describe the making of a variety of medicines whose powers came from the stars, and which linked the macrocosm to the microcosm. Libavius regarded such an astral scheme to be a taxonomic fiction. In his knowledge tree, what was relevant to *chymia* had to have, like disease itself in regard to medicine, a terrestrial, not a celestial basis. 'Nothing should be received into *chymia*,' he says, 'that is not of *chymia*.' In *chymi*a the limit of the art was the material world. Everything else was heterogeneous; and 'everything heterogeneous is false.'[14] How should one understand a chemical essence, he asks? Should one accept that formal and specific essences could be separated from material things (as Paracelsians claimed) to the extent that they were no longer even physical, but having set aside their elementary qualities had passed into the nature of something celestial? This, however, would be an illusion. In looking for what was homogeneous, the essence of a substance made up of terrestrial elements had also to be terrestrial, and not defined, Libavius concludes, as some other celestial or metaphysical thing.[15]

The principle of homogeneity was Libavius's logical anchor, and was as much a part of Aristotelian as Ramist traditions. Ramus called it the *lex justitiae*, the principle by which the purpose of an art determined what was proper, or homogeneous, to its discussion. It was a rule that Libavius expected his students to know and use as a fundamental element in "judging well." In a student thesis written later when Libavius directed a superior gymnasium in Coburg (a thesis that Libavius probably wrote himself) the discussion of the elements as composed of heavenly qualities by the Aristotelian professor of logic at Padua, Jacopo Zarabella (1533–1589), fell victim to the same logical criticism.[16] Whether stemming from the views of an Aristotelian like Zarabella or related to the claims of Paracelsian physicians, Libavius's students learned that attempts to extract celestial powers from terrestrial things was to commit a mistake of categories, and thus logically and chemically wrong headed.

13 Ibid., pp. 13–23: 'ens astrale.'

14 *Rerum chymicarum epistolica forma […] liber primus* (1595), Epistola XIII, pp. 116–124; p. 119: ‚Iuxta hanc doctrinam nihil in chymiam recipietur, quod non sit chymicum: Nihil nisi quod verum. Omne enim falsum heterogeneum.'

15 Ibid., Epistola IX, pp. 92–97; pp. 93–94: 'Quidam vesani putant se essentias formales et specificas a rebus separare posse; ita ut non amplius ad censum elementorum pertineant, sed qualitatibus elementaribus spoliate transierint in coelestium αποιων naturam […] Quod afficitur ab elementis, id necesse est his homogeneum esse […] Quin nec fieri potest verae ab elementari materia et qualitatibus in elementaribus seiungantur. Portentosum ita que hoc est figmentum.'

16 *De mundi corporumque mixtorum elementis et principiis Platonicis, Aristotelicis, Hippocraticis, Hermeticis exercitatio physica* […], Coburg: impressa Coburgi typis Ducalibus a Iusto Hauck, 1608, paragraphs 34–35.

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Although the Rothenburg *paedonomus* approved the usefulness of much of Ramus's method for purposes of efficient pedagogy, Libavius spurned Ramus's attacks upon Aristotle and other ancient figures like Cicero and Quintilian. His judgments oscillated between praise and blame on numerous occasions, and opponents took note of the reproving and derisive language that he brought to bear upon specific points of Ramist writing.[17] After all, it was a short distance between claiming, as Ramus did, that Aristotle lacked method and asserting that some of Aristotle's arguments were logically false. Regardless, Ramus was one thing, his advocates, another. And here is where the real trouble in Libavius's Ramist disputes primarily lies; because the debate about logic and method, and the texts that Libavius produced aimed at dialectic and reasoning, did not arise in isolation, but were connected to other arguments, some of them confessional and others connected to ideas concerning the theory and practice of the arts and sciences. This was a struggle in great part over the minds of boys, and how the adults of tomorrow were to be trained to view the world. It is by no means surprising, therefore, that the works for which Libavius is most remembered, his *Alchemia* (1597) and his three volumes of chemical letters, *Rerum chymicarum epistolica forma […] liber primus, secundus* (1595), *tertius* (1599) were conceptually knitted together with school texts and polemics concerning logic and method that appeared throughout most of the 1590s, and with a searing focus in the years 1594–1596. His first major printing venture (1591) was, in fact, not a text about medicine or *chymia* at all, but a comparison of Peripatetic and Ramist positions concerning elements, qualities, and other issues of natural philosophy.[18]

Aristotle as much as Ramus gave advice about what was proper to any art or science, and to students and others Libavius explained that 'there are some who consider it shameful to agree with the ancients wherever the ancients are unique and disagree with modern ideas. I am not so devoted as to defend their errors. Nevertheless, when they assert things that are not definite, but probable, and my own reasoning seems likewise probable, I bow to them in such a way that [if necessary] I still have a clear path of retreat. Sometimes, however, they are filled with enough clear truth, and I think then it wrong not to agree with them. For they were not brute animals, nor did they just make statements of truth without logic or honesty. So, why reject them, as some of the moderns, puffed up with the pride of Ramus, do?'[19] Some of those labeled "moderns" had used Ramist dialectics as a platform

17 For a list as they appeared in Libavius's *Dialecticae emendatae libri duo* (1595) see Joannes Bisterfeldius, *Nex et anatomia horridi et furfuracei, informis et infirmi apodictici monstri […]*, Hanoviae, apud Guilielmum Antonium, 1597, pp. 13–16.

18 *Questionum physicarum controversarum inter peripateticos et Rameas tractatus […]*, Francofurti: apud Ioannem Feirabendium, impensis Ioannis Wecheli et Petri Fischeri sociorum, 1591.

19 *D.O.M.A. Singularium […] pars prima* […], Francofurti: impressa a typis Ioannis Saurii, 1599, *ad lectorem de palaestricis*, p. 11: 'Tu vero Lector scias velim, me non astrictum esse ita vetustati, ut errores defensos velim: veruntamen cum aliquando non quidem plane firma, sed probabilia afferant, et meae rationis item videantur non improbandae; ita deflicto ut interim recessum retineam liberum aliquando manifesta veritate satis stipentur tunc nefas esse exi-

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from which to launch attacks upon Peripatetic philosophy as a whole, and in doing so had also attacked the system of logic taught in schools that pertained to the knowledge of medicine.[20] Some detractors had gone further, not only attacking Galenic and Hippocratic thinking, but supporting the medical-philosophical system linked to Paracelsus as well. At the beginning of his text of 1591, dedicated to the Senate of Rothenburg, Libavius noted that the Ramist faction had begun making a great effort to oppress the truths laid out by Hippocrates, Galen, Aristotle and others, and this to such an extent as possibly to jeopardize the talents of students.[21]

Constructing definitions, for *chymia* or anything else, was not an easy task, especially when the basis for doing so was linked to Aristotle's view, expressed in the *Posterior analytics*, that any definition meant discovering the actual essence or being of a thing.[22] In one of his many chemical letters Libavius acknowledged the complexity of the problem. Aristotelian definitions, he notes, were in great danger, and had even been censured by intelligent persons, since the true essences of things might never be known. In the attempt to know "being," things were joined together in so many ways that a description, in terms of an immutable subject demonstrated by means of its proper cause, was scarcely ever immune to criticism. 'In a jumble of so many things the [Aristotelian] way' was, he had to admit, 'prone to error.'[23] In trying to define what counted as *chymia*, then, how was one to proceed? Clearly, piling up observations without rational guidelines was no solution. Not everything, he explained, could be waded through individually. Ambiguous judgments, combined with a harvest of accidents, always left open the possibility of contradiction. Moreover, Ramus himself had granted that for knowledge to be scientific it had to be grasped by means of causes and universal principles; and whatever was universal, according to Aristotle, proceeded from the inner intellect.[24] Intellect and experience, while different in nature, could,

stimo cum illis non sentire. Non enim fuerunt bruta animalia, nec nihil cum ratione et argumentorum fiducia pronunciarunt. Cur ergo eos ita repudiem ut recentes nonnulli supercilio Rami tumentes, solent.'

20 On the relation between writing about logic and other areas of knowledge see Ian Maclean, *Interpretation and Meaning in the Renaissance: the Case of Law*, Cambridge 1992; *Logic, Signs and Nature in the Renaissance: the Case of Learned Medicine*, Cambridge 2001; and "Logical Division and Visual Dichotomies: Ramus in the Context of Legal and Medical Writing," in: *The Influence of Petrus Ramus: Studies in Sixteenth and Seventeenth Century Philosophy and Sciences*, ed. Mordechai Feingold, Joseph S. Freedman and Wolfgang Rother, Basel 2001, pp. 228–247.

21 *Questionum physicarum controversarum inter peripateticos et Rameas tractatus […]* (1591), epistola dedicatoria: 'Magnus est conatus Rameae factionis in opprimenda veritate naturali, per Hippocratem, Galenum, Aristotelem et alios horum studiosus explicata: adeo ut non immerito perturbari ingenea adhuc tenera possint.'

22 90b30ff, *Posterior analytics*, transl. Hugh Tredennick, Cambridge 1960, p. 183: 'Definition is of the essence or essential nature, and it is obvious that all demonstrations assume the essence as a received fact.'

23 *Rerum chymicarum epistolica forma […] liber primus* (1595), Epistola VIII, pp. 88–91; p. 89: 'In congerie plurium prona ad errandum via est […].'

24 *Tetraemerum autoschediasticum pro defensione sententiae Andreae Libavii […] contra mentem Petri Rami* […], Francofurti: excudebat Ioannis Saurius, impensis Petri Kopffij, 1596, pp. 153–154.

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nevertheless, work in harmony. For Libavius, theory and practice supplied clarity and constancy to one another. At the beginning of a discussion concerning the preparation of chemical medicines he observed that 'no science or art is fixed unless the principles and rules have been discovered through reason produced by opportunity and necessity, verified by use and experience, and made certain by the authority and judgment of wise craftsmen […]. When we call upon art, we turn attention to an aptness [for doing something] in accordance with knowledge based in theory.'[25] In searching for definitions, a method of division offered a means of selecting and properly organizing essential attributes. In this regard, *techne* (an art or skill) and *episteme* (understanding) worked together; and while Aristotle made a distinction between programs of teaching (based in demonstrations) and programs of scientific investigation (based in first principles derived via intuition and dialectic), both were necessary in describing the relationship between universals and particulars, and in identifying those things, as predicates or middle terms, that lay between.[26]

Reasoning by mean of causes, principles, and axioms fixed the *genus* of specific procedures and these in turn, precisely articulated, further defined the subject itself. Libavius called this axiomatic homogeneity, and it was, he thought, the only way of instituting the arts. From a first definition, the properties of an art immediately followed, and the properties related to procedures and *techne* clarified thereafter whatever in the art was held to be axiomatic and universal.[27] 'If therefore to all these special offices together you assign the name of a *genus*, you would not be mistaken in your definition. For the members complete the essence of the whole, and from this a not unacceptable definition is made.'[28]

In three volumes of letters, the first two published in 1595 and the last in 1599, Libavius attempted to determine what sorts of actions and observations pertained to the procedural *genus* of *chymia*. There he announced his own views, and invited responses to them, concerning the definition of chemical terms, the construction of a common chemical language, and the best means of scrutinizing specific chemical operations and techniques. Parsing out what was accidental to the subject of *chymia*, and what were its specific characteristics, its *proprium*, could in this way

25 *Liber hypomnematum* […] in *Syntagmatis arcanorum chymicorum […] tomus secundus*, Francofurti: excudebat Nicolaus Hoffmannus, impensis Petri Kopffii, 1611, *Praefatio*, p. 224: 'Nullum scientiam nec artem constantem esse, quin principiis regulisque ratione ab occasione aut necessitate inducta inventis, usuque et experientia comprobatis sapientumque artificium auctoritate et iudicio confirmatis […] Artem cum vocamus, ad efficiendi secundum scientiam theorematicam facultatem respicimus.'

26 On the difference between "scientific teaching" and "scientific knowledge" in Aristotle see Richard W. Bauman, *Aristotle's Logic of Education*, New York 1998, esp. pp. 78–86.

27 Libavius, *Dialecticae emendatae libri duo*, Francofurti: excudebat Ioannes Saurius, impensis Petri Kopffij, 1595, pp. 285–287.

28 *Rerum chymicarum epistolica forma […] liber primus* (1595), Epistola VIII, pp. 88–91; p. 89: 'Si ergo officiis specialibus coniunctis, praeposueris nomen generis; non inscite definiueris. Nam membra essentiam integri complent, sitque inde definitio non improbanda […].'

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become a communal effort. At the same time (indeed, over the very same years), he sought to delineate the specific nature of chemical knowledge by paying attention to broader debates about logic and method, especially among those who defended the views of Philipp Melanchthon (1497–1560) and Petrus Ramus.[29] In one text, *Dialecticae emandatae libri duo* (1595) Libavius collected precepts related to dialectics drawn from the opinions of Aristotle, Melanchthon, and Ramus, and added what he called 'a threefold judgment concerning logical controversies,' focusing upon errors among Ramists as well as those among anti-Ramists, while explicating and defending Aristotelian demonstrations against specific Ramist views. Libavus's book is really a textbook, a catechism of logic, something for students to memorize. In defining method, he chose to describe it not as *ratio* or *via*, but as *dispositio*,[30] as an ordered assembly. He was not alone in doing so, but in his hands method became a way of discovering what parts of *chymia* were subordinate to others, and how the definition of the entire subject might come to light as homogeneous parts fell into line as species of axioms and precepts, and, thereafter, "by a certain circularity," helped further define the essence of the whole.

Through homogeneous division and distribution what was less distinct in its own right became clearly subordinate to a particular subject. Near the end of volume two of his book of chemical letters, it is precisely this notion of *dispositio* that Libavius brings to bear upon the question of the difference between *destillatoria* and *alchymia*. There he acknowledged the stubbornness of certain Italians (he is thinking of the physician at Ravenna Hieronymus Rubeus [i. e. Girolamo Rossi], 1539–1607) who had attacked alchemy, thinking it only concerned with the metamorphosis of metals and claiming it to be far different from distillation. Yet alchemy and distillation, Libavius admonished, differed only in the way that complete knowledge differs from a part. Distillation, transmutation, calcination, resolution, and other processes were parts of a whole, no matter if the whole was called *alchymia* or what Paracelsians, who had allowed celestial powers to be part of material things, improperly defined as *chymia*. Distillation pertained to both, although there was a key difference between the two. *Alchymia* represented true logic, *chymia* in the hands of Paracelsians reflected, he warned, the logic of sophists.[31]

29 These include *Exercitiorum logicorum […] liber primus*, Francofurti: Excudebat Ioannes Saurius, impensis Petri Kopffii, 1595. *Dialogus logicus secundus continens declarationem dialecticae P. Rami facilem et expeditam adhibitis una praeceptis et regulis D. Philippi Melanchthonis* […], Francofurti: excudebat Ioannes Saurius, impensis Petri Kopffii, 1595. *Dialecticae emendatae libri duo*, Francofurti: excudebat Ioannes Saurius, impensis Petri Kopffij, 1595. A further textbook in logic appeared shortly after Libavius transferred to Coburg to be become director of the Gymnasium Academicum Casmirianum, *Dialectia Philippo-Ramaea, ex descriptionibus et commentariis P. Melanchthonis et P. Rami* […], Francofurti 1608.

30 *Dialecticae emendatae libri duo*, p. 285.

31 *Rerum chymicarum epistolica forma […] liber secundus* (1595), Epistola XCIX, pp. 606–611: 'Verum, si recte sentire volumus, statuendum est ita distare alchemiam et destillatoriam, sicut integra scientia et membrum […] Si destillatoria est pars essentialis chymiae, quomodo tam longis distabit parasangis, ut vituperata alchymia illa sit immunis? […] Ita distinctam chymiam etiam a Paracelsia velim, quo pacto solemus inter logicam veram et sophisticam mul-

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The impetus for the intellectual mixing of logic, medicine, and *chymia* in Libavius's writings arose initially from a small text touting a medicinal panacea written by a German physician and Junker, Georg Amwald (1554–1616). The little book declared, on the basis of a prior and cordial letter, that Libavius had witnessed the medicine's powerful effects. Libavius, however, had intended his letter to suggest no such thing and denounced the panacea thereafter, exposing its components (quicksilver and sulphur joined together through sublimation) in a response called *De panacea amwaldina* (1594). The attack on Amwald became the first part of a larger book, called the *Neoparacelsica* (1594),[32] that defended Galenic and Hippocratic medicine in general and, more specifically, rebutted of the writings of another Paracelsian advocate, Johann Graman (fl 1593).[33]

In two texts published at Erfurt in 1593[34] Graman condemned the practices of Galenic physicians within the university's medical faculty and exhorted the methods of Paracelsian "chymists" who knew, he said, how to extract incorporeal celestial virtues from material substances and bring them to bear upon illness. In answering Graman, Libavius found himself also writing about the dialectics of Aristotle, Melanchthon, and Ramus, and sometimes supporting ancient opinions against "modern" views. Questions of definition were central to these disputes, and Libavius noted at one point that opposing the medical and pharmaceutical claims of Amwald and Graman had also required him to enter the arena in which arguments concerning logic took place.[35] Publishers loved such debates and made money from the printed quarrels that grew out of them. Libavius's publisher, Peter Kopff (fl. 1593–1633), conveniently located in the same city, Frankfurt am Main, as one of the most productive publishers in German lands of Ramist writing, André Wechel and his heirs, was therefore eager to print whatever Libavius could send. Using a friend and physician in Frankfurt, Johann Hartmann Beyer, as an intermediary, Libavius responded to a market demand for rebuke and vilification, supplying Kopff with a printer's elixir of dialectic, alchemy, and medicine that, in numerous renderings, informed, argued, examined, appraised, exulted and/or outraged for more than two decades.

tis contaminatam fraudibus et malo usu vera praecepta inquinantem.' On Libavius's presentation of alchemy in accordance with Ramist method see Owen Hannaway, *The Chemists and the Word: the Didactic Origins of Modern Chemistry*, Baltimore, London 1975.

32 *Neoparacelsica in quibus vetus medicina defenditur* […], Francofurti: excudebat Ioannes Saur, impensis Petri Kopffij, 1594.

33 Bruce T. Moran, "Medicine, Alchemy, and the Control of Language: Andreas Libavius Versus the Neoparacelsians," in: *Paracelsus: the Man and his Reputation, his Ideas and their Transformation*, ed. Ole Peter Grell, Leiden 1998, pp. 135–149.

34 *Apologetica refutatio* […], Erphordiae: Baumannum, 1593. *Tractatus de pharmaco purgantis* […], Erphordiae: Georgium Baumannum, 1593.

35 *Rerum chymicarum epistolica forma […] liber tertius* (1599), Epistola I, p. 9: 'Soliti sunt nostri aliquanto acrius obsistere Paracelso, mihique luctandum simili in arena fuit cum improbitate et nequitia Ambaldi, Gramani, Bisterfeldii, Engelharti, Diaconi […].'

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Many of the texts concerning dialectic and method written by Libavius and published at Kopff's expense were fiercely polemical and aimed at Ramist authors who had simultaneously denounced Peripatetic philosophy as well as Galenic medicine. In these texts *scientia* and *historia* intersected; and they did so in particular in relation to occurrences at the University of Erfurt that were set in motion by a prominent member of Libavius's epistolary network, a physician and mathematician at Erfurt named Bartholomaeus Hubner (c. 1543–c. 1603).

In an *Oration on the True and immovable Foundations of the Art of Medicine and Philosophy*, declaimed in a public assembly of the greater academy at Erfurt in June, 1593, Hubner decried Paracelsus's theological views concerning the physical nature of Christ, denounced his description of creation as separation from an initial *mysterium magnum*, and assailed the Paracelsian notion of the human being as composed of multiple bodies, spirits, and souls. While acknowledging the efficacy of chemical preparations, he denied that these were new with Paracelsus and argued that new remedies did not make a new art. Most serious was Paracelsus's perversion of the four elements and his view of the physical body as nothing more than "a cadaver," made living, or sick, by the nature of the spirits, or astra, that joined the world at large to the microcosm.[36] Libavius joined the debate soon thereafter defending Hubner and denouncing Paracelsian claims. He also added Hubner to his list of correspondents; and at the beginning of the first volume of Libavius's three volume book of letters, Hubner added a lengthy elegy in praise of the book and its author, joining others, including Joachim Camerarius, Zacharius Brendel, and Johann Hartmann Beyer, in endorsing the epistolary project.

Six letters addressed to Hubner appeared in the second volume, and while these ostensibly concerned distillation, they were equally concerned with the question of how one ought to establish an art, whether by reason, or by practice and experience, or by both together, or in some other way. Aristotle judged an art as a virtue of the intellect, but others argued that an art was to be demonstrated by means of practice. While Libavius confessed to being a novice among craftsmen, he knew enough to observe that artisans were not at all in agreement about what the discipline of *chymia* was. Each thought that he was a chemist if he had scraped together some formulas and operations. But if practices were to help define the art, what sorts of practices should they be? Aristotle had discerned operations by means of ends, ends by means of skills [*facultates*], and skills or agency by means of methods [*instrumenta*]. In this regard, distillations, calcinations, sublimations, solutions, and the like had separate ends and none could define *chymia* as a whole. Practice alone could not define an art. So the good "chymist," in addition to mastering techniques, had to learn logic, not in the everyday sort of way [*non vulgariter*] but purely

36 *Oratio de veris immotisque fundamentis artis medicae et philosophiae, deque impietate, vanitate, portentosis et pernitiosis erroribus Philippi Paracelsi, et sectatorem eius, quibus theologiam pariter et philosophiam cum medicina nefarie conspurcarunt* […], Erphordiae: apud Iohannem Pistorium, 1593.

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[*emendate*] as stipulated in the precepts elaborated by Peter Ramus.[37] Then, through the method of proper division and distribution guided by the principle of homogeneity, practices characteristic of the art could be joined to what was axiomatic.

Someone else around this time to attack the claims of Paracelsians, and the specific claims of Johann Graman at Erfurt, was a professor of philosophy and medicine at Altdorf named Philipp Scherbe (1553–1605). Scherbe moved in heady circles. He had been trained in Basel and Heidelberg, before visiting universities in northern Italy (specifically Bologna, Rome, and Padua). His Paduan teachers included heavy hitters—Franciscus Piccolomini, Tommaso Pellegrini, and Jacopo Zabarella, but Scherbe admired Andrea Cesalpino above all, and like Cesalpino Scherbe made use of Galenic, Hippocratic, as well as Aristotelian texts in medical instruction. Libavius referred to him as 'a great philosopher, whose intelligence the Italians admire and the Germans respect.'[38] What Libavius especially liked was Scherbe's defense of Aristotle against overenthusiastic Ramists in his *Dissertatio pro philosophia peripatetica, adversus Ramistas* (1590). There Scherbe had distinguished dialectical syllogisms (syllogisms showing that something is the case) from apodictic syllogisms (syllogisms that tell us why something is the case), and had attributed a better understanding and construction of the latter to Aristotle. While experience might give shape to knowledge, knowledge itself was demonstrative and followed from "first principles" or axioms that came to light by means of intuition or reason. Reason, not experience, made "art" possible. [39]

Scherbe became Libavius's logical darling, and Libavius himself joined the Ramist debate in 1591 by replying to the Aristotelian criticisms of a Scottish philosopher named James Martin of Dunkeld whose positions had been republished and emended by a Ramist supporter and Cambridge professor of philosophy, William Temple.[40] By the standards of the day, the response was measured and, for the most part, impersonal. After all, Libavius considered Ramus and Melanchthon as having offered refinements to Aristotelian reasoning,[41] and noted a number of Ramist scholars, including Friedrich Beurhaus (Beurhusius) (1536–1609) and Johannes Piscator (1546–1625), who had not refrained from correcting Ramist positions. Nevertheless, in creating their own rules for establishing the arts, Li-

37 *Rerum chymicarum epistolica […] liber secundus*, Francofurti: excudebat Ioannes Saurius, impensis Petri Koffij, 1595, Epistola LXXXVI, pp. 521–529; p. 526.

38 *Schediasmata medica et philosophica ad Henningum Rennemannum phiosophum M. apud Erfurdenses* […], Francofurti: excudebat Ioannes Saur, impensis Petri Kopffij, 1596, Andreas Libavius D. Henningo Rennemano M. apud Erfurdenses […] epistola.

39 *Dissertatio Philippi Scherbii, medicinae ac philosophiae professoris in academia Altorfina, pro philosophia peripatetica, adversus Ramistas* […], Giessae: excudebat Casparus Chemlinus, 1590.

40 *Quaestionum physicarum controversarum inter Peripateticos et Rameos Tractatus* (1591). On debates surrounding Temple see Elizabeth Anne Boran, "Ramism in Trinity College, Dublin in the Early Seventeenth Century," in: *The Influence of Petrus Ramus: Studies in Sixteenth and Seventeenth Century Philosophy and Sciences*, Basel 2001, pp. 177–199.

41 On Melanchthon and Ramus see Joseph S. Freedman, "Melanchthon's Opinion of Ramus and the Utilization of their Writings in Central Europe," in: *The Influence of Petrus Ramus*, Basel 2001, pp. 68–91.

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bavius observed that Ramists like Tempel had 'conspired upon the destruction of Aristotelian writings' and 'by those rules, as if they were torturers and inquisitors, everything peripatetic gets crucified.'[42] Ramist scholars not only censured Aristotle, but often rebuked one another, doing so sometimes aggressively, sometimes, he acknowledged, with 'a soft sponge.' There was, however, nothing soft about Libavius's response to two other authors whose caustic critiques made them personal adversaries. Both held positions within German schools. The first was a reformed theologian and philosopher teaching at the *Hohe Schule* in Herborn named Johannes Bisterfeld (1568–1616), the father of the better known Johann Heinrich Bisterfeld. The second was a philosopher, jurist, and Dean of the Saxon College at Erfurt named Henning Rennemann (1567–1646).

Especially in regard to Bisterfeld, who revered Ramus not only as a logician, but also as a martyr of Christ, things got really nasty as the two exchanged insults in 1596 and 1597, arguing, among many other things, about whether an effect preceded a cause in the case of election and predestination, whether justice is a species of nobility, and whether color occurs by means of illumination. The exchange, as abusive as it was even by the standards of the macho world of early modern academic disputation, helped Libavius get clear on his own Aristotelian sympathies. 'The matter,' he says to Bisterfeld, 'is over the exposition of Aristotle, namely whether he has a doctrine and whether it is stable and suitable for learning [*litterae*] or not. The ancient Peripatetics say yes, the modern Ramists say no […]. the truth leans toward the Peripatetics and shies away from modern Ramist factions because the latter have neither faithfully nor at all well interpreted the claims which the [Peripatetics] make.'[43] Libavius referred to forty two arguments that he had made demonstrating the fallacies of Ramist positions. As a result Bisterfeld, Libavius complained, had attacked him 'so madly and stubbornly' that he far surpassed 'the custom of a liberally educated man,' not only dreaming modern dreams in the field of logic but assaulting his medical, poetic, physical, and chemical dignity. In a separate response, Bisterfeld made Libavius into the maker of an 'apodictic monster,' a reference to Libavius's previous writing, the *Tetraemerum autoschediasticum*, a text, as he saw it, that conflated monstrous abuses so repulsive that one did not know whether to be afraid of it or to loathe it. While not condemning the chemical art, Bisterfeld observed that a ridiculous *chymicus* had attempted to write about logic and had apparently used magic to construct syllogisms. Libavius, he mocked, should be sent back to the grammarians to learn the essence of words.[44]

In replying to Rennemann (a more formidable presence at Erfurt), Scherbe and Libavius joined forces in several texts. In one, the *Schediasmata medica et philosophica* (a text running to 728 pages with 288 miscellaneous notes or schediasmata),

42 *Quaestionum physicarum controversarum […] ad lectorem de praefatione Tempelli contra Aristotelem.*
43 *Tetraemerum autoschediasticum* (1596), preface.
44 *Nex et anatomia horridi et furfuracei, informis et infirmi apodictici monstri […]*, Hanoviae: apud Guilielmum Antonium, 1597, pp. 111–112; p. 166.

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Scherbe wrote an opening letter in which he acknowledged the enormous talent, prudence, and labor that Libavius had brought to bear upon subduing 'those monsters of men who had insulted Galen' and in calling back to the form of the art of *chymia* those things that had strayed away without order. Rennemann he described as *Erfurdianus ille Pyrgopolinices* who had recently ranted against Aristotelian philosophy. The name is a reference to the swaggering braggart in Plautus's *Miles Gloriosus* and Scherbe hoped that Libavius would 'tame the quarrelsome Erfurdian mutt.' Having the temper to do so would earn him distinction not only in the schools of physicians but also in those of the Peripatetics.[45]

In a separate opening epistle addressed to Rennemann, Libavius gives us a sense of his own disappointment in the alignment of Ramist logic with attacks aimed at Peripatetic reasoning and Galenic medicine. 'Being most desirous to teach well,' Libavius says, he had at first seized upon Ramist logic as if he had drunk the whole golden *Syrenem* of the chymists with eyes, ears, and mind. But in Rennemann's writing he had found only arguments attacking Peripatetic learning. But how, he wondered, had Peripatetic learning served Rennemann so poorly that he could attack German schools, gymnasia, and academies so bitterly. 'You have declared yourself an enemy of the schools of Germany, yet you were raised in them, and you still draw breath in them.'[46] At Erfurt, Rennemann used his institutional authority, and his judicial knowledge of logic, to support the Paraclesian views of Johann Graman and had rebuked arguments opposing Graman that Libavius had made earlier in a text suitably called *Antigramania*. Feeling insulted, Libavius buttressed his position by calling upon institutional allies at other German schools. 'Attacking me,' he wrote, 'is to attack the medical faculties at Nürnberg, Jena, and Tübingen, each of which recognizes the authority and reasoning of Galen.'

If we stitch together the logical treatises in defense of Aristotelian logic and the project of writing and publishing letters concerning chymical matters (both of which consumed the years in which he was also preparing his best-known text, the *Alchemia* (1597), the thread that binds these two apparently different projects is a venture aimed at defining the subject of *chymia* as a didactic discipline within the liberal arts. The true art of *chymia*, Libavius argued, was really nowhere to be found. That is why he says in one of his letters that if anything were to be written about *chymia*, much less taught, *chymia* had to be reduced almost to ABCs, and before teaching it, one had to learn what sort of art, what kind of thing, *chymia* was.[47]

45 *Schediasmata medica et philosophica ad Henningum Rennemannum philosophum M. apud Erfurdenses* […], Francofurti: excudebat Ioannes Saur, impensis Petri Kopffij, 1596, Andreae Libavio, medico et philosopho praestantissimo, amico meo multum colendo, Phil. Scherbius […] epistola.

46 *Schediasmata medica* […] Andreas Libavius D. Henningo Rennemano M. apud Erfurdenses […] epistola.

47 *Rerum chymicarum epistolica forma […] liber primus* (1595), Praefatio ad lectorem, pp. 1–14; p. 4.

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This meant distinguishing its axioms and definitions according to reasoning and logic. Only then could it become a true art, possessing its own disciplinary domain.

Significantly, Libavius claimed that the subject of *chymia* deserved a place as both an art and a science, as both *techne* and *episteme* combined. As an art and a science *chymia* could then join the liberal arts, and need no longer be considered solely a handmaid to medicine. The person best prepared to do that was, he thought, the professor of medicine at the University of Jena, Zacharius Brendel (the elder, 1553–1626) and he reminded Brendel in one of his letters that the tomb of Archimedes had been marked by a sphere in honor of his discovery and that Ramus had proposed for himself a monument for his restoration of logic. Since Brendel possessed erudition, eloquence, experience, and method he could win similar praise for himself in establishing the art of *chymia* within the curriculum of his university.[48]

It was, however, not at Jena, but at Marburg that what was called *chymia* became part of university instruction,[49] and the irony is that, for Libavius, this was an enormous disappointment. Following the principle of homogeneity meant finding the essence or definition of the art and science of *chymia* in elementary matter, not in the heavens, nor in regions of magic and mysticism. But the person who taught so-called *chymiatria* (chymical medicine) at Marburg, Johannes Hartmann (1568–1631), was not at all concerned with this type of chemical *scientia*. By describing special procedures like distillation, sublimation, and calcination without first describing the principles and causes for what was prescribed, he had created what Libavius liked to call an artless art [*sine arte artem*].[50] Hartmann taught technique at Marburg, but teaching the subject of *chymia* required much more than that. Hartmann taught how to make things, but simply making things did not make an art.

Ramist dialectic was well situated at Marburg. The university's patron Moritz of Hessen-Kassel (1572–1632) had made sure of that, preferring teaching methods, very much in the Libavian spirit, in which the judgments of Ramus were adjusted by reference to Aristotle.[51] But none of this entered the course in medical chymistry that Hartmann taught. Despite being called a "public" laboratory Hartmann's students swore to keep secret the procedures learned there. They also learned that the reasons the medicines that they made had the effects that they did was because of macrocosmic-microcosmic correspondences in nature, and because of the action of spiritual subtleties derived from the heavens. From Libavius's point of view, there was no art here, just faulty logic and the accidents of practice. The proper principles and axioms that defined a subject and to which all practices

48 Ibid., Epistola XII, pp. 115–116.

49 Fritz Krafft, „Das Zauberwort chymiatria – und die Attraktivität der Marburger Medizin-Ausbildung, 1608–1620. Eine etwas andere Frequenzbetrachtung," in: *Medizinhistorisches Journal* 44 (2009), pp. 130–178. Bruce T. Moran, *Chemical pharmacy enters the University: Johannes Hartmann and the Didactic Care of Chymiatria in the Early Seventeenth Century*, Madison 1991.

50 *Rerum chymicarum epistolica forma […] liber primus* (1595), Epistola XII, p. 114.

51 Hotson, *Commonplace Learning* […], p. 29; p.105.

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should refer were nowhere to be found. *Chymia*, like medicine, demanded principles, not figments of principles. 'Hence we find fault with *Paracelsia* in that it seeks causes from every which way, from heaven, earth, and others, and with such great discrepancies that you could not find even two agreeing among themselves, and Paracelsus himself, as if floating in an unknown sea, at one time alleging this, at another that, just as if it had flowed out of a drunkard's quill.' What was the meaning of the practices one learned, especially if their foundation was made up of symbolisms and parables which only got in the way of certitude? *Paracelsia,* Libavius noted, 'discloses very many things symbolically; but with such inconsistency and confusion that most of it renders even its very own professors uncertain, and one says this and the other that. Then there are those who claim for themselves the keys to Paracelsian certainty, which they alone possess. And so anything is interpreted in any way to the extent that if Paracelsus were to come back to life he himself would regard them as bastards.'[52] Alas, the Marburg laboratory was no place to learn the subject of *chymia*.

