

## The Sexes and the Sciences

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**Abstract:** This is an introduction to a special issue on the theme ‘The Sexes and the Sciences’. Here we provide useful context for the ensuing research articles by way of discussing specific terms (‘science’ and ‘sex’), detailing relevant historiographies and presenting select, illuminating case studies. Taken as a whole, this special issue demonstrates that eighteenth-century scientific understandings of the sexes – male and female – were diverse and debated, and that, while formal scientific institutions and publications were almost exclusively comprised of men, their gendered relationships were various, and numerous women still meaningfully contributed to science as both practitioners and patrons.

**Keywords:** sex, science, nature, gender, natural philosophy, history of science, history of sex

Consider Fig. 1, an iconic frontispiece designed and executed by the poet–engraver Jan Luyken for the first comprehensive manual to comparative anatomy, Gerard Blaes’s *Anatome animalium* (Amsterdam, 1681).<sup>1</sup> To represent the wide compass of anatomical learning, Luyken depicted Science, armed with a scalpel and magnifying glass, unveiling a fertile Nature, whose figure, adorned with astronomical symbols, bears marks of Isis and Artemis Ephesia.<sup>2</sup> Together, Science and Nature stare dispassionately out, poised to divulge the hidden symmetries and curious idiosyncrasies of the animal world to readers, who need only look. Versions of this trope, of a womanly Science revealing a womanly Nature, appeared throughout the long eighteenth century, including in another notable frontispiece, which Henry Fuseli designed and Moses Haughton engraved for Erasmus Darwin’s evolution-themed poem *The Temple of Nature* (1803).<sup>3</sup> Another lasting contribution made by Blaes’s treatise is the dissection of male rat genitalia, which shows and identifies the sex-specific bulbourethral gland, a discovery that pre-dated the finding of that organ in human bodies by the English anatomist William Cowper.<sup>4</sup> This era’s comparative and human anatomy gave rise to modern biological explanations of sex difference, yet anatomy was only one of many scientific fields that explored the natural world as innately sexed. Sex – the division between male and female – was both a central topic and a structuring principle of Enlightenment science.<sup>5</sup> However, and as the articles in this special issue demonstrate, its role in scientific endeavours and understandings varied in many important ways.

This special issue of *Journal for Eighteenth-Century Studies* examines two inseparable and mutually influential themes: how Enlightenment sciences defined the sexes and how the sexes participated in the sciences. Each of the articles presented here addresses these themes in relation to one of a number of specific contexts, which include different national stages – Dutch, English, French and Spanish – and different social settings – provincial philosophical societies, metropolitan royal societies, the Republic of Letters and private households. While most were only then emerging as distinct fields, the scientific topics



1. Jan Luyken, frontispiece of Gerard Blaes, *Anatome animalium*, 26 × 21 cm, published by Johannes van Someren, Amsterdam, 1681. Courtesy of the National Library of Medicine, National Institutes of Health, Bethesda, MA. [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

examined in the following articles include anatomy, medicine, physiology, reproductive technology, chemistry, botany, permutations of early psychology and sociology, and ‘science’ as general knowledge of natural history. The authors of this issue’s eight articles use various historical methods and sources – including comparison of scientific, literary and artistic works, tracking of epistolary networks and tracing of institutional practices – to reveal something new about the roles of masculinities, femininities or sexualities in scientific cultures of eighteenth-century Europe.

As a whole, this special issue offers two conclusions: 1) that scientific understandings of the sexes – male and female – were diverse and debated, contrary to many broad studies of cultural history that have argued for hegemonic shifts in sex difference ushered in by eighteenth-century science; and 2) that although the prevailing sex of science in most formal institutions and on paper was evidently male, numerous women were prominent and prolific contributors to science as both practitioners and patrons. Moreover, formality as a concept reveals its contingency when we consider its relation to gendered spaces and practices, such as the exclusion of women from full membership of male-led scientific societies. In other words, women’s exclusion may have been part of what made a society a ‘Society’, rather than, say, a coterie or circle (see Jon Mee’s article in this volume).

Whether written or unwritten, such rules shaped the institutions that in time determined whether an individual might identify or be identified as a scientist, and directed the course of disciplines such as biology and medicine that were largely responsible for modern understandings of sexual dimorphism.

