

Sybille Krämer – Jan Wöpking

Plenary Agenda Report for Research Group D-III-1

Diagrams

Members:

- Sybille Krämer (Philosophy, Freie Universität Berlin/Research Training Group: Notational Iconicity)
- Jan Wöpking (Philosophy, Freie Universität Berlin)

Keywords: Diagrammatics

- Knowledge Production
- Plato
- Oresme, Galileo
- Aristotle
- Geometry
- Physics

Abstract: *a) Topics and Objectives.* This research group investigates the history and theory of thinking with the help of diagrams. Diagrams are conceived as cognitive instruments which exploit spatial relationships paradigmatically in order to represent, analyze, and generate knowledge. We use the term »diagram« in both a narrow and in an extended sense: defined more narrowly, diagrams are schematic figures such as geometric constructions or chemical structural formulae; defined in an extended sense, the term may also refer to texts, charts, mathematical formulae, in short: all types of inscriptions upon a delimited surface which display diagrammatical aspects. The guiding presuppositions of our research are: (1) by means of spatial logics and topological orders, diagrams are preferred forms for representing *non-spatial*, theoretical relationships. (2) Diagrams do not display simple ›objects,‹ but instead *relationships* within a conceptual or knowledge field. (3) As a consequence, diagrams not only open up spaces of representation, but also *experimental, explorative, and operational* spaces, in many cases involving abstract, non-sensory, or ideational contents. Diagrams render theories susceptible to experience in sensory terms. (4) On the whole, the capacity for graphism may be ranged alongside the capacity for language as a universal anthropological trait. Against this horizon, our research project – whose orientation is epistemological and philosophical – pursues two problems. The first involves the basic contours of a general theory of diagrammatics and – starting from the ›cartographic impulse‹ embodied in Plato's parable of the line and in Ptolemy's ›handbook of geography‹ – an ›epistemology of the line‹ as a philosophical reconstruction of the implicit and explicit diagrammatical aspects of philosophical texts. The second problem involves the diagram as a cognitive artifact which is examined from historical and systematic perspectives.

b) Methods. Philosophical analysis of texts, case studies of individual thinkers and specific types of diagrams. *c) Current state of the discussion within the research group.* Basic concepts related to diagrammatics have been elaborated, central episodes in the Occidental theory of the diagram identified and analyzed, and central elements of a general theory of diagrammatic cognition developed. Planned for the future is on the one hand deepened work on historical case studies, and on the other the integration of the hitherto developed modules into a consistent, overarching theory.

Projects:

- »The Basic Contours of the General Theory of Diagrammatics« (Sybille Krämer)
- »Outline of an ›Epistemology of the Line‹ as a Philosophical Reconstruction of the Implicit and Explicit Diagrammatic Dimensions of Philosophical Texts with a Point of Departure in Plato's Parable of the Line« (Sybille Krämer)
- »Diagrams as Cognitive Artifacts in Historical and Systematic Perspectives« (Jan Wöpking)

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1 Results

1.1 Subproject 1 (Sybille Krämer)

Two hypotheses:

- 1) The graphic artifacts of diagrammatic inscriptions encompass a wide spectrum which alongside diagrams includes notations, charts, schemata, and maps. These forms constitute a graphic intermediate realm whose epistemological task is to mediate between perception and thought.
- 2) Plato's simile of the line is a ›diagrammatic primal scene‹ in two respects: manifest here on the one hand is a cartographic impulse which strives to furnish a ›world picture,‹ in the sense that Plato visualizes his ontology in the form of a linear schema. Regarded from the point of view of the history of ideas, there are links to Ptolemy's visualization of the world picture by means of projection methods, and in both cases, a point of view that is unavailable to the human eye (a bird's eye view, etc.) becomes cartographic. With its introduction of the distinction between the visible and the conceivable and at the same time its demonstration of the unbridgeable gap between the two, on the other hand, the parable of the line represents a decisive point of departure for the philosophical enterprise in Europe.

For a series of important philosophical thresholds which lie beyond Plato, we can also assume that diagrammatological reconstructions are capable of revealing hitherto unexamined aspects contained in the works of many philosophers (including Descartes/Leibniz, followed by Peirce/Frege/Wittgenstein, and finally Derrida/Deleuze).

A theory of the diagrammatic (the project »The Basic Contours of the General Theory of Diagrammatics«): with regard to *structure*, the *mode of spatiality* peculiar to the diagrammatic is describable as a ›topographic surface‹ upon which schematizations – which result from the interaction of surface, point, and line – lead a ›double life.‹ They are empirical markings which nonetheless function as non-empirical and exclusively conceptual entities. This double nature of the sensory/non-sensory within the homogenous space of the diagram is an artifice which enables the diagrammatic to behave like a hinge between concept and intuition. With regard to *function*, this ›topographic surface‹ makes possible epistemic actions (= movements of thought). To this extent, the diagrammatic is not only a form of representation or memorization of epistemic contents, but instead – and within the triad composed of eye, hand, and intellect – an explorative or demonstrative knowledge resource.

Reconstructions of philosophies (the project »Outline of an ›Epistemology of the Line‹ as a Philosophical Reconstruction of the Implicit and Explicit Diagrammatic Dimensions of Philosophical Texts with a Point of Departure in Plato's Parable of the Line«): with reference to Plato's simile of the line, it is possible to demonstrate *first* that the topological order of the line categorizes recognition itself as a spatial process of *ascension*, and *second* that it constitutes the parable as a statement about the use of illustrations as the indispensable and fertile soil for mathematical and concept-driven science.