From a distance Libavius's battles may seem to be "much ado" about very little. Yet the controversies that interlaced logic, medicine, and *chymia*, and in which he became a formidable agent, served to mediate, albeit with polemical scruffiness, links between what was practical and concrete on the one hand with what was theoretical and abstract on the other. The enterprise of defending Aristotle while defining *chymia* taught students good habits for making judgments by means of proper logic and "disputative skirmishing," and gave those habits a moral purpose aimed at serving the public good. For the paedonomus at Rothenburg, the logic of Aristotle required nature to be moved only by what was natural (*naturam movet per naturam*).[53] In education as well as in the pursuit of natural knowledge, what was particular and what was general needed to share homogeneous characteristics. In light of this reasoning, students at German schools and elsewhere learned what was useful and virtuous in the republic, and what was logically sensible in explaining the physical world.

52 *Delineatio constitutionis artis medicae* […], p. 119: 'Hinc reprehendimus in Paracelsia, quod rationes undecunque petat ex coelo, terra, et aliis, idque adeo discrepanter, ut de duos quidem invenias inter se consentientes, et Paracelsus ipse tanquam in ignoto mari fluctuet modo hoc afferendo, modo aliud prout in Ebrii calamum defluxit.. […] Paracelsia plurima enunciat symbolice; sed cum ea inconstantia et confusione, ut pleraque etiam ipsos professores incertos reddant, et hic hoc dicat, ille illud. Sunt et qui sibi Paracelsia certas claves arrogent, quas ipsi soli possideant. Itaque interpretantur quovis quidvis quos si revivisceret Paracelsus, ipse pro spuriis haberet.'

53 *Rerum chymicarum epistolica forma […] liber primus* (1595), Epistola II, p. 31: 'Naturam mouet per naturam, sicut agricola et hortulanus ex pomo producit pyra.'

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Reforming the *Prisca Medicina*: Libavius' Axioms of Elements and Mixture

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Trained in philosophy at Wittenberg and Jena and in medicine at Basel, Andreas Libavius was a major actor in German alchemy at the dawn of the seventeenth century. In the history of science, he is mainly known for his *Alchymia* (1606), a sophisticated textbook describing the multiple instruments, tools and operations of alchemy. Moreover, the recent research has enhanced Libavius' polemical, institutional and intellectual approach to alchemy as a field of knowledge.[1] In the same way as the Swiss physician and theologian Thomas Erastus (1524–1583), Libavius was an effortless adversary of the Paracelsian philosophy, which he accused of subverting the Aristotelian natural philosophy, Galenic medicine, and medieval alchemy. He described the Paracelsian "pseudo-chymistry" as a heterogeneous and contradictory current with a confused terminology, which is unfit to provide a clear and homogeneous knowledge. In Libavius' view, alchemy should be institutionalized at the university through its inclusion in the curriculum based on Aristotle's rhetoric, logic and natural philosophy.

As Bruce Moran has shown, Libavius attempted to legitimize the doctrinal tradition studied in universities by organizing knowledge with clear boundaries between each discipline.[2] In his *Alchemia* of 1597, alchemy is presented as a didactic discipline and a demonstrative science, whose principles and axioms need to be determined.[3] Following Aristotle's argumentation and logic, *chymia* is considered as a specific field of knowledge studying nature according to definite principles. However, Libavius also applied this scheme to medicine as an art and a body of

1 See Bruce T. Moran, *Andreas Libavius and the Transformation of Alchemy: Separating Chemical Cultures with Polemical Fire*, Sagamore Beach 2007; Owen Hannaway, *The Chemist and the Word: The Didactic Origins of Chemistry*, Baltimore 1975; William R. Newman, *Atoms and Alchemy: Chymistry and the Experimental Origins of the Scientific Revolution*, Chicago 2006, pp. 66–84; Peter J. Forshaw, "'Paradoxes, Absurdities, and Madness': Conflict over Alchemy, Magic and Medicine in the Works of Andreas Libavius and Heinrich Khunrath", in: *Early Science and Medicine* 13 (2008), pp. 53–81.

2 Bruce T. Moran, "Axioms, Essences, and Mostly Clean Hands: Preparing to Teach Chemistry with Libavius and Aristotle", in: *Science & Education* 15 (2006), pp. 173–187.

3 Moran, "Axioms", pp. 173–187; idem, "Eloquence in the Marketplace: Erudition and Pragmatic Humanism in the Restoration of *Chymia*", in: *Osiris* 29 (2014), pp. 49–62; idem, "Andreas Libavius and the Art of *Chymia*: Words, Works, Precepts and Social Practices", in: *Bridging Traditions: Alchemy, Chemistry and Paracelsian Practices in the Early Modern Era*, ed. Karen Hunger Parshall, Michael T. Walton and Bruce T. Moran, Kirksville 2015, pp. 59–78.

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knowledge.[4] At the institutional level, the medical discipline follows "axiomatic" precepts which the physician applies in his practice for making a diagnosis. Though this definition of medicine as theory and practice based on natural philosophy was already established by the medical tradition, Libavius placed it in a didactic framework suitable to his own programmatic view on the organization of knowledge. In this perspective, he developed medical axioms concerning the notions of elements, qualities and temperament, which he strove to rehabilitate from the attacks of Paracelsian physicians. To this purpose, Libavius' argumentation operates on multiple plans including the tradition established by Hippocrates, Galen and Aristotle, some medieval alchemical texts mostly attributed to Arnald of Villanova and Ramon Lull, as well as the Scriptures. Moreover, Libavius relied on the Paracelsian notion of *tria prima* (Salt, Sulfur and Mercury) as components of bodies, and on Renaissance medical debates on the existence of a celestial principle within the body.[5] With this multifarious subtext, he sought to debunk the Paracelsian medical philosophy while replacing its religious scope in a framework faithful to the tradition.

This chapter aims to show that Libavius' medical axioms, physiological theory and appeal to the Scriptures make him a proponent of an alternative view on the "ancient medicine" (*prisca medicina*) promoted by Paracelsian physicians. Among the latter, the Danish physician Petrus Severinus (1540–1602) considered *prisca medicina* as the ancient medicine grounded on a genealogy starting from Hippocrates and leading up to Paracelsus.[6] According to Severinus, this ancient medical knowledge has been spoiled by Aristotelian and Galenic mistakes and needs to be recovered through a doctrinal reform founded on the Paracelsian philosophy, and on the broader current of *prisca sapientia*—the Renaissance project of restoring the Christian Platonic wisdom. Though Severinus' view on *prisca medicina* was shared by numerous Paracelsian physicians, the restoration of ancient medicine could also be urged against such a Paracelsian-Platonic framework. As Martin Mulsow has pointed out, late Renaissance glorification of ancient knowledge took multiple forms featuring diverse protagonists and goals in various cul-

4 On the classification of alchemy and medicine as disciplines, see Jean-Marc Mandosio, "La place de l'alchimie dans les classifications des sciences et des arts à la Renaissance", in: *Chrysopoeia* 4 (1990–1991), pp. 199–282; Ian Maclean, *Logic, Signs and Nature in the Renaissance: The Case of Learned Medicine*, Cambridge 2002, pp. 66–100.

5 Bruce T. Moran, "The Less Well-Known Libavius: Spirits, Powers, and Metaphors in the Practice of Knowing Nature", in: *Chymists and Chymistry: Studies in the History of Alchemy and Early Modern Chemistry*, ed. Lawrence M. Principe, Sagamore Beach 2007, pp. 13–24.

6 Jole Shackelford, *A Philosophical Path for Paracelsian Medicine: The Ideas, Intellectual Context, and Influence of Petrus Severinus (1540/2–1602)*, Copenhagen 2004, p. 145–152; idem, "The Chemical Hippocrates: Paracelsian and Hippocratic Theory in Petrus Severinus' Medical Philosophy", in: *Reinventing Hippocrates*, ed. David Cantor, Aldershot 2002, pp. 59–88; Hiro Hirai, *Le concept de semence dans les théories de la matière à la Renaissance, de Marsile Ficin à Pierre Gassendi*, Turnhout 2005, pp. 217–265.

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tural contexts.[7] For this reason, genealogies of wisdom could exclude or include Aristotelian philosophy, depending on their aim of removing or integrating the philosophical tradition in their project. In this regard, Libavius represents the latter position through his claim to return to the sources of Galen and Aristotle as authorities continued by medieval alchemists and subsequently subverted by Paracelsus and his disciples. In this manner, Libavius' medical theory aims to offer a competing view on *prisca medicina* which articulates medical axioms about elements and temperament with medieval alchemy and Renaissance accounts on the body's celestial nature.[8]

In what follows, I first examine the axiomatic approach to medicine as an art and academic discipline which Libavius proposed in the *Schediasmata medica and philosophica* [*Medical and Philosophical Sketches*] (1596). Then, I consider the doctrinal content of his medical axioms concerning elements, mixture and temperament as expounded in the *Novus medicina veterum tam Hippocratica quam Hermetica tractatus* [*New Treatise on the Hippocratic and Hermetic Medicine of the Ancients*] (1599).[9] In light of these treatises, I shall reconstruct Libavius' medical theory by stressing its didactic, alchemical and religious scope.

1 The Axiomatic Principles of Medicine

In 1596, Libavius published the *Schediasmata* against the *Responsio apologetica* of Henning Rennemann (1567–1646), a German philosopher trained at Helmstedt, who at that time was college dean in Erfurt and would later become college rector in Hildesheim.[10] Rennemann's treatise seeks to defend Ramist philosophy against the attacks of Philip Scherb (1553–1605), physician at Altdorf.[11] To his criticism of Aristotelian philosophy, Rennemann joins that of Galenic medicine, and suggests that Ramism and Paracelsianism share the same project of reforming the antiquated university model. In the epilogue of his *Responsio*, he advises Scherb,

7 Martin Mulsow, "Ambiguities of the *Prisca Sapientia* in Late Renaissance Humanism", in: *Journal of the History of Ideas* 65 (2004), pp. 1–13. See also Hiro Hirai, "*Prisca Theologia* and Neoplatonic Reading of Hippocrates in Fernel, Cardano and Gemma", in: *Cornelius Gemma: Cosmology, Medicine, and Natural Philosophy in Renaissance Louvain*, ed. Hiro Hirai, Rome 2008, pp. 91–104.

8 On Libavius as a figure of "chemical compromise", see Allen G. Debus, *Science, Medicine, and Society in the Renaissance: Essays to Honor Walter Pagel*, London 1972, pp. 151–165.

9 Andreas Libavius, *Schediasmata medica et philosophica, ad Henningum Rennemannum Philosophum M. apud Erfurdenses*, Frankfurt 1596; Idem, *Novus de medicina veterum tam Hippocratica, quam Hermetica tractatus*, Frankfurt 1599.

10 Henning Rennemann, *Responsio apologetica, ad dissertationem pro philosophica peripatetica adversus Ramistas*, Frankfurt 1595. On Rennemann, see Ernst Landsberg, "Rennemann, Henning", in: *Allgemeine Deutsche Biographie*, vol. 28, Munich/Leipzig 1889, p. 225.

11 Philip Scherb, *Dissertatio pro philosophia peripatetica, adversus Ramistas*, Altdorf 1590. On Scherb, see Sascha Salatowsky, "Scherb, Philip", in: *Encyclopedia of Renaissance Philosophy*, ed. Marco Sgarbi, Cham 2015. doi: 10.1007/978–3–319–02848–4_334–1. On the conflict between Rennemann and Scherb, see Kay Zenker, *Denkfreiheit: Libertas philosophandi in der deutschen Aufklärung*, Hamburg 2013, pp. 38–42.

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as a Galenist physician, to concentrate his efforts on Paracelsianism rather than Ramism, because it represents a much more dangerous threat to the tradition, as testify the fruitful cures of the Paracelsian physician Johann Gramann in Erfurt. Rennemann ironically adds that Scherb should team up with the only opponent to this current, the confident, yet unsuccessful, Libavius.[12] In reaction to this provocation, Libavius wrote "sketches" (*schediasmata)* in support of his fellow Scherb, and more broadly, of the Aristotelian philosophy and Galenic medicine.[13] Each of the *schediasmata* refutes a specific question or paragraph addressed in the *Responsio*, and further elaborates on the foundations of medicine, logic and physics.[14]

Beyond its polemical stake, the *Schediasmata* also aim to underline Libavius' own *ethos* as a chymist physician trained in the disciplines of the *trivium*: grammar, rhetoric and logic.[15] From his university training at Wittenberg and Jena to his profession as schoolmaster in Rothenburg and Coburg, Libavius always considered the teaching of the *trivium* indispensable, for which he relied on both Melanchthon and Ramus. As Joseph Freedman has shown, the German "trivial" schools were then promoting a "Philippo-Ramist" program in the course of their university-preparatory training.[16] While the Ramist philosophy provides a useful method for the preparatory teaching of the *trivium*, the Philippist logic and rhetoric are the basis for learning Aristotelian natural philosophy.[17] Libavius adopts this didactic framework in his *Schediasmata*, which are conceived as harangues advocating the indispensable character of the mastery of *trivium* for the understanding of natural philosophy. He seeks to demonstrate the organization of knowledge by syllogisms based on universal premises following Aristotle's *Posterior Analytics* as well as Ramus' Socratic method of *elenchus*, namely the logical

12 Rennemann, *Responsio*, p. 309.

13 On Ramist logic in the Renaissance, esp. in Libavius and Rennemann, see Peter Mack, *A History of Renaissance Rhetoric, 1380–1620*, Oxford 2011, pp. 136–165; Walter J. Ong, *Ramus: Method and the Decay of Dialogue, From the Art of Discourse to the Art of Reason*, Cambridge/London 1958; Joseph S. Freedman, "The Diffusion of the Writings of Petrus Ramus in Central Europe, c. 1570–c. 1630", in: *Renaissance Quarterly* 46 (1993), pp. 98–152; Howard Hotson, *Commonplace Learning: Ramism and Its German Ramifications, 1543–1630*, Oxford 2007.

14 On Libavius' polemic with Rennemann, see Moran, *Andreas Libavius*, pp. 11–30; Idem "Axioms", pp. 173–187.

15 See Richard W. Serjeantson, "Proof and Persuasion", in: *The Cambridge History of Science. Volume 3: Early Modern Science*, ed. Katharine Park and Lorraine Daston, Cambridge 2008, pp. 132–175; Bert Roest, "Rhetoric of Innovation and Recourse to Tradition in Humanist Pedagogical Discourse", in: *Medieval and Renaissance Humanism: Rhetoric, Representation, and Reform*, ed. Stephen Gersh and Bert Roest, Leiden/Boston 2003, pp. 115–148.

16 Freedman, "The Diffusion", pp. 98–152.

17 Sachiko Kusukawa, *The Transformation of Natural Philosophy: The Case of Philip Melanchthon*, Cambridge 1995; Günter Frank, "Philipp Melanchthon (1497–1560): Reformer and Philosopher", in: *Philosophers of the Renaissance*, ed. Paul Richard Blum, Washington 2010, pp. 148–162; Idem, *Philipp Melanchthon: Der Reformator zwischen Glauben und Wissen. Ein Handbuch*, Berlin/Boston 2017; Dino Bellucci, *Science de la nature et Réformation: la physique au service de la Réforme dans l'enseignement de Philipp Mélanchton*, Rome 1998.

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refutation of an argument by syllogism.[18] Moreover, he considers his definition of medical art as a passage from axiomatic precepts to the physician's *praxis* following the Ramist philosophy.[19] This scheme supports his definition of medicine as a theoretical and practical discipline involving other fields of knowledge such as physics and alchemy.

Following the "Hermetic" filiation of *prisca medicina*, Libavius first mentions the roots of ancient medicine in Egypt, Palestine and Chaldea, allegedly familiar with alchemy.[20] He nonetheless considers Hippocrates as the father of medicine as a discipline, which Galen supplemented with his own medical experience. For this reason, Libavius presents himself as a supporter of Galenism, to which he adds the precepts of his experience concerning "new" diseases—e. g. syphilis—and alchemical preparations.[21] In his view, the foundations of medicine are built on medical axioms and theorems as the premise of an effective diagnosis in practice. "True medicine", Libavius explains, is composed of well-arranged principles observed by long experience and sharp judgement. In this regard, the "form" of health and disease is axiomatic and requires to be extracted from a homogenous "multitude" according to Hippocratic and Galenic commentaries.[22] Such a principle of homogeneity is inspired by Aristotle's *Posterior Analytics* on the homogeneity of discourse, and further illustrated by an alchemical metaphor. The axioms are indeed extracted from experience just like essences are alchemically separated from their homogeneous substrate.

According to Libavius, Hippocrates and Galen established the axioms of medicine and its proper end: health. The ultimate objective of medicine, he claims, is the conservation of health, which is achieved by repelling diseases with the assistance of *natura medicatrix*.[23] To cure the patient, the physician needs to iden-

18 Moran, *Andreas Libavius*, p. 21; Hannaway, *The Chemist*, p. 134–142.

19 Libavius, *Schediasmata*, p. 57: "Obtundet te Ramus tuus vi θεωρίας καὶ πράξεως, quae non sunt dissentanea, sed alterum alteri subordinatum."

20 Libavius, *Schediasmata*, pp. 14–17. See Nancy G. Siraisi, "In Search of the Origins of Medicine: Egyptian Wisdom and Some Renaissance Physicians", in: *Generation and Degeneration: Tropes of Reproduction in Literature and History from Antiquity Through Early Modern Europe*, ed. Valeria Finucci and Kevin Brownlee, Durham 2001, pp. 235–261; Eadem, *History, Medicine, and the Traditions of Renaissance Learning*, Ann Arbor 2007.

21 Libavius, *Schediasmata*, p. 16: "[…] possimusque beneficio artis vel ipsius Galeni censores esse liberales, haud aegrè ferimus, artem ipsam nominari Galenicam, nosque Galeni sectatores, modò non habeamur pro mancipiis Galeni, sed pro his qui eadem via modoque artis incedunt […]. Et illa noua artis vsu, non autem praeceptis, libenter addimus priscis, quo pacto et de nouis tum morbis tum medicinis, et praeparatione harum chymica à multis praeclare est factitatum."

22 Ibid, p. 23: "Vera medicina principiis constat his, quae ad benè medendum sunt composita, atque longa experientiâ et acri iudicio spectata, siue sanitatem spectes, siue morbos et remedia. Eorum forma est axiomatica, multitudine homogenea ita contexta, ut requirit vera ratio, quanquam ex commentariis Hippocraticis et Galenicis laboriosius sint excerpenda." See Moran, "Axioms", pp. 173–187.

23 Libavius, *Schediasmata*, p. 49: "Sed fortassis Galenus noster tibi sordet. Hippocrates ait, medicinae propositum esse sanare. At huius finis et perfectio ultima est sanitas. […] Vulgò

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tify the cause of the disease by applying medical precepts or "principles" to the patient's case. For this reason, making a correct diagnosis requires the theoretical knowledge of nature, namely physics. As the "study of natural things", physics is involved in many other fields such as arithmetic (numbers), geometry (quantities), and music (sounds and harmonies).[24] In the case of medicine, physics is needed for the contemplation of the causes and effects of natural things, as a starting point for the study of health and disease.[25] Consequently, the physician applies natural theorems to his *praxis* in order to preserve health or to bring back afflicted bodies to health.[26] However, Libavius nuances that a skillful empirical physician might grasp, through observation, the precepts of medical art according to the rules converging with "true reason".[27] Such an enlightened "empiric" would then follow medical axioms and endorse a finer philosophy than Paracelsianism. Within the medical practice, alchemy plays the role of an ancillary field for pharmaceutical purpose. Libavius nevertheless specifies that alchemical pharmacy only serves to therapy, so that medicine cannot be reduced to the art of distilling "quintessence", a notion I will discuss in the last section of this paper.[28]

Libavius does not fail to emphasize that the therapeutic objective of medicine is enhanced by Paracelsus and his disciples. Yet Paracelsian pathology, like Rennemann's "empirical" approach to medicine, advocates that the knowledge of health is not necessary to repel disease.[29] For Libavius, this contradicts the definition of the state of health as resulting from the "temperament", namely the proportion of elements and their qualities. As an imbalance of the primary qualities, illness is cured by a "contrary" remedy whose temperament is opposite to that of the patient. Contrastingly, the Paracelsian system considers disease as a local and autonomous process of alchemical nature rather than a qualitative imbalance. For Libavius, such a view is improper to establish medicine as an art based on logical

notum est: quod aegrotorum salus in medendo summa lex esse debeat. Paracelsus adeò non insaniuit, ut negârit, sanationem facere medicum. […] medicum non tam morbos et aduersa alia depellere, quam naturam iuuare seruareque, ut ita morbos potius in fine priore habeat, sanitatem verò in ultimo."

24 Libavius, *Schediasmata*, p. 71.

25 Ibid., p. 55: "Ego dixerim, Physicum contemplari de natura, ut se habet caussis, effectis, adiunctis naturalibus: et eatenus etiam attingere, de sanitate et morbo. At medicum […] laborare in sana conseruanda, afflicta verò iuuanda et ad sanitatem adducenda. […] medici autem etiam porro ad sanitatem seu constitutionem secundum naturam praecepta ponere etiam vbi non est morbus, quod fieri sine sanitatis praeceptis et noticia non potest. Ita commune quid habent medici et Physici."

26 Ibid., pp. 71–72: "Sanè tu etiam nobis videris tantum practicam medicinam fingere. Vbi verò Theoremata? medicina id ad praxin transfert, quod in praeceptis habet. Hoc si est in rebus Physicis, euenit. Non enim per se res physicas contemplatur medicina, sed in illis salubritatem aut vires ad hanc facientes, siue conseruanda sit sanitas, siue restituenda."

27 Ibid., p. 65: "Fieri tamen potest, vt etiam Empiricus paulo attentior longo vsu tandem incurrat in easdem obseruationes et regulas artis, atque tandem arripiat etiam praecepta sua, congrua quodammodo rationi verae."

28 Ibid., pp. 179–181.

29 Rennemann, *Responsio*, p. 262.

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axioms, as it proposes "boorish", "random" and "inexperienced" treatments.[30] For this reason, Libavius considers Paracelsus and his disciples as quacks peddling superstitious remedies in the example of the *panacea Assylvana* of Georg am Wald (1554–1616).[31] He previously condemned, in his *Neoparacelsica* (1594), the Bavarian healer's universal cure, which was advertised as a secret preparation and became a commercial success in Germany.[32]

As Libavius explains in the *Schediasmata*, the physician cures illness by identifying the patient's temperament or *krasis*, and by seeking a "contrary organic disposition".[33] According to Galen, such temperament is the product of the "mixture" of elements and primary qualities, in reference to Hippocrates' *On the Nature of Man* and Aristotle's *On Generation and Corruption*. While Libavius fully endorses the Galenic definition of the temperament, he still has to justify its compatibility with his alchemical views. As this question is not at the center of the *Schediasmata*, I shall explore it in light of another polemical treatise of Libavius.

2 Axioms of Elements and Mixtures

In his *Novus de medicina veterum… tractatus* (1599), Libavius develops his medical theory of elements, qualities and temperament. This treatise is a critical response to the *Apologia chymica* (1597) of the Italian physician Giuseppe Micheli (Michelius), who accuses him of destroying alchemy because of his inexperience in practical operations.[34] Established in Middelburg in the Dutch Republic, Michelius was a reformed Paracelsian scholar from Lucca in Tuscany. His *Apologia* mostly criticizes the content of some letters that Libavius published in *Rerum chymicarum…liber primus* (1595). In this context, Libavius' main goal, in *Novus de medicina veterum…tracta-*

30 Libavius, *Schediasmata*, p. 54–55: "Si enim non; ars non est, quamquam rusticus fortassis tam benè disputet citra artem, ac Logicus cum arte. Vis nos artificiosè mederi; non fortuitò, non casu, non imperitè et inscienter? Ex arte promenda axiomata. Hic nulla est sanatio sine sanitatis et cognitione et scopo."

31 Ibid., p. 65: "Apparuit item qui se nobilem profitetur circumgestans non tantum panaceam Assyluanam, sed et superstitionem specie religiosum, cum praeter imposturas, etiam magicas, nihil capiat."

32 On Georg am Wald, see Wolf-Dieter Müller-Jahncke, "Georg am Wald (1554–1616): Arzt und Unternehmer", in: *Analecta Paracelsica: Studien zum Nachleben Theophrast von Hohenheims im deutschen Kulturgebiet der frühen Neuzeit*, ed. Joachim Telle, Stuttgart 1994, pp. 213–304; Alisha Rankin, "Empirics, Physicians, and Wonder Drugs in Early Modern Germany: The Case of the *Panacea Amwaldina*", in: *Early Science and Medicine* 14 (2009), pp. 680–710; Moran, *Andreas Libavius*, pp. 127–130.

33 Ibid., p. 67: "Non ita volumus remedia opposita morbis, ut primis, seu elementaribus, seu simplicibus et nudis qualitatibus contrarium contrario καθόλου sanescat, sed si morbus est in Crasi, quae non unam qualitatem nudam, sed totam facultatem et subtantiam secum fert, Crasi aduersante cum curamus, si in organo, organicam dispositionem contrariam inquirimus, atque ita de disiunctis."

34 Josephus Michelius, *Apologia chymica, adversus invectivas Andreae Libaui calumnias*, Middelburg 1597. On the quarrel between Libavius and Michelius, see Moran, *Andreas Libavius*, pp. 43–49; Didier Kahn, *Alchimie et paracelsisme en France à la fin de la Renaissance (1567–1625)*, Geneva 2007, pp. 354–357.

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tus, is to respond to Michelius' "calumnies" and to dismantle his argument by railing against his lack of qualification in grammar, logic, rhetoric, physics, medicine and alchemy. This treatise is followed by an extensive commentary on alchemical operations attributed to the medieval physicians Ramon Lull and Arnald of Villanova.[35] Although the title "New Treatise on Hippocratic and Hermetic Ancient Medicine" connotes the Paracelsian enterprise of uncovering the *prisca medicina*, the purpose of Libavius is somewhat different. He seeks to drown the Paracelsian system in the tradition by showing the historical compatibility between medieval alchemy and the authority of Galen and Aristotle. Libavius' sources include some collections of medieval alchemical texts such as the *Rosarium philosophorum* and *De alchemia*, among others.[36] Furthermore, the therapeutic application of Libavius' philosophy is presented in the treatise attached to the *Novus de medicina veterum… tractatus*, commenting on recipes attributed to Lull and Villanova.[37]

The first part of the treatise, entitled "De alchymia", contains forty-five "remarks" (*notae*) on Michelius' alchemy, while the second part, "De medicina", includes twenty-seven "points" (*puncta*) on his medical theory. Throughout the treatise, Libavius blames Paracelsus for usurping the "true" alchemy, for corrupting alchemical art by using symbolic names, and for misunderstanding the analogy between macrocosm and microcosm. At the same time, he rebuts Michelius' accusations of plagiarizing Thomas Erastus in his polemic against Severinus.[38] According to Libavius, the fact that he himself shares the objections of Erastus is hardly surprising given that "the speech of truth is simple and uniform".[39] In addition, Libavius requites his Paracelsian opponents the accusation of imitating Severinus' *Idea medicinae philosophicae* (1571), a major treatise for the diffusion of Paracelsianism in the late sixteenth century. In this manner, he distinguishes Paracelsus and Severinus from their disciples, whom he considers as pale followers reciting the precepts of Paracelsus without really understanding them.

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35 On the alchemical works attributed to Lull and Villanova, see Michela Pereira, "L'Alchimista come medico perfetto nel *Testamentum* pseudolulliano", in: *Alchimia e medicina nel Medioevo*, ed. Chiara Crisciani and Agostino Paravicini Bagliani, Florence 2003, pp. 77–109; eadem, "Maestro di segreti o caposcuola contestato? Presenza di Arnaldo da Villanova e di temi della medicina arnaldiana in alcuni testi alchemici pseudo-lulliani", in: *Actes de la 'II Trobada Internacional d'Estudis Sobre Arnau de Vilanova'*, ed. Josep Perarnau, Barcelona 2005, pp. 381–412; Antoine Calvet, *Les oeuvres alchimiques attribuées à Arnaud de Villeneuve : grand oeuvre, médecine et prophétie au Moyen-Âge*, Paris-Milan 2011.

36 S.n., *Rosarium philosophorum. Secunda pars alchimiae de lapide philosophico vero modo praeparando, continens exactam eius scientiae progressionem*, Frankfurt 1550; Geber, *In hoc volumine de alchemia continentur haec*, Nuremberg 1541.

37 Andreas Libavius, *Medicinae hermeticae artificibus catholicae ad hominis sanitatem tuendam aduersamque valetudinem profligandam […] Expositio fidelis*, Frankfurt 1599.

38 On Erastus, see Charles Gunnoe, *Thomas Erastus and the Palatinate: A Renaissance Physician in the Second Reformation*, Leiden 2011, pp. 263–338; Jole Shackelford, "Early Reception of Paracelsian Theory: Severinus and Erastus", in: *The Sixteenth Century Journal* 26 (1995), pp. 123–135; Newman, *Atoms*, pp. 45–65.

39 Libavius, *Novus*, pp. 48–49. See Michelius, *Apologia*, pp. 40–42.

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3 Reuniting Elements and Qualities with the *Tria Prima*

Libavius first strives to defend the notion of primary qualities against the attacks of Michelius, who reduces them to "vain shadows of bodies" following the Platonic formula.[40] From the Paracelsian viewpoint presented in Severinus' *Idea*, the fertile properties of seeds (*dynameis*), from which derive the *tria prima*, are distinct from the sterile qualities of the elements (*relollacea*), which are downgraded to simple material "rudiments".[41] On that basis, the Paracelsian philosophers dissociate the figure of Hippocrates from Galen and his followers by asserting that the founder of medicine never stated the existence of four elements and qualities, but affirmed that the body's juices were endowed with a seminal power. To this claim, Libavius responds that the primary qualities related to the elements are attested in humors and other "juices". As "reasons" and "virtues" of bodies, primary qualities give a determined status to the elements and interact by action and passion during their mixture.[42] Since they provide the body's properties and participate in their formation during mixture, there is no reason to replace them by the Paracelsian seminal powers. As Libavius recalls, medieval alchemists acknowledge the four qualities and elements. For instance, Bernardus Trevisanus advocates four efficient qualities, while Ricardus Anglicus stresses the role of primary qualities in the composition of Sulphur and the constitution of diseases.[43]

As Libavius explains, it is Paracelsus and the supporters of his "utopia" like Michelius and Severinus who claim the anteriority of the three principles to the elements in the composition of bodies. Libavius nonetheless remarks that, in the (apocryphal) treatise *De pestilitate* [*On Pestilence*], Paracelsus acknowledges that the elements precede the *tria prima* in the order of divine creation.[44] Libavius then tries to overcome this inconsistency in Paracelsus' works by taking the example of *De primis tribus essentiis* [*On the Three First Essences*].[45] In this treatise, Paracel-

40 Michelius, *Apologia*, p. 42. On Libavius' endorsement of the four qualities, see Forshaw, "Paradoxes", pp. 53–81.

41 Hirai, *Le concept*, pp. 217–265.

42 Libavius, *Novus*, p. 75: "[…] cur vanas appellat qualitates, quas et Chymici veteres, quos praedicat, agnouerunt […]? Si error est, qualitates agnoscere, non minus is Paracelsitis debetur quam Platonicis. Sed nec vanum est id, quod tantas ad agendum patiendumque vires obtinet. Frigore certe calor expugnatur, siccitate humor."

43 Bernardus Trevisanus, *De chymico miraculo, quod Lapidem Philosophiae appellant*, Basel 1583, p. 27; Ricardus Anglicus, *Correctorium alchemiae*, in: Geber, *De alchemia*, Nuremberg 1541, pp. 288–294. On Bernardus Trevisanus, see Didier Kahn, "Recherche sur le livre attribué au prétendu Bernard le Trévisan (fin du XVe siècle)", in: *Alchimia e medicina*, ed. Chiara Crisciani and Agostino Paravicini Bagliani, Florence 2003, pp. 265–336. On Ricardus Anglicus, see Joachim Telle, "Ricardus Anglicus", in: *Die Deutsche Literatur des Mittelalters: Verfasserlexicon*, ed. Karl Ruh, Berlin 1992, vol. 8, pp. 38–41.

44 Libavius, *Novus*, p. 123: "Sed Chymici veteres omnes Mercurio elementa priora faciunt, et Bernhardus ait, in principio chaos ceratum [sic] est, ex quo fiebant quatuor elementa, et ex his bestiae (quod et Paracelsus in lib. de pestilitate repetit) item sicut omnia semina sunt ex quatuor elementis, ita et sulphur et Mercurius, etc. Ita scilicet consentiunt Chymici Paracelsici inter se, et cum veteribus Chymicis." See Paracelsus, *Bücher und Schrifften*, Basel 1589, vol. 3, p. 30.

45 Paracelsus, *Bücher und Schrifften*, Basel 1589, vol. 3, pp. 15–23.

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sus affirms the resolution of elements into *tria prima* in reference to the ancient distinction between "common" and "prior" elements.[46] Without adhering to the primacy of the three principles, Libavius agrees on the distinction between pure elements in their natural place and the elements composing the bodies, in accordance with Aristotelian physics. In the same way, he defines the first compounds of elements as *elementata* holding an essence of great strength.[47] Libavius most likely takes this notion from his alchemical sources. For example, the *Rosarium philosophorum* defines the element (*elementum*) as the first body subject to composition, but states that earth, water, air and fire are not pure and simple elements, as they are mingled into an "elemented" part (*elementatum*).[48] In the same way, Ricardus Anglicus' *Correctorium alchemiae* distinguishes common elements from the four elements endowed with qualities, which are specific to the nature of "elemented" things.[49] More broadly, the notion of *elementatum* refers to the Platonic medieval tradition transmitted by William of Conches in *De philosophia mundi* (ca. 1129). This current defines "elemented" bodies as elemental entities perceptible in the physical world, contrarily to pure *elementa*, only accessible in thought.[50] Their formation succeeds to the biblical chaos, from the creation of elements to that of organic bodies. Such explanation overlaps the medical account of the body's division into "anhomeomerous" or organic parts, "homeomerous" parts (homologues of the *elementata*), and elements.