This leads us to the question of what qualifies as science. Here we can encounter problems, as Andrew Cunningham has discussed, because those before 1770 (or thereabouts) who were doing what we now call science did not necessarily use that term to describe their activities, or think of themselves as scientists.<sup>6</sup> To avoid presentism, Cunningham argued, historians of science must take into account the intentions of historical actors: natural philosophy should be treated as a different thing from science. Nevertheless, there are manifold overlaps and continuities between these two kinds of human endeavour, even if their objects and practices differ.<sup>7</sup> While many of the formal qualities of modern science developed in the nineteenth century, the seventeenth- or eighteenth-century natural philosopher had also pursued the furtherance of human knowledge about the natural world. This issue is concerned with multiple forms of 'scientific' pursuit, including natural philosophy and natural history, with early science in disciplinary forms that are more or less recognisable today and with science in the sense that persisted in the English language throughout the eighteenth century (closer to the German *Wissenschaft* in that it could embrace all kinds of systematic study). It may also gesture towards Tita Chico's recent interrogation of science as a trope, a 'form of figuration, a kind of literary act'.<sup>8</sup>

Indeed, historians of science seeking to understand the 'invention of science' around 1780-1850 (as Cunningham termed and dated it) could do worse than look to literary works such as Anna Letitia Barbauld's, which played an important role in the theorisation of science in late eighteenth-century Britain, or to biographies such as Maria Edgeworth's *Memoirs of Richard Lovell Edgeworth, Esq.* (1820), which reveals much about the construction of scientific masculinity during the Industrial Revolution. The arts throughout the long eighteenth century proved a constant, critical and defining complement to the sciences, but we should be as wary of making sharp distinctions between the two as we are of assumptions regarding their associated genders. Likewise with the important and definitive relationship between science and religion: although several Enlightenment-era natural philosophers fell foul of religious codes and orders, science was typically conceived as revelatory of God and creation.<sup>9</sup> Jump ahead to the mid-nineteenth century and the fissures between scientific and religious institutions seem chasmal. By then, the female personification of Science – with which both women and men identified – had been largely displaced in iconography by the figure of the male scientist.<sup>10</sup>

In recent decades critical gender studies has been a core topic in the history of science. It would now be a gross oversight to survey the sociological aspects of the history of science without commenting on gender, as, for instance, Steven Shapin omitted to do in his 1982 article on that subject.<sup>11</sup> Only a few years later, several scholars published historical studies about the way science constructed sexual difference and about the central role gender played in scientific observations, practices and knowledge. These scholars have tended to peg the eighteenth century as a crucial era of change in scientific understandings of the sexes; studies by Ludmilla Jordanova, Thomas Laqueur and Londa Schiebinger carved out new intellectual terrain with their respective cultural histories, which similarly located modern scientific definitions of sex and sexual difference in that period.<sup>12</sup> At around the same time academics gave new attention to women in science, both in the past and the then present, with feminist historians pioneering enquiries into how women figured in the Scientific Revolution and beyond.<sup>13</sup> The study of how science

is gendered was yet further advanced by the emerging field of science and technology studies.<sup>14</sup>

In 2003 George Haggerty declared that ‘the study of gender and sexuality in the seventeenth and eighteenth centuries has come of age’.<sup>15</sup> That topic has further matured in the intervening years, as researchers have continued actively to question and debate these subjects (see Karen Harvey’s article). Knowledge about the scientific contributions of women has grown, as have understandings of masculine and feminine forms of participation in scientific culture and the complicated ways that scientific ideas and observations related to sex difference (see Elena Serrano’s article). Cultural, literary and social historians investigating sex and science continue to point to the long eighteenth century as the crucible of the gendered self, biological determination, modern gender politics and sexual dimorphism as we know it. Continued debate centres on how the gendered divisions of past science may be entrenched in the present, and these scholarly queries have focused on different eras of science, often homing in on the Scientific Revolution, European Enlightenment and the nineteenth century as critical moments for consolidating science as a masculine realm. Building on these historiographies, this special issue addresses the cultural, social and material dimensions of the categories ‘sex’ and ‘science’ and the dynamics between them in eighteenth-century Europe. The articles presented here affirm that the eighteenth century realised many important developments in the way gender related to the observation of nature, the communication of knowledge, the composition of institutions and the modes of scientific participation.

### *I. Men and Women of Science*

Scholars since the 1970s have cast much-needed light on the scientific contributions of seventeenth- and eighteenth-century women. Laura Bassi, Emilie du Châtelet, Margaret Cavendish, Mary Wortley Montagu and Caroline Herschel are today just some of the better-known examples. Women’s contributions to specific fields, notably botany and astronomy, continue to receive deserved attention as feminist historians seek to mitigate their erasure over the intervening centuries of androcentric historiography.<sup>16</sup> Studies of gender and science have often centred on historical processes of women’s systematic exclusion from most formal institutions of science, although there were exceptions.<sup>17</sup> As Jordanova points out, however,

it is essential to distinguish writings concerned with gender from those that reclaim forgotten women scientists and restore their lost voices. These are distinct projects, intellectually, politically and emotionally. Of course, there are situations where, by their very presence, female practitioners challenge the status quo and/or take issue with gendered scientific assumptions and practices. But this does not necessarily occur, and has to be established case by case.<sup>18</sup>

Examinations of the theories and practices of women of science should not, therefore, be collapsed into gender history: this would be to replicate the ‘marked asymmetry beneath gender, evident in the way women were referred to as “the sex”’ in eighteenth-century anglophone literatures.<sup>19</sup> Nevertheless, gender (the term we now use to talk about femininities and masculinities) remains a key tool of analysis for understanding the social contexts of Enlightenment science, including the early formalisation of scientific disciplines and the kinds of participation available to and developed by men and women of various characters and identities.

Mary Terrall has highlighted the stark difference in the gendering of 'Parisian salons as sites of philosophical and literary production frequented by both men and women' and the male-dominated space of the Académie Royale des Sciences, in Paris, in which 'the exclusion of women from the membership rolls did not have to be formally stipulated'.<sup>20</sup> Even so, and as several of the articles here suggest, the ideas and practices of scientifically minded women permeated the walls of institutions in eighteenth-century Europe. The heterosocial quality and perceived social benefits of polite, domestic science were highly conducive to collaboration and exchange between the sexes (see Mary McAlpin's article).<sup>21</sup> Women established their own societies, and clubs with both male and female attendees combined scientific and political discussion with ideals of radical friendship.<sup>22</sup> The places (salons, universities, theatres, gardens, cabinets and museums), practices (observations, experiments, demonstrations and reviews) and communications (periodicals, epistles, meetings, lectures and illustrations) of science were diverse. And, of course, gender is only one determinant – in addition to class, vocation, ethnicity and faith – of whether people were granted access to scientific learning.

Examples of women with university degrees, such as Dorothea Christiane Erxleben of Quedlinburg and Dorothea Von Rodde-Schlözer of Göttingen, are exceedingly few. Although, as Schiebinger points out in her essay on the 'guild wife' astronomer Maria Winkelmann, craft traditions such as illustration 'fostered women's participation in science' in seventeenth-century Europe, they were 'counterbalanced by other trends, both old and new', including exclusion from universities and the new scientific academies.<sup>23</sup> Winkelmann, who published several astronomical pamphlets, sought official appointment at the Berlin Academy, at that time called the Königlich Preußische Sozietät der Wissenschaften, a livelihood that, after 'one and a half years of active petitioning', was finally refused to her in 1712.<sup>24</sup> For bourgeois and upper-class women, the privilege of a scientific education comparable to that of their male peers was usually dependent on the support of male relatives or husbands; and while many are known to have participated in domestic science, there are more cases than can possibly be listed here of unacknowledged collaborative work within families and social circles. The authorial attribution of scientific publications is frequently deceptive. The Danzig astronomer Elisabeth Hevelius, who worked alongside her much older husband, Johannes Hevelius, completed their impressive *Prodromus astronomiae* (1690) and published it under her husband's name after his death, though her importance as a collaborator is indicated by her depiction, working opposite Johannes, in the engraving of the Large Sextant in *Machina caelestis* (1673).