According to Libavius, the notion of *elementatum* implies that the first compounds enclose an essence corresponding to the Paracelsian three principles,

46 Libavius, *Novus*, p. 123: "Paracelsus vulgaria elementa iterum resoluit in elementa, quod fortasse sic aestimaret ex veterum sententia nullum elementum circa nos in nostro loco esse purum, hoc est, omnia vicissim composita esse ex elementis prioribus. In lib. de essentiis tribus, quicquid ex elementis productum est ex tribus esse putat, quae principia vocat."

47 Libavius, *Novus*, p. 42: "[…] Elementatum ex elementis tanquam membris constat. Id Paracelsitae, maximeque Seuerinus iudicant in se comprehendere essentiam ex principiis, (quae tria fingunt, Sulphur scilicet, salem, et mercurium) ortam: In hac separanda laborare Chymicum, quanquam Seuerinus neget possibilem esse separationem totalem et longe aliam habeat Chymiam, quam Michelius."

48 S.n., *Rosarium*, f. g2 v. On the *Rosarium philosophorum*, Antoine Calvet, "Étude d'un texte alchimique latin du xɪvᵉ siècle: le *Rosarius philosophorum* attribué au médecin Arnaud de Villeneuve (ob. 1311)", in: *Early Science and Medicine* 11 (2006), pp. 162–206; Joachim Telle, "Remarques sur le *Rosarium philosophorum* (1550) avec une liste sélective d'ouvrages sur l'alchimie médiévale", in: *Chrysopoeia* 5 (1992–1996), pp. 265–319; Giuliana Camilli, "Il *Rosarius philosophorum* attribuito ad Arnaldo da Villanova nella tradizione alchemica del trecento", in: *Actes de la I Trobada Internacional d'Estudis Sobre Arnau de Vilanova*, ed. Josep Perarnau, Barcelona 1995, vol. 2, pp. 175–208.

49 Ricardus Anglicus, *Correctorium*, p. 302.

50 See Theodor Silverstein, "*Elementatum*: Its Appearance Among the Twelfth-Century Cosmogonists", *Mediaeval Studies* 16 (1954), pp. 156–162; Idem, "Guillaume de Conches and the Elements: Homiomeria and Organica", *Mediaeval Studies* 26 (1964), pp. 363–367; Danielle Jacquart, "*Minima* in Twelfth-Century Medical Texts from Salerno", in: *Late Medieval and Early Modern Corpuscular Matter Theories*, ed. Christoph Lüthy, John E. Murdoch and William R. Newman, Leiden 2001, pp. 39–56; Dorothy Elford, "William of Conches", in: *A History of Twelfth-Century Western Philosophy*, ed. Peter Dronke, Cambridge 1988, pp. 308–327.

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which alchemists attempt to separate. Therefore, he insists on the conventional character of the distinction between impure elements and pure alchemical principles. The distinction between the "elemental part" designating the residues resulting from the separation, and the "essence" related to the *tria prima* only concerns the alchemical art.[51] As Libavius explains, the *tria prima* are principles only by analogy, because the principles of art differ from those of nature. Consequently, the *tria prima* are "pure" in the context of the *magisterium*, but in nature, they correspond to "elemented" bodies.[52] For Libavius, it is the Paracelsians who misunderstand the symbolic dimension of the terms "principles" and "essences" that the ancient alchemists used in their art.[53] From this, Libavius concludes that the three principles pertain to Aristotelian physics, hence obeying to the axioms of elements and mixture. For this reason, he attributes a qualitative constitution to the *tria prima*: Mercury is cold-moist and composed of water, Sulphur is hot and composed of fire and air, and Salt is hot-dry and composed of earth.[54] Moreover, the sensory properties of the *tria prima*, for instance the thick and liquid texture of Sulphur, come from their secondary qualities.[55]

It still remains for Libavius to explain the origin of the alchemical properties contained in the *tria prima*, which he defines as first elemental bodies (*elementata*). In his view, God created, mingled and tempered these compounds by infusing into them an "efficient and prolific" seminal power. The material in which this seminal force has been infused is nonetheless elemental and comes from the pri-

51 Libavius, *Novus*, p. 42: "Ego re perpensa video, has assertiones posse in Chymia ita ferri, vt institutum eius artis proprium, relatumque, neutiquam autem vniuersales toti Philosophiae naturali esse. Nam in separatione partis potissimae in qua et vis maxima est, sordes quaedam et veluti recrementa abiectanea inueniuntur. Haec pro artis propria consideratione vocantur partes elementariae. Pura vero natura ex his fecibus elicita essentiae nomen sustinet. At si haec ad Physicam vniuersalem accommodare velis, non habebunt locum."

52 Ibid., pp. 118–119: "Si pro mercurio ponas aquam, pro sulphure aëream igneamque partem quanquam haec etiam aquae forma latere possit, pro sale, terram: ita enim plerique exponunt; sed tamen diuersimodè in arte, et extra artem, cum in arte signent elaborata ad purum extra artem vero impura: non absurdus est syllogismus, ita tamen, vt vox Omnia non extendatur vltra composita corpora, et elementata."

53 Ibid., pp. 47–48: "Quod autem attinet ista tria, patior quidem Chymicos intra artis suae septa manentes ita symbolice loqui. Sed si vniuersalem Physicam spectes et ista succumbent mistionum Elementorumque axiomatis. Ita Michelius per mercurium intelligit aquam; per Sulphur, oleum; per salem, terram."

54 Libavius, *Novus*, p. 45: "Ita Michelius in resolutione opii Mercurio huius ascribit frigiditatem. […] Cum qua necessario est humiditas. Dicitur enim aqua essentialis esse. Sulphur, oleum et aëream igneamque partem nominant. Calidum ergo. Sal terra est, et simul calidus siccus."

55 Ibid., p. 119: "Oleum, seu sulphur coagulat ex liquido. Ipso Michelio teste necesse est, duos humores in eo fuisse, liquidum, et crassum. Crassum vero secundarum qualitatum è mistione est: et indicat idem flamma, quae simplicem ignem, aërem, aquam, terram, aut si ita volunt, omnino simplex principium non prehendit. […] Nec elementa Chymica sunt vltima compositionis. Sunt enim duntaxat artis, et ex analogia nomen acceperunt."

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mordial "viscous silt" composed of water and earth.[56] The divine nature of the seminal force is thus limited to the episode of Creation, when it was introduced into the elemental compounds by the divine breath in order to be subsequently immanent in them.[57] After the divine creation, the transformations occurring in all bodies follow the laws of Aristotelian physics. Their seminal property is involved in the constitution of beings to operate the physiological functions and the alchemical properties.

Having stated the elemental composition of bodies and their seminal properties, Libavius moves on to discuss the medical implications of his theory for the body's temperament.

4 The *Krasis* of the Living Body

To introduce his interpretation of temperament, Libavius first reacts to Michelius' denial of the notion of temperament (*krasis*) as a mixture resulting from the union of elements achieved by a substantial form.[58] Against this view, he recalls that the *krasis* is to be understood in two ways, first as an elemental mixture, and second, as the "form of the mixt" related to the seminal principle.[59] He refers this description to the *Rosarium*, reporting mixture according to the Aristotelian formula of "union of altered miscibles".[60] The "first elements" are the "material principles" of things, as agent and patient "miscibles" through their qualities.[61] The process of mixture ensures their composition into a single entity endowed with matter

56 Ibid., p. 120: "Terram autem quam? Illam, quae erat ante species distinctas. Certum autem est, eam fuisse tunc rude elementum, et ancipitem ad omnes species, quas postea diuino iussu produxit, materiam. Haec sunt vltima elementa […]. Videmus item etiamnum, hodiè ex aqua et terra fieri limum viscidum, et hunc conglutinari, aut concrescere in lapidem. Si hic resoluitur in vltima; non in mercurium, sulphur et salem, nisi haec sint elementorum Symbola, sed in elementa vulgata soluetur."

57 Ibid., p. 48: "Non fugit nos, autorem creaturae initio miscuisse contemperasseque ista prima et postea efficaciam prolificam seminariamque inspirasse. Sed tamen eius rei vestigia videmus in ruditer compositis, in imperfecte mistis, in resolutionibus, in nutritione et augmentatione, in vita inter Elementa. Nemo est, quin intelligat hominis corpus ex semine et sanguine agente interno principio ad similitudinem generantis, post primum Adamum effectum esse. At oraculum diuinum dicit, ex terra creatum, et terram esse, et in terram reuersurum. Conspirat itaque haec nostra Physica cum sacris literis, quae nihil sciunt de mercurio, nec de sale et sulphure."

58 Michelius, *Apologia*, pp. 84–94.

59 Libavius, *Novus*, p. 38–39: "Ego soleo dupliciter de crasi loqui. Intelligo enim interdum primarum qualitatum conspirationem, qua aliquid calidum, humidum, frigidum, siccum, etc. dicitur: interdum formam misti, quâ mistum est, licet substantiam habeat non ex concursu elementorum, qualis fit, […] sed ex seminaria propagatione instituta in elementis et ex materia vniuersi à Creatore, vt […], quod tamen postea tum elementis conseruatur, tum mistis. Esse autem in illa materia elementa, si argumento nutritionis et generationis non credunt, credant saltem oraculo diuino, quod testatur hominis corpus ex terra factum in terram reuersurum."

60 *Rosarium*, f. o3 v.

61 Libavius, *Novus*, p. 104: "Aristoteles mistionem appellat mistilium alteratorum vnionem, quasi sit elementorum (ita vocantur principia materialia siue prima omnium sint elementa, siue certi generis) agentium et patientium mutuo (haec enim sunt mistilia) per qualitates seu

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and form. As Libavius explains, the resulting *krasis* is also a substance associated to the form of the compound, derived from the seeds introduced into the water-earth primordial dyad during the divine creation.[62] Infused by God, these "seminal reasons" are propagated in the body's seed with the divine blessing to be fruitful and multiply.[63] Within the human body, they act in blood and the seed for the perpetuation of species, and operate through its "substantial innate heat".

Libavius' account of *krasis* merges different sources, overall Aristotle's *Meteorology* and Renaissance medical philosophy, in order to debunk the flourishing Paracelsian interpretations of the body's transformations in relation to the *Genesis*.[64] On the one hand, he takes up Aristotle's account of homogeneous bodies as first compounds of elements made of water and earth. As Aristotle explains in the *Meteorology*, such bodies include the "homeomerous" body parts (skin, bones, veins, muscles, etc.) and metals, both subject to coagulation. On that basis, Libavius draws a parallel between the alchemical transformation of metals and the physiological processes of the human body, in continuity with the recurrent medical analogies in medieval alchemy.[65] Upon this framework, the alchemist's material can be considered as endowed with a temperament and experiencing processes of generation, nutrition and digestion in the same way as the human body. On the other hand, Libavius' interpretation of *krasis* follows Renaissance medical theories of temperament, in particular that of the French physician Jean Fernel (1497–1558). In his *Universa medicina* (1567), Fernel relates the living body's temperament to a vital principle of ethereal nature, the "innate heat" inserted in the body's elemental mixture, following a Platonic interpretation of Galen.[66]

vires pugnaces compositio ad vnum quiddam similare tota substantia, et viribus. Talis vnio est mistionis modus et forma."

62 Ibid., p. 100: "Vbi vero iam illa mirifica crasis? Intelligitur facta esse in institutione naturae, et postea cum illis principiis semper propagari, ita tamen, vt quia indiuulsa est comes generationis mistorum, et se accommodat ad cuiusque speciem et naturam intimam ; non sit absurda per eam explicatio."

63 Ibid., p. 107: "Sane ita Deus ex elementis constituit mista, iisque inseuit seminarias rationes, iuxta quas vnumquodque produceret suum semen et gigneret simile, sicut in animalibus vox oraculi iubet ea crescere et multiplicari. Illae rationes seminariae in ea parte sunt, quam Chymici essentiam vocant, […] calidum innatum substantialem […]. Haec doctrina nec Aristoteli nec Galeno repugnat quanquam explicatione egeat, et collatione." See *Genesis* 1:28.

64 On the Paracelsian accounts of *Genesis*, see Michael T. Walton, *Genesis and the Chemical Philosophy: True Christian Science in the Sixteenth and Seventeenth Centuries*, New York 2011; Didier Kahn, "L'interprétation alchimique de la Genèse chez Joseph Du Chesne dans le contexte de ses doctrines alchimiques et cosmologiques", in: *Scientiae et artes: Die Vermittlung alten und neuen Wissens in Literatur, Kunst und Musik*, ed. Barbara Mahlmann-Bauer, vol. 2, Wiesbaden 2004, pp. 641–692.

65 See Chiara Crisciani, "Il corpo nella tradizione alchemica: Teorie, similitudini, immagini", in: *Micrologus* 1 (1993), pp. 189–233; Barbara Obrist, "Les rapports d'analogie entre philosophie et alchimie médiévales" in: *Alchimie et philosophie à la Renaissance*, ed. Jean-Claude Margolin and Sylvain Matton, Paris, 1993, pp. 43–64.

66 See Hiro Hirai, *Medical Humanism and Natural Philosophy: Renaissance Debates on Matter, Life and the Soul*, Leiden 2011, pp. 46–79.

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In the same way as Fernel, Libavius considers the *krasis* as a union of elements crowned by a supra-elemental form of divine origin. For the body's functioning, it runs through the innate heat and operates physiological functions like reproduction, growth and nutrition.

Building on Fernel's view on innate heat, Libavius further anchors his interpretation of the body's *krasis* in medieval alchemy by relating it to the notion of quintessence. In medieval alchemy, quintessence relates to a spiritual nature within the body, which is intermediate with the soul, as theorized in the *Testamentum* attributed to Ramon Lull in the fourteenth century.[67] To this conception of quintessence, John of Rupescissa (c.1310–c.1370), in *De consideratione quintae essentiae* [*Consideration on the Fifth Essence*], added a pharmacological dimension.[68] From Rupescissa, Libavius takes up the celestial origin of the quintessence, which is nonetheless enclosed in the elements and associated with the body's vital principle.[69] He further links the notion of quintessence to the distinction between *elementum*, *elementatum* and *quinta essentia* developed in the *Rosarium*.[70] Accordingly, the quintessence is a body subsisting by itself, which is distinct in nature from elements and "elemented" bodies. For this reason, quintessence is devoid of any cause of corruption but can be extracted from elemental bodies. As Libavius explains, such a definition of quintessence takes root in the natural alchemy of the ancients, which was continued by medieval authors. The latter, he insists, were aware that the alchemical terminology is restricted to a practical context and relates only by analogy to natural philosophy.[71]

With this explanation of innate heat, quintessence and elements, Libavius aims to endorse the Galenic notion of temperament by showing its coherence with medieval alchemy and the Scriptures, while absorbing the theory of seeds developed by Paracelsus and his disciples.[72]

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67 Michela Pereira, "Heavens on Earth: From the Tabula Smaragdina to the Alchemical Fifth Essence", in: *Early Science and Medicine* 5 (2000), pp. 131–144.

68 On Rupescissa, see Leah DeVun, *Prophecy, Alchemy, and the End of Time: John of Rupecissa in the Late Middle Ages*, New York 2014; Robert Halleux, "Les ouvrages alchimiques de Jean de Rupescissa", in: *Histoire littéraire de la France,* ed. Académie des Inscriptions et Belles Lettres, Paris 1981, vol. 41, pp. 242–277; Robert P. Multhauf, "John of Rupescissa and the Origin of Medical Chemistry", in: *Isis* 45 (1954), pp. 359–367.

69 de Rupescissa I., *De consideratione quintae essentiae rerum,* Basel 1561, pp. 15–21.

70 *Rosarium*, f. g2 v.

71 Libavius, *Novus*, p. 43: "Nam et veteres mentionem faciunt mysterii seu arcani, magisterii, quintae essentiae, et similium. Sed in sua arte permanserunt, nec nisi analogia quadam ad explicationes naturales, quatenus arti inseruirent suae, accommodarunt."

72 Ibid., p. 80: "Haec Paracelsici quidem corruperunt, sed Galenici sciunt ab Aristotele, Galeno caeterisque eadem scribi de […] calidi innati substantia, vnde postea dependent tertiae […] qualitates viresque quarum motus non est elementalis. […] Sed rectius semineo tribuitur principio, nec tam est aliena ab elementis, quin in eis conseruetur, imo initio creationis etiam ex iisdem sit concinnata, accedente diuina virtute in eis instituta. […] Haec et similia non sunt aliena à Galenica doctrina, sed eiusdem partim manifesta praecepta, partim consectaria, quae tamen illustrari altius ex Theologia repetitis causis possunt."

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5 Conclusion

Libavius expounds the institutional nature of his medical project according to a logical approach. His Philippo-Ramist training leads him to renew the demarcation of medicine with alchemy while insisting on the continuity of knowledge from the *trivium* to theology. Within a Galenic and Aristotelian framework, his argumentation emphasizes the role of divine intervention in the constitution of bodies in a similar way as Renaissance Platonic medical interpretations enhancing the divine nature of life and its principles. Nonetheless, Libavius' explanation of temperament is not anchored in the Platonic scheme of *prisca sapientia*, but in an alternative hermeneutic emphasizing the role of logic, nature and divine providence at all levels of knowledge. In this perspective, Libavius seeks to limit the body's divine part to the episode of Creation, whereas Platonic physicians, either Galenist like Fernel or Paracelsian like Severinus, exalt the body's celestial imprint. With his own interpretation, Libavius thus works to naturalize and institutionalize alchemical medicine by using the "divine oracle" as a theological evidence for a reformed *prisca medicina*.

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Johann Ludwig Hannemann (1640–1724) and the Defence of Paracelsism in Kiel

Bernd Roling

1 Introduction

Even in the eighteenth century Paracelsism could still function as a definitive account of the world for scholars in the Baltic region, especially if they rejected not only the gradually fading scholastic Aristotelianism but also Cartesianism, which had become widespread since 1680. In Sweden, as has been shown by Sten Lindroth, Susanne Åkerman and above all Håkan Håkansson, Paracelsism was given wide attention by Georg Stiernhielm, Johan Bureus and Friedrich Menius, despite considerable opposition.[1] It is often forgotten how readily Paracelsus was read in Uppsala even in the eighteenth century. Gustaf Bonde, chancellor of the university there and one of its greatest patrons, may have been one of the most enthusiastic followers of his doctrine.[2] And the successes of Paracelsism in Denmark have been demonstrated by Jole Shackleford and Sten Ebbesen.[3] Less attention has so far been paid to the history of reception of this Scandinavian Paracelsism. I here wish to present one figure in particular, Johann Ludwig Hannemann,

1 As a selection of classical studies see Sten Lindroth, *Paracelsismen i Sverige till 1600–talets mitt*, Uppsala 1943, pp. 93–252, id., *Svensk Lärdomshistoria*, 4 vols, Stockholm 1975, vol. 2, pp. 152–160, Susanna Åkerman, *Rose Cross over the Baltic. The Spread of Rosecrucianism in Northern Europe*, Leiden 1998, pp. 29–67, id., "The Gothic Kabbala: Johannes Bureus, Runic Theosophy, and Northern European Apocalypticism", in: *The Expulsion of the Jews. 1492 and after*, eds. Raymond B. Waddington and Arthur H. Williamson, London 1994, pp. 177–198, and id., "Alruna Rediviva. Johannes Bureus' Hyperborean Theosophy", in: *Rosenkreuz als europäisches Phänomen im 17. Jahrhundert*, ed. Bibliotheca Philosophica Hermetica, Amsterdam 2002, pp. 311–338. In addition see now Matthew Norris, *A Pilgrimage to the Past. Johannes Bureus and the Rise of Swedish Antiquarian Scholarship, 1600–1650*, Lund 2016, there pp. 328–579, Håkan Håkansson, *Vid tidens ände. Om stormaktstidens vidunderliga drömvärld och en profet vid dess yttersta rand*, Halmstadt 2014, there pp. 307–359, and with regard to alchemy, id., "Alchemy of the Ancient Goths: Johannes Bureus' Search for the Lost Wisdom of Scandinavia", in: *Early Science and Medicine* 17 (2012), pp. 500–522.

2 On Gustaf Bonde as alchemist and paracelsian see Susanna Åkerman, *Fenixelden. Drottning Kristina som alkemist*, Möklinta 2013, pp. 256–266, Lindroth, *Svensk Lärdomshistoria*, vol. 3, pp. 643–644, and esp. Carl Michael Edenborg, *Gull och Mull. Den monstruöse Gustaf Bonde*, Lund 1997, pp. 126–159.

3 On a figure like Cort Aslakssøns see Sten Ebbesen—Carl Henrik Koch, *Dansk filosofi i Renæssancen 1537–1700*, Kopenhagen 2003, there e. g. pp. 284–289, on the much better known Petrus Severinus esp. Jole Shackelford, *A Philosophical Path for Paracelsian Medicine. The Ideas, Intellectual Context, and Influence of Petrus Severinus (1540/2–1602)*, Kopenhagen 2004, pp. 318–353.

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professor at the University of Kiel and at once one of the great Paracelsists and Anti-Aristotelians of the early eighteenth century.

Hannemann's family were from Amsterdam; they had moved, perhaps for religious reasons, to the largely Dutch town of Friedrichstadt, which Frederick III, Duke of Schleswig-Holstein-Gottorf, had founded as a safe destination for Remonstrants and Mennonites from all over Europe. Hannemann's mother, Anna Gysia, had remarried, to a burgher of the town. Hannemann completed his medical studies in Copenhagen and Kiel; he practised as a doctor first in Friedrichstadt, then in Stade and in Buxtehude.[4] In 1675 he became Professor of Medicine at Kiel, a university that had been founded ten years previously by the local ruler, Duke Christian Albrecht of Schleswig-Holstein-Gottorf. Hannemann remained loyal to the university of the House of Gottorf until his death. The young scholar achieved scientific recognition early. Hannemann had already published in various academic journals during his time as a practising doctor; after a period as assessor he became a member, under the name Nestor II, of the Leopoldina, whose journal he henceforth filled with his studies. After retiring, he returned again to his hometown of Friedrichstadt. Of his otherwise rather uneventful life it may be reported that his son, shortly after correcting a large book-manuscript for his father, was stabbed to death by a fellow student in a brawl. Whether this blow was the reason Hannemann's publication activities fell silent for many years, I cannot say, but it is not unlikely. Hannemann died in 1724 at the age of 84.[5]

Leaving aside for a moment the works that will be discussed in more detail below, Hannemann, like so many natural scientists of his era, published numer-

4 As only result of Hannemann's short and intermediary activity as *Urbis Buxtehudae physicus* exists a short advertising leaflet to possible students, see Johann Ludwig Hannemann, *Oculus Tauri artis medicae, ceu Epistola ad Medicinae studiosos, qua Autor, quemlibet studiosum (qui humaniora absolvit) universam medicinam biennii spatio sic docere, in Academiis promoveri queat, promittit et pollicetur*, Buxtehude 1673, passim.

5 As fundamental source for Hannemanns biography, with a catalogue of publications, see in the dossier of his elegies, stored in Wolfenbüttel, his contemporary *Epicedion, Prorector et Senatus Academiae Kiloniensis ad iusta Viro amplissimo et experientissimo, Io. Ludovico Hannemanno, Doctori Medico et Professori Physices […] decenti prolixoque comitatu solvenda omnes omnium ordinum cives academicos, litteratorumque ordini bene cupientes […] invitant*, Kiel (without year) 1724, passim. All later reports depend on this summary of Hannemann's life. In a fitting way, one of his students in his funeral poem declares, as F. C. Franck, *Die Vortrefflichkeit der Artzney-Kunst, in Verlängerung des Menschlichen Lebens, wolte an dem Exempel des Hoch-Edel-Gebohrnen, und Hoch-Erfahrnen Herrn, Johann Ludwig Hannemann […] vorstellen*, Kiel 1724: *Wie man sein Leben nicht mit etwa tausend Jahren, / Nein, mit der Ewigkeit vermögend sey zu paaren. /Da man indessen hier der Glieder mürben Rest, / Der Erden schwarzer Schooß in Hoffnung überlässt; / Daß, wann die Erde soll durch Flammen einst vergehen, / Du gleich dem Phoenix wirst, in Klarheit auferstehen.* A collegue of him, is lamenting in the same volume, J. F. Rahtge, *Bey Beerdigung des Wohlseligen Hoch-Edel-Gebohrnen, Hoch-Gelahrten und Hoch-Erfahrnen Herrn Johannis Ludovici Hannemanns […], zur Bezeugung seiner schuldigsten Observance […]*, Kiel 1724, str. 5: *Weshalben da den itzt erblaßt, der Cimbrer Musen edles Alter, / Der Wissenschaften Thron und Zierd, ja deren Aufnahm Miterhalter, / So sollte das gelehrte Chor / Zwar billig auch im schwarzen Flor / Den schmertzlichsten Entriß beklagen / Und für empfindlichen Verdruß nichts als von saltzen Thränen sagen.*

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ous works on medical questions and wrote handbooks, but was also responsible for genuinely theological studies. To date, much attention has been accorded only to the dispute that Hannemann pursued over a period of several years with the Wolfenbüttel scholar Leonhard Christoph Sturm;[6] its subject was the defence of astrology and chiromancy as science. Hannemann was a passionate defender of astrology but, in the whole gallery of treatises that the controversy generated, he could not move Sturm to waver from his critical attitude.[7] Only occasionally does Hannemann turn up in the established literature on the subject. Eric Leibenguth mentions him as a transmitter of the ideas of Michael Maier;[8] Joachim Telle described him a few years ago, quite rightly, as a "dyed-in-the-wool hermetic".[9] In his own setting he was regarded as a solid medic and natural philosopher, but above all as an indifferently successful alchemist who pursued the 'Great Art' all his life. The alchemist Johann Conrad Creiling stayed for many years with Hannemann in Kiel, in order to learn from him how to produce the *lapis philosophorum*, and finally even composed eulogies upon his works. However, in his own *Ehrenrettung der Alchemie* ('Saving the Honour of Alchemy') of 1730, six years after Hannemann's death, Creiling lamented bitterly that he had spent so much time with the old scholar and had again and again fallen for his pleas and promises to generate the philosopher's stone. Creiling ultimately regarded Hannemann as a charlatan and later would repeatedly express outrage at Hannemann's *imposturae*, though, admittedly, without losing his own faith in alchemy.[10]

6 On the dispute between Hannemann and Leonhard Christoph Sturm see Claudia Brosseder, *Im Bann der Sterne. Caspar Peucer, Philipp Melanchthon und andere Wittenberger Astrologen*, Berlin 2004, pp. 295–297.

7 As writings of Hannemann on this subject see in three continuations Johann Ludwig Hannemann, *Verthädigung der Astrologie, oder rechtmässige Erklärung der Sprüche, so von d. Herrn Professore Sturmio in seinem Tractat, genandt: Die Abfertigung Bileams gegen die artes divinandi sind angeführet worden, worinnen gezeiget wird, daß die Astrologia judiciaria, Chiromantia, Metoposcopia und Geomantia aus den Gründen der Heiligen Schrifft und der Natur füglich können behauptet werden* (3 vols.), Hamburg 1699–1701, and as counterpart Leonhard Christoph Sturm, *Bileams Abfertigung, oder Gründliche Wiederlegung der Astrologie und aller anverwanten Wahrsager-Künste, aus der Heiligen Schrifft, der realen Philosophie, der unfehlbaren Mathesi, und der Historie*, Braunschweig 1699, id., *Antwort, Auf die Verthädigung der Astrologie, welche Hr. D. Joh. Ludewig Hannemann auf der berühmten Albertinischen Universität wohlverdienter Prof. Ordin. Philos. Natur wider seine Abfertigung Bileams, oder Die daselbst angeführte Auslegung verschiedener Oerter H. Schrifft heraus gegeben*, Braunschweig 1699, and id., *Die Letzte und völlige Abfertigung Bileams, Oder nochmahliger sonnen-klarer Beweiß, daß die heilige Schrifft nicht vor, sondern wider die Wahrsager-Kunst spreche, in einer Replica auf die I. Continuation der Vertheidigung des Hn. Johann Ludewig Hannemanns außgeführet*, Braunschweig 1700.

8 Eric Leibenguth, *Hermetische Poesie des Frühbarock. Die "Cantilenae intellectuales" Michael Maiers. Edition mit Übersetzung, Kommentar und Bio-Bibliographie*, Tübingen 2002, p. 16, p. 490.

9 Joachim Telle, „Jacob Böhme unter deutschen Alchemikern der Frühen Neuzeit", in: *Offenbarung und Episteme. Zur europäischen Wirkung Jacob Böhmes im 17. und 18. Jahrhundert*, eds. Wilhelm Kühlmann and Friedrich Vollhardt, Berlin 2012, pp. 165–182, here pp. 173–174.

10 Johann Conrad Creiling, *Ehren-Rettung der Alchymie, oder Vernünfftige Untersuchung, Was von der herrlichen Gabe, welche denen Menschen geschencket, und insgemein mit dem verächtlichen Nahmen der Alchymie beleget wird, zu halten seye: Durch Rationes, auch viele curiose Exempla und Ex-*

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In what follows I aim to do two things. I wish to cut a cross-section through Hannemann's hundreds of works and so try to reconstruct the largely Paracelsist natural philosophy on which they are based. He remained committed to this in its essential lines for over forty years, and it also provided the theoretical foundation of his own undertakings in alchemy. Beyond this, I shall attempt to do justice to Hannemann's works against the background of his times, a context that arises from the distinctive position of Kiel, and thus of the House of Gottorf. Kiel lay between Sweden and Denmark; both powers had major influence on the political situation in Gottorf and so also on the local university, but, as we have already seen, both countries were also centres of Paracelsism both inside and outside the universities. Given Hannemann's interests, it was almost inevitable that he would be forced to operate within the tense overlap between these two academic networks, which themselves hardly came into contact with each other due to the war. It was the University of Kiel that made these contacts possible.

2 From Swedish Stade to Kiel: A Paracelsist in Northern Germany

Hannemann's publications began in Stade, after his first years working as a doctor in Friedrichstadt. He would remain committed to Stade for many years. Unlike Friedrichstadt, part of the Gottorf Duchy, Stade was part of the Duchy of Bremen and Verden and hence, from the end of the Thirty Years' War, part of the Swedish empire.[11] Its academic elite had made their peace with Swedish rule rather promptly, comparatively speaking, as is revealed by numerous speeches of praise of the period. Hannemann, too, dedicated his writings of these years to the Swedish ruler and his local governor. We will see in more detail later just how strongly Hannemann felt his ties to Sweden. Two works by Hannemann are notable here, above all because they can stand programmatically for his later output. In a short work on blood infusions, the *Ars clynastica*, Hannemann emphatically announced the authorities to whom he would show allegiance in his future scholarly career: they are Basilius Valentinus, Paracelsus, Van Helmont, Isaac Holland and, most importantly, Hermes Trismegistus.[12] The second work sketched the outline of a cosmology to which, as I wish to show in what follows,

perimenta abgehandelt. Wobey noch von der Medicina Universali Meldung geschiehet, Herrenstadt 1730, Vorrede (without pagination).

11 On Bremen and Verden as part of the Swedish Empire see e. g. Klaus-Richard Böhme, *Bremisch-verdische Staatsfinanzen 1645–1676. Die schwedische Krone als deutsche Landesherrin*, Uppsala 1967, and also Beate-Christine Fiedler, *Die Verwaltung der Herzogtümer Bremen und Verden in der Schwedenzeit 1652–1712. Organisation und Wesen der Verwaltung*, Stade 1987, passim.

12 Johann Ludwig Hannemann, *Nova ars clymastica, enervata*, Stade 1670, there on Hannemann's authorities already fol. 3 rf. The same year Hannemann published a large encyclopedia of medicine, consisting of more than 600 pages, see Johann Ludwig Hannemann, *Prodromus Lexici utriusque Medicinae practicae*, Hamburg 1670. Hannemann published on medicine until the end of his life, see as selection e. g. Johann Ludwig Hannemann, *Sylloge philosophico-medico de anomalis et paradoxis morborum curationibus aliquot disputationibus*, Kiel 1706, or Johann Ludwig Hannemann—Stefan Grafe (resp.), *Dissertatio Fridericiana visus et oculorum thaumatographiam recensens*, Kiel 1711, these writings won't be taken into account further.

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Hannemann would remain committed in different variants and disguises, the *Ruah in mundo restitutus* of 1670.

The followers of Aristotle, so Hannemann begins, had made the great mistake of denying the Platonic dogma of the world soul, the *anima mundi*. In truth, however, no thinker had demonstrated the immortality of the soul with more philosophical soundness than Plato and the many who had not been deceived by Aristotelian scholastic philosophy.[13] Platonic, Hermetic and Paracelsist philosophy could be combined with each other, as Hanneman then sets out to demonstrate. The world soul of the Platonists was called *archeus universalis* by the Paracelsists. It was identical with the Biblical *Ruah*, the spirit that, according to the Bible, moved upon the face of the waters.[14] Only a universal final nexus of the entire cosmos such as this, an ultimate shaping force, made it possible to explain all the sympathies and antipathies, the occult qualities as well as the processes of transformation, without which a coherent natural science and medicine could not be conceived.[15] According to the Bible, God had created the heavens, the Hebrew *shamayim*, a term that, so Hannemann explained, was composed of the *esh*, fire, and *mayim*, waters.[16] To fire corresponded the world soul, the Archeus, which as *vis creata universalis* structured the still formless stellar matter, that is, the 'water'. The Archeus provided the *virtus plasmatica* for the natural order, but it was only with the Archeus, as the first creature, that the process of creation had begun at all.[17] The ongoing formation of the universe was carried out, so Hannemann continues, according to the measures of number, order and form. God bore the Ideas in himself; as *idea ideans*, the Archeus as creating principle pressed them into the matter and generated the multiplicity of creatures. If the Archeus created without reference back to God, which was not to be excluded, it produced subaltern monsters such as the comets. When materialised, the Idea functioned as form.[18] Its actual relation to the other forms was responsible for the harmonious order of the whole creation.[19] The most important instrument of the Archeus or world soul were the celestial bodies, above all the sun, which condensed the spiritual principle into warmth and made it fertile for the creatures.[20] The individual effects of the celestial bodies on the sublunary sphere were explained by the young Hannemann with the help of the Swedish royal physician at Stade, Johann Heinrich Voigt.[21] But the decisive momentum remained with the Archeus itself. as *natura*

13 Johann Ludwig Hannemann, *Ruah: Spiritus universalis mundo restitutus*, Stade 1670, Praefatio, pp. 6–8.
14 Ebd., §§ 1–2, pp. 9–11.
15 Ebd., § 3, pp. 11–14.
16 Ebd., § 5, pp. 15–16, § 9, pp. 20–22.
17 Ebd., §§ 6–7, pp. 15–19, § 10, pp. 22–26, §§ 12–13, pp. 27–29.
18 Ebd., § 18–19, pp. 35–37.
19 Ebd., §§ 21–22, pp. 38–39,
20 Ebd., § 23, p. 40.
21 Ebd., § 24, pp. 40–44. Johann-Henrich Voigt was the most important astronomer in Bremen of his age, see e. g. Johann-Henrich Voigt, *Colloquium Calendario-Graphicum, Von der Vergleich-*

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naturans it was responsible for the fertility of the seed; and the Archeus' all-generating force as *fermentatio* and vegetative energy was also what, according to Hannemann, kept the cosmos alive despite all its continuous changes.[22] The planets were responsible only for the range and variations of this primordial force. No follower of Aristotle, so Hannemann, had grasped the scope of the world soul.[23]

When in 1675 Hannemann moved to Kiel, his *alma mater* at which he would teach for the following forty years, he encountered a circle of scholars with whom he had been in contact already while he was in Friedrichstadt and Stade.[24] As at almost no other university in Germany, the professors of the Gottorf university operated within the difficult overlap of Danish and Swedish interests, without surrendering entirely to one side or the other.[25] Of necessity the university was in this way responding to the position of the Gottorf Duchy between the two Baltic great powers. It was terrain marched over by the armies of the Northern Wars that smouldered on almost continuously in the second half of the seventeenth century, and the ducal house made strenuous attempts to save itself by a marriage politics that paid dues to both sides. A daughter of Duke Frederick III, Hedwig Eleonora, had already married King Charles X Gustavus of Sweden; Frederick's son, Duke Christian Albrecht, the founder of the university, then, despite his marriage to the daughter of the Danish king, had to engage in bitter struggles with his father-in-law that had even driven him into temporary exile in Hamburg. The Gottorf Duchy moved closer to Sweden again after Christian's son Frederick IV married Hedwig Sophie, daughter of Charles XI and sister of Charles XII of Sweden.

The university could in this period boast not only theologians like Christian Korholt or mathematicians like Samuel Reyher; it had, in particular, a strong faculty of medicine and natural science which was for the most part very open to Paracelsism. Via Denmark the works of Peder Sörensen, in particular his *Idea medicinae philosophicae*, had reached Holstein early; they had given the teachings of Paracelsus a very engaging scholarly form. Later there had also been good

oder Vereinigung des alten Julianischen und des neuen Gregorianischen Calenders, Hamburg 1668, passim, and close to Hannemann esp. Id., *Der Obern Himmels-Magnaten Vom Anfange der Welt biß hieher, in den unterschiedenen Himmels-Kreissen gehaltene Reichs- Kreiß- und Land-Tage: und was in der untern Welt darauff schon erfolget, und künfftig zu vermuthen sey*, Hamburg 1676, passim.

22 Hannemann, *Ruah: Spiritus universalis*, §§ 25–27, pp. 44–48.

23 Ebd., §§ 29–31, pp. 50–63.

24 As summaries on the early modern history of the university of Kiel see e. g. Henning Ratjen, *Geschichte der Universität zu Kiel*, Kiel 1870, there, structured according to the faculties pp. 64–80, and more recently Oliver Auge (ed.), *Christian-Albrechts-Universität zu Kiel. 350 Jahre Wirken in Stadt, Land und Welt*, Hamburg 2015, there e. g. Uta Kuhl, „Wissenschaften und die Gelehrsamkeit um ihrer selbst willen—Die Gottorfer Herzöge als Förderer der Wissenschaft", pp. 51–67, or Swantje Piotrowski, „Von der Fakultätenhierarchie und der Entwicklung des Lehrkörpers an der Christiana Albertina in der Zeit von 1665 bis 1815", pp. 450–497.

25 As a good summary of the political situation of Holstein-Gottorf during these decades see e. g. Joachim Krüger, "Das Herzogtum Schleswig-Holstein-Gottorf im 17. Jahrhundert", in: *Staat – Militär – Gesellschaft. Festschrift für Jens. E. Olesen zum 65. Geburtstag*, eds. Robert Oldach and Thomas Wegener Friis,Greifswald 2015, pp. 93–116.

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contacts with the learned clan of the Bartholins and Simon Pauli; Ole Borch's writings, too, had been read in Kiel at an early stage. Pauli's student Joel Langelott had worked in Gottorf itself, having been made personal physician to Duke Frederick III. Langelott had spoken out passsionately in favour of alchemy and published a whole series of works on the topic.[26] Sympathies for alchemy and Paracelsus had arisen also from another direction. Langelott's son-in-law Johann Nicolas Pechlin and his colleague, the medic Wilhelm Ulrich Waldschmidt, had paid some attention, at least, to these topics.[27] A stronger interest in alchemy was maintained especially by the most famous member of the Kiel professoriate at this time, the polyhistor Daniel Georg Morhof. In 1673 Morhof published a whole treatise with the title *De metallorum transmutatione*, which was still addressed to Langelott; his enthusiasm for alchemy would never entirely cease afterwards.[28]

It is hence no surprise that Morhof, if one can believe Hannemann, soon became one of the latter's best friends, straight after he arrived in Kiel, and one whom he would praise all his life as *amicus amicissimus*. Hannemann's publications in his first years in Kiel reveal him as an exponent of a medicine that was rather sceptical towards new directions. In 1675 he published a treatise against William Harvey's *De generatione animalium,*[29] and shortly thereafter a work against Thomas Willis and a treatise on the use opiates,[30] whose side effects he was criticizing.[31] In 1679 a treatise appeared in which Hannemann gave more pointed

26 As examples see Joel Langelott, *Epistola ad praecellentissimos naturae curiosos de quibusdam in chymia praetermissis, quorum occasione secreta haud exigui momenti proque non-Entibus hactenus habita, candide deteguntur et demonstrantur*, Hamburg 1673, and also Johannes Tilemann, *Chymiatri olim in Germania Clarissimi Experimenta circa veras et irreducibiles Auri solutiones*, Hamburg 1673.

27 As exemples of modest interest in Paracelsism see Johannes Nicolas Pechlin, *De aeris et alimenti defectu, et vita sub aquis meditatio*, Kiel 1676, c. 1, pp. 5–20, and see Johann Jacob Waldschmidt – Wilhelm Ulrich Waldschmidt (resp.), *Dissertatio chymica de auro*, Kiel 1685, passim, and Johann Jacob Waldschmidt – Wilhelm Ulrich Waldschmidt (resp.), *Dissertatio chymica de argento et cypro*, Kiel 1685, passim.

28 Daniel Georg Morhof, *De metallorum transmutatione ad virum nobilissimum et amplissimum Joelem Langelottum, Serenissimi Principis Cimbrici Archiatrum celeberrimum Epistola*, Hamburg 1673, and in a german translation id., *Vom Goldmachen, oder physikalisch-historische Abhandlung von Verwandlung der Metalle*, Lübeck 1764.

29 Johann Ludwig Hannemann, *Exercitatio philosophica-medica academica prima de vero et genuino sanguificandi organo*, Kiel 1675, and id., *Ovum harvaeanum generationis animantium curiosum seu Exercitatio philosophica curiosa vel Prodromus, quo demonstrator adversus materialistas, quod generatio animalium fiat ex nihilo*, Hamburg 1675. Later on Hannemann was less sceptical about Harvey, see Johann Ludwig Hannemann—Johann Augustin Fasch (resp.), *Exercitatio physica Fridericiana de motu cordis*, Kiel 1706, Thesis III, pp. 5–9.

30 Johann Ludwig Hannemann, *Aetiologia philosophico-medica curiosa facultatis purgatricis qua ostenditur contra Willisium et Willisianos in Resinosis particulis non esse collocandam Catharsin*, Hamburg 1677. During the same year Heinemann published also a treatise, which debated different possible reasons for coloured skin of Africans see Johann Ludwig Hannemann, *Curiosum scrutinium nigredinis posterorum Cham, i. e. Aethiopum, iuxta principia philosophiae corpuscularis adornatum*, Kiel 1677, passim.

31 Johann Ludwig Hannemann, *Dissertatio Pharmaceutico-Therapeutica de usu et abusu inebriaminum*, Nürnberg 1679, pp. 27–40.

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form to his reflections on the natural sciences and now gave them a clearly Paracelsist orientation, the *Phoenix botanicus*.[32] The topic of the treatise is palingenesis, and again it is the continuity of matter and its complete imperishability that Hannemann moves to centre stage. Previously, as he himself stresses, he had already treated the key issue of the work on the margins of his botanical work, which had appeared two years previously,[33] and in his introduction to medicine, which he had written already during his time at Stade. Was it possible to cause a plant to be resurrected from its ashes? Did matter conceal in itself the roots of its own restoration? The reconstitution of the burnt rose, as is well known, was the crowning experiment of Paracelsism, the widely publicised touchstone of its truth. Hannemann draws on it in order to adduce it emphatically in argument against the supporters of Aristotelian scholastic philosophy. It was the proof of the existence of a universal matter which, at the same time, could also underlie all alchemical transformations. What arguments had the opponents of the recreation of plants presented? Could life be recalled?

Out of privation, so the Aristotelians argued, there was no route back to habitus. If soul and body, be it in the case of a human being or of a plant, as form and matter, were sundered from each other, death ensued. Only a miracle could then reconstitute the individual in its identity, so the orthodox Aristotelians had maintained—and here Hannemann names Albert Kyper and Johannes Sperling. Life as *actus corporis*, however, was lost.[34] Against this, Hannemann offers a Paracelsist definition of life. Life must be understood as *exercitium efficax*, as an efficacious exercise of harmonious *complexio*, the syncrasis of the elements, which permitted differing degrees of vitality. Syncrasis was constituted by the basic Paracelsic elements of sulphur, quicksilver and salt, which, according to Hannemann, a *lex adrastea* of weight, number and mass necessarily weaves together. God had, in the moment of creation, in his freedom created a mutable matter, as the Cartesians too might admit, which could be repeatedly reconfigured, but the quantity of which God had in the same act of creation fixed in its immutability. This matter remained identical to itself forever; it could never be robbed entirely of its essence and the life principle. God upheld it, so a total privation, an extinguishing of matter, could therefore come only from Him. Instead of death, there were differing degrees of rest and motion. Each object strove to return to the original state that God had foreseen for it, Hannemann adds.[35]

The second argument that had been adduced against the reconstitution of plants was more concrete in character. Evidently, even a small degree of burning

32 Johann Ludwig Hannemann, *Phoenix botanicus, ceu diatriba physica curiosa de plantarum ex suis cineribus resuscitatione*, Kiel 1679.

33 Johann Ludwig Hannemann, *Nova et accurata methodus cognoscendi simplicia Vegetabilia iuxta triplicem cognitionem 1. grammaticam, 2. philosophicam, 3. Medicam, neotericorum philosophorum et medicorum propriisque principiis superstructa, et curiose adornata*, Kiel 1677, e. g. § 48, pp. 103–108.

34 Hannemann, *Phoenix botanicus*, §§ 3–4, fol. A2 v–A3 v.

35 Ebd., §§ 5–6, fol. A3 v–A4 v.

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or a gnawing mouse could prevent the seeds from germinating anew. Must it not therefore, under this premise, be remarkably easy to drive the life force out of the organism? Hannemann responds with well worn Paracelsist arguments, which he was able to draw in part from Peder Sörensen and in part also from his own works for the Leopoldina.[36] The decisive mistake of the Aristotelians was the assumption that there was a *forma specifica* that was needed to preserve the generative force for the body. Such a thing had never existed, however; rather, oil and salt, as the *primordialia entia*, magnetically drew nutrition to themselves and were responsible for the growth of creatures. Rather than a form, there existed as productive motor a *complexio harmonica*, a generative continuum of the elementary particles, which could dissolve just as easily as it could be reconstituted. A plant, too, that was reduced to ash or to its elementary salts, therefore preserved the option of its restitution; it was anchored in its *particula*, its atoms, and was ultimately not dependent on its specific seeds. Plants could be reconstituted precisely because they had no *forma specifica*. The general panspermic force of nature, but above all the flux and ongoing reshaping and transformation of the supposedly coherent and distinct arrangement of the species, revealed how little weight could be accorded to the old Aristotelianism. 'No seed is univocal' is how Hannemann formulated it. No individual was therefore necessarily obliged to reproduce itself exclusively within the bounds of its own species.[37] Through the all-forming spirit, the Archeus, and the heavenly bodies new, superordinate, forming instances could additionally arise, which were able to shake up the structure of plant species. From wheat came pasture grass, out of rocket came mint. In the human embryo, the fantasy of the mother, as every doctor could confirm, could give rise to such an independent force that the original human nature of the child could be overtaken. In the case of the rose that arose from its own remains, it had been reduced in the fire to its *salia volatilia*, the volatile salts, which as a critical mass were able to bind to themselves the amount of sulphur and quicksilver capable of reproduction and to unite them into a new conglomerate.[38]

Hannemann would have been no Paracelsist if he had not accompanied these remarks with the expected chain of experimental designs, that adequately supported his claim that the theoretically established possibility of reconstituting a creature out of its reproducible remains and the continuously fermenting basis of matter was also a practical fact. It was the chain of authorities that are cited also in other similar treatises and which had given Paracelsism its great history of success through a series of extremely heterogeneous phenomena from the natural

36 Petrus Severinus, *Idea Medicinae Philosophicae, Fundamenta continens totius doctrinae Paracelsicae, Hippocraticae, et Galenicae*, Basel 1571, there esp. c. 8, pp. 78–132, and see Johann Ludwig Hannemann, *Fasciculus miscellanearum quaestionum sexaginta, una exhibens 1. mantissam anti-Hoffmannianam de vero genuino, et legitimo sanguificandi organo, 2. ideam dispensatorii Hannemanniani*, Bremen 1672, Decas VI, q. 7, pp. 57–59.

37 Hannemann, *Phoenix botanicus*, §§ 7–11, fol. A4 v–B3 v.

38 Ebd., §§ 12–14, fol. B3 v–B4 v.

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world.[39] These included Martin Kerger with his treatise on yeast,[40] Johannes Karl Rosenberg with his *Rhodologia*,[41] Johann Christian Mergenius,[42] Peter Johannes Faber,[43] Philipp Sachse,[44] Christian Adolph Balduin with his *Hermes in Phosphoro*,[45] but also many others. The best known was certainly the experiment that Joseph du Chesne had ascribed to a Polish medic, who had succeeded, so he believed, in setting the ashes of a rose in motion again, like a swarm of bees, by means of warmth and light, and to force it to take on its old form again, though now only ashen grey.[46] The salt of absinth, *Sal Tartari*, 'morning dew' or tartar, had been the materials that formed the starting point for such experiments.[47] Hannemann is able to add a local note to this chain of Paracelsian laboratories. The Kieler Joel Langelott, the Frisian chemist Jodocus de Haen and the great Danish scholar Ole Borch had succeeded in bringing forth new plant forms from salt or sulphur, or in bringing forth a new cypress from the remains of an old one. Finally, in 1673 it had been vouchsafed to Hannemann himself, in the presence of Caspar Bartholin, the son of Thomas the Elder, to observe a tree grow out of a glass jar. Fire, the great destroyer, had reduced the physical substance to its seminal elements, the natural *complexio* of the elementary particles had returned and the plant had formed itself anew according to the *lex adrastea*, the law of mass, form and size.[48] Even in 1718 Hannemann still repeats his results in a work on the doctrine of

39 As basic summary see Joachim Telle, „Chymische Pflanzen in der deutschen Literatur", in: *Medizinhistorisches Journal* 8 (1973), pp. 1–34, and Bernd Roling, „Die Rose des Paracelsus: Die Idee der Palingenesie und die Debatte um die natürliche Auferstehung zwischen Mittelalter und Neuzeit", in: *Zoology in Early Modern Culture. Intersections of Science, Theology, Philology and Political and Religious Education*, eds. Karl A. E. Enenkel and Paul J. Smith, Leiden 2014, pp. 263–297, here pp. 281–293.

40 Martin Kerger, *De fermentatione Liber Physico-medicus, cui de inseparabilitate formarum materialium et Vita singularia sunt innexa, omnia perpetuis experimentis firmata*, Wittenberg 1663, Sectio I, c. 6, pp. 54–56.

41 Johannes Karl Rosenberg, *Rhodologia seu philosophico-medica generosae rosae descriptio*, Straßburg 1628, Pars II, c. 33, p. 311.

42 Johann Christian Mergenius, *Democritus reviviscens, sive vita et philosophia Democriti*, Leiden 1648, Disputatio II, c. 2, pp. 183–185.

43 Peter Johannes Faber, *Panchymicum seu anatomia totius universi, in quo omnibus, quae in et sub caelo sunt spagyricae tractantur*, in: Opera omnia, 2 vols, Frankfurt 1652, vol. 1, Liber III, pp. 324–326.

44 Philipp Sachse von Lewenhaimb, *Gammarologia sive Gammarorum vulgo cancrorum consideratio physico-philologico-historico-medico-chymica*, Frankfurt 1655, c. 13, § 6, pp. 262–263.

45 Christian Adolph Balduin, *Aurum Superius et Inferius Aurae Superioris et Inferioris Hermeticum*, Frankfurt 1674, there as appendix Phosphorus hermeticus, and id., *Hermes Curiosus, sive Inventa et Experimenta Physico-Chymica Nova*, s.l., c. 7, fol. B3 v–B4 v.

46 Joseph DuChesne, *Ad veritatem hermeticae medicinae ex Hippocraticis veterumque decretis ac therapeusi necnon vivae rerum anatomiae exegesi responsio*, Frankfurt 1605, c. 23, pp. 231–232.

47 Hannemann, *Phoenix botanicus*, §§ 14–16, fol. B4 v–Cv.

48 Ebd., §§ 17–18, fol. C2 r–C3 v, and see Tilemann, *Experimenta*, Praefatio, fol. A4 v, and Thomas Bartholin, *Acta Medica et Philosophica Hafniensia*, 5 vols, Kopenhagen 1673–80, vol. 1, § 42, pp. 78–79.

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signatures;[49] indeed, the motif of universal restitution out of the universal matter was so important to the Kiel scholar that he even followed this with a disputation, committed to the same maxims, on the wide-ranging palingenesis of all things. Perhaps, so Hannemann argued here, the prophet Elisha had even succeeded in waking the dead in the Second Book of Kings with the help of the revitalising force of his own body salts.[50] In this Hannemann, with his belief in natural resurrection, was being no less optimistic than other Paracelsists. Johannes Tacke, Johann Rosenberg and above all Robert Fludd had shared his view.[51]

3 Hermeticism and Alchemy in Kiel

3.1 The great transformation

In the following period Hannemann would remain committed above all to alchemy. Perhaps the whole Paracelsian cosmology had served him in essence to back up in theory the transformation processes of the *Ars magna* and the transmutation of gold. In 1690 there appeared the *Cato chemicus*, an introductory work that contained a defence of alchemy, a genealogy that linked it to Hermes and ancient Egypt, and its own catalogue of authors. Especially important to the Kiel professor was the conclusion, not unusual among supporters of alchemy, that many of the mythological traditions of the past should be understood, in their character of mysteries, as cyphers for alchemical transformation.[52] A predecessor for Hannemann here, as is perhaps to be expected, was the *adeptus Holsaticus* from Rendsburg, Michael Maier, whose *Arcana arcanissima* and *Symbola aureae mensae* Hannemann had read with care.[53] Four years later his first major work appeared, the *Ovum hermeticum-paracelsico-trismegistum*, which took the construction of tradition even further. Hannemann dedicated it directly to Duke Christian Albrecht.[54] Like the majority of his works, it had little resonance. I would

49 Johann Ludwig Hannemann—Gerhard Gottlob Richter (resp.), *Curiosum specimen physices characteristicae, sive disputatio Fridericiana de naturae characteribus in triplici regno*, Kiel 1718, Thesis IV, pp. 38–41.

50 Johann Ludwig Hannemann—Johann Michael Eckard (resp.), *Triumphus naturae et artis seu Dissertatio physica Friedericiana Naturae Phoenicem sistens*, Kiel 1710, Thesis VI, pp. 28–32.

51 Robert Fludd, *Utriusque cosmi maioris scilicet et minoris metaphysica, physica atque technica historia*, 2 vols, Frankfurt 1617–26, vol. 2, Tractatus II, Sectio I, Portio 3: De anatomia triplici, Pars II: De mystica sanguinis anatomia, c. 6, p. 233.

52 Johann Ludwig Hannemann, *Cato chemicus, tractatus quo verae ac genuinae philosophiae hermeticae, et fucatae ac sophisticae pseudo chemiae et utriusque magistrorum characterismi accurate delineantur*, Hamburg 1690, c. 2–3, fol. A4 r–A10 r.

53 On the symbolic language see e. g. Michael Maier, *Arcana arcanissima, hoc est, Hieroglyphica Aegyptio-Græca, vulgo necdum cognita, ad demonstrandam falsorum apud antiquos deorum, dearum, heroum, animantium et institutorum pro sacris receptorum, originem, ex uno Aegyptiorum artificio, quoad aureum animi et Corporis medicamentum peregit, deductam*, Regensburg 1614, there esp. Liber I, pp. 1–55.

54 Johann Ludwig Hannemann, *Ovum hermetico-paracelsico-trismegistum, id est Commentarius philosophico-chemico-medicus, in quondam epistolam Mezahab dictam de auro, in quo et 108 quaestiones chemicae ab Morhofio propositae ab autore solvuntur*, Frankfurt 1694, fol. A2 r. The book

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like to draw attention to at least some aspects of this work that are important in particular for their distinctive period colour. The *Ovum* consists of two parts. The first part is a detailed commentary on a treatise by a Jewish alchemist from Hamburg, Benjamin Mussafia, the *Epistola Mezahab*, on *aurum potabile*, 'drinkable gold', which Mussafia had published a few years previously. This Kabbalist and natural philosopher, too, had been in the service of the House of Gottorf. His work provided a biblical genealogy of alchemy, the achievements and secret knowledge of which Mussafia traced directly to the Bible.[55] The second part of Hannemann's work is a catalogue of answers that the Kiel professor had collected to 108 questions that his colleague Morhof had put to him. The result was a 400–page encyclopaedia of alchemy and the transmutation of gold, and at the same time a detailed genealogy of the *ars magna* that attempted, via Hermeticism, Egypt and the Old Testament, to elevate Paracelsism to a primeval revelation.[56] Hannemann prefaced the treatise with a short cosmology, the premises of which are already familiar to us. The natural order had no substantial forms, but only a *contextus materiae*, which permitted differing degrees of interaction of elementary particles depending on whether minerals, plants or more noble substances were involved. The formative force of the Archeus was responsible for their cohesion, but also for their periodic transformation. Minerals were held together by a *contextus granularis*, Hannemann remarks, a condensed stream of quicksilver, sulphur and salt, which was able to concretise into ever new metals. Matter itself existed as an undivided *one*; in its essence, as Paracelsus and the *Tabula Smaragdina* had taught, it was entirely indestructible and, through the spagyric art, it could be returned again and again to its original form.[57]

Hannemann's commentary on the alchemical treatise of Mussafia and his response to the questions of Morhof undertake a systematic dignification of chrysopoetics, relying largely on established authorities, such as Petrus Johannes Faber, Michael Maier and Paracelsus himself, on Ole Borch's writings on the history of chemistry,[58] but also on less common works, such as the *Lanx peripatetica* of Valeriano Bonvicini and the *Experimenta Osiandrina* that Johann Ulrich Resch had published a few years previously.[59] Gold was to be understood as an ideally balanced

took him quite a lot of energy, as Hannemann confesses, see id., *Sciagraphia thaumatographiae curiosae microcosmi physico-medico-theologico-historicae*, s.l. 1694, fol. Bv.

55 Hannemann, *Ovum hermetico-paracelsico-trismegistum*, Text, pp. 1–10, Commentary, pp. 11–251, and see Benjamin ben Emmanuel Mussafia, *Sacro-medicae sententiae*, Hamburg 1640, with the ‚Epistola de auro potabili' as Appendix.

56 Hannemann, *Ovum hermetico-paracelsico-trismegistum*, pp. 251–379.

57 Ebd., Discursus praeliminaris (without pagination).

58 Ole Borch, *De Ortu et Progressu Chemiae dissertatio,* Kopenhagen 1668, and id., *Hermetis Aegyptiorum et chemicorum sapientia ab Hermanni Conringii animadversionibus vindicata*, Kopenhagen 1674.

59 Valeriano Bonvicini, *Lanx peripatetica, qua vetus arcani physici veritas appenditur et auctoris mundi subterranei nova obiecta revocantur ad pondus*, Padua 1667, and Johann Ulrich Resch, *Osiandrische Experiment von sole, luna et mercurio, welche in fürnehmer Herren Laboratoriis probirt worden sammt andern Observationen u. Explicationen*, Nürnberg 1659.

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composition of the three Paracelsian elements; it was the most noble metal that the cosmic *Archeus* could bring forth.[60] The obscure 'drinkable gold', the *aurum potabile*, Hannemann stresses, was a *liquor*, a tincture, that was able to transform all metals into gold through its solvent power, since it was able to reduce them to their basic substance. It was identical to the Azot of the alchemists and to the perfect elixir and was also able to release the gold present in all clinkers.[61] Hannemann sets alongside it further variants of gold; his particular interest is in the *aurum vegetativum*, 'growing gold', which was able to concentrate the force of the Archeus and in particular its seminal force.[62] The Israelites had known about the tincture of 'drinkable gold', as shown by the Golden Calf, and about the other varieties of alchemical chrysopoetics. Adam, Tubalcain, Moses, David and Solomon had passed down this secret knowledge.[63] The Egyptian hieroglyphic system had likewise been able to keep its secret hidden in the treasury of its symbols, according to Hannemann, as the *Tabula Smaragdina* had in part revealed. This system had arisen around three hundred years after the Flood, so Hannemann, when rulers such as Osiris had held power in Egypt.[64]

3.2 A Swedish impact: Atlantic Alchemy

Hannemann's genealogical speculations would not in themselves have been unusual if he had not been able to add to them a distinctive and, as it were, Scandinavian note. Already in his catalogue of authorities he had set great weight on the Germanic-Nordic tradition of alchemy, which once again picked up the Biblical-Hermetic thread, and therefore, like Michael Maier, he gave a special role not only to Paracelsus, but also to Albertus Magnus. Great German scholars such as Maier or Khunrath, so Hannemann recalled, had even raised the suspicion that Hermes Trismegistus himself might have been of Germanic origin.[65] However, the decisive link in the chain between the Holy Land, Egypt and Old Europe that would make plausible the Hermetic transfer of knowledge was to be found not in Germany but, so Hannemann believed, in Sweden. Morhof had familiarised the scholars of the University of Kiel with a work that had finally caused the Swedish national mythology, Gothicism, to go global—the *Atlantica* of the titan of scholarship from Uppsala, Olaus Rudbeck the Elder.[66] Sweden, so Rudbeck and his followers had believed, had been not just the legendary Thule of the ancient world and the land of the Hyperboreans and the first Scythians from which Abaris had come to the Greeks, but also the Atlantis glorified by Plato, the source of all cul-

60 Hannemann, *Ovum hermetico-paracelsico-trismegistum*, §§ 4–5, pp. 15–20.
61 Ebd., § 6, pp. 20–26, § 11, pp. 38–42, § 14, pp. 59–63.
62 Ebd., § 15, pp. 63–77.
63 Ebd., § 12, pp. 42–50.
64 Ebd., § 20, pp. 116–135.
65 Ebd., § 20, pp. 126–127.
66 Daniel Georg Morhof, *Unterricht von der Teutschen Sprache und Poesie, deren Ursprung, Fortgang und Lehrsätzen, sampt dessen teutschen Gedichten*, Lübeck 1700, Erster Theil, c. 1, pp. 11–17, c. 2, pp. 24–26.

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tures and sciences, with its great temple of Poseidon and its exalted priestly caste. Rudbeck had also developed a Euhemeristic exegesis of myth, which believed that all myths could be explained by the light of the midsummer night and elevated them to cyphers of the Nordic natural world; Sweden was where they originated, so from a Swedish perspective they could be made meaningful.[67] But why should these myths in their Nordic reading, so Hannemann asked with Maier's *Atalanta fugiens* backing him up, not then also have been symbols of alchemy, metaphors of the Great Work that had come down from the Egyptians and Israelites to the Hyperboreans and so to Sweden? Latona, the mother of Apollo, the primeval Swedish god, could be understood as a signum of the *lapis philosophorum*; Apollo and Diana, given the stories associated with them, were images of its transformation. But above all, so Hannemann, the golden temple of Uppsala, which had once been described by Adam of Bremen, that sanctuary in which Odin, Thor and Freya had been worshipped, must be a complex of symbols of alchemical transformation, and at the same time the place where it had been successfully carried out. Could it be mere chance that Adam of Bremen had given the temple a golden chain as palisade and a roof of silver? And the stele inscribed with runes that, if Rudbeck was to be believed, had glorified Jupiter at its very site, could it not have been the *Tabula Smaragdina*? Was it mere chance that Freya too, the Nordic Isis, chose to dazzle with her golden tears in the colours green, white and black, the colours of transformation? And wasn't the dragon, the hieroglyph of the first matter, shown on so many runestones? But there was more: one of the first students of the legendary Jewish primeval alchemist Maria, shrouded in legends, had borne the name Edda and so revealed how closely the two traditions were interwoven. Hannemann finds alchemical correspondences for a whole gallery of images that he draws from Rudbeck's Nordic-Greek conglomerate of myths. The Arimaspians of the North, the mythical custodians of gold in Herodotus, had been the keepers of the treasures of the ancient world, but above all they must be understood as the ur-Swedes, the Hyperboreans, who had known about alchemy in all its facets and had preserved this tradition for Europe.[68]

If one recalls the legend, often retailed especially in Sweden, that Paracelsus himself had once travelled to Lapland in search of secrets, and if one also bears in mind the long and successful history of Paracelsists in Sweden, as mentioned at the outset of this paper, then Hannemann's Gothicist invention of alchemical tradition no longer seems as eccentric as it may do at first sight. Johan Bureus, too, had with great imagination tried to settle the genesis of alchemy in Scandinavia and had revaluated the imagery of Nordic mythology accordingly. Olaus Rudbeck had studied under the alchemist Johan Frank in Uppsala, who for pa-

67 On Rudbeck's allegorical interpretation of mythology see e. g. Mats Malm, *Minervas äpple. Om diktsyn, tolkning och bildspråk inom nordisk göticism*, Stockholm 1996, pp. 73–106, and Mats Malm, "Olaus Rudbeck's Atlantica and Old Norse Poetics", in: *Northern Antiquity: the post medieval reception of Edda and Saga*, ed. Andrew Wawn, Enfield Lock 1994, pp. 1–26.

68 Hannemann, *Ovum hermetico-paracelsico-trismegistum*, § 21, pp. 135–146.

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triotic reasons had argued strongly for a similar genealogy.[69] That all metallurgy was Swedish in origin had been asserted even by the Swedish Gothicists who had themselves taken no interest in alchemy. And among the professors of Kiel Hannemann was not the first to articulate his sympathy for Gothicism openly.[70] Morhof had sung the praises of Rudbeck's *Atlantica* and accepted it into his *Polyhistor*; even earlier, the physicist and scholar of antiquity,[71] Johann Daniel Maior, who had catalogued the natural science collection of the House of Gottorf, had been conspicuous as a passionate supporter of the Swedish national ideology and had begun, above all, to load artefacts with interpretations along these lines.[72] In the meantime the wedding of the Gottorf prince with Hedwig Sophie, daughter of the king of Sweden had taken place, as already mentioned.

3.3 Paracelsism: a Swedish network in Kiel

More than in the case of his colleagues, Hannemann's professorial chair, it seems, would develop into a bridgehead to the Caroline empire in the following period. The *Ovum paracelsicum* of 1694 was swiftly followed by further, extensive works on alchemy—just two years later a large treatise on the Philosophers' Stone and a commentary on the *Tabula Smaragdina*,[73] and later also a collection of experiments intended to demonstrate the efficacy of the Great Art.[74] The most famous example of the successful goldmaker's art cited by Hannemann had taken place in Sweden. The Livonian count Otto Arnold von Paykull, who had been facing execution for high treason during the Northern War, had during his imprisonment succeeded, so he himself had claimed, in creating a gold coin by means of

69 Johannes Franck, *Colloquium philosophicum cum diis montanis, thet är: Ett lustigt och liuflighit samtaal emillan the förnembsta och edelste berg-gudar och een högförfaren philosopho Zamolxides benämbd, om then edle och dyrbare klenodien lapide philosophorum, huru och på hwad sätt then samme rätteligen skall praepareras och tillberedas*, Uppsala 1651, there on the genealogy of the Philosophers' stone fol. Ciiir–Cvr.

70 On the role Gothicism in Kiel see so far Sonia Brough, *The Goths and the Concept of the Gothi in Germany from 1500 to 1750. Culture, Language and Architecture*, Frankfurt 1985, pp. 163–166, and Dieter Lohmeier, "Das gotische Evangelium und die cimbrischen Heiden. Daniel Georg Morhof, Johann Daniel Major und der Gotizismus" in: *Lychnos* (1977–78), pp. 54–70.