When the scientific work of women did receive recognition, it was not necessarily flattering. Caroline Herschel, who discovered several comets, received a stipend of £50 per year from 1790 for her work with her brother William Herschel, court astronomer to George III.<sup>25</sup> A print entitled *The Female Philosopher, Smelling out the Comet* (Fig. 2) shows a woman eagerly taking astronomical observations: the obvious target here is Herschel, but it also slights scientific women generally. By playing on the notional hierarchy of the senses, a female philosopher, it suggests, is incapable of achieving the vision crucial to Enlightenment empiricism. In return, nature revels in debasing her – the moon sniggers in collusion with the farting, cherubic Zeus. Discarded on the ground are a sextant and another scientific instrument, perhaps a mercury thermometer or barometer,<sup>26</sup> with a spermatic squiggle pointing between her legs. Her misidentification of the comet as a meteor confirms the insinuation of imbecility in the Female Philosopher's rapturous pose and blush at the 'strong sulphurous scent'. This is, of course, self-defeating: in its own sensory terms the print reeks of a vulgar sexism that, while noxious, is a blatant emission of insecurity in the face of scientific merit.



2. *The Female Philosopher; Smelling Out the Comet*, hand-coloured etching, 24.9 × 18 cm, published by R. Hawkins, Soho, London, 2 February 1790. Courtesy of the Draper Hill Collection, the Ohio State University and the Billy Ireland Cartoon Library and Museum, Columbus, OH

The perceived masculinity of scientific endeavour, of practical knowledge, of dedicated study and of experimental activity to the exclusion of feminine-associated 'feeling' persists in some form. In 1982 Elizabeth Fee proposed a 'radical feminist critique of science and technology [that] locates the problems not in women, but in the particular character of our production of scientific knowledge'. 'The problem', Fee argued, 'is not one of making women more scientific, but of making science less masculine. When masculinity is seen as an incomplete and thus distorted form of humanity, the issue of making science and technology less masculine is also the issue of making it more completely human.'<sup>27</sup> This does not necessarily entail total relativism about facts or an all-out rejection of the authority of science, but serves as a reminder that interrogating claims to scientific objectivity means looking to whom or what science serves.

As Heather Ellis has recently argued about nineteenth-century configurations of the 'man of science', neglecting to scrutinise such a cultural construction leaves normative suppositions about men's 'natural' fitness for science untroubled.<sup>28</sup> Earlier versions of this prominent figure require scrutiny too, and historians have now produced many studies of masculinity in eighteenth-century science (see Lisa Wynne Smith's contribution here).<sup>29</sup>

The transmission, in journals such as *Philosophical Transactions*, of practical and epistemological developments in natural philosophy generally derived from the perspectives of men within a polite, homosocial community in which careful self-fashioning was essential.<sup>30</sup> In the arts, prefigurings of the ‘man of science’ include the natural philosopher or demonstrator so arrestingly depicted by Joseph Wright of Derby in his *An Experiment on a Bird in the Air Pump* (1768; Fig. 3). With a gaze reminiscent of that given by Science and Nature in Blaes’s frontispiece, the aged experimenter demonstrates a vacuum by emptying the air from a glass containing an exotic cockatoo. The scene is domestic, affluent, intergenerational and, crucially, heterosocial. The coupling of young and old, female and male, is essential to the picture’s emotional, moral and intellectual tensions.<sup>31</sup> However, natural philosophers were not always portrayed in such a flattering light. Rather, both medical advice and satirical comment suggested that men committed to scientific study suffered feebleness, effeteness and general debility.<sup>32</sup> Scientific men throughout the eighteenth century had their masculinity regularly scrutinised.

Since Schiebinger wrote ‘The History and Philosophy of Women in Science: A Review Essay’, a great deal has changed regarding the participation of women in scientific and in historical scholarship.<sup>33</sup> But while gender proportions within some disciplines of STEM have shifted, some remain predominantly male even after years of university quotas and incentives, and new imbalances in scientific education and careers have arisen.<sup>34</sup> Too often, sex and gender remain essential and dividing qualities, if not in the science itself then in the media representation of science.<sup>35</sup> For the historically minded, such failings evoke little surprise as the complex social, cultural and political backdrop of gendered practices and perceptions frequently remain unaddressed. By looking to the origins of modern gender essentialism, scholars of the eighteenth century can help expose its faults and dismantle its harmful edifices. Through ‘denaturalizing differences and the norms that govern them’, as Anthony La Vopa observes, ‘we open the putatively unquestionable to fundamental critique, and we make a society and culture self-critical right down to its roots’.<sup>36</sup>



3. Joseph Wright of Derby, *An Experiment on a Bird in the Air Pump*, 1768, oil on canvas  
183 × 244 cm. © The National Gallery, London