71 Daniel Georg Morhof, *Polyhistor in tres tomos literarium, philosophicum et practicum divisum opus postumum*, ed. by Johannes Möller, 2 vols, (Third edition), Lübeck 1708 (first 1688–92), vol. 2/1, Liber IV, c. 3, § 3, pp. 21–23, vol. 2/2, Liber I, § 14, pp. 8–9.

72 As example on a gemmic stone see Johann Daniel Major, *Prodromus Atlanticae vel Regnorum septentrionalium in Achate albo expressorum declaration praeliminaris chrorographica*, Kiel 1691, c. 13–21, fol. D2 v–G2 v.

73 Johann Ludwig Hannemann, *Pium, Castum et Devotum Philosophiae Adeptae et Theologiae Orthodoxae Osculum, i. e. Exercitatio Philosophico-Mystico-Theologica, qua pio quodam Zelo et studio adumbratur et instituitur Analogia Quorundam Mysteriorum Theologicorum, cum Lapidis Philosophorum Arcano Magisterio,* Hamburg 1696, there esp. c. 11, pp. 95–108.

74 Johann Ludwig Hannemann, *Jason seu catalogus testimoniorum veritatis metamorphosin metallorum ignobiliorum in aurum nativo praestantius asserens*, Kiel 1709, passim, there on alchemy in Sweden e. g. p. 43, and see Johann Ludwig Hannemann—Heinrich Adolf Wettering (resp.), *Dissertatio physica Fridericiana sistens Hermetem Trismegistum intra Sindonem cognoscendum et per Tabulam Smaragdinam Naturae et Artis Pandoram mundo porrigentem*, Kiel 1707, passim.

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alchemy.[75] The apparent transformation had drawn considerable attention among his contemporaries. Charles XII nonetheless, despite the intercession of prominent Swedish Paracelsists such as Urban Hjarne,[76] had the count beheaded, and the alchemist had taken his secret to the grave.[77] Two expansive commentaries on two works by Jean d'Espagnet that Hannemann had repeatedly cited in other contexts, the *Arcanum Philosophiae* and the *Enchiridion Physicae*, would follow;[78] the latter even earned a second edition.[79]

But the northward thrust of the works remains striking. Evidently Hanneman was from then on determined to pursue Paracelsism in service to the Swedish crown. Not only did the Kiel scholar himself undertake disputations with Swedish respondents on the pearls that,[80] to the glory of the North,[81] could be won from oysters and on the Old Norse doctrines on the gods,[82] but there was a method to his approach. From 1701, after the vexing controversy about astrology had been argued out, we find Hannemann as Praeses of a whole series of disputations devoted to a fixed range of themes. They treat the materialistic-Paracelsian cosmology whose basic features Hannemann had already developed in Swedish Stade. But, even more than the content, what seems remarkable here is the scholars with whom these disputations, for which Hannemann himself was almost always responsible, were conducted. The majority of the respondents came from

75 For a contemporary summary of the Paykull-case see Otto Arnold von Paykull, *Problema Chymicum oder des weyland Herren General Lieutenants O. A. v. P. Chymischer Proces, wodurch nach Proportion eines Quentleins praeparirten Sulphuris Antimonii, anderthalb Loth Bley in das schöneste und feineste Gold verwandelt worden*, Berlin 1719, passim, and as manuscript e. g. *Otto Arnold Paykulls 1707 giorda anbud, emot lifwets behållande, uptäcka konsten, huru man kan förwandla bly och ringare metaller i fint guld* (Stiftsbiblioteket Växjö, MS. 4° 3, Några historiska acter, Nr. 8, pp. 133–168).

76 On Hjärne in general and his role in the Paykull-affair see Hjalmar Fors, *The Limits of Matter. Chemistry, Mining and Enlighment*, Chicago 2015, pp. 21–41, and esp. Sten Lindroth, "Hiärne, Block och Paracelsus. En redogörelse för Paracelsusstriden 1708–1709", in: *Lychnos* (1941), pp. 191–231.

77 As personal report of Urban Hjärne see Urban Hjärne, *Tanker om Paikulls Guldmakerij* (Upsala Universitets Biblioteket, MS. D 1415).

78 Johann Ludwig Hannemann, *Instructissima Pharus in Oceano Philosophorum ostendens Viam veram et tutam ad Ophir Auriferum, i. e. Commentarius Hermetico-Spagyricvs in Arcanum Philosophiae Hermeticae, Autoris, qui latet sub Aenigmate penes Nos Unda Tagi*, Kiel 1712, and id., *Synopsis Philosophiae Naturalis Sanctioris Illustrata, id est, Commentarius in Physicae Restitutae Enchiridion olim a Viro Illustri editum, Opus vere Aureum*, Tübingen 1718.

79 Johann Ludwig Hannemann, *Pharus ad Ophir Auriferum, i. e. Commentarius in Anonymi Galli Arcanum Philosophiae Hermeticae*, Lübeck 1714, and id., *Veteris Philosophi profundissimi Physica Restituta cum Exegesi, Opus Curiosis Naturae scrutatoribus utilissimum et jucundissimum nunc demum restitutum*, Tübingen 1725.

80 That Hannemann was visited especially by Swedish students is demonstrated e. g. by the diary of Sven Bredberg, see Henrik Sandblad, *Greifswald – Wittenberg – Leiden – London. Västgötamagistern Sven Bredbergs resedagbok 1708–1710*, Göteborg 1982, p. 50.

81 Johann Ludwig Hannemann—Hans Roslin (resp.), *Dissertatio physica ostrea Holsatica exhibens*, Kiel 1708, there with material taken from Urban Hjärnes c. 3, pp. 23–31.

82 Johann Ludwig Hannemann—Eric Notmann (resp.), *Diacepsis historico-physica de superstitione veterum Gothorum*, Kiel 1706.

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the Swedish domain, from Stralsund, Greifswald—that is, Swedish Pomerania—from Courland or from Sweden itself; the others were from the Gottorf territory of Holstein, or, at furthest, from the area of Lower Saxony. Some works are dedicated to Swedish scholars, including Rudbeck's son Olaus Rudbeck the Younger, Laurentius Roberg and Urban Hjarne, at this time the most important representative of Paracelsism in Sweden, who himself had written many works in defence of Paracelsus. All the works treat partial aspects of a model that admits only one sole matter, which condenses and transforms itself, dissolves into its component parts and re-forms, and the Archeus, the world soul, whose plasmatic power extended into eschatology. There are works on light, fire, on 'fluor' as universal substance, on the sun, several treatments of the metals, the kingdoms of nature, the nexus of matter in causal and vertical-hierarchical perspective, and finally on the microcosm. Its basic thesis, as Hannemann again and again makes clear, was the thoroughgoing coherence and continuity of matter in all spheres and the absence of substantial forms. The most frequently cited authorities for Hannemann are Kenelm Digby and the Güstrow physicist Sebastian Wirdig;[83] in much of it Hannemann does not name any source.

The cosmos knew three manifestations of the universal matter, to which Hannemann gives the title *fluor*: the most subtle, to which light, fire and air were to be reckoned; subtler ones, for example water; and less subtle variants. In its realisation in finest material form the ur-substance formed the real bond of all things; it pervaded all other materials, but at the same time constituted them in their differing densities.[84] The more purely the most sublime variants were to be found in crude materials, the more vegetable power, but also the more beauty must inhere in them. The inherent light ennobled gold as the most precious of metals; it was also detectable in the alchemical *purum naturae*, the elixir purified of all specific attributes. At the same time, so Hannemann, this *fluor* in fine material form was able to guarantee the continuity of all substances and their capacity to be transformed. While heat and cold were the basic forces of mutation and could always reduce everything back to sulphur, quicksilver and salt, it was the highly subtle basic material that was responsible for the final coherence. It upheld the causal connection that conferred identity and at the same time, as motive force, it brought about the constant reconstitution of the elementary components once again. All nature possessed a drive to return to its origin in fine material form.[85] But the monistic theory had a yet far greater reach: even miracles could be explained, Hannemann insist-

83 Sebastian Wirdig, *Nova medicina spirituum, curiosa scientia et doctrina unanimiter hucusque neglecta et a nemine merito exculta, medicis tamen et physicis utilissima, in qua primo spirituum naturalis constitutio, vita, sanitas, temperamenta, dehinc spirituum praeternaturalis seu morbosa dispositio, causae, curationes per naturam, per diaetam, per arcana majora demonstrantur*, Hamburg 1673. Wirdig had been *physicus regius* of the Dukes of Mecklenburg.

84 Johann Ludwig Hannemann—Adolph Wilhelm von Buren (resp.), *Exercitatio physica Fridericiana secunda de fluido*, Kiel 1702, Thesis I–III, pp. 1–15.

85 Ebd., Thesis IV–VI, pp. 15–20.

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ed, by reference to a unitary substrate in their cause-effect relation; the same was even true of resurrected bodies, which otherwise, Hannemann stressed, would be hard to explain in their organic continuity, necessary for identity.[86] The basic light-matter must be the starting material of the glorified body and at the same time of the infernal fire. It is not difficult to see here how Hannemann is trying to give a broader foundation to the model of palingenesis.

At a cruder level the ur-matter manifested itself, so Hannemann continues, as *contextus granularis* and as somewhat firmer *contextus filamentalis.*[87] No metal was held in shape by an ontological form; they all differed from each other only by degree. It must hence be correspondingly easy for the alchemist to bring about their reduction and transformation. Far superior to the metallic-material manifestations were fire and light. Light too was matter, and not an accidental, as Hannemann insists; it constituted that first universal quantity that God had founded with his *Fiat lux* in the act of Creation; thanks to its finegrainedness it passed through all other bodies or remained within them, as every sparkling emerald could demonstrate. As the formative force of the cruder elements, as energetic transmitter and inherent principle of creation, it was responsible for the maintenance of the subaltern manifestations of reality; as the ontic precondition of every further qualitative formation, and at the same time the most noble basic substance, it ensured the ultimate material identity of all creatureliness. It was entirely indestructible. Like the obscure liquid basic substance, it would survive the calcination and purification processes of the Apocalypse and was responsible for the reconstitution of all things. Hannemann leaves open the question of whether angels or souls might consist of this matter, even though he apparently finds something to be said for this option.[88] Less pure than light is its first condensation, fire, which likewise has the character of, so Hannemann, a spiritual substance, as it were, and provides the active precondition for the decomposition of all metals into the three Paracelsian foundational elements. As a material bearer of energy brought from the sun, the largest concentration of light in the cosmos, down into the world, like light fire,

86 Ebd., Thesis XI–XIII, pp. 24–26.

87 Johann Ludwig Hannemann—Adolph Wilhelm von Buren (resp.), *Exercitatio physica Fridericiana omnium corporum naturalium in sextiduo creationis a Deo conditorum oeconomiam, in suas partes potiores, scilicet in Atalantam et Hippomanen divisam exhibens*, Kiel 1701, Thesis II–III, pp. 2–5, and in detail Johann Ludwig Hannemann—Adolph August Heick (resp.), *Exercitatio physica de contextu corporum naturalium*, Kiel 1703, Thesis I–XIII, pp. 1–15, and regarding the coherence and the substance of metals Johann Ludwig Hannemann—Anton Lütgens (resp.), *Thubalcain ad fornacem et incudem stans, id est metallorum naturam et differentias explicans dissertatio physica*, Kiel 1707, Thesis III, pp. 14–44, and again Johann Ludwig Hannemann—Anton Lütgens (resp.), *Agricola, seu dissertatio Fridericiana de metallis*, Kiel 1709, pp. 1–46.

88 Hannemann—Buren, *Exercitatio physica Fridericiana omnium corporum naturalium in sextiduo creationis*, Thesis IV–V, pp. 6–10, and in detail once more Johann Ludwig Hannemann—Christoph Pyl (resp.), *Exercitatio physica Fridericiana omnium creaturarum naturalium fluidissimam sistens substantiam, id est Lucem*, Kiel 1704, Thesis IV–XII, pp. 5–16, and also Johann Ludwig Hannemann—Conrad G. Stohlmann (resp.), *Dissertatio physica systematis coeli et terrae atlantem sistens*, Kiel 1708, Thesis I, pp. 3–7.

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according to Hannemann, is the source of the panspermic earth and in its seminal force it drives the subterranean metals from the underworld up to the surface. The great extent to which fire, sun and light merge into each other and must be understood only as variations of the same substrate, can be easily demonstrated by any experiment starting a fire with a magnifying glass.[89]

Hannemann does not neglect to devote disputations also to the animal kingdom. These works, which were structured essentially as eulogies of Swedish colleagues, are, with their commonplace content, certainly among the weakest of the whole series.[90] It is only the electric ray, the *Torpedo*, which since Athanasius Kircher had been of special interest to the followers of Paracelsus due to its interior electricity, its productive fire as it were, that allows Hannemann to produce something of more interest, in a study devoted specially to it.[91] However, as already hinted, the point of this whole series of disputations, which ended, perhaps not by chance, with the Great Northern War, may have been less in the generation of new discoveries than in bringing to general university attention a Common-sense Paracelsism.[92] This was intended to prepare the ground for the Swedish empire rhetorically too. Nonetheless, the Kiel professor remained true to Paracelsism and alchemy in the following years.[93] Like many professors, he used his close retirement as an opportunity finally to pursue his own interests to the full. Two further works on the Philosophers' Stone followed, written in Friedrichstadt, where he spent his retirement; both defend its achievability, place special weight on phosphorus as an auxiliary agent and continue to hit a strong note of local patriotism by repeated praises of the exemplary role played by Michael Mai-

89 Johann Ludwig Hannemann—Christoph Wasmundt (resp.), *Exercitatio physica Fridericiana Furtum Promethei, id est Fluidissimam Naturae substantiam Ignem, nexum corporum naturalium solventem et combinantem sistens*, Kiel 1705, Thesis II–V, pp. 5–21. Sun and Moon, as the opposite sources of heat and cold were treated in addition in Johann Ludwig Hannemann—Johann Ludwig Roslin (resp.), *Exercitatio physica Fridericiana de sole*, Kiel 1706, passim, and Johann Ludwig Hannemann—Johann Michael Eckhard (resp.), *Exercitatio physica Fridericiana saevitiam Saturni elapsae hyemis sistens, id est De frigore*, Kiel 1709, there esp. Thesis IV–V, pp. 7–11, the law of divine causality in Johann Ludwig Hannemann—Friedrich Finck (resp.), *Dissertatio Physica Fridericiana Systematis Coeli et Terrae Legem Adrasteam id est Mechanismum, exhibens*, Kiel 1710, and Johann Ludwig Hannemann—Joachim Ernst Cappell (resp.), *Dissertatio physica Systematis Caeli et Terrae Auream Catenam exhibens*, Kiel 1710, passim.

90 As a kind of survey see Johann Ludwig Hannemann—Johann Augustin Fasch (resp.), *Exercitatio physica Fridericiana de tribus naturae regnis*, Kiel 1705, passim.

91 Johann Ludwig Hannemann—Georg Abias Cramer (resp.), *Dissertatio physica piscem torpedinem, eiusque proprietates admirandas exhibens*, Kiel 1710, Thesis II, pp. 7–14.

92 The ultimate disputations were dealing with anthropology and epistemology, see Johann Ludwig Hannemann—Stefan Grafe (resp.), *Dissertatio qua aliqid Urim et Tumim analogiam hominis menti a Deo esse jehot inscriptum ostenditur*, Kiel 1711, and Johann Ludwig Hannemann—Johannes Ratenburg (resp.), *Aurea Poma in argenteo vase seu Dissertatio physica Fridericiana Lucernam Jehova Proverb. XX. 27. suspendens*, Kiel 1711.

93 As short and basic defence of the Ars magna against its critics see Johann Ludwig Hannemann, *Dealbatio aethiopis, id est demonstratio epistolica ad chymiae Europae nostrae primates qua ostenditur quod solutio auri radicalis ad confectionem L. P. sit non ens et prorsus inutilis labor*, Kiel 1714, passim.

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er.[94] By including palingenesis, which was at the same time being defended once again by Georg Frank von Frankenau,[95] these works also attempt a make a link to previous works. The option of reconstitution in the natural order, as occurred most clearly in the plant kingdom, Hannemann once again insists, provided the empirical key to the functionality of the Ars magna of alchemy as a whole.

4 Conclusion

To his dying day Hannemann remained a convinced alchemist. His last work in its defence was delivered by the now elderly scholar in 1719.[96] Hannemann must have kept a large number of further, unpublished treatises in his files in Kiel and Friedrichstadt, or in preparation, for already while at Stade he continually cited from manuscripts that were apparently never published. His final works, too, contain references to texts that were to follow. Whether these manuscripts still exist, I have not been able to establish. Henning Ratjen's 1873 catalogue of the manuscripts of the University of Kiel lists no titles by Hannemann.[97] The early collections of the City Archive of Friedrichstadt were largely destroyed by the devastations of the German-Danish War in the nineteenth century. Inquiries there have unfortunately yielded no such documents.[98]

A few words in conclusion: Johann Ludwig Hannemann's popular-Paracelsist cosmology can certainly not be classed among the strokes of genius of the early eighteenth century. It continued to batter away at Aristotelian hylemorphism; and it continued to draw on the great standard works of the seventeenth century. That is why it insists so firmly on the quantitative unitariness of all matter, since the latter was necessarily an essential precondition of the art of creating gold, to which Hannemann was so committed. In a way, Hannemann's physics stands between the eras. Its universal light-matter, generated in the primordial act of the Creation, which preceded as substrate all further development of the creatures,

94 Johann Ludwig Hannemann, *Xystus, in Hortum Hesperidum, id est Parasceue ad Aureum Vellus!*, Kiel 1715, id., *Horae Subcisivae, Fridrichstadienses seu Nodus Gordii de L. P. elaboratione a Sophitis connexus, solutus*, Kiel 1715, id., *Otium Fridrichstadiense, seu Tantalus chemicus, id est commentarius physico-chemicus de L. P. B. scala sapientiae, non altum volare, sed humi morari, ratio stultitiae sublime scrutari, et penes solem nidulari*, Hamburg 1717, and see also once more with Maier on the role of symbolic language already id., *Nebo Chemicus ceu Viatorium ostendens viam in Palestinam auriferam, id est Hortum Hesperidum, in quo aurea crescunt Poma, una et verum Menstruum Philosophorum ostendit*, Kiel 1714, pp. 1–9.

95 Georg Friedrich von Frankenau, *Palingenesia Francica, oder: Tractätlein von der Künstlichen Auferweckung derer Pflanzen, Menschen und Thiere aus ihrer Asche*, Leipzig 1716, there §§ 38–44, pp. 63–70, and id., *De Palingenesia sive resuscitatione artificiali plantarum, hominum et animalium e sui cineribus liber singularis, commentario illustratus*, Halle 1717, there §§ 38–44, pp. 237–258.

96 Johann Ludwig Hannemann, *Aurora Oriens, id est assertio, duo in natura homogenea esse materiam L.P.B. adaequatam ceu alloquium ad omnes Europae chemicos de L. p. B. materia vera*, Plön 1719.

97 Henning Ratjen, *Verzeichniss der Handschriften der Kieler Universitätsbibliothek, Abtheilung 1–4*, Kiel 1873.

98 According to personal information by the City Archive of Friedrichstadt, no manuscripts of Hannemann are stored in the Archive anymore.

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will for medievalists recall, and perhaps not just by chance, the cosmology of a Robert Grosseteste, whose ingenious writings were printed already in 1514.[99] There too we find continual talk of light, the extension and de-sublimation of which was a necessary precondition of all further matter, which was understood as unitary, in its mutability; according to Wilhelm Schmidt-Biggemann, no one has ever inquired into a possible early modern reception of these models.[100] For the attempt to derive angels and the resurrected body similarly from the one fluctuating ur-substance, half a century earlier in Sweden the Paracelsist Friedrich Menius had almost been excommunicated by the Lutherans;[101] yet Hannemann's own reflections also anticipate those physico-theological speculations that would enjoy such favour in the second half of the eighteenth century.

There is something else that seems important. Hannemann, in his biography, his academic migrations, his position as professor in Kiel and his interests, strikingly documents for us the closely interwoven educational landscape of the North Sea and Baltic regions. It created a scholarly and discursive formation that endured for two centuries, that was held together by the Latin language, with the help of Swedish, Danish and Low German, and the bond of Lutheranism and broke up only in the nineteenth-century world of nation states. What they had in common was educational paradigms, which in part superseded each other, in part reacted against each other, such as scholastic Aristotelianism, Cartesianism, late baroque Paracelsism and physico-theology, but also Gothicist or other Scandinavophile national myths. Even later, a comparable role in this cultural and linguistic area would still be played by the reading of Herder or Kant and even by romanticism. Geographically the area included large parts of northern Germany as well as Sweden and with it the whole Baltic, Denmark and Norway. The majority of these men, and the few women, who made up this scholarly landscape had studied all over Europe, but their attention turned northward. If it is indeed the case that the Nachlass of the admittedly not outstanding but for his time still very striking Hannemann did indeed go up in flames in the Schleswig-Holstein War of 1850, then that too may be a sign.

99 Robert Grosseteste, *Opuscula dignissima, nunc primum in lucem edita et accuratissime emendate*, Venedig 1514, there 'De inchoatione formarum' fol. 11 va–12 vb.

100 Wilhelm Schmidt-Biggemann, *Philosophia perennis. Historische Umrisse abendländischer Spiritualität in Antike, Mittelalter und Früher Neuzeit*, Frankfurt 1998, pp. 446–454.

101 Salomon Maius (Friedrich Menius), *Consensus hermetico-mosaicus. Von dem wahren Anfange aller siechtigen und unsiechtigen Dingen, sodann auch von der warhafften einigen Universalmaterie (so wol seiner Natur als Kunst gehörigen) höhesten Arcani der gantzen Welt*, o. O. 1644, pp. 169–173, and against Maius e. g. *Errores praecipui in Consensu hermetico-mosaico Fr. Menii et Declaratio Menii* (Upsala Universitets Biblioteket, MS. Palmsk. 106), pp. 949–992, there 'Errores' pp. 950–952.

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Knowledge, Community and Authority at the Academia Naturae Curiosorum

Simon Rebohm

1 Introduction

The scientific academies of the Early Modern period are often portrayed as organizations, which explicitly distanced themselves from the universities and especially from the dominance of Aristotelianism in favour of a new, modern concept of science. The Academia Naturae Curiosorum (ANC), later known simply as Leopoldina, was the first persistent and formally instituted academy in the German lands, and even though its foundation in 1652 predated the Royal Society, it is mostly excluded from the historical narrative on the early modern European academies.[1] More recent studies focus on the social, political and organizational aspects of this academy in different periods.[2] The academy's way of producing knowledge however has so far only received limited attention. How did the ANC work as a community of scholars? How did it deal with the authority of traditional knowledge? To better understand the ANC, this essay will look at the way, in which it dealt with authority on different levels. The first part will briefly show that the academy initially stressed the idea of a group of peers and the importance of collaboration in science. At least in part, it wanted to distance itself from the universities' culture of debate. The second part will look at the ANC's attitude towards the authorities of antique medicine and philosophy. The third part examines the academy's journal, the *Miscellanea curiosa*, and its editors' approach towards the interpretation of observations.

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2 The foundation of an *academia* in Schweinfurt

The Academie Naturae Curiosorum was founded in 1652 by four physicians in Schweinfurt. One of them was the town physician Johann Laurentius Bausch (1605–1655), who had inherited an extensive medical library from his father and became the academy's first president. Schweinfurt was a free imperial city and a protestant centre amid the catholic Franconia. During the Swedish occupation of the Thirty Year War Gustav Adolf had planned to found a university here as the counterpart to the catholic university of Würzburg, but nothing came of it.[3] As we shall see, town physicians and the situation in Schweinfurt would be important influences on the academy's way to become an official institution.

The social and educational background of the foundational members was remarkably homogenous: Besides the fact that they were physicians, they all came from families, which had managed to ascend in the social hierarchy of Schweinfurt, and they all had toured Italy as a part of their medical studies.[4] As town physicians they had not only secured a certain social status inside of the city, they also distinguished themselves from the university doctors or the mere practitioners. Together with the court physicians they formed a distinct group within the medical community, which even had its own favoured mode of publication: the *observatio*, which would play a crucial role in establishing a successful model of publication for the ANC.[5]

The goals of the academy were strongly connected to the medical profession of its founders and thus provided a stronger focus for its activities than in the case of other early modern academies: By establishing a cooperation between physicians in the study of nature and by the exchange of knowledge, the academy wanted to enhance practical knowledge for the common good.[6] This also entailed strict formal requirements: Membership was at first limited to medical doctors, and even in the 18th century other professions were apparently only represented in a very small percentage.[7] In principle, this made the academy an early organization of *professionals* in contrast to the heterogeneous group of *virtuosi* at the Royal Society or the members of the Académie des sciences, who were appointed as state

3 Thomas Horling, Uwe Müller and Erich Schneider: *Schweinfurt. Kleine Stadtgeschichte*, Regensburg 2014, p. 40.

4 Uwe Müller, "Johann Laurentius Bausch und Philipp Jacob Sachs von Lewenhaimb. Von der Gründung der Academia Naturae Curiosorum zur Reichsakademie", in: *Die Gründung der Leopoldina – Academia Naturae Curiosorum – im historischen Kontext*, eds. Richard Toellner, Uwe Müller, Benno Parthier and Wieland Berg, Stuttgart 2008 (Acta historica Leopoldina 49), pp. 13–41, here pp. 23–25.

5 Gianna Pomata, "Observation Rising: Birth of an Epistemic Genre 1500–1650", in: *Histories of Observation*, eds. Lorraine Daston and Elizabeth Lunbeck, Chicago/London 2011, pp. 45–80, here p. 59.

6 Müller, "Johann Laurentius Bausch", p. 18–29.

7 Uwe Müller, "Die Leges der Academia Naturae Curiosorum", in: *Die Gründung der Leopoldina – Academia Naturae Curiosorum – im historischen Kontext*, eds. Richard Toellner, Uwe Müller, Benno Parthier and Wieland Berg, Stuttgart 2008 (Acta historica Leopoldina 49), pp. 243–264, here p. 255.

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officials. Initially the academy had struggled to gain enough members to sustain itself, but in the following years it relied on already existing networks of physicians to expand as is evident from a study on early members from Switzerland.[8]

The internal organisation of the ANC consisted in three representatives: The president originally had the responsibility to assign research topics to the members. He was to be informed, when members wanted to publish their work on assigned topics, and he had to keep the archive of the academy, which would consist of these publications. The president took office by election through the members, but only after his predecessor had died. Helping the president in his work were two *adiuncti*, whose main task was to invite new members. Also, they were the candidates for the next presidency. The academy later added the position of a *director ephemeridum*, who had to compile the contributions for the academy's journal and organise the publication. The internal regulations, which describe these positions, emphasize their tasks and say almost nothing about privileges or power, not even in the case of an internal argument.[9]

Since Schweinfurt already had a strong connection to the Holy Roman Empire, the academy's second president Johann Michael Fehr (1610–1688) turned towards Emperor Leopold to earn official approval. The court was willing to grant the academy most of the requested privileges: Even though there would be no financial support, the ANC was exempted from censorship, and its president and the two *adiuncti* gained the title of a Hofpfalzgraf upon election. Interestingly enough however, the court had a problem with the name *academia*: Since universities were often also called academies the name was considered confusing, and the court requested to change it to *societas*. Commonly this is interpreted as a reluctance to grant the ANC the privileges of a university, but this is partly contradicted by the fact, that the president in the end actually obtained the right to promote people to medical doctors by the imperial privilege.[10] Yet there is another possible explanation for the resistance against the name *academia*: The imperial court might not have wanted to give the impression that it sanctioned the foundation of a protestant counter university in Schweinfurt, which was, as mentioned, a protestant enclave in a catholic region. It is interesting to note in this regard that once the ANC had made it clear to the court, that they had no intention of teaching students, the court allowed the name *academia* to prevail without any further argument and officially instituted the academy as the *Academia Caesareo-Leopoldina Naturae Curiosorum* in 1687.[11]

However, the omission of teaching was not the only way, in which the academy distanced itself from the universities: The ANC made it a rule to keep out of all the harsh controversies, which were going on between the different medical

8 Heinrich Buess, "Der Beitrag der Schweizer Ärzte zu den Miscellanea curiosa der Deutschen Akademie der Naturforscher", in: *Sudhoff's Archiv für die Geschichte der Medizin und der Naturwissenschaften* 37 (1953), pp. 1–22.
9 Müller, "Leges", pp. 248, 251–252, 254, 257–258.
10 Müller, "Johann Laurentius Bausch", p. 38.
11 Müller, "Johann Laurentius Bausch", p. 36–38.

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schools, and it requested its members to refrain from any hurtful remarks towards each other.[12] Considering the very few instances of quarrels, which were reported in the academy's internal history, it appears to have achieved this goal quite successfully.[13] This was a deliberate step away from the culture of debate represented by the universities and a call for a greater acceptance of different opinions on matters of medicine and natural philosophy. Since the members of the early academy adhered to philosophical notions ranging from pansophism to modified Cartesiansim it was probably a necessary step.[14]

3 Jason, Phosphorus, Hippocrates, Aristotle: the academy's relation to antiquity

In addition to the plea for moderate behaviour, the academy employed various symbols to strengthen the community sense of its members. Towards the outside world, this was done by wearing a ring with the academy's symbol.[15] Additionally, the members received names: While the founders took their *cognomina* from the tale of Jason and the Argonauts to remind themselves of their common goal, later members first took other names from antique mythology.[16] In addition to the aspect of unity through the second identity offered by them the names gained a semantic level at one point. In most cases there are no explanations offered as to the meaning of the specific names, but Philipp Jacob Sachs von Lewenhaimb (1627–1672) explicitly received the name *Phosphorus* as a mark of honour for his work, which was welcomed as a forecasting light by the members of the early academy.[17]

Soon the favour shifted from mythology towards the names of antique scholars. The first of these references probably was the name of *Melissus*, given to Hieronymus Conrad Virdung von Hartung (1640–1708) in 1664.[18] Then, around 1678, the names of scholars started to eclipse the mythological references.[19] What do these names tell us about the academy and its members? First of all, some names seem to have been more popular than others as they were taken more

12 Frances Mason Barnett, *Medical Authority and Princely Patronage: The Academia Naturae Curiosorum 1652–1693*, Diss., Chapel Hill University 1995, pp. 232–235.

13 For the few instances of disputes see *Protocollum Academiae Caesareo-Leopoldinae Naturae Curiosorum. Edition der Chronik der Kaiserlich-Leopoldinischen Akademie*, ed. Uwe Müller, Danny Weber and Wieland Berg, Stuttgart 2013 (Acta Historica Leopoldina 60), pp. 63, 103–105, 107.

14 Buess, "Schweizer Ärzte", pp. 4, 12; Ralf Bröer, *Salomon Reisel (1625–1701). Barocke Naturforschung eines Leibarztes im Banne der mechanistischen Philosophie*, Leipzig 1996 (Acta Historica Leopoldina 23), p. 54.

15 Müller, "Leges", pp. 251, 260.

16 Barnett, *Medical Authority*, pp. 81–83. For lists of the *cognomina* see *Protocollum*, pp. 405–426, 443–455.

17 "Mense Junio censure academicae submissit Ampelographiam suam Dn. D. Phil. Jacob. Sachsius, qui pro studio praestito Phosphori agnomine fuit honoratus, verè Phosphorus, cum aliis omnibus Collegiis hoc Libro suo praeluxisset […]" (*Protocollum*, pp. 40–41). *Cognomina* were first given as an honour after publishing one of the requested books, later on they were given or taken at the confirmation of membership (Müller, "Leges", pp. 254, 258).

18 *Protocollum*, pp. 44, 405. This could either have been a reference to the eleatic philosopher Melissos of Samos or the mythological king Melissos of Crete.

19 *Protocollum*, pp. 407.

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than once; sometimes even at the same time. The earliest example for this was unsurprisingly the name *Hippocrates*, which was first given to Lorenz Gieseler († 1685) in 1678, and then again to Johann Jakob Döbel (1640–1684) in 1682.[20] Another, even more striking example is the name of Aristotle, which was given to two members, who both joined in 1685: Theodor Zwinger (1657–1724), received the name *Aristotelis Stagirites*, while Philipp Jacob Hartmann (1648–1707) was just called *Aristotelis II*.[21]

The reasons for the assignment of this particular *cognomen* are not as simple as in the case of Sachs. Zwinger probably received it due to his interest in a wide range of topics: At the time, he was professor of rhetoric in Basel, but soon he became the professor of physics, then of botany and anatomy, then of theoretical medicine and at last of practical medicine. However, he was more interested in experimental than traditional natural philosophy, as is revealed by his plans to found an experimental college in Basel around 1700.[22] Hartmann on the other hand was extraordinary professor of medicine in Königsberg and then became professor of history for two years before returning to the medical faculty as a full professor.[23] The relevance of Aristotelianism for Hartmann is evident in a dissertation by one of his pupils on ancient anatomy published in 1684, but it presents a rather critical interpretation of Aristotle in comparison with Galen.[24]

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20 *Protocollum*, pp. 407.

21 In addition to being both admitted to the academy in the same year and with the same name, both of them indirectly gained membership in the academy through the same person: Georg Wilhelm Wedel (*Hercules I.*) had proposed Georg Franck von Franckenau (*Argus I.*) and Johann Ludwig Hannemann (*Nestor II.*) as members, who in turn proposed Zwinger and Hartmann respectively (*Protocollum*, p. 384).

22 Rudolf Wolf, "Theodor Zwinger von Basel, 1658–1724", in: idem, *Biographien zur Kulturgeschichte der Schweiz*, Zürich 1858–1862, 4 vols., vol. 3, pp. 119–132, here pp. 119–125.

23 Christian Gottlieb Jöcher, *Allgemeines Gelehrten-Lexicon*, 4 vols, Leipzig 1750–1751, vol. 2, p. 1383. Hartmann's book on amber (*Succini Prussici physica & civilis historia cum demonstratione ex autopsia & intimiori rerum experientia deducta*, Frankfurt 1677) is normally listed among the monographs published as a semi-obligatory step to join the ANC (Wieland Berg and Jochen Thamm, "Die systematische Erfassung der Naturgegenstände. Zum Programm der Academia Naturae Curiosoum von 1652 und seiner Vorgeschichte, in: *Die Gründung der Leopoldina—Academia Naturae Curiosorum—im historischen Kontext*, eds. Richard Toellner, Uwe Müller, Benno Parthier and Wieland Berg, Stuttgart 2008 (Acta historica Leopoldina 49), pp. 285–304, here p. 297). However, the book was actually printed five years before Hartmann became a member and does not display the typical references to the academy. It is also worthy of note that Hartmann at this time had not been promoted to medical doctor yet, which would have been required for joining the ANC.

24 Philipp Jacob Hartmann and Johannes Sigismund Lange, *Exercitationum anatomicarum in publicas lectiones de iis quae contra peritiam veterum anatomicam afferuntur in genere, prima*, Königberg 1684, especially p. 15. Given the slight difference in the name, it could even be considered, whether Hartmann was perhaps named after another Aristotle than great the natural philosopher, for example the historian from Chalcis in Macedonia (Johann Heinrich Zedler, *Grosses Universal-Lexicon aller Wissenschaften und Künste*, Halle/Leipzig 1731–1754, 64 vols, vol. 1, pp. 1484–1485).

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Thus, neither Zwinger nor Hartmann were called Aristotelians because of an affiliation with Aristotelian philosophy. The name of the philosopher was rather used in a fashion, which was also common at the early modern universities: Here references to Aristotle often focused on certain works or aspects from an ahistorical perspective to establish a disciplinary identity.[25] In a similar way, the *cognomina* of the academy members helped to establish a community with medicine as a framework, which was closely connected to a single discipline and in consequence was more focused than that of other early modern academies. The names of antique scholars were used as a sign to merely indicate a certain direction (or width) of interest inside this frame.[26] Furthermore, they emphasized a supposed continuity of knowledge: The referenced philosophers and physicians were no longer the authorities behind opposing schools, but rather landmarks in an additive development of knowledge.

The idea of continuous and additive knowledge from various sources as well as the compatibility of different authorities is one of the principal ideas of the ANC during its early years: Each member was required to publish a book on a natural object of medical value consisting mainly in a compilation of already existing knowledge on the subject. This however was not a successful project, since only a few books were actually published, while the members did not sufficiently increase in numbers.[27] As an alternative the ANC started to publish its own journal in 1670 titled *Miscellanea curiosa*. While here the focus was less on compilation, the disciplinary perspective on antique scholars is still present: Since the contributions focus on medicine, they only refer to a small range of works, which are always closely connected to the issue at hand. For example, references to Aristotle almost exclusively mention the *Historia animalium, De partibus animalium* and *De generatione animalium*. Most of these references are of an ahistorical nature in the sense that they focus on the descriptions of phenomena contained in this texts and do not discuss Aristotelian philosophy. An example for this is an observation by Georg Wolfgang Wedel (1645–1721) about a human heart situated on the right side of the body. As Wedel remarks, similar cases were not only describes by William Harvey,

25 Alternatively, metadisciplinary connections surfaced as the consideration of a wider range of works under a historical perspective (Ulrike Zeuch, "Aristoteles in der historia literaria—transdisziplinäres Bindeglied oder disziplinenspezifische Referenz?", in: *Der Aristotelismus an den europäischen Universitäten der frühen Neuzeit*, ed. Rolf Darge, Emmanuel J. Bauer and Günter Frank, Stuttgart 2010, pp. 333–356) Both perspectives on Aristotle have also been pointed out in the works of Athanasius Kircher by Thomas Leinkauf, "Athanasius Kircher und Aristoteles. Ein Beispiel für das Fortleben aristotelischen Denkens in fremden Kontexten", in: *Aristotelismus und Renaissance. In memoriam Ch. B. Schmitt*, ed. Eckhard Keßler, Charles H. Lohr and Walter Sparn, Wiesbaden 1988 (Wolfenbütteler Forschungen 46), pp. 195–216.

26 There are cases easier to understand, for example Friedrich Christian Lesser (1692–1754), who joined the academy in 1735 during his work on an *Insectotheologia*, was fittingly named after Aristomachus of Solis, a devoted scholar of bees (Zedler, *Universal-Lexicon*, p. 1469).

27 Müller, "Johann Laurentius Bausch", p 29. For a bibliography of the monographs see Berg and Thamm, "Programm der Academia Naturae Curiosorum", pp. 295–302.

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but already by Aristotle in the *Historia animalium* and by Plato.[28] This juxtaposition of antique authorities like Pliny, Hippocrates or Galen with contemporaries again stressed similarities and continuity but pointed out differences in notably fewer cases. At the same time, this diminished the authority of these scholars to a certain extent, since they were now referenced to primarily as sources for facts.

But the *Miscellanea curiosa* also introduced a new level of authority within the academy, which soon started a debate among the members.

3 Communication and authority: the *Miscellanea curiosa*

3.1 Thematic focus, structure and authorship in the Miscellanea curiosa

Since the ANC's members lived across the German lands, one of the main goals of the *Miscellanea curiosa* as a journal was to establish a means of communication.[29] It quickly became the academy's most important project. When its continuation in 1693 was at risk, the academy saw it as a real danger to its own existence.[30] This crucial role for the academy is the first aspect, which sets the *Miscellanea* apart from other learned journals of the time: The *Journal des sçavans* was the work of an anonymous group, which apparently had no other goals than to publish the journal.[31] The *Philosophical Transactions* on the other hand were a private enterprise of Henry Oldenburg, which only in the 18th century became the official journal of the Royal Society, although from the beginning much of its contents related to this academy.[32]

Another important difference is the thematic focus, which was a consequence of the ANC's goals: According to the title page of the first volume, the journal would feature medico-physical observations consisting in contributions on anat-

28 Georg Wolfgang Wedel, "Observatio CXCIV. Cor in Dextro latere pulsans", in: *Miscellanea curiosa* 1671, p. 296.

29 This has been stressed a number of times: Uwe Müller, "Die Leopoldina unter den Präsidenten Bausch, Fehr und Volkamer (1652–1693)", in: *350 Jahre Leopoldina – Anspruch und Wirklichkeit. Festschrift der Deutschen Akademie der Naturforscher Leopoldina 1652–2002*, ed. Benno Parthier and Dietrich von Engelhardt, Halle (Saale) 2002, pp. 45–93, here pp. 52–56, 61–62); Richard Toellner, "Im Hain des Akademos auf die Natur wißbegierig sein: Vier Ärzte der Freien Reichsstadt Schweinfurt gründen die Academia Naturae Curiosorum", in: *350 Jahre Leopoldina—Anspruch und Wirklichkeit. Festschrift der Deutschen Akademie der Naturforscher Leopoldina 1652–2002*, ed. Benno Parthier and Dietrich von Engelhardt, Halle (Saale) 2002, pp. 14–43, here 37–38; Frances Mason Barnett, "Anspruch und Wirklichkeit. Reformen in der frühen Academia naturae curiosorum", in: *Gelehrte Gesellschaften im mitteldeutschen Raum (1650–1820)*, ed. Detlef Döring and Kurt Nowak, 2 vols, Stuttgart/Leipzig 2002 (Abhandlungen der Sächsischen Akademie der Wissenschaften zu Leipzig 76/75), vol. 2, pp. 47–72, here p. 71. However, there is little information about, how the communication and editorial process actually worked.

30 *Protocollum*, pp. 130–133.

31 Jean-Pierre Vittu, "La formation d'une institution scientifique. Le Journal des Savants de 1665 à 1714", in: *Journal des savants* 2002, pp. 179–203, 349–377, here pp. 180–189.

32 Noah Moxham, "Fit for Print: Developing an Institutional Model of Scientific Periodicals Publishing in England, 1665–ca. 1714", in: *Notes & Records of the Royal Society* 69 (2015), pp. 241–260.

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omy, botany, pathology, chirurgy, therapeutics and chymia.[33] The invitation to new authors at the beginning of the first volume stressed the close connection of these topics to medicine: Observations on minerals, plants and animals were linked to the invention of new pharmaceutica, and of the chymical matters only those were to be published, which had a specific use.[34]

This was much narrower than the topics found in other journals: The *Journal des sçavans* had announced to review the most important books and provide news concerning physics, chemistry, mathematics, anatomy, the arts as well as the decisions concerning censorship at the ecclesiastical and secular courts or the universities.[35] As for the *Philosophical Transactions*, Oldenburg had explicitly envisaged 'perfecting all Philosophical Arts, and Sciences'.[36]

The *Miscellanea*'s focus on medicine led to a different structure of the volumes than in other journals: The main part of the *Miscellanea* consisted of shorter observations, which were printed in the order of their arrival at the editor's and thus without regard to any similarities or relation of content.[37] These observations reported from the activities of the members (and other contributors) and made the academy visible as an active network for the first time. The *Philosophical Transactions* on the other hand initially consisted of a wider range of genres like letters, reports from meetings of the Royal Society, reviews, book extracts and so on, which were grouped together according to thematic similarities.[38]

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33 'Observationes medicas & physicas, vel anatomicas, vel botanicas, vel pathologicas, vel chirurgicas, vel therapeuticas, vel chymicas' (*Miscellanea curiosa* 1670, title page).

34 'His praegnantibus rationibus mota *Curiosa Societas* opem & operam summorum Medicorum & Physicorum implorans *Ephemerides Medicas* quotannis colligere & conscribere, tandemosq[ue] typis divulgare sibi proposuit, *in quas* varias *Physicas & Medicas observationes rariores* sed fide dignans *tam Practicas Medicas* quàm *Chirurgicas, nova experimenta tam Physica quàm Anatomica, nova inventa in Regno minerali, Animali, Vegetabili, remedia* selectoria & *chymica* generosiora singulari usu comprobata tam per literas communicata quàm ex rarioribus & peregrini saepè idiomatis libris exhausta tanquam in viridarium quoddam multifariis florum blanditiis exornatum disponere constituerunt' (Johann Michael Fehr, "Epistola invitatoria ad celeberrimos Europae medicos. Viri magnifici, amplissimi, nobilissimi, excellentissimi, experientissimi medicinae anstites scrutatores naturales arcanorum solertissimi", in: *Miscellanea curiosa* 1670, separate pagination, here p. 6).

35 'Le dessein de ce Journal estant de faire scavoir ce qui se passé de nouveau dans la Republique des lettres […] Premierement d'un Catalogue exact de principaux livres […] En troisième lieu on sera scavoir les experiences de la Physique & de Chymie […] les nouvelles decouvertes qui se font dans les Arts & dans les Sciences […] Mathematiques: les observations du Ciel […] & ce que l'Anatomie […]' (Anonymous, "L'Imprimeur au lecteur", in: *Journal des sçavans* 1665, January 5th, without pagination).

36 '[…] contribute what they can to to the Grand design of improving Natural knowledge, and perfecting all *Philosophical Arts*, and *Sciences'* (Henry Oldenburg, "The Introduction", in: *Philosophical Transactions* 1665, No. 1, pp. 1–2, here p. 2.).

37 Müller, "Leges", pp. 259.

38 David Banks, "Starting science in the vernacular. Notes on some early issues of the Philosophical Transactions and the Journal des Sçavans, 1665–1700", in: *ASp* 55 (2009), pp. 1–17, here pp. 11–14.

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In the *Miscellanea* other texts genres were limited to the appendices, which would at first feature mostly longer, formally more heterogeneous treatises. Those were in part written by members of the ANC, in part they were reprints or translation of texts, which the editors deemed important additions to their readers' libraries. Later volumes also included lists of new books, excerpts and other genres, but the main part was still reserved for observations only.[39]

Both the observations and the texts in the appendices were attributed with a high visibility to their authors, who all were medical doctors though not necessarily members of the ANC. In fact, in the early years of the *Miscellanea* there were more contributions by non-members than by members.[40] Also there were almost no anonymous contributions, while in the *Journal des sçavans* anonymity was the rule, and in the *Philosophical Transactions* the authors' names were often dropped in the editing process, apparently in a deliberate effort of Oldenburg to emphasize his personal importance for the journal.[41] In the *Miscellanea* the authors were not only named, a separate list would also reveal their occupation and residence.[42] This means that besides communicating knowledge through the observations and the texts in the appendix, the *Miscellanea* also encouraged a direct communication between its readers and its contributors.

3.2 Text genres: observations and scholia

The choice of observations as the main part of the *Miscellanea* was deliberate: Observations were already well established as a text genre and epistemological model in the medical community. The collections of medical observations, which had been published since the middle of the 16th century, presented themselves as the result of a collective empirical effort, which tried to separate the descriptions of phenomena from their interpretation. This lead to a typographical distinction of the explanations and references to literature under the separate header of a scholium. This also allowed for a wider reception of these texts, since they could be used as collections of facts independent of philosophical preferences.[43] The ob-

39 Later volumes also contained obituaries for the wider known members. The treatises still require a detailed analysis just as much as the observations, especially since the authors of both parts of the *Miscellanea* overlap to a certain extent.

40 See the table by Buess, "Schweizer Ärzte", p. 5.

41 Banks, "Starting science in the vernacular", pp. 4–7; Noah Moxham, "Authors, Editors and Newsmongers: Form and Genre in the Philosophical Transactions under Henry Oldenburg", in: *News Networks in Early Modern Europe*, ed. Joad Raymond and Noah Moxham, Leiden/Boston 2016, pp. 465–495.

42 'Syllabus Excellentiss. Dn. Medicorum qui pro augendo Tomo I. Ephemeridum Phyico-Medicarum Observationes communicarunt: Secundum Ordinem Alphabeticum' (*Miscellanea curiosa* 1670, n. p.). In the first volume this list preceded the table of contents, in later years it was sometimes put at the end of the volume.

43 Pomata, "Obervation Rising", pp. 55–56, 64; Barnett, "Anspruch und Wirklichkeit", p. 71. In consequence, most of the norms, which are established for journal texts in the Enlightenment are already present in the *Miscellanea* (Thomas Habel, "Gelehrtenzeitschriften", in: *Historisches Wörterbuch der Rhetorik*, ed. Gert Ueding et al., 12 vols, Tübingen/Berlin 1992–2012,

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servations as a model or genre also emphasized the expertise of the observer or author, since they were not random notes on phenomena but were presented as the result of a refined perception.[44]

The conventions incorporated in the observations as a genre matched with the idea of an academy of professionals engaging in knowledge production without polemics. This is also apparent in the constant naming of the title of medical doctor for the contributors, and in the fact that there was almost no distinction between the contributions of members and non-members.

At the same time, the conventions of the observations were the cause of the problem between the editor and some of the contributors of the *Miscellanea*: Sachs von Lewenhaimb, the aforementioned *Phosphorus*, was instrumental in the preparation and publication of the *Miscellanea*, but he also received criticism after the first volume. In a letter to fellow academy member Georg Hieronymus Welsch (1624–1677) he wrote that some people were displeased, that he had added scholia to some of the observations. To his defence, he added that these scholia were only meant to further illustrate the cases through similar ones from rare books and that they would not contain any judgement. Furthermore, they would be necessary to also make the *Miscellanea* appeal to various scholars as well as noble men.[45]

Generally, in the published collections of observations the same person wrote the observations and the scholia, not a second party.[46] To some extent, this discrepancy is even visible in the academy's leges: The original 1651 version was conceived before the idea of the *Miscellanea*, and it mentions the possibility of a commentary from a second party only in respect to the monographs, which the members were to write. The revised version from 1671, i. e. one year after the first volume of the *Miscellanea*, simply extends this paragraph to include publication in the journal but never the less continues to refer to the commentary as *mantissa* or *corollarium*, not scholium. In fact, the *leges* mention the scholium explicitly in another paragraph as the possibility for an author to comment on his own observations.[47] In the actual volumes of the *Miscellanea* however, the scholia were in most cases added afterwards by the editor, meaning that description and interpretation were not only separated but now had different authors all together. Furthermore, Sachs' claim that only a few observation had been supplemented by a scholium was an understatement: Of the 160 observations in the first volume 59 had a scholium, 43 of

vol. 10, pp. 318–328, here p. 323). But this should less be attributed to some progressive attitude of the editors than to their reliance on an already established text genre.

44 Pomata, "Observation Rising", p. 49–53, 59.

45 'Audio quibusdam scholia observationibus addita displicere. Paucis ista sunt addita, nec ἐπίκρισω faciunt, quod a nobis maxime alienum. Historica sunt, non critica, rariorem historiam ex rarioribus libris, analogis historiis illustrantia: praecipue cum Ephemerides nostrae non pro solis Medicis conscribantur, quibus instructae Bibliothecae, sed et in gratiam aliorum curiosorum, virorum illustrium, religiosorum, aliorumque eruditorum' (*Protocollum*, p. 104).

46 Pomata, "Observation Rising", pp. 50, 64.

47 Müller, "Leges", pp. 250, 256, 259–260.

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which were written by Sachs, while the rest was either by the authors themselves (13) or by the person, who had transmitted the observation for publication (3).

Sachs may have actually intended to make the Miscellanea more appealing to a broader audience by adding non-critical commentary, but his intention was not necessarily evident to the reader. If a scholium had not been written by the author of the observation, this was only announced in small print at its end. On the one hand, the readers could have easily overlooked this, opening the possibility for a misattribution of interpretations to an author. If the readers, on the other hand, did notice the distinction of author and commentator, they were given no real explanation as to why this specific observation had been commented on, while others were not. Though contradictions between the observation and other reports usually did not lead to an open judgement in the scholium, its consideration of alternatives at least pointed towards the possibility that the author may have misinterpreted the case. Adding to the whole problem was probably that Sachs did not only refer to literature for his comments on other's observations but also to his own experience as a physician, while he supplemented only a single one of his own 13 observations with a scholium. At least in some instances the references to similar phenomena and their causes could have been understood as an attempt to seize authority over the interpretations of the observations.

A good example for this problem is an observation by Johann Wepfer (1635–1670), who was a physician from Basel and not a member of the academy.[48] In a contribution to the first volume of the *Miscellanea*, Wepfer conveyed the medical history of the countess Franziska Elisabeth von Fürstenberg, who had suffered from an enlarged spleen. The failure of her usual purgative led to a different medication and set in motion a chain of events, which ultimately had led to her death in 1668. Wepfer was allowed to perform an autopsy, and he described the enlarged and disfigured spleen, which was coloured entirely black by blood. Furthermore, he detected some inflammations nearby and a gastric ulcer.[49] Sachs' scholium to this observation starts with the information that Wepfer had already written about the countess' spleen in 1661 in a letter to the famous Danish physician Thomas Bartholin (1616–1680). In this letter, Wepfer had surmised that blood serum had filled up the spleen and caused the enlargement. Bartholin, on the other hand, was of the opinion that the swelling was caused either by wandering matter from a previous illness or by blood from the arteries. Sachs now commented that the autopsy would clearly support Bartholin's earlier explanation of the disease. After this statement, Sachs continued with other reports on similar cases from the books of Bartholin and other authors.[50] While Wepfer seems to have cho-

48 Wepfer was born in Schaffhausen, studied medicine in Basel, Strasbourg and Paris, was assessor of the medical faculty in Basel and worked as physician in Schaffhausen (Jöcher, *Allgemeines Gelehrten-Lexicon*, vol. 4, p. 1892).

49 Johannes Wepfer, "Observatio II. Lien Magnus", in: *Miscellanea curiosa* 1670, pp. 15–18.

50 Bartholin is probably the most referenced author in the scholia of the first volume, and he also contributed 13 observations of his own, just as much as Sachs.

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sen deliberately to omit his own interpretation of the case, Sachs not only added explanations. He also made a decision on the right explanation.

The aforementioned complains about this questionable shift of authority in the handling of the observations had no further consequences: Even though the number of scholia dropped significantly in the next volumes, this was more the result of Sachs untimely death in 1672. Over the following years, the new editors continued to comment on observations, leading to another protest from contributors in 1688, this time including Gabiel Clauder (1633–1691), who was at the time one of the *adiuncti* of the academy. Lukas Schroeck (1646–1730), who at this time was the editor of the journal, discussed the matter with the third president of the academy, Johann Georg Volckamer (1616–1693). Both again decided against a change and even referred back to Sachs' reasoning as an explanation.[51] Originally, the scholia may not have been intended to establish authority, but the discussion between the contributors and the editors shows, that the academy had seized control over the observations and was not willing to let go of it.

Interestingly enough, there were other comments on observations in the *Miscellanea*, which did not attract criticism: Throughout the years, it became quite common for observations to refer back to contributions on similar topics in earlier volumes. In addition to this, some members wrote longer comments regarding a larger number of observations under the title of *Parallelismus*.[52] In each of these cases, the comments could be easily recognized as the additional opinion of a separate person, and consequently none of them seem to have caused any controversy.

3.3 Editorship as power over the academy

As mentioned before, the publication of the *Miscellanea* was quickly considered the most important project of the Academia Naturae Curiosorum. However, the relationship between the president and the editors soon became strained: Johann Michael Fehr, the second president of the academy, put a stronger emphasis on hierarchy than his predecessor. This soon brought about a clash with the editors of the *Miscellanea*, who continued the work of Sachs in Breslau after his death. When Fehr, who was still located in Schweinfurt, ordered them to publish some documents in honour of one of the academy's patrons in 1678, the editors refused for now unknown reasons. This started a series of conflicts between the president and the editors, which included the demand of a financial compensation for their efforts but was mainly about their perceived lack of respect towards Fehr. At times,

51 *Protocollum*, p. 104.

52 The first of these longer commentaries came from Rosinus Lentilius, "Parallelismus ad Observationes in Ann. II. Decad. I. Ephem. Curios. Contentis", in: *Miscellanea curiosa* 1694, Appendix, pp. 124–134. Lentilius continued this commentary in the three subsequent volumes of the *Miscellanea* (1696, 1700, 1702) and the first volume of its' successor the *Ephemerides* (1712). This overlapped with another commentary by Georg Detharding, "Observationes parallelae, in Ephemeridum Curiosorum Decad. I. Ann. I", in: *Miscellanea curiosa* 1700, pp. 147–156. Detharding's commentary continued in the two subsequent volumes (1700, 1712).

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the editors completely broke off communication with the president. The problem was only solved, after the plague had made it impossible to continue printing the volumes in Leipzig and one of the editors in Breslau had died. Fehr now appointed a new editor and contracted a printer in Nuremberg.[53] The whole conflict, but especially Fehr's helplessness towards the editors shows, that they had expanded their power beyond the authority over the journal's content due to its importance for the academy. But despite his problems, in a way Fehr was the one, who finally acknowledged the authority of the editors in respect to the observations: While Sachs and his immediate successors had simply been called *collectores*, the editor now was added to the *leges* of the academy as the *director ephemeridum*.[54]

4 Conclusion

The Academia Naturae Curiosorum is often characterized as a representative of modern science in the seventeenth and eighteenth centuries, since it so strongly emphasized collaboration and empirical research. However, in contrast to other academies of the time, the ANC never openly criticized the universities or the more traditional fractions of medical and natural knowledge. Instead, the ANC called for a neutral collaboration of professionals and highlighted the continuities from traditional to more recent knowledge: The members took on the names of antique philosophers or physicians and continued to reference their works, albeit by limiting the perspective to the description of phenomena.

With the *Miscellanea curiosa*, the academy started a journal to pursue its goal of enhancing medicine through communication of knowledge between professionals. But by trying to appeal to a broader audience, the academy transformed the established conventions of observation and scholium, turning the latter into commentaries by the editors. This, at least in principle, meant a shift towards authority for the academy and led to protests from the members, which the president repeatedly decided to ignore. At the same time, the editors unexpectedly emerged as a power inside the academy and a threat to the authority of the president.

The early history of the Academia Naturae Curiosorum thus presents an effort to change the structures of knowledge production and communication. One can discern two phases: Initially the academy stressed the equality among members (or even physicians in general). The personal authority of antique scholars was in part dissolved by the appropriation of their names by the members as well as the use of their works as mere collections of facts interspersed with references to contemporary literature. In the second phase however, a new authority superseded this attempted equality: Sachs and the successive editors did not only compile observations but tried to establish a new model for the communication of knowledge. This again led to a diminishment of personal authority, this time on part of the journal's contributors. The forces responsible for this, i. e. the *director ephemeri-*

53 Barnett, *Medical Authority*, pp. 264–277.
54 Barnett, *Medical Authority*, p. 277.

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dum and the academy's president, represented a new form of authority, which was less focused on specific items of knowledge than on the rules of communication.

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The Reconfiguration of *Natura* and *Ars* in Cartesian Rhetoric and the Epistemological Reflections in the Prize Questions of the French Academies[1]

Martin Urmann

1 Aristotelianism and natural knowledge from the perspective of rhetoric

Loin cet orgueil philosophique
Qui séduit la crédulité:
Le doute sage et méthodique
Seul éclaircit la vérité.
Interprète de la nature,
C'est à toi qu'elle a sans mesure
Prodigué ses secrets divers.
Viens disputer, nouveau Lyncée,
Aux fiers élèves du lycée,
L'honneur d'instruire l'univers.
[…][2]

This ode to Descartes, for which Father Lisle from the congregation of the Doctrinaries was awarded the *prix de poésie* by the eminent Académie des Jeux Floraux in Toulouse in 1710, presents its protagonist as a truly epoch-making figure, setting his work apart from tradition. The author, a professor of rhetoric at the Collège de l'Esquille in Toulouse, subsequently guides the reader through the different areas of Descartes' philosophy, with which he is clearly familiar. Beyond Cartesian astronomy and theory of matter,[3] he is most impressed by the psychology, the theory of passions, that Descartes had developed. Lisle's song of praise demonstrates his keen awareness of the ambivalence of this conception of the soul, which from its first appearance had led both to deterministic and to idealistic interpretations.[4] As the 'esclave souveraine', in the author's paradoxical

1 The research for this article was conducted at the Collaborative Research Center 980 "Episteme in Motion" (Freie Universität Berlin) as part of the project A07 *Erotema. The Question as an Epistemic Genre in the Learned Societies of the Seventeenth and Eighteenth Centuries*.

2 "Descartes", in: *Recueil de plusieurs pièces d'éloquence et de poésie présentées à l'Académie des Jeux Floraux, pour les prix de l'année 1710*, Toulouse 1710, pp. 1–6, here v. 1–10, p. 1.

3 See ibid., v. 41–60, pp. 3–4.

4 Cf. Stéphane Van Damme, *Descartes. Essai d'histoire culturelle d'une grandeur philosophique*, Paris 2002, pp. 61–72 and pp. 96–110 and François Azouvi, *Descartes et la France. Histoire d'une passion nationale*, Paris 2002, p. 32–35.

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phrase, the soul is subjected to the 'lois du corps', while at the same time it is the realm where 'la matière, sans connaissance, reçoit […] des sentiments' and gains spiritual qualities.[5] Although the ode does not explicitly invoke the pineal gland, the famous bridge connecting the Cartesian dualism of body and mind, it shows considerable knowledge of Descartes' conception of the passions and of the far-reaching epistemological consequences of the 'doctrine nouvelle'.[6]

The new philosophical principles had a particular impact in the theory of affects which Descartes developed, or rather summed up, in *Les passions de l'âme* (1649).[7] This conception of the passions in a way condenses the transformative elements that put rhetorical theory on a new basis in the second half of the 17th century. This leads us to one of the main issues of this article: the reconfiguration of *natura* and *ars* in concepts of rhetoric inspired by Descartes. Accordingly, I seek to show from the perspective of the history of rhetoric how Aristotelianism and natural knowledge interacted in this particular field. This article deals with the complex processes of amalgamation between, on the one hand, the knowledge of the textual tradition based ultimately on the principles of Aristotelian dialectic and rhetoric and, on the other, empirical knowledge based on the observation of nature. This interaction led to a remarkable epistemic 'transfer' in the rhetorical tradition.[8] In order to reconstruct this transfer, I will first examine the reception of Cartesian philosophy in the universities and the *collèges* in France in the second half of the 17th century. I will then turn to the conception of a "new" rhetoric in Bernard Lamy's *Art de parler* (1675) before focussing finally on the epistemological reflections in the rhetorical prize contests held by the French academies in the 18th century. As a case study in early modern institutional history of knowledge, this essay is a contribution to this volume on science and Aristotelianism in Protestant Europe by means of a comparative study in a different setting, that of an intellectual history of scientific and philosophical ideas in a Catholic context.

This approach seems fruitful when we seek to understand Aristotelianism as a dynamic tradition of knowledge open to (certain) debate(s) in several ways. First, it allows us to see that also at the Catholic universities in France the Aristotelian corpus could be applied to new contexts and, to a certain extent, be reinterpreted. Moreover, the case of Lamy demonstrates how difficult it was to forsake the enduring power of tradition, even when the endeavour was essentially founded on the new notion of nature. Finally, consideration of the prize contests of the French academies is not merely an end in itself. The prize questions allow us to

5 Lisle, "Descartes", v. 66, v. 77 and v. 83–84 (pp. 4–5).

6 Ibid., v. 26, p. 2.

7 Cf. Panajotis Kondylis, *Die Aufklärung im Rahmen des neuzeitlichen Rationalismus*, Hamburg 2002, pp. 188–196.

8 On the notion of transfer as the gradual change of knowledge that results from the complex interaction of traditional and novel epistemic elements see Eva Cancik-Kirschbaum/Anita Traninger, "Institution – Iteration – Transfer. Zur Einführung", in: *Wissen in Bewegung. Institution – Iteration – Transfer* (Episteme in Bewegung. Beiträge zu einer transdisziplinären Wissensgeschichte, vol. 1), eds. Eva Cancik-Kirschbaum and Anita Traninger, Wiesbaden 2015, pp. 1–13.

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examine how the contestants reflected on the intricate relationship between Aristotelianism and natural knowledge at that time. After the 1720s, this particular genre of public knowledge exchange actually stimulated an intense discourse on the relation between the textual tradition and the new sciences. This discourse bears witness to the reconfiguration of *natura* and *ars* which can be observed in the major rhetorical theories of the second half of the 17th century.

2 Descartes in the university

Research has established a very precise understanding of the reception of Descartes' work in France in the 17th and early 18th century.[9] Despite the strong resonance among the leading researchers of the age and before its triumph in the years after 1700, Descartes' philosophy had to pass through a critical phase during which it met fierce opposition from the three major institutions: the Church (particularly from the Jesuits), the theological faculties in the universities, and ultimately the Crown. The most spectacular occurrence of this confrontation undoubtedly took place in 1663 when the Church placed Descartes' writings on the *Index Librorum Prohibitorum* (even though with the somewhat milder notation of *donec corrigantur*, i. e., until corrected).[10]

After the theological faculty of the university of Leuven officially forbid Descartes' notion of substance in 1662,[11] the ban of his teachings in the French universities soon followed. In 1664 the University of Paris issued the first of several decrees demanding that physics classes should be based only on Aristotelian philosophy. In 1671 finally, the *Sorbonne* imposed an overall ban on the teachings of Descartes. Renewed in 1691 and 1704, it halted the introduction of Cartesian metaphysics into the theological curricula. The idea that matter and extension coincide was absolutely incompatible with the doctrine of transubstantiation. Many of the *collèges*, too, implemented restrictive measures against Cartesianism, in part because of pressure from the Crown.[12]

At the centre of one of the most intense controversies, we find Bernard Lamy (1640–1715), the professor of rhetoric and philosophy at the Oratorian *collège* in Angers.[13] Lamy, to whose rhetorical work I will turn in the next section, early in his career had defended Cartesian ontology in metaphysical questions and continued to teach his positions on the *res extensa* in Angers (from 1673). When, like other Cartesians, he was suspected of advocating democracy as a more rational form of government than monarchy, he was suspended from office in August

9 See especially Van Damme, *Descartes*, pp. 27–137 and Azouvi, *Descartes et la France*, pp. 15–93.

10 With Descartes' death in 1650, however, this ban was actually definitive. Cf. Roger Ariew, *Descartes and the Last Scholastics*, Ithaca/London 1999, pp. 173–181 and Azouvi, *Descartes et la France*, pp. 23–28.

11 See Van Damme, *Descartes*, p. 90.

12 See ibid., pp. 96–102 and Azouvi, *Descartes et la France* 38–42.

13 On the following see ibid., pp. 43–45. See also François Girbal, *Bernard Lamy (1640–1715). Étude biographique et bibliographique*, Paris 1964, pp. 28–42.

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1675 by royal decree. The *collège* of Angers, which had long tried to protect him, was now forced to prohibit the teaching of Cartesian positions and to exile Lamy to the abbey of Saint-Martin-de-Miséré near Grenoble. But thanks to the protection of the cardinal Le Camus, Lamy could again take up his courses of philosophy at the *séminaire de Grenoble* as well as publish his theories.

The outcome of the Lamy affair already shows that, in the practice of university or college teaching, there remained some room for manoeuvre with regard to Cartesian philosophy, despite official prohibitions. In fact, there was a sustained interest in Descartes's theories at the French universities and *collèges* from the 1660s, as especially Laurence Brockliss has shown.[14] This interest came from a number of professors who were willing to confront the new teachings and introduce them into their classes. The first to do so were the professors of physics, who discussed mechanistic principles within a system that was still dominated by the Aristotelian tradition. This process of assimilation continued to broaden with the result that by 1690, due to the work of various professors at the University of Paris and beyond, the basis for a more heterogeneous system of physics had been created. This system was capable of absorbing the main tendencies in contemporary natural philosophy—without abandoning the Aristotelian foundation of university physics.[15]

The 1690s, then, marked a turning point as, from that time, the agenda was increasingly set by convinced adherents of Cartesian philosophy who sought to establish mechanics as the defining system of physics at the university. After the University of Paris had been won over in the early 1700s, the Cartesian cause soon became widely accepted. By 1720 'there was hardly a *collège de plein exercice* or a regular convent that had not succumbed' to the mechanists. Even though the professors may not have been wholesale supporters of every Cartesian position, the 'rejection of Aristotle was rapid and universal'.[16] The new teachings then penetrated even into the classes in logic and to a certain extent even in metaphysics.[17]

It is particularly interesting to see how the professors dealt with the new philosophy of nature, especially in the period between 1660 and 1690 when it had not yet become the new consensus at the universities. In fact, they discussed Descartes's theses within the traditional framework of the *disputatio* in order to see how they measured up against the Aristotelian system.[18] The axioms of mechanist physics, including its empirical discoveries, thus fed into the dialec-

14 See the fundamental work of Laurence W. B. Brockliss, *French Higher Education in the Seventeenth and Eighteenth Centuries. A Cultural History*, Oxford 1987, pp. 197–216, 332–333 and pp. 345–376.