## II. *The Science of the Sexes*

One of the most prominent topics of enquiry during the eighteenth century was generation, a subject that – in present-day terms – encompassed sexuality, reproduction and gender (see the articles by Karen Hollewand and Raymond Stephanson). Works about generation regularly addressed how the bodies of females and males differed. In their influential studies about the history of sexual dimorphism, Laqueur and Schiebinger respectively located difference in depictions of genitalia and bones. Both argued that eighteenth-century anatomy reflected social and political shifts towards a mutually defined dissimilarity between men and women.<sup>37</sup> These claims have since undergone much criticism, debate and revision, especially regarding the selection and interpretation of source material.<sup>38</sup> However, ensuing historical examinations of medical and scientific conceptions of sex difference have confirmed the eighteenth century as a formative period for such biological explanations.<sup>39</sup> This period had an abundance of anatomical representations of genitalia in visual forms – in dissections, prints and models – that slipped between the medically objective and the graphically erotic.<sup>40</sup>

The significance of scientific sex categories was not limited to men and women but was projected onto the grander scheme of things, colouring the whole order of nature, from the recently observed microbial world to the vast nomenclature of all living species (see Millie Schurch's article here about mycology). Even the new research into 'electric fire' was sexed; as the professor of mathematics Christian August Hausen (the younger) theorised, there was the '*male fire*, which is attended with crackling, and has a considerable force, and the *female fire*, which is a luminous emanation, without violence or percussion'.<sup>41</sup> Sex proved a useful and nearly universal lens for observing nature. However, the delineation of human sexual difference during the eighteenth century differed greatly from today's perspectives: lingering notions of humoralism allowed for such phenomena as menstruating men; the microscopic forms of female and male seed were relatively new observations and their respective qualities still generally unknown; early forms of developmental biology were just emerging with studies of gonad morphology in embryos; and, with hormone theory a distant future, sexual physiology was a matter of nerves, which seemed to differ more between classes than between genders.<sup>42</sup>

Natural philosophers and medical practitioners also took special notice of phenomena that seemingly disrupted systems of sexual division. Hermaphroditism was a prominent topic within early modern discussions of monstrosity and wonders, for example in publications like Jakob Rüff's *De conceptu et generatione hominis* (1554) and Ambroise Paré's *Des monstres et prodigies* (1573).<sup>43</sup> In the early eighteenth century the interest in human hermaphroditism continued as a form of curiosity – as exemplified by Iakov, a hermaphrodite and 'living exhibit' in Peter the Great's *Kunstkammer* who, after death, was dissected, preserved and put back on display.<sup>44</sup> However, hermaphroditism was also then a subject of learned debate related to embryological and sexual development, as instanced by a report by the Scottish man-midwife and physician James Douglas at the Royal Society about Constantia Boon, a hermaphrodite who was exhibited at fairs and coffee-houses in London,<sup>45</sup> and by publications such as Georges de Ronsil Arnaud's *A Dissertation on Hermaphrodites* (1750). Some of these publications, including James Parsons's *A Mechanical and Critical Enquiry into the Nature of Hermaphrodites* (1741), repudiated the very existence of these differently sexed bodies.<sup>46</sup> One revelation available from historiography about the scientific contestation of hermaphroditism is a shift in focus from questions of possibility within Nature to definitions of pathological categories.<sup>47</sup> In the first half of the nineteenth century the study of 'monstrous', 'wonderful', 'marvellous' and 'curious' forms led to

more discrete categories of developmental ‘abnormality’ and the establishment of biological teratology.<sup>48</sup>

As Anita Guerrini shows, eighteenth-century individuals who were exhibited as hermaphrodites – such as Constantia Boon and the unnamed, enslaved Angolan advertised in a broadside as ‘Female, Male, Moor, monster miracle of the world’ – were subjected to ‘invasive and at times painful’ examination by anatomists.<sup>49</sup> The genital organs of people who crossed gender boundaries and defied heteronormative expectations, such as Catterina Vizzani/Giovanni Bordoni, could also be exposed to rigorous anatomical scrutiny.<sup>50</sup> In the nineteenth century the conflict between medically designated sex in clinical contexts and an individual’s gender identity would result in personal histories of suffering and tragedy.<sup>51</sup> As Susan Stryker writes about transgender history, medicine has the power ‘to transform potentially neutral forms of human difference into unjust and oppressive social hierarchies’.<sup>52</sup> This later trend towards the pathologisation of difference in sexual morphology paved the way for experimental treatments and surgical interventions, which are now critically debated practices.<sup>53</sup> The eighteenth-century example gives important context to the modern history of sex determination and the continuing struggle to have rights and freedoms recognised for transgender, non-binary and intersex people.

There is a growing body of research on how sexual categories intersected with biological racism diachronically.<sup>54</sup> In examining the man-midwife and anatomist Charles White (1728–1813), a founding member of the Manchester Literary and Philosophical Society, Lisa Forman Cody argues that ‘knowledge about reproduction and obstetrics played a foundational role in the construction of racial and national differences’.<sup>55</sup> Another example is the above-mentioned Parsons, whose refutation of hermaphroditism included a section on the length of women’s clitorises in ‘*Asiatic*’ and ‘*African Nations*’.<sup>56</sup> Across medical and scientific fields, the long eighteenth century saw many attempts to categorise humans not just according to sex but also according to skin colour, skull size, facial characteristics and other physical differences. The relations between the sexes are central, for example, to Daniel Nikolaus Chodowiecki’s illustrations of Johann Friedrich Blumenbach’s five varieties of the human species in *Beyträge zur Naturgeschichte* (1790).<sup>57</sup> As is clear from the treatment and representation of Sara Baartman in the early nineteenth century, the sexualised exhibition of black women has a crucial bearing on the colonial roots of anthropology.<sup>58</sup> Indeed, white male voyeurism under the guise of science is satirised in Richard Newton’s print *The Full Moon in Eclipse* (1797). An imitation of *The Female Philosopher, Smelling out the Comet*, it shows a prurient white European man examining a grotesquely caricatured African woman through a telescope.<sup>59</sup> From these varied contexts, the articles comprising this special issue further explore and illuminate the many ways in which people understood sex in the eighteenth century.

The organisation of this special issue is roughly chronological. It is thematically fitting, however, that we begin with Karen Hollewand’s article on the study of sex as a concern of both natural and moral philosophy in the Dutch Republic c.1660–1730. Hollewand reveals how observations of generation on both microscopic and societal levels reflect the relatively progressive intellectual culture of that time and place. From comparisons between several Dutch experimenters and theorists we proceed to a focused examination of the esteemed physician and naturalist Sir Hans Sloane. As carefully detailed by Lisa Wynne Smith, the legacy of Sloane does not adequately recognise the significance of his masculine self-fashioning. Whether in medical training, aristocratic service, epistolary relationships or Royal Society disputes, Sloane dedicated ongoing care and attention to meeting expected standards of masculine character, and, by so doing, advanced his medical career and scientific reputation.

Also investigating the experiences and gendering of the middling sort, Karen Harvey explores men's and women's experiences of their bodies – their embodiment – in familial letters and diaries from 1726 to 1827. Harvey's analysis shows that, contrary to assumptions about the centrality of sex and gender to perceptions of embodiment, other factors, including religion, were fundamental to the ways individuals in non-medical contexts understood and talked about their bodies. Following Harvey's examination of lay language, Raymond Stephanson's article analyses three mid-century satires about artificial life. He demonstrates that these literary treatments not only evidence a deep, critical understanding of then new scientific developments, which he succinctly describes in a case-by-case fashion, but also reveal early generic characteristics of science fiction. Mary McAlpin continues the focus on literary treatments, with a close inspection of the medical theories about masturbation that underlie the narrative of Diderot's *Rêve de D'Alembert* (1769). As McAlpin explicates, dialogues in Diderot's text respond to medical ideas about female sexual desire and the need for intervention, especially when those desires go unrealised in young innocents. The question of innocence also appears in Elena Serrano's article on the improvement of Spanish female prisons by a charitable society of genteel women in the late eighteenth century. Serrano explores how this society used scientific theories, practical experiments and feminine technologies of moral and religious correction to implement several far-reaching penal reforms.