15 Aristotelian physics, as Brockliss notes, had by then 'become a highly eclectic philosophy'. Ibid., p. 350. See also idem, "Der Philosophieunterricht in Frankreich", in: *Die Philosophie des 17. Jahrhunderts*, vol. 2/2: *Frankreich und Niederlande*, ed. Jean-Pierre Schobinger (Grundriß der Geschichte der Philosophie, ed. Friedrich Ueberweg), Basel 1993, pp. 3–32, here pp. 23–25.

16 Brockliss, *French Higher Education*, pp. 350–351. Brockliss consequently speaks of the 'Cartesian era' between 1690 and 1740. The last Aristotelian textbook by the Jesuit Gaspard Buhon actually appeared in 1723, ibid., p. 187.

17 Cf. ibid., pp. 197–216.

18 See ibid., pp. 337–350.

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tical logic of the disputation, which was originally designed to verify or refute propositions. This seeming paradox is understandable if one considers the fact that the *disputatio* remained an essential form of knowledge debate in the early modern period.[19] Moreover, there are important parallels between the two modes of knowledge on a formal level, which facilitated this epistemic transfer. Both Aristotelians *and* Cartesians conceived of physics as a science based on deductive principles. Neither of the camps regarded physics as founded on observation and empirical data. The fact that the two deductive systems, axiomatic on the one hand, dialectical on the other, were quite different in nature was not a major problem to the professors; at least it did not stop them from combining the two modes of demonstration.[20] Besides, both of these theories of physics were based on logical, rather than mathematical principles. Descartes and his followers, to be sure, attached crucial importance to mathematics, but principally as a model for clear deductive reasoning. It was only with Newton that the laws of nature were expressed in a purely mathematical language.[21]

In their discussions of Descartes's theories, the professors must certainly have realised substantial divergences from the Aristotelian tradition. In this regard, it is particularly interesting to see how they dealt with these differences and thus to examine the terms of the epistemic transfer. The most common attitude was the position of Aristotelian eclecticism, which basically preserved the traditional principles of physics while at the same time seeking to integrate the findings of the new philosophy of nature.[22] It is striking to see how important it was to the professors to make the new teachings appear as traditional as possible. Consequently, they preserved the Aristotelian notions of form and element, and they referred to their positions as Aristotelian although they were based on the principles of matter and motion. In this way, Descartes could even be presented as a materialist Aristotelian. This was the perspective taken by François Bayle, a professor of philosophy at the university of Toulouse, who in 1700 dedicated an entire textbook to the reconciliation of Aristotle and Descartes.[23] The more "radical" professors on the other hand tended to present Aristotle as a mechanist *avant la lettre* whose theories had been wrongly interpreted later by the scholastics.[24]

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19 On the persistence of the *disputatio* see especially the contributions in: *Frühneuzeitliche Disputationen. Polyvalente Produktionsapparate gelehrten Wissens*, eds. Marion Gindhart, Hanspeter Marti and Robert Seidel, Köln/Weimar/Wien 2016 and Hanspeter Marti, "Disputation und Dissertation. Kontinuität und Wandel im 18. Jahrhundert", in: *Disputatio 1200–1800. Form, Funktion und Wirkung eines Leitmediums universitärer Wissenskultur*, eds. Marion Gindhart and Ursula Kundert, Berlin/New York 2010, pp. 63–85. See also Emmanuel Bury, "Les lieux de l'argumentation dans les discours médicaux du XVIIe siècle", in: *Archives internationales d'histoire des sciences* 55/154 (2005), pp. 35–54.

20 See Brockliss, "Der Philosophieunterricht in Frankreich", p. 29.

21 See ibid., p. 30.

22 Cf. Brockliss, *French Higher Education*, pp. 352–359.

23 See idem, "Der Philosophieunterricht in Frankreich", p. 27.

24 See ibid.

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When the divergences from the Aristotelian model were too serious, they were either tacitly ignored or reinterpreted; sometimes the new facts were simply denied. The latter applies especially to the cases of superlunary comets, new stars, and solar *maculae*.[25] Regarding the sunspots, the professors in fact denied their existence in order to prevent harm to the Aristotelian system. Although they had to admit the empirical observation of the phenomena they countered by denying that the spots were situated on the sun.[26]

The reception of Descartes in the French universities and *collèges* is also significant in terms of the confessional dimension natural knowledge had assumed in the early modern period. It clearly shows that, in the 17th century, the dynamic tradition of Aristotelianism was not the privilege of the Protestant universities. It is true that many of the professors who were particularly open to Cartesian theories were reform-oriented Oratorians[27] or even close to Jansenism and hence in a certain way theologically predisposed to the Augustinian heritage in Descartes' philosophy.[28] Moreover, the secular philosophy professors played an important part, especially at the University of Paris. Nevertheless, all of these university lecturers were, of course, of the Catholic faith and, more importantly, they taught at Catholic institutions. Finally, even among the professors of physics who were receptive to Cartesian philosophy there were many Jesuits.[29]

In the next section, the analysis of Bernard Lamy's *Art de parler* will demonstrate the epistemic transfer that resulted when the Cartesian notion of nature was introduced into the field of rhetoric.

3 Bernard Lamy and the Reconfiguration of *Natura* and *Ars* in Cartesian Rhetoric

> 'Les passions ont des caractères particuliers avec lesquels elles se peignent elles-mêmes dans le discours.'[30]

In the first place, it has to be emphasised how Cartesian philosophy fundamentally challenged rhetoric.[31] According to Descartes, the reasonable inner nature

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25 See Brockliss, *French Higher Education*, pp. 342–344.

26 See ibid., p. 342.

27 Cf. the detailed prosoprographic documentation in ibid., pp. 459–477, here especially pp. 463–468; see also ibid., pp. 348–350.

28 On this relation see Azouvi, *Descartes et la France*, pp. 24–27 and Kondylis, *Die Aufklärung*, p. 182.

29 On the confessional dimension see also Brockliss's conclusion regarding France and other parts of Catholic Europe in *The Cambridge History of Science* (ed. Roy Porter, vol. 4: Eighteenth-Century Science, Cambridge e.a. 2003, p. 46): 'The Jesuit and other Aristotelian professors' did not teach 'a physics completely oblivious of contemporary developments in the natural sciences: sixteenth- and seventeenth-century Aristotelianism was a vibrant and eclectic physical philosophy that successfully incorporated most of the new observational discoveries'.

30 Bernard Lamy, *La Rhétorique ou l'art de parler*, 4th Ed., Amsterdam 1699 (repr. Brighton 1969; abbreviated below as 'Adp'), book II, chap. 7, p. 108.

31 On the following see in particular Thomas M. Carr, *Descartes and the Resilience of Rhetoric: Varieties of Cartesian Rhetorical Theory*, Carbondale/Edwardsville 1990, especially pp. 1–5 and

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of man representing the rational external order is the only legitimate and valid source of knowledge, at least as far as the programmatic level of Cartesian epistemology is concerned. The central position of nature (both external and internal to man) as *the* field of methodical investigation, the deeply rooted scepticism towards all (verbal) media interfering with the direct study of the objects of nature and the inward turn in the interior monologue of reason with itself were all factors that not only undermined the status of rhetoric, but compelled Descartes to reject it in the *Discours de la méthode* (1637):

> J'estimais fort l'éloquence, et j'étais amoureux de la poésie; mais je pensais que l'une et l'autre étaient des dons de l'esprit, plutôt que des fruits de l'étude. Ceux qui ont le raisonnement le plus fort, et qui digèrent le mieux leurs pensées, afin de les rendre claires et intelligibles, peuvent toujours le mieux persuader ce qu'ils proposent, encore qu'ils ne parlassent que bas-breton, et qu'ils n'eussent jamais appris de rhétorique. Et ceux qui ont les inventions les plus agréables, et qui les savent exprimer avec le plus d'ornement et de douceur, ne laisseraient pas d'être les meilleurs poètes, encore que l'art poétique leur fût inconnu.[32]

As Descartes had stated earlier in the *Regulae ad directionem ingenii* (1628/29), rhetoric, only probabilistic in nature, was not part of the 'cognitio certa et evidens' that 'omnis scientia' was to be.[33]

Nevertheless, this denial of rhetoric, presented itself in a highly rhetorical manner,[34] did not lead to the end of rhetoric. Instead, it provoked a new interest in the traditional art of persuasion: it re-focussed the question regarding what actually made a speech effective, or, more generally, how the spoken or written word could most effectively convey the intended message to the public. Besides, there was an urgent need to redefine the specific role of rhetoric among the various and evolving branches of learning.[35]

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pp. 26–31, Gilles Declercq, "La rhétorique classique entre évidence et sublime (1650–1675)", in: *Histoire de la rhétorique dans l'Europe moderne (1450–1950)*, ed. Marc Fumaroli, Paris 1999, pp. 629–706, here pp. 638–645 and Kondylis, *Die Aufklärung*, pp. 174–190.

32 René Descartes, "Discours de la méthode pour bien conduire sa raison, et chercher la vérité dans les sciences", in: *Œuvres de Descartes*, ed. Charles Adam and Paul Tannery, vol. 6, new Ed., Paris 1965, pp. 1–78, here p. 7.

33 'Omnis scientia est cognitio certa et evidens […]. Atque ita per hanc propositionem rejicimus illas omnes probabiles tantum cognitiones, nec nisi perfecte cognitis, et de quibus dubitari non potest, statuimus esse credendum'. René Descartes, „Regulae ad directionem ingenii," in: ibid., vol. 10, pp. 349–488, here p. 362.

34 Cf. Marc Fumaroli, "Ego scriptor: rhétorique et philosophie dans le *Discours de la méthode*", in: *Problématique et réception du* Discours de la méthode *et des* Essais, ed. Henry Méchoulan, Paris 1988, pp. 31–46; Roger Ariew, "Descartes's Fable and Scientific Methodology", in: *Archives internationales d'histoire des sciences* 55/154 (2005), pp. 127–138.

35 See Dietmar Till, *Transformationen der Rhetorik. Untersuchungen zum Wandel der Rhetoriktheorie im 17. und 18. Jahrhundert*, Tübingen 2004, pp. 297–302; Rudolf Behrens, *Problematische Rheto-*

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Cartesian rhetoric—that is seventeenth-century conceptions of eloquence inspired by Descartes, including essentially the works of Bernard Lamy, Nicolas Malebranche, Géraud de Cordemoy, and the *Logic* of Port-Royal—[36] is one distinct and particularly influential way to investigate these questions. In Bernard Lamy's work *La Rhétorique ou l'art de parler*, first published in 1675, the tensions between tradition and innovation resulting from the reconfiguration of *natura* and *ars* become most apparent.[37] A success from the start, the book reached its sixth edition in 1701 and remained a crucial reference in France throughout the 18th century. Lamy's work was also widely read beyond France, thanks to an early translation into English and a later one into German. In Germany, Gottsched was one of its most fervent admirers.[38]

In Lamy's *Art de parler*, the crucial shift that is typical of the new Cartesian conception of rhetoric becomes especially evident. Eloquence is no longer conceived as an *ars*, that is as a learnable technique based upon certain normative rules. On the contrary, Lamy wants to develop a theory of language which analyses communication by means of linguistic and psychological methods.[39] Accordingly, he seeks to explore the empirical mechanisms operating when the written or spoken word is used effectively and convincingly. This implies a fundamental redefinition of the relation between *natura* and *ars*. This transformation was already axiomatic in the *Logique* of Port-Royal (1662), whose authors declare: 'Ainsi cet art ne consiste pas à trouver le moyen de faire ces opérations, puisque *la nature seule* nous le fournit en nous donnant la raison: mais à faire des réflexions sur ce que la nature nous *fait* faire.' [40] By denying the foundations of logic and rhetoric in the normative principles of an *ars,* Arnauld and Nicole also delegitimize, like Descartes in the passage quoted from the *Discours de la méthode*, the benefit of rules for those seeking to reason logically and to speak eloquently: 'Tout cela se fait naturellement, et quelquefois mieux par ceux qui n'ont appris aucune règle […], que par ceux qui les ont apprises.'[41] This theoretical idea is diametrically opposed to the rhetorical tradition which had, of course, recognised the dimension of *ingenium*, the natural gift of the orator. But that had always been secondary to *exercitatio* and *studium*, the constant learning and practising of one's skills by means of the authoritative

rik. Studien zur französischen Theoriebildung der Affektrhetorik zwischen Cartesianismus und Frühaufklärung, München 1982, pp. 30–32.

36 The term is used as in Carr, *Descartes and the Resilience of Rhetoric* and Till, *Transformationen der Rhetorik*, pp. 297–340.

37 For the following analysis, I rely heavily on the reconstruction and interpretation of Lamy's work by Dietmar Till, *Transformationen der Rhetorik*, pp. 319–340. See also the crucial analysis by Carr, *Descartes and the Resilience of Rhetoric*, pp. 125–167.

38 See John T. Harwood, "Introduction", in: *The Rhetorics of Thomas Hobbes and Bernard Lamy*, ed. idem, Carbondale 1986, pp. 131–163, here p. 131 and Girbal, *Bernard Lamy*, pp. 47–48.

39 See Till, *Transformationen der Rhetorik*, especially p. 303 and p. 314.

40 Antoine Arnauld and Pierre Nicole, *La Logique ou l'Art de penser*, ed. Pierre Clair and François Girbal, 2. rev. Ed., Paris 1993, p. 38 (my emphasis). On the *Logic* of Port-Royal see Carr, *Descartes and the Resilience of Rhetoric*, pp. 62–87; Behrens, *Problematische Rhetorik*, pp. 33–83 and Till, *Transformationen der Rhetorik*, pp. 302–313.

41 Arnauld/Nicole, *La Logique*, p. 38.

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classical texts.[42] This demonstrates once again how deeply embedded the epistemological ideal of the 'mirror of nature' had become, even in rhetoric.[43]

What sets Lamy's and the Port-Royal authors' conceptions of rhetoric apart from Descartes, however, is the role attributed to language in the cognitive process. Even for Arnauld and Nicole, who in this respect are much closer to Descartes's universal epistemological ideal of the *esprit géométrique* than Lamy, it is clear that, apart from the fields of logic and the exact sciences, language does influence human understanding. At least they concede that the established use of words and their polyvalence cannot be simply done away with and that this fact, though irrelevant to logic, is not irrelevant in a broader epistemological perspective.[44] What is more, Arnauld and Nicole, along with Augustine and the *Doctrina Christiana,* consider religious experience as the legitimate field for the evocation of strong affects. This realm is hence crucial to the 'return' not of rhetoric but of the 'rhetorical' in the *Logique*.[45] Its source and its aim are the passions of the heart.

The strongest criticism of Descartes in this context comes from Pascal. Assuming that different forms of reasoning and specific rationalities are involved in human understanding and, more fundamentally, that man's cognitive faculties are inextricably linked to the passions of the soul and ultimately founded in an intuitive contemplation of the world, Pascal distinguishes the 'esprit de justesse' and the 'esprit de finesse' from the 'esprit de géométrie'.[46] The 'esprit de finesse' in particular is the expression of spontaneous judgement beyond rational grasp. It relies on a sense of certainty conveyed by the human heart ('cœur)', which for Pascal represents the ultimate source of truth:

> Nous connaissons la vérité non seulement par la raison mais encore par le cœur. C'est de cette dernière sorte que nous connaissons les premiers principes et c'est en vain que le raisonnement, qui n'y a point de part, essaie de les combattre […]. Cette impuissance ne doit donc servir qu'à humilier la raison, qui voudrait juger de tout, mais non pas à combattre notre certitude comme s'il n'y avait que la raison capable de nous instruire.[47]

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42 See the fundamental article by Florian Neumann, "Natura-ars-Dialektik", in: *Historisches Wörterbuch der Rhetorik*, ed. Gert Ueding, vol. 6, Tübingen 2003, col. 139–171 and Till, *Transformationen der Rhetorik*, pp. 77–87; see also Henri-Irénée Marrou, *Histoire de l'éducation dans l'antiquité*, 2. rev. Ed., Paris 1950, pp. 268–282 and pp. 359–389.

43 The allusion is of course to Richard Rorty, *Philosophy and the Mirror of Nature*, new Ed., Princeton/Oxford 2009, especially pp. 45–67.

44 See the reflections on the 'signification propre' in Arnauld/Nicole, *La Logique*, p. 94 and p. 100. This aspect is especially underlined by Carr, *Descartes and the Resilience of Rhetoric*, pp. 84–86.

45 Ibid., pp. 68–75. In this context, Carr also speaks of 'the rhetorical without rhetoric', ibid., pp. 85–87. See also Behrens, *Problematische Rhetorik*, pp. 77–83.

46 See Blaise Pascal, *Pensées*, in: idem, Œuvres complètes, ed. Michel Le Guern, vol. 2, Paris 2000, fr. 465 and fr. 466, pp. 741–744. On these specific forms of reasoning see Claude Chantalat, À la recherche du goût classique, Paris 1992, pp. 64–70, Eduard Zwierlein, *Blaise Pascal*, Hamburg 1996, pp. 73–83 and Declercq, "La rhétorique classique", p. 645 and pp. 650–654.

47 Pascal, *Pensées*, fr. 101, pp. 573–574. See also the famous passage from the *Art de persuader*: 'Personne n'ignore qu'il y a deux entrées par où les opinions sont reçues dans l'âme, qui

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Lamy's *Rhétorique* takes a position that, like the *Logique* of Port-Royal, affirms the Cartesian idea of methodical science but at the same time gives considerably more weight to rhetoric.[48] The latter is considered the fundamental medium and propaedeutic tool without which philosophical findings could not be conveyed.[49] According to Lamy, only through rhetoric are the abstract notions of philosophy made understandable to man as a sensual being, who is above all exposed to the suggestive powers of the passions. What is more, Lamy believes in the epistemological complementarity of mathematics and rhetoric which goes beyond the traditional ideal of a formal analogy between the two disciplines dating back to Quintilian.[50] For Lamy, rhetoric's task is to develop a natural language of affects which at the same time makes the passions of the heart work towards reason and the methodical ideal of the *esprit géométrique*. To develop a deeper understanding of this theoretical approach, we now have to turn to Lamy's argument presented in the *Art de parler* and especially to his conception of the passions.

What is particularly interesting about Lamy's chief work is the fact that, in some respects, it seeks to establish once more a system of rhetoric, even though the *ars rhetorica* had come under such severe criticism in the 17th century, especially in France, that the authors of the major treatises renounced the term "rhétorique", preferring instead titles like *Art de persuader* (as for example Pascal's work from 1660).[51] Lamy, who explicitly refers to Augustine, Horace, and Quintilian, does not simply dismiss the tradition of rhetoric. He wants to revise it and take it to a new (theoretical) level. In fact, his work is originally divided into two independent parts, the first one dealing extensively with the 'art de parler' in terms of an analytical theory of language, the second one, much shorter, treating the 'art de persuader'.[52] The latter part is, in a way, Lamy's tribute to the *officia*-rhetoric, that is to the classical teaching system of eloquence which goes back to Cicero and Quintilian. It is highly significant that the traditional pillars of the *ars rhetorica*—to which Lamy refers symptomatically as 'la science de gagner les cœurs'[53]—are treated so

sont ses deux principales puissances, l'entendement et la volonté', Œuvres complètes, ed. Jean Mesnard, vol. 3, Paris 1964, p. 413. For the on-going debate on the notion of *cœur* in Pascal see Vincent Carraud, *Pascal et la philosophie*, Paris 1992, especially pp. 250–273, Wilhelm Schmidt-Biggemann, *Blaise Pascal*, München 1999, pp. 46–50 and Hervé Pasqua, "Le cœur et la raison selon Pascal", in: *Revue Philosophique de Louvain* 95/3 (1997), pp. 379–394.

48 See also Carr, *Descartes and the Resilience of Rhetoric*, pp. 137–141.

49 See Lamy, *Adp*, pp. 316–339. On the relation of philosophy and rhetoric in Lamy see also Lyndia Roveda, "Des épines aux fleurs des mathématiques: l'enseignement des sciences chez Bernard Lamy", in: *Archives internationales d'histoire des sciences* 55/154 (2005), pp. 193–202 and Till, *Transformationen der Rhetorik*, pp. 324–325.

50 See especially Roveda, "Des épines aux fleurs des mathématiques", pp. 199–201.

51 Cf. Declercq, "La rhétorique classique", p. 632.

52 It is only with the quoted edition from 1699, that the 'discours' on the 'art de persuader' is integrated into the work as the 'livre cinquième' (comprising less than one fifth of the entire book). See also Till, *Transformationen der Rhetorik*, p. 322.

53 Lamy, *Adp*, p. 330.

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briefly in the *Art de parler*.[54] In fact, Lamy speaks very little of the rules of *inventio* and *dispositio*,[55] two of the five major canons of the art, thereby marginalizing the logical and analytical dimension of rhetoric, which gets 'amputée de l'art de la preuve'.[56] This low esteem, notably for the system of topics, was well-established in the rationalist critique of rhetoric in France, especially in the Cartesian context.[57]

It must appear even more symptomatic, however, that the principles of *elocutio*, that is the rules of style and tropes, which had constituted one of the key aspects of rhetoric since antiquity, do not figure at all in the framework of the *art de persuader*. Lamy intentionally removes these major topics from the traditional context and elaborates on them from the Cartesian perspective on language and the human passions developed as the *art de parler* in the first section of the book.[58] Indeed, this new theoretical view of *elocutio* constitutes the centre-piece of Lamy's (re-)definition of rhetoric, which Dietmar Till has described as an 'Affekt-Grammatik', a grammar of affects.[59]

Dismissing the rules of the *ars*, Lamy seeks to demonstrate that eloquent speech stems rather from the natural use of language, that is from its use in accordance with certain natural principles. Instead of prescribing rules with which to structure an eloquent speech, he wants to disclose its non-intentional mechanisms in order to explain what actually happens when communication achieves the effect of convincing others. For Lamy, the key lies in the passions. In essence, he assumes that 'les passions sont bonnes en elles-mêmes: leur seul dérèglement est criminel. Ces sont des mouvements dans l'âme qui la portent au bien, et qui l'éloignent du mal'.[60] Moreover, the effective regulation of the passions is not a normative matter but rather depends on their correct internal economy. Believing that 'l'on ne peut faire agir les hommes que par le mouvement des passions',[61] Lamy makes the case for fighting passions with counter-passions, even if the latter are dangerous as such.[62] Rightly conceived, rhetoric must hence be a rhetoric of affect that represents

54 This fact puzzled contemporary critics until the end of the 18th century. Cf. Till, *Transformationen der Rhetorik*, pp. 321–324. On the traditional system of the *officia oratoris* see ibid., pp. 71–97 and Karl-Heinz Göttert, *Einführung in die Rhetorik. Grundbegriffe, Geschichte, Rezeption*, 4th rev. Ed., Paderborn 2009, pp. 27–71.

55 See Lamy, *Adp*, pp. 306–314 and the critical conclusion regarding 'cette méthode des lieux' (pp. 314–316). On *dispositio* see ibid., pp. 354–365.

56 Declercq, "La rhétorique classique", p. 644.

57 See ibid., pp. 632–646 and Till, *Transformationen der Rhetorik*, pp. 89–92 and pp. 305–307.

58 See especially the 'livre second' of the *Art de parler*, pp. 85–152.

59 Till, *Transformationen der Rhetorik*, pp. 328–334. Regarding the *Logique* of Port-Royal, Behrens, *Problematische Rhetorik*, pp. 77–83, also speaks of a 'grammaire affective'.

60 Lamy, *Adp*, p. 343.

61 Ibid., p. 344.

62 Lamy thus thinks that the evocation of stimulating affects is the best remedy against inhibiting passions, even when it comes to strong emotions like anger. If 'la colère' is considered 'un mouvement, une affection de l'âme qui nous anime à vaincre les empêchements qui nous retardent la possession de quelque bien', no one can say 'raisonnablement qu'il n'est pas permis d'exciter la colère et se servir de son mouvement pour animer les hommes à chercher le

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the natural movements of the heart—'les mouvements du cœur'.[63] This means not only that the orator must appeal to the emotions of the audience—that, to be sure, had been a founding principle of the *ars rhetorica* since Aristotle. According to Lamy, eloquent speech is the direct expression of the human heart which uses the natural means of passions to articulate itself. Thus, the passions themselves are reflected in language, 'les passions se peignent elles-mêmes dans le discours'.[64] For Lamy, the language of the heart is superior to any form of knowledge written in books: 'Il n'y a point de meilleur livre que son propre cœur; c'est une folie de vouloir aller chercher dans les écrits des autres ce que l'on trouve chez soi'.[65]

In the *Art de parler*, the human heart takes on exceptional significance as the primordial, natural source of rhetoric. The crucial means for turning the 'movements of the heart' into language are the tropes and figures of speech. They are of fundamental importance to Lamy since there is no 'langue assez riche et assez abondante pour fournir des termes capables d'exprimer toutes les différentes faces sous lesquelles l'esprit peut se représenter une même chose'.[66] Again, this is only partly surprising against the backdrop of rhetorical tradition and especially given the appreciation of the tropes in early modern rhetorical theory.[67] What is new, however, is Lamy's theoretical explanation of the origins of the tropes: 'Ce n'est point l'art qui les règle; ce n'est point l'étude qui les doit trouver [sic], ce sont des *effets naturels de la passion*'.[68]

Moreover, in Lamy's description of the tropes the physiological conception of language typical of the *Art de parler*—a work that starts with a chapter on the 'organes de la voix' and discusses style in the context of the 'qualité de la substance du cerveau et des esprits animaux'—[69] becomes particularly evident. The tropes are in fact considered the immediate correlate of the physiological impact of affects. They directly represent the movements of the passions and 'imprint' them into the mind of the reader: 'Les figures impriment dans l'esprit des lecteurs les passions dont elles sont les caractères'.[70] From here the impressions find a direct way into language, which in Lamy appears, of course, a peculiarly passive medium: 'Le discours est l'image de l'esprit: on peint son humeur et ses inclinations dans ses paroles sans que l'on y pense'.[71] Here, Lamy shows himself as a firm

bien qu'on leur propose.' Lamy even concludes that: 'dans les passions les plus déréglées […] il y a toujours quelque chose de bon'. Ibid., pp. 343–344.

63 Ibid., p. 263. See also p. 108 and pp. 251–254. Lamy also speaks of the 'mouvements de l'âme', ibid., especially pp. 231–232.

64 Ibid., p. 108 (see also above, footnote 30).

65 Ibid., p. 136. See also Till, *Transformationen der Rhetorik*, p. 332.

66 Lamy, *Adp*, p. 90.

67 Cf. Till, *Transformationen der Rhetorik*, pp. 310–313, Declercq, "La rhétorique classique", pp. 644–649 and Göttert, *Einführung in die Rhetorik*, pp. 149–166.

68 Lamy, *Adp*, p. 137 (my emphasis).

69 Ibid., pp. 1–5 and pp. 249–252. The physiological approach is very pronounced throughout the entire work.

70 Ibid., p. 293.

71 Ibid., p. 249.

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adherent of Cartesian language theory in general and in particular follows the approach of Géraud de Cordemoy's *Discours physique de la parole* (1668).[72]

Compared to Lamy's theoretical conception, the discussion of the diverse tropes and figures of speech, which constitutes a major part of the second section of the *Art de parler,* appears fairly traditional.[73] This contrast is symptomatic of a greater ambivalence, that is to say the hybrid character of a work throughout which traditional and novel elements are inextricably linked and overlap one another. This is due to the specific way in which Lamy redefines the relation between *natura* and *ars*. Actually, Lamy merely inverts this constellation and gives new theoretical explanations to well-established rhetorical issues. Lamy's reinterpretation of Quintilian's famous comparison of the art of rhetoric with fencing is particularly symptomatic in this respect.[74] Quintilian refers to a fencer who, fighting without art and tactical training, acts merely impetuously. It is only by means of those qualities that he can overcome his adversary, like a good orator outdoes his opponent with well chosen and well prepared words. Lamy actually inverts this similitude by arguing that every fighter (or as he says 'soldat') in imminent danger resorts by natural impulse of the passions to the feints and postures that will save him from defeat.[75] Yet, despite the pronounced re-interpretation, the traditional image symbolising the role of the *ars rhetorica* remains untarnished. Lamy alters the theoretical background which leads to essentially different explanations. But he does not change the substance of the rhetorical tradition in itself.

Nevertheless, the new theory of rhetoric as the natural language of the passions emanating from the human heart was most influential on the way eloquence was conceived until well into the 18th century. This becomes particular evident when we turn to the prize questions of the French academies.

4 The Epistemological Reflections in the Prize Questions of the French Academies

> 'C'est un sentiment […] auquel il faut se livrer pour le connaître, et que l'âme est d'autant moins capable d'étudier, qu'elle en est plus affectée.'[76]

Finally, the prize competitions held by the French academies offer us a source that is particularly suitable to assess how deeply the transformations of rhetorical theory penetrated into the wider practice of eloquence in France in the 18th century.

72 On Cordemoy see Behrens, *Problematische Rhetorik*, pp. 87–95 and Till, *Transformationen der Rhetorik*, pp. 314–319.

73 See the listing of the over thirty tropes and figures of speech which Lamy treats in short articles like entries in a dictionary, *Adp*, pp. 92–100 and pp. 114–135.

74 Cf. ibid., pp. 137–141 and pp. 362–363. See also Göttert, *Einführung in die Rhetorik*, pp. 165–166.

75 'La passion le rend adroit et ingénieux; elle lui fait trouver des armes'. In the case of the orator, these weapons are none other than the tropes: 'Les figures sont les armes de l'âme'. Lamy, *Adp*, pp. 137–138.

76 *Recueil des ouvrages de poésie et d'éloquence, présentés à l'Académie des Jeux Floraux, en l'année 1765*, Toulouse 1765, pp. 58–59.

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In fact, the prize questions represent a genre that mostly attracted authors of average intellectual backgrounds. The participants were typically members of the lower clergy, of the *parlements* or the *artes* faculties of the universities, but also, to a minor (though increasing) extent, *gens de lettres*.[77] Especially after the 1720s, the *concours académique* turned into a popular medium of the Republic of Letters, appealing to more and more participants all over France and beyond. This is above all due to the fact that the contests, judged on the basis of strict anonymity, were open to the general public without any restrictions based on social rank, gender, money, or institutional membership.[78] The prize questions of the French academies, more specifically the eloquence competitions, must thus be considered a supremely valuable source for an intellectual history of rhetoric at an intermediate level: beneath the lofty heights of the preeminent rhetorical theories, they provide rich evidence of the actual practice of eloquence in 18th century France.

It is all the more significant then that the *discours* (by a certain M. Taverne) that won the prize at the Académie des Jeux Floraux in Toulouse in 1733 leaves no doubt that it is the specific task of eloquence 'd'exprimer dignement les sentiments de notre âme' and, what is more, that 'la nature, qui veut conduire tous les hommes à la connaissance de la vérité, a profité des dispositions de leurs cœurs pour parvenir à ses desseins'. To do so, nature only employs, according to the author, 'les moyens les plus conformes à nos inclinations. Telle est l'origine de l'éloquence'.[79] The same view is taken by the two other texts submitted that the academy did not select for the prize, but nevertheless decided to publish in its annual *recueil*. One of them draws the concise, very Lamy-like conclusion: 'La vraie éloquence […] trouve dans les passions mêmes de quoi vaincre les passions'.[80] These positions are indeed very common among the authors writing

77 On the sociology of the participants see the chapter on the *concours académique,* which is still fundamental to the study of this particular genre, in Daniel Roche's magisterial work *Le siècle des lumières en province. Académies et académiciens provinciaux, 1680–1789*, 2 vols, Paris 1978, vol. 1, pp. 324–355, here pp. 336–339.

78 On the regulations of the *concours académique* and its practical implications see the detailed descriptions in Jeremy L. Caradonna's essential monograph: *The Enlightenment in Practice. Academic Prize Contests and Intellectual Culture in France, 1670–1794*, Ithaca/London 2012, pp. 40–87, especially pp. 50–53 and pp. 78–87.

79 "Discours qui a remporté le prix, par le jugement de l'Académie des Jeux Floraux, en l'année 1733", in: *Recueil de plusieurs pièces de poésie et d'éloquence présentées à l'Académie des Jeux Floraux, pour les prix de l'année 1733*, Toulouse 1733, pp. 131–148, here p. 134 and pp. 142–143.

80 "Troisième discours", in: ibid., pp. 168–188, here pp. 180–181. The second *discours* argues likewise that eloquence essentially 'sert à toucher le cœur des auditeurs' and regards the human heart as the seat of truth: 'la vérité a des droits si incontestables sur son cœur'. Following the inclinations of the heart eloquence must even 'donner à la vérité et à la sagesse les mêmes attraits qui lui faisaient préférer la volupté'. Ibid., pp. 149–167, here pp. 150–151 and p. 166. Everything thus depends on 'maîtriser le cœur de l'homme pour régler ses penchants', as the third discourse notes. Eloquence in this way realises man's *natural* disposition towards truth, 'les rappelle aux premières sources du vrai, à ces dons que la nature a faits à tous les hommes pour leur servir de guide'. Ibid., p. 169 and p. 171.

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on the nature and function of eloquence in the rhetorical prize questions of the 18th century.[81] The competition held by the Académie de Pau in 1739: 'La sagesse n'interdit pas les plaisirs; mais elle en règle l'usage' even adopts one of the new axioms as its subject matter.[82] So in this particular genre and context, too, we find the redefinition of eloquence as a rhetoric of affect, focussed essentially on the passions of the human heart (*cœur*), permitting their *natural* and thus their most effective expression. As such, rhetoric persuades less by normative prescriptions than by appealing to the (right) dispositions of the heart.

What is particularly remarkable about the prize competition of 1733 in Toulouse is the fact that the question (or rather the thesis) proposed by the Académie des Jeux Floraux, one of the strongholds of rhetorical tradition in France,[83] had an explicit focus on truth: 'L'éloquence ne doit avoir d'autre objet que de faire connaître la vérité'. Nevertheless, none of the texts published by the academy contains any explanations of how truth can be established by means of a traditional or revised system of *topics*. The whole logical and analytical tradition of rhetoric thus seems cast aside and irrelevant to its actual purpose. Instead, the emphasis is essentially placed on the style and the effects to be evoked by the rhetoric of the passions. Truth seems indeed to have become a matter of the heart.