The final two articles return to England, to probe the social relations between scientific men and women. Millie Schurch examines the differently gendered approaches to mycological study in the Bulstrode circle, demonstrating how categorically resistant fungi at once posed problems for Linnaean taxonomy and provided opportunities for innovation in botanical practice and scientific self-fashioning. The final essay, by Jon Mee, addresses the literary and philosophical societies of northern England, c.1782–1831. Mee discusses what he terms the 'absent presence' of women in these societies, bringing to light processes of exclusion in institutions that nevertheless gained value from association with influential women such as Barbauld. From women's participation in scientific institutions, the private sexual lives of natural philosophers and the science of generation to Linnaean classification, embodied philosophies, erotic medicine and the sociological implications of scientific theory, eighteenth-century developments regarding the sexes and the sciences are seen here to be demonstrably entangled, lastingly influential and ready for reflection.

## NOTES

1. Gerard Blaes [Blasius], *Anatome animalium, terrestrium variorum, volatilium, aquatilium, serpentum, insectorum, ovorumque, structuram naturalem* (Amsterdam, 1681).

2. Pierre Hadot, *The Veil of Isis: An Essay on the History of the Idea of Nature*, trans. Michael Chase (Cambridge, MA: Harvard University Press, 2006), p.239. For the role of artisan engravers in constructing Science, see Pamela H. Smith, 'Art, Science, and Visual Culture in Early Modern Europe', *Isis* 97:1 (2006), p.83–100.

3. On this trope, see Ludmilla Jordanova, *Sexual Visions: Images of Gender in Science and Medicine between the Eighteenth and Twentieth Centuries* (Madison, WI: University of Wisconsin Press, 1989), p.87–110.

4. Jeremy M. Norman, 'An Interactive Annotated World Bibliography of the History of Medicine, Biology and Dentistry from circa 2000 BCE to circa 2010 by Fielding H. Garrison (1870–1935), Leslie T. Morton (1907–2004), and Jeremy M. Norman, Traditionally Known as "Garrison-Morton"', [www.historyofmedicine.com](http://www.historyofmedicine.com), 2008, entry no. 296 [accessed 26 February 2019].

5. While it has come to mean the 'union of the sexes', the predominant meaning of 'sex' in the eighteenth century, and the one to which this issue's title primarily refers, is the division of human-kind into male and female – the sexes. In some ways this encompasses present-day uses of 'gender' and the more biologically oriented 'sex'. See Raymond Williams, *Keywords: A Vocabulary of Culture and Society*, rev. edn (New York: Oxford University Press, 1983), p.283.
6. Andrew Cunningham, 'Getting the Game Right: Some Plain Words on the Identity and Invention of Science', *Studies in History and Philosophy of Science* 19:3 (1988), p.365-89.
7. Peter Dear, 'Religion, Science and Natural Philosophy: Thoughts on Cunningham's Thesis', *Studies in History and Philosophy of Science* 32:2 (2001), p.377-86.
8. Tita Chico, *The Experimental Imagination: Literary Knowledge and Science in the British Enlightenment* (Stanford, CA: Stanford University Press, 2018), p.5.
9. Colin Jager, *The Book of God: Secularization and Design in the Romantic Era* (Philadelphia, PA: University of Pennsylvania Press, 2007), p.4; Wayne Hudson, *The English Deists: Studies in Early Enlightenment* (London: Routledge, 2009), p.9-10.
10. See Londa Schiebinger, 'Feminine Icons: The Face of Early Modern Science', *Critical Inquiry* 14:4 (1988), p.661-91.
11. Gender goes unmentioned in Steven Shapin's 'History of Science and Its Sociological Reconstructions', *History of Science* 20:3 (1982), p.157-211. In contrast, it is a recurrent theme in Bernard Lightman (ed.), *A Companion to the History of Science* (Chichester: Wiley Blackwell, 2016).
12. Jordanova, *Sexual Visions*; Thomas Laqueur, *Making Sex: Body and Gender from the Greeks to Freud* (Cambridge, MA: Harvard University Press, 1990); Londa Schiebinger, *Nature's Body: Gender in the Making of Modern Science* (Boston, MA: Beacon Press, 1993).
13. See, for example: Carolyn Merchant, *The Death of Nature: Women, Ecology, and the Scientific Revolution* (San Francisco, CA: Harper & Row, 1980); Joan Kelly-Gadol, 'Did Women Have a Renaissance?', in Renate Bridenthal and Claudia Koonz (eds), *Becoming Visible: Women in European History* (Boston, MA: Houghton Mifflin, 1977), p.137-64; and Londa Schiebinger, *The Mind Has No Sex? Women in the Origins of Modern Science* (Cambridge, MA: Harvard University Press, 1989).
14. Evelyn Fox Keller, *Reflections on Gender and Science* (New Haven, CT: Yale University Press, 1985); Sandra G. Harding, *The Science Question in Feminism* (Ithaca, NY: Cornell University Press, 1986).
15. George E. Haggerty, 'Sexual Diversions', *Eighteenth-Century Studies* 37:1 (2003), p.123.
16. See Patricia Fara, *Pandora's Breeches: Women, Science and Power* (London: Pimlico, 2004).
17. There were exceptions, such as Charlotte Amalie Ernestine, duchess of Sachsen-Gotha-Altenburg, who participated in astronomical observations, communications and scientific meetings at the Gotha Observatory. See Dieter B. Herrmann, 'Das Astronomentreffen im Jahre 1798 auf dem Seeberg bei Gotha', *Archive for History of Exact Sciences* 6:4 (1970), p.326-44; Julia Burbulla, *Allumfassende Ordnung: Gartenkunst und Wissenschaft in Gotha unter Ernst II. von Sachsen-Gotha-Altenburg (1772-1804)* (Bern: Peter Lang, 2010), p.18-19.
18. Ludmilla Jordanova, 'Gender and the Historiography of Science', *The British Journal for the History of Science* 26:4 (1993), p.474.
19. Jordanova, 'Gender and the Historiography of Science', p.473-4.
20. Mary Terrall, 'Masculine Knowledge, the Public Good, and the Scientific Household of Réaumur', *Osiris* 30 (2015), p.182-3.
21. See, for example, Alice Walters, 'Conversation Pieces: Science and Politeness in Eighteenth-Century England', *History of Science* 35:2 (1997) p.121-54.
22. Fredrika J. Teute, 'The Loves of Plants; or, the Cross-Fertilization of Science and Desire at the End of the Eighteenth Century', *Huntington Library Quarterly* 63:3 (2000), p.319-45.

23. Londa Schiebinger, 'Maria Winkelmann at the Berlin Academy: A Turning Point for Women in Science', *Isis* 78:2 (1987), p.175. Winkelmann's married name was Kirch, and academic peers often referred to her as 'Kirchin'.
24. Schiebinger, 'Maria Winkelmann', p.188.
25. Mascha Hansen, 'Scientifick Wives: Eighteenth-Century Women between Self, Society and Science', in Ralf Haekel and Sabine Blackmore (eds), *Discovering the Human Life Science and the Arts in the Eighteenth and Early Nineteenth Centuries* (Göttingen: Vandenhoeck & Ruprecht, 2013), p.59.
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55. Lisa Forman Cody, *Birthing the Nation: Sex, Science, and the Conception of Eighteenth-Century Britons* (Oxford: Oxford University Press, 2005), p.238, 240.

56. Parsons, *A Mechanical and Critical Enquiry*, p.10-11.

57. According to Blumenbach, there were no sharp divisions; rather, varieties flowed into one another. Blumenbach did not make distinctions in terms of intellectual capacities of the varieties. His praise of Phyllis Wheatley is noted in Arlette Frund, 'Phyllis Wheatley: A Public Intellectual' in Mia Bey, Farrah J. Griffin, Martha S. Jones and Barbara D. Savage (eds), *Towards and Intellectual*

*History of Black Women* (Chapel Hill, NC: University of North Carolina Press, 2015), p.45-6. We are grateful to Dominik Hünninger and Demetrius Eudell for bringing Chodowiecki's illustrations to our attention.

58. See Stephen Jay Gould, *The Flamingo's Smile: Reflections in Natural History* (New York: W. W. Norton & Co., 1985), p.291-305; Yvette Abrahams, 'Images of Sara Bartman: Sexuality, Race, and Gender in Early-Nineteenth-Century Britain', in Ruth Roach Pierson, Nupur Chaudhuri and Beth McAuley (eds), *Nation, Empire, Colony: Historicizing Gender and Race* (Bloomington, IN: Indiana University Press, 1998), p.220-36.

59. For discussion of Newton's print in the context of British satirical culture and race, see Temi Odumosu, *Africans in English Caricature, 1769-1819* (London: Harvey Miller, 2017), p.113.

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