81 See as another, earlier example the answers to the question 'Si la sagesse qui vient du tempérament est aussi sûre que celle qui vient de la raison', proposed by the Académie des Jeux Floraux in 1725, in: *Recueil de plusieurs pièces d'éloquence et de poésie présentées à l'Académie des Jeux Floraux, pour les prix de l'année 1725*, Toulouse 1725, pp. 65–84., pp. 85–108 and pp. 109–128. The discourse selected for the prize also argues that 'les passions nous fournissent elles-mêmes des preuves incontestables de la force de l'homme […]. Si quelquefois elles maîtrisent son cœur, il peut les dompter à son tour; et en les sacrifiant les unes aux autres, il n'en est point qu'il ne puisse soumettre […]. L'homme est naturellement porté à la perfection […]. Il ne peut donc trouver son bonheur que dans la connaissance et dans la possession d'un bien auquel il puisse aspirer. Il faut qu'il remplisse son cœur'. Ibid., p. 68 and pp. 77–78. The second discourse is even convinced that 'la sagesse qui vient de la raison est moins sûre dans son principe, parce qu'elle est plus sujette à l'erreur que celle qui vient du tempérament'. This is due to the fact that 'la sagesse qui est fondée sur un penchant naturel au bien, sera plus ferme dans son attachement pour la vertu, que celui qui n'a que la raison en partage'. Ibid., p. 88. On the shift towards a *rhétorique du cœur* in the eloquence prize questions see also my article, "Les médias de la réflexion sur le savoir: concours académique, journalisme savant et les discours sur la question du goût", in: *Friedrich Melchior Grimm – philosophe et homme de réseaux dans l'Europe des Lumières*, eds. Kirill Abrosimov and Jonas Hock (Romanische Studien, Beiheft 2018), forthcoming.

82 Accordingly the discourse selected for the prize (by the père Chabaud) argues that 'la sagesse […] ne nous fait point pratiquer la vertu par contrainte et par devoir; mais elle nous la rend aimable et nous donne du goût pour ce qu'elle nous prescrit. Elle nous enseigne une philosophie d'usage qui n'a rien de rebutant'. *Pièces d'éloquence et de poésie qui ont remporté le prix au jugement de l'Académie royale des sciences et belles lettres établie à Pau*, Paris 1746, pp. 3–19, here p. 12.

83 Not only was the tradition of poetry contests held in Toulouse since the 14th century one of the origins of the academic prize questions. The statutes of the *Jeux Floraux* also served as the model for the structure and regulations of the *concours* when it was introduced at the Académie française in 1670. See Caradonna, *The Enlightenment in Practice*, pp. 15–16, 21–26 and p. 42.

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This tendency is not the only noteworthy aspect in the evolution of the rhetorical prize competitions. Since the 1730s, the questions set aimed explicitly at launching a debate over the contemporary development of knowledge. This led to what one can call a self-reflection of knowledge;[84] a self-reflection based amongst other things on the beginning specialisation of knowledge and further stimulated by the appearance of the *Encyclopédie* in the 1750s.[85] This development is especially striking when one considers the early history of the prize questions at the French academies. The genre seemed hardly predestined, in fact, for such a self-reflective turn.

Established in 1670 at the Académie française in the disciplines of *poésie* and éloquence (the prizes being distributed annually in one of the categories) the *concours académique* was, on the one hand, first of all the medium of the panegyric on Louis XIV and a forum for the discussion of traditional theological and moral topics on the other. This was the case both in the capital and in the provincial academies.[86] It is only in the course of the eighteenth century, in the wake of the second wave of academy foundations after the 1720s, that new fields of knowledge were explored and that the range of subjects treated in the prize competitions started to increase. This was above all due to the new disciplines of the *concours académique*, namely the scientific prize questions, established first at the Académie de Bordeaux in 1715 and then at the Académie Royale des Sciences in 1720, and the historical contests held at the Académie des Inscriptions et Belles-Lettres since 1734 and soon spreading to the provincial academies, too.[87] The *concours* thus mirrored the contemporary spectrum of knowledge in its tendency towards growing differentiation. At the same time, this meritocratic medium of emulation, which registered an increase from 48 contests in the decade from 1670 to 1679 to 476 competitions in the 1780s, appealed to more and more aspiring members of the Republic of Letters. When it was abolished by the National Convention in 1793, the *concours académique* had mobilized altogether over 10,000 participants.[88]

84 Cf. Martin Urmann, "Zwischen *prix de dévotion*, Wissensreflexion und Reformdiskurs. Die Preisfragen der französischen Akademien als literarische und epistemische Gattung und die Frage nach dem 'Jugement du Public' an der Akademie von Besançon aus dem Jahr 1756", in: *Aufklärung* 28 (2016), pp. 105–133, here pp. 128–129.

85 On the specialisation of knowledge which at the time, to be sure, still took place within the one community of scholars called the Republic of Letters, see the contributions in: *La république des sciences*, eds. Irène Passeron, René Sigrist and Siegfried Bodenmann [*Dix-huitième siècle* 40 (2008)], especially the introduction by the editors (pp. 5–27) and the articles by Jean-Pierre Schandeler (pp. 315–332) and René Sigrist (pp. 333–357).

86 Cf. Caradonna, *The Enlightenment in Practice*, pp. 23–32.

87 See ibid., pp. 88–89 and also the most valuable *Appendix F* listing all the prize contests offered by academies, scholarly societies, and agricultural societies in Continental France from 1670 to 1794, URL: http://www.jeremycaradonna.com/appendix-f, 28.02.2018 (pp. 335–515).

88 Cf. ibid., p. 45. Caradonna estimates the total number of participants in the *concours académique* between 1670 and the abolition of the academies in 1793 at between twelve and fif-

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The scientific prize competitions undoubtedly represented an important source of innovation within the *concours académique*. The questions produced genuine contributions to contemporary scientific research. Very quickly, they became a medium—like scholarly journals, much more accessible and flexible than books—where current problems were collectively discussed by major and (still) unknown researchers. The numerous successes of the Bernoulli family (Jean and his two sons), the Euler family (above all Leonard, but also Charles and Jean-Albert) and of Lavoisier are only the most obvious evidence in this context.[89] Moreover, the *prix de science* continuously gained in epistemic as well as in quantitative importance representing 60 per cent of the whole number of contests in 1793.[90] The new empirical knowledge of nature thus found its way into a genre that had originally been established for cultivating the tradition of poetry and eloquence and hence, epistemically speaking, the knowledge of the textual tradition.

Despite the changing functions and topics of the *concours académique*, the rhetorical and poetical prize questions remained one of the pillars of this popular medium for the entire 18th century. Contrary to the opinion so dear to current research on the prize questions, the eloquence contests must not be considered as the progressive forum for the factual debate of new knowledge.[91] Neither should they be seen in the sceptical tradition of the early modern essay. In fact, the discourses of the *prix d'éloquence* were heavily influenced by the dialectical tradition of the question as an 'epistemic genre'.[92] It is thus a technique of knowledge deeply rooted in scholasticism, in the *quaestio* and notably the practice of disputations at the universities,[93] that strongly shapes the academic genre of the prize contests.

teen thousand. In comparison, the total number of academicians in France over the period amounts to 6.000 (male) persons.

89 See James E. McClellan, *Science Reorganized. Scientific Societies in the Eighteenth Century*, New York 1985, p. XXVII and p. 94; see also Caradonna, *The Enlightenment in Practice*, p. 92 and p. 149. The brothers Jean and Daniel Bernoulli personally noted, as mentioned by McClellan (*Science Reorganized*, pp. 11–12), that their research on the *theoria magnetis* was launched by the corresponding prize contest at the Académie Royale des Sciences which they won in 1746 together with Euler and Dutour.

90 Furthermore, the scientific prize questions had numerically outrun the poetic and rhetorical competitions, which constituted 30 per cent of the whole number of contests, by the middle of the 18th century. Cf. Roche, *Le siècle des lumières en province*, vol. 1, pp. 343–344.

91 The article by Gunhild Berg, "Sind Preisfragen die aufklärerisch-öffentliche Form der *disputatio*? Ein Antwortversuch am Beispiel der Berliner Volksbetrugs-Frage von 1780", in: *Disputatio 1200–1800*, pp. 167–199, is symptomatic of this tendency. The prize questions are presented as the future-oriented replacement of the *disputatio* as they allowed the open reflection of new knowledge.

92 It is especially Gianna Pomata who has employed the notion of 'epistemic genre', in order to designate a 'standardized textual format […] handed down by tradition for the expression and communication of some kind of content […] primarily cognitive in character'. Gianna Pomata, "Observation Rising: Birth of an Epistemic Genre, 1500–1650", in: *Histories of Scientific Observation*, eds. Lorraine Daston and Elizabeth Lunbeck, Chicago/London 2011, pp. 45–80, here p. 48.

93 On the disputation and its epistemological as well as its practical implications, see Anita Traninger, *Disputation, Deklamation, Dialog. Medien und Gattungen europäischer Wissensverhan-*

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That is all the more surprising since early modern academies actually presented themselves in strong opposition to the universities and reproved the old methods of the "schools".[94]

The mode of arguing, especially in the early rhetorical prize questions, is therefore astonishingly close to the form of debate known from university disputations. In fact, the texts submitted to the eloquence contests all seek to defend a thesis by refuting the arguments put forward against it. Apart from this technique of argumentation based on clear-cut oppositions and the traditional rhetorical ways of amplification, the subjects of the prize questions at the Académie française also remind us of the contemporary university context. The genre had actually been established as a *prix de dévotion* with a quite narrow focus on conventional moral and theological topics.[95] The discourse which won the prize in 1673 on the question—proposed in the form of a thesis to be defended: 'De la Science du Salut opposée aux vaines et mauvaises connaissances, et aux curiosités blâmables et défendues' consequently argues in favour of religious knowledge which is praised in the starkest possible contrast to idle philosophical curiosity.[96]

In the course of the 18th century, however, the eloquence contests also underwent an important change, both regarding the modes of argumentation and the subjects proposed. Under the influence of Enlightenment discourse the prize questions, notably at the provincial academies, dealt more and more with the new philosophical topics of the age, in particular with the changing role of the arts and sciences and the epistemic status of rhetorical knowledge in relation to the observational knowledge of the flourishing natural sciences. The self-reflective turn of the rhetorical prize contests is induced, on the one hand, by the specific focus of the questions proposed, as for example: 'Combien les sciences sont redevables aux belles-lettres'/'Combien les belles-lettres sont redevables aux sciences' (Jeux Floraux, 1753/1757), 'Si la multiplicité des ouvrages en tout genre est plus utile que

dlungen zwischen Scholastik und Humanismus, Stuttgart 2012. On continuities and changes in this essential medium of the early modern Republic of Letters, see the contributions in: *Frühneuzeitliche Disputationen* (as mentioned above, note 19).

94 Cf. McClellan, *Science Reorganized* and Roger Hahn, "The Age of the Academies", in: *Solomon's House Revisited. The Organization and Institutionalization of Science*, ed. Tore Frängsmyr, Canton 1990, pp. 3–12. For a critical revision of this self-fashioning of early modern academies which points out important continuities between these institutions and the universities, see Mordechai Feingold, "Tradition versus Novelty. Universities and Scientific Societies in the Early Modern Period", in: *Revolution and Continuity. Essays in the History and Philosophy of Early Modem Science*, eds. Peter Barker and Roger Ariew, Washington 1991, pp. 45–59.

95 Cf. Caradonna, *The Enlightenment in Practice*, pp. 23–30.

96 See the selected 'discours' (by the abbé de Melun de Maupertuis), in: *Recueil de pièces d'éloquence, présentées à l'Académie française pour les prix qu'elle distribue*, vol. 1, 1671–1685, Amsterdam 1750, pp. 129–154. For a more detailed analysis see Urmann, "Zwischen *prix de dévotion*, Wissensreflexion und Reformdiskurs", pp. 117–20. The texts of eminent literary quality for which Mademoiselle de Scudéry (‚De la gloire', 1671) and Fontenelle (‚De la patience', 1687) won the eloquence contests of the Académie française must thus be considered as the exceptions to the standard of conventional rhetoric that is characteristic of the *prix de dévotion*.

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nuisible aux progrès des sciences et des belles-lettres' (Académie de Pau, 1754), 'En quoi consiste l'esprit philosophique?' (Académie française, 1755), 'Quelle a été l'influence de la philosophie sur ce siècle?' (Académie de Besançon, 1772) and, naturally, 'Si le rétablissement des sciences et des arts a contribué à épurer les mœurs', the most famous competition won by Rousseau at the Académie de Dijon in 1750. On the other hand, such reflections can also come up in contests less directly related to epistemic matters, as for example the numerous questions on taste ('goût') at the provincial academies after the 1730s,[97] on 'L'utilité des bibliothèques publiques' (Académie de Pau, 1746) or, as we shall see in detail, in the competition of the Académie de Dijon for 1757: 'Est-il plus utile d'étudier les hommes que les livres?'.

Most remarkably, in these eloquence prizes we can witness how the rhetoric of affect is used as a fundamental critique of the claim to universal knowledge asserted by the exact sciences. This critique of science and of its belief in method is at the same time a self-reflection of the rhetorical production of (text-)knowledge. To conclude, I want to analyse two examples from the eloquence prizes in which the typical arguments of this critique, based on the central notion of *cœur*,[98] are developed in a particularly elaborate manner.

The prize contest of the Académie française for the year 1755: 'En quoi consiste l'esprit philosophique?' is actually one of the very rare occasions when this illustrious institution took up a much debated, contemporary philosophical issue before its eloquence competitions began to be devoted almost exclusively to eulogies on the *grands hommes,* which lasted until the abolition of the *concours*.[99] The answer selected for the prize, by the Jesuit Father Guénard, begins with a survey of the development of contemporary knowledge. The author cannot but pay tribute to the 'nouvel ordre de choses' arising from the 'génie d'observation' which has kept accumulating more and more findings, 'mille vérités particulières'.[100] This process was launched by no other than Descartes, 'le père de la philosophie pensante', who placed 'la nature et l'évidence' at the centre of his investigations.[101] Although some of his positions and assumptions needed to be corrected by his successors, there is no denying that Descartes and his method were essential to the 'heureuse et mémorable révolution dont nous goûtons aujourd'hui les avantages'.[102]

97 On these competitions see Urmann, "Les médias de la réflexion sur le savoir".
98 Instead of the 'rhetoric of affect' I will hence speak more specifically of the rhetoric of the heart in the following analysis.
99 On the widespread academic genre of the eulogy ('éloge') see Roche, *Le siècle des lumières en province*, vol. 1, p. 344 and pp. 166–171. Beyond the prize contests, the eulogy was an important medium for the shaping of a collective identity among the academicians. As such, it did not remain uncriticized by the *philosophes*.
100 "Discours qui a remporté le prix en l'année 1755", in: *Pièces d'éloquence qui ont remporté le prix de l'Académie française, 1750–1763*, vol. 3, Paris 1764, pp. 73–98, here pp. 75–76 and p. 81.
101 Ibid., pp. 79–80.
102 Ibid., p. 80.

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However, this development has reached a point where, according to the author, it becomes clear that the intrinsic tendency of the 'raison géométrique' to transcend all borders needs to become aware of its limits.[103] In fact, this kind of philosophical spirit and its methodical quest for knowledge are characterized for Guénard by a profound 'intempérance' and 'ivre[sse]': 'cette raison qui ne connaît plus de retour, quand une fois elle a franchi les bornes'.[104] The idea of human knowledge being related to certain boundaries beyond which it starts losing its sense constitutes the epistemological centrepiece of Guénard's critical reflections. The author consequently asks, 'quelles sont donc […] les bornes où doit se renfermer l'esprit philosophique'; more specifically 'les bornes qu'il *doit se prescrire* relativement aux *divers objets* dont il s'occupe'.[105]

The answer is obvious, as Guénard immediately concludes: 'la nature elle-même l'avertit à tout moment de sa *faiblesse*'.[106] This leads us to the anthropological basis of the argument which is essential to the rhetoric of the heart: the fundamentally finite character of human nature.[107] It is precisely in its will to disregard this primordial condition and the needs of the 'cœur humain'[108] that a wrongly conceived *esprit philosophique* finally becomes dogmatic, carried away by its own 'intempérance', turning into the opposite of what it set out for. Faced with this 'excès', the author brings to mind the very foundations of the philosophical spirit and advocates the 'exacte sobriété'.[109] It thus becomes clear that the text, far from simply repeating orthodox religious arguments, is not critical of the *esprit philosophique* as such. The critique starts at the point where methodical reasoning transgresses and ignores the multiple borders within which human knowledge is situated. The text thus makes the case, typical of the rhetoric of the heart, for an augmented epistemic sensitivity to boundaries and transitions. This becomes particularly manifest when the author addresses the relation of the *esprit philosophique* with religion as well as with matters of taste ('goût'), especially the arts.

Religion and the 'esprit éclairé' are anything but contradictions to Guénard.[110] Again, the legitimate range of knowledge in these matters depends on how the line 'séparant les opinions humaines des vérités sacrées de la religion' is drawn.[111] In this particular realm however, the 'faiblesse' of man and the shortcomings of the *esprit géométrique* are particularly striking. Hence, when the rationalistic viewpoint is hypostatised reason turns into its opposite and 'votre sagesse est convaincue de folie et […] à force d'être philosophe, vous cessez d'être raisonna-

103 Ibid., p. 89.
104 Ibid., p. 94.
105 Ibid. and p. 84 (my emphasis). See also ibid., p. 74.
106 Ibid. p. 94 (my emphasis).
107 See also ibid., pp. 96–97.
108 Ibid., p. 90.
109 Ibid., p. 92 and p. 94.
110 Ibid., p. 92.
111 Ibid.

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ble'.[112] With its unifying gaze overlooking the necessity of boundaries, the philosophical spirit must especially be blind to the depth ('profondeur') of the phenomena it tries to grasp. The dimension of 'profondeur', accessible only through the specific insights of the heart ('cœur'), actually becomes the central epistemic objection to the universal claims of the *esprit philosophique*.[113] What this reasoning fundamentally lacks, is the ability 'de […] comprendre l'infini'[114] since it permanently treats this dimension like a quantifiable entity.[115]

At the same time, questions concerning taste and the arts reveal that the 'raison géométrique' is too monolithic a conception to represent the diverse intellectual faculties of man which require a *plurality* of methods. Hence for Guénard, the 'discours méthodiques' trying to explain the logic of art which is 'presque toute entière dans le cœur et l'imagination' are doomed to fail. They especially fall short of the in-between-dimension of 'nuances'.[116] This reveals the universal categories of the philosophical spirit as being simply '[des] abstractions idéales', too remote from the phenomena at stake.[117] Against the geometric reasoning à la Descartes which is 'accoutumé […] à dépouiller les objets de leurs qualités particulières, pour ne leur laisser que des qualités vagues et générales qui ne sont rien pour le cœur humain',[118] Guénard thus becomes the advocate of the irreducible material and sensual dimension of all worldly phenomena. It is only the 'faits éclatants et sensibles' which make truth graspable and understandable.[119] And that, for the Jesuit Guénard, also applies—or rather especially applies—to religious truth.[120] It is 'touchante dans ses preuves comme dans sa morale' and destined to 'entrer dans l'âme par tous les sens'.[121] A form of rhetoric which is acquainted with the secrets of the heart is conscious of the limits of reason and hence for Guénard the more appropriate—and the more valid kind of knowledge. Above all, it is the expression of the various intellectual faculties of man and possesses a sufficiently complex notion of human practice and experience.

112 Ibid., p. 96.
113 Ibid., especially pp. 95–96.
114 Ibid., p. 96.
115 'Ce grain de sable que je foule aux pieds est un abîme que tu ne peux sonder; et tu voudrais mesurer la hauteur et la profondeur de la sagesse éternelle […] par cette pensée, trop étroite pour embrasser un atome?', ibid., pp. 96–97.
116 Ibid., p. 91.
117 Ibid., p. 90.
118 Ibid.
119 Ibid., p. 95. This is indeed a crucial conviction for the defenders of the rhetoric of the heart: 'Combien peu sont assez dégagés des sens pour être touchés de la vérité, si on ne la rend sensible et agréable! L'éloquence, pour ménager notre faiblesse, nous présente cette vérité sous l'appas du plaisir'. *Recueil […] des Jeux Floraux, pour les prix de l'année 1733*, p. 171 (cited above, note 80).
120 On the Jesuit tradition of this conception of religious truth see Stéphane Van Damme, "Culture rhétorique et culture scientifique: crise ou mutation de la poétique des savoirs dans la Compagnie de Jésus en France (1630–1730)", in: *Archives internationales d'histoire des sciences* 55/154 (2005), pp. 55–69, here especially pp. 59–62.
121 "Discours qui a remporté le prix en l'année 1755", p. 98.

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The latter idea is developed particularly in the answer by the Abbé Millot selected for the eloquence prize of the Académie de Dijon for 1757: 'Est-il plus utile d'étudier les hommes que les livres?'.[122] Millot's argument (in favour of studying men rather than books) is essentially based on a conception of *cœur* as the crucial intellectual and sensible faculty of man. The text actually develops the central anthropological assumptions of the rhetoric of affect, which has left such a strong mark on the rhetorical prize questions of the 18th century, by giving an especially dense and detailed description of the paradoxes of the human heart. Man is thus depicted as 'ce mélange singulier de perfections et de défauts'.[123] His heart, 'ce théâtre fertile en scènes toujours variées', is nothing less than the fiercely contested site of pure becoming, 'où les désirs se choquent, s'engloutissent perpétuellement les uns les autres; où les passions, sous une infinité de formes, produisent une infinité d'effets étranges et presque incroyables'.[124] In light of the conflicting energies that run through his soul ('âme') man must remain a stranger even to himself: 'tant de fibres entrelacées et confondues qui composent le cœur humain; ces contrastes d'humeurs, de passions, de sentiments qui mettent entre les âmes plus de différence, que l'œil le plus perçant n'en aperçoit entre les visages; ces métamorphoses rapides et fréquentes qui souvent nous rendent méconnaissables à nous-mêmes; ces variétés si délicates et multipliées à l'infini'.[125] According to Millot, only a self-reflective thinking grounded in introspection, 'la connaissance de soi-même'[126], and focussing essentially on human practices is able to shed at least some light on this overwhelming complexity. Believing that 'la vraie peinture des hommes, ce sont leurs discours et leurs actions'[127] and that 'le premier devoir de l'homme est de contempler son être, d'en étudier à fond la nature,[128] Millot dismisses the 'méditations abstraites' of purely theoretical book knowledge.[129] This is why he is also sceptical of the capacity of the natural sciences ('les sciences exactes'[130])—which Millot, himself a partisan of the Enlightenment,[131] admires and endorses

122 Cf. Claude-François-Xavier Millot, "Discours qui a remporté le prix à l'Académie de Dijon en 1757", in: idem, *Discours académiques sur divers sujets*, Lyon 1760, pp. 78–134.

123 Ibid., p. 85.

124 Ibid.

125 Ibid., pp. 88–89.

126 Ibid., p. 90. On this self-reflective dimension see also ibid., p. 92. It has to be emphasised again that the turn towards the inner nature of man is typical of the rhetoric of the heart: 'L'éloquence […] nous fait puiser en nous-mêmes et développer ces connaissances'. *Recueil […] des Jeux Floraux, pour les prix de l'année 1733*, p. 171 (cited above, note 80).

127 "Discours qui a remporté le prix à l'Académie de Dijon en 1757", p. 89. Accordingly, the value of rules and methods for Millot essentially depends on how 'je tâche de les mettre en pratique', ibid., p. 104.

128 Ibid., pp. 90–91.

129 Ibid., p. 113.

130 Ibid., p. 114.

131 After the success of his works on French and English history from the late 1760s, Claude-François-Xavier Millot (1726–1785), who had originally been a teacher of rhetoric at the Jesuit collège of Lyon (which he had to leave for an eulogy on Montesquieu in 1757), won the support of the *philosophes* and became a member of the Académie française (1777) where

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in his text more firmly than Guénard—to illuminate the nature of man *beyond a certain point*. The scientific method fails to recognise the extent to which human knowledge is grounded in practices and tends to construct abstract systems of nature 'tandis que ceux qui l'habitent […] nous sont à peine connus'.[132] The most fundamental form of knowledge is hence the study of 'les abîmes profonds du cœur humain' and no other branch of learning could be more suitable for that purpose than rhetoric.[133] For Millot, 'le grand art de persuader' had always possessed the theoretical insight into the passions of man and at the same time the ability to influence and alter his actions.[134] Revised, in an age of sciences, as an instrument 'méthodique et profonde' '[qui] creuse les principes, développe les conséquences, démontre à l'homme ce qu'il doit être', while simultaneously preserving its distinctive aesthetic sensitivity, rhetoric turns for Millot into the new leading discipline connecting theory to practice.[135] As the most outstanding example of this novel 'science des mœurs' the author mentions Montesquieu and his approach in the *Esprit des Lois*.[136] This is why Millot can finally conclude: 'l'étude des hommes, loin de mettre obstacle aux autres études, les anime et les dirige […]. Peut-on trop se livrer à une étude aussi propre à satisfaire l'esprit qu'à former le cœur?'[137]

5 Conclusion

To sum up, I want to point out the specific constellation into which the knowledge of the textual tradition and the empirical knowledge of nature enter in the light of the rhetorical prize questions of the French academies in the 18th century. Yet, it has to be emphasised again that none of the arguments we have encountered in the context of the *concours* is genuinely new. In particular, the critique of science analysed in the two examples above had been presented in its main aspects in the *Querelle des Anciens et des Modernes*, in the answers given by Longepierre and Huet to Fontenelle's and Perrault's astonishing extension of scientific method to the realms of arts and rhetoric.[138] Vico should then elaborate quite similar philosophical arguments in *De nostri temporis studiorum ratione* (1708), though this text

he was especially endorsed by d'Alembert. Later he also became the preceptor to the duc d'Enghien. See *Dictionnaire historique, ou Biographie universelle des hommes qui se sont fait un nom […] par F.-X. de Feller*, vol. 4, 8th Ed., Paris 1839, p. 451.

132 "Discours qui a remporté le prix à l'Académie de Dijon en 1757", p. 87. For this critique of the scientific method see also ibid., pp. 113–116.

133 Ibid., p. 94.

134 Ibid., p. 124. See also ibid., pp. 121–123.

135 Ibid., p. 117.

136 Ibid., p. 116. For the praise of Montesquieu see ibid., pp. 109–113. Here, Millot also reacts to criticism which his defence of Montesquieu had provoked before and which may have been the origin of his demission at the Jesuit collège of Lyon.

137 Ibid., p. 132 and p. 134.

138 See especially Larry F. Norman, *The Shock of the Ancient. Literature and History in Early Modern France*, Chicago/London 2011, pp. 153–155, 200–223 and p. 257; Marc Fumaroli, "Les abeilles et les araignées", in: *La Querelle des Anciens et des Modernes, XVIIème–XVIIIème siècles*, ed. Anne-Marie Lecoq, Paris 2001, pp. 7–218, here especially pp. 178–196.

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did not become an important reference in the contemporary debates in France.[139] Here, the critical discussion of the *esprit philosophique* and its epistemological limits was further nurtured, albeit from a sensualist point of view, by Jean-Baptiste Du Bos in his *Réflexions critiques sur la poésie et sur la peinture* (1719) which remained very influential throughout the century.[140]

What is particularly striking about the prize questions is the fact that at a certain point in the evolution of this genre a critique of the exact sciences and their claim to universal knowledge arises; a critique that is developed and presented from a rhetorical point of view. At the same time, the selected discourses—at least a significant part of them, which were also awarded the prizes of renowned conservative academies like the Jeux Floraux—reflect the shifts in the epistemological foundations of rhetoric related to the rise of the natural sciences and the insight into the sensual and affective nature of man. Clearly, we are dealing with a changed kind of rhetoric that has reacted to the major epistemic transformations in the Republic of Letters. It must also be noted, however, that this particular perspective on affects remains rather metaphorical. It is not interested in an interpretation based on a more empirical description of emotions which was a central aim of contemporary philosophy in its search of 'une esthétique des passions […] centrée sur l'étude de la subjectivité cognitive et affective'.[141] Notably, the rhetoric of the heart—at least as it appears in the specific medium of the prize questions—does not get to the level of individual emotions as it basically follows a pre-subjective conception.[142]

The affective turn of rhetoric, its change into an instrument essentially conceived to understand the passions of the human heart, was certainly not exclusively the result of the Cartesian rethinking of language and eloquence by Lamy and the logicians of Port-Royal. All of the major treatises on *les passions humaines* since the 17th century, from Coeffeteau to Senault and Bouhours, raised the status of affects in the interaction of body and soul against the traditional theological doxa and sought to reconceive morals as the right use of passions.[143] And there is

139 See ibid., pp. 202–203. On Vico's epistemological position see Kondylis, *Die Aufklärung*, pp. 436–444.

140 See Dan Edelstein, *The Enlightenment. A Genealogy*, Chicago/London 2010, pp. 24–29; on the deeper philosophical implications of Du Bos' arguments see Kondylis, *Die Aufklärung*, pp. 314–319.

141 Daniel Dumouchel, "L'emprise du 'Mitleiden'. Mendelssohn et Lessing sur les émotions tragiques et la moralité du théâtre", in: *Revue germanique internationale* 4 (2006), pp. 121–136, here p. 121. See also Elisabeth Décultot, "Kunstgenuss. Zu Rousseaus Anthropologie der Kunstwahrnehmung", in: *Genuss bei Rousseau*, eds. Helmut Pfeiffer, Elisabeth Décultot and Vanessa de Senarclens, Würzburg 2014, pp. 115–135.

142 It is therefore neither an expression of the 'personale Prägnanz', a distinct articulation of the person as such, as in the Enlightenment culture of letter writing. Robert Vellusig, "Aufklärung und Briefkultur. Wie das Herz sprechen lernt, wenn es zu schreiben beginnt", in: *Das achtzehnte Jahrhundert* 35/2 (2011), pp. 154–171, here p. 167.

143 See Jean-Claude Rambach, "À propos des passions. Ombres et lumières avant Descartes", in: *Travaux de linguistique et de littérature* 15/2 (1977), pp. 43–65; see also Frank Baasner, "The Changing Meaning of 'Sensibilité': 1654 till 1704", in: *Studies in Eighteenth-Century Culture*

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of course the influential moralist tradition which for one of their chief exponents, La Rochefoucauld, makes it possible to note in his *Maximes* (1665), in a way as natural as axiomatic: 'Les passions sont les seuls orateurs qui persuadent toujours. Elles sont comme un *art de la nature* dont les règles sont infaillibles; et l'homme le plus simple qui a de la passion persuade mieux que le plus éloquent qui n'en a point'.[144] The fact that the Académie de Dijon chose one of La Rochefoucauld's maxims for its *concours* in 1757—'Il est plus nécessaire d'étudier les hommes que les livres' –[145] shows not only the high esteem for the authors of the *siècle classique* but also how strong the influence of the moralist tradition was at the academies and among the public addressed by the *concours* in the 18th century.

What is more, this way of thinking did not share the Cartesian affirmation of science. On the contrary, it was, both in its style and in its philosophical outlook, fundamentally sceptical of the scientific claim to truth. This becomes most evident, as mentioned above, in Pascal's notions of *cœur* and *esprit de finesse*. Beyond Lamy, the moralist tradition must hence be considered a major source of inspiration for the rhetoric of the heart in the prize questions and for its critique of science.[146] As far as the latter is concerned, Anthony Grafton is certainly right when he warns us not to assume that 'the two cultures' of scientists and humanists were 'locked in the battle that the pamphleteers of the New Philosophy called for; they coexisted and often collaborated'.[147] Yet in France since the end of the 17th century, notably since the *Querelle des Anciens et des Modernes*, there is, at least on the theoretical level, an intense discourse on the methodological differences and epistemological incompatibilities between them.

Believing that the intuitions of the heart are a 'sentiment […] auquel il faut se livrer pour le connaître, et que l'âme est d'autant moins capable d'étudier, qu'elle en est plus affectée'[148] the rhetoric of affect, as presented in the rhetorical prize

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15 (1986), pp. 77–96 and Jean Mesnard, "Le classicisme français et l'expression de la sensibilité", in: *Expression, Communication, and Experience in Literature and Language*, ed. Ronald G. Popperwell, London 1973, pp. 28–37.

144 François de La Rochefoucauld, "Réflexions ou sentences et maximes morales" (Ed. 1678), in: idem, *Œuvres complètes*, ed. Louis Martin-Chauffier and Jean Marchand, new Ed., Paris 1964, pp. 387–471, max. 8, p. 404 (my emphasis). It is also clear that 'la force et la faiblesse de l'esprit sont mal nommées; elles ne sont, en effet, que la bonne ou la mauvaise disposition des organes du corps', ibid., max. 44, p. 409.

145 Ibid., *Maximes posthumes*, max. 550, p. 481.

146 With the moralist authors not explicitly quoted (neither is Lamy) and footnotes remaining rare in the texts submitted to the rhetorical prize questions—a medium deeply rooted in the ideal of orality—there is no direct evidence of this obvious philosophical relation on the philological level. Pascal is mentioned once however by Millot, "Discours qui a remporté le prix à l'Académie de Dijon en 1757", p. 107. At the same time, it is clear that as a medium at the intersection of diverse common opinions, positions and theories the prize questions are too hybrid a source to look for one direct, "original" line of inspiration.

147 Anthony Grafton, *Defenders of the Text. The Traditions of Scholarship in an Age of Science, 1450–1800*, Cambridge, Mass./London 1991, p. 5.

148 This fundamental assumption of the rhetoric of the heart is taken from one of the (published) discourses of the *concours* held by the Académie des Jeux Floraux in 1765: 'Déterminer ce

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questions, turns against the epistemological ideal of science. Essentially assuming that human knowledge is finite and valid only within certain boundaries and that man's *various* intellectual faculties are founded in an intuitive comprehension of the world beyond conceptual knowledge, it formulates a fundamental critique of the exact sciences and their belief in method.

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