1.2 Subproject 2 (Jan Wöpking)

The project »Diagrams as Cognitive Artifacts in Historical and Systematic Perspectives« adopts a systematic-historical perspective in order to investigate how we think through diagrams. Here, the special emphasis is on two fundamental questions:

- 1) How is geometric knowledge possible?
- 2) How can we employ geometric resources in order to think non-geometrical questions – e.g. topics in physics or economics?

The first question is discussed with reference to Kant's theory of mathematics. According to Kant, mathematical knowledge is not derivable from concepts alone. Intuition must be involved as well. If he wants to reflect upon the properties of a triangle, the geometrician must construct a triangle, for example a drawing on a piece of paper. But how can we be assured that the demonstration we have performed on the individual drawn triangle is true as well for all other possible, non-drawn triangles? And how can we avoid being deceived by intuition, avoid wrongly projecting onto the object of observation that which resides solely in our observations? Kant claimed to be able to clarify this problem with his theory of the *construction of concepts and perception*. This project strives to reconstruct the concept of construction and in particular to render it usable for general questions of diagrammatic and model-based knowledge.

The second basic question is investigated on the basis of the application of two-dimensional geometric figures used to represent and analyze qualitative natural processes in the Middle Ages (by Nicole Oresme) and in the modern period (by Galileo Galilei). Oresme's *doctrine of configuration* (1350s) is a trailblazing theory concerning the question of how non-geometrical content such as paths of motion or temperature distribution can be reflected upon by means of geometric figures, and the reasons for doing so. Oresme's ideas in particular can be traced to an appropriation of the Aristotelian philosophy of time (*Physics* IV). The works of Oresme, in turn, are at least indirectly formative for Galileo's physics, in particular his observations concerning the law of falling bodies. The much-discussed theme of the mathematicization of the world – anticipated in Oresme and attaining a striking form in Galilei – is reconstructed on the basis of the role played by diagrams in the thought of these two natural philosophers.

2 Publications

Krämer, Sybille. 2008. »Does the Body Disappear? A Comment on Computer Generated Spaces«. In Uwe Seifert – Jin Hyun Kim – Anthony Moore (eds.), *Paradoxes of Interactivity. Perspectives for Media Theory, Human-Computer Interaction, and Artistic Investigations*. Transcript: Bielefeld. 26–43.

Krämer, Sybille. 2008. »The Productivity of Blanks. On the Mathematical Zero and the Vanishing Point in Central Perspective. Remarks on the Convergences Between Science and Art in the Early Modern Period«. In Helmar Schramm – Ludger Schwarte – Jan Lazarding (eds.), *Instruments in Arts and Sciences. On the Architectonics of Cultural Boundaries in the 17th Century*. Berlin/New York: de Gruyter. 457–478.

Krämer, Sybille. 2009. »Gibt es maßlose Bilder?«. In Ingeborg Reichle – Steffen Siegel (eds.), *Maßlose Bilder. Visuelle Ästhetik der Transgression*. München: Fink. 17–36.

Krämer, Sybille. 2009. »Operative Bildlichkeit. Von der ›Grammatologie‹ zu einer ›Diagrammatologie‹? Reflexionen über erkennendes Sehen«. In Martina Hessler – Dieter Mersch (eds.), *Logik des Bildlichen. Zur Kritik der ikonischen Vernunft*. Bielefeld: Transcript. 94–123.

Krämer, Sybille. 2010. »Epistemology of the Line. Reflections on the Diagrammatical Mind«. In Olga Pombo – Alexander Gerner (eds.), *Studies in Diagrammatology and Diagram Praxis*. London: Kings College Publications. 13–39.

Krämer, Sybille. 2010. »Medien zwischen Transparenz und Opazität. Reflexionen über eine medienkritische Epistemologie im Ausgang von der Karte«. In Markus Rautzenberg – Andreas Wolfensteiner (eds.), *Hide and Seek. Das Spiel von Transparenz und Opazität*. München: Fink. 216–225.

Krämer, Sybille. 2010. »Notationen, Schemata, Diagramme: Über ›Räumlichkeit‹ als Darstellungsprinzip. Sechs kommentierte Thesen«. In Gabriele Brandstetter – Franck Hofmann – Kirsten Maar (eds.), *Notationen und choreographisches Denken*. Freiburg im Breisgau: Rombach. 27–45.

Krämer, Sybille. 2010. »Sprache, Stimme, Schrift. Über die implizite Bildlichkeit im Sprachgebrauch«. In Arnulf Deppermann – Angelika Linke (eds.), *Sprache intermedial: Stimme und Schrift, Bild und Ton*. Berlin/New York: de Gruyter. 13–28.

Krämer, Sybille. 2010. »Übertragen als Transfiguration oder: Wie ist die Kreativität von Medien erklärbar?«. *Zeitschrift für Medien- und Kulturforschung* 2, 78–93.

Krämer, Sybille. Forthcoming. »Diagrammatische Inskriptionen: Über ein Handwerk des Geistes«. In Horst Bredekamp – John Michel Krois (eds.), *Sehen und Handeln*. Berlin: Akademie Verlag.

Krämer, Sybille. Forthcoming. »Die Welt aus der Satellitenperspektive: Google Earth«. In Christoph Marksches – Peter Deufelhard – Jochen Brüning (eds.), *Atlas der Weltbilder*. Berlin: Akademie Verlag.

Krämer, Sybille. Forthcoming. »Punkt, Strich, Fläche. Von der Schriftbildlichkeit zur Diagrammatik«. In Sybille Krämer – Eva Cancik-Kirschbaum – Rainer Totzke (eds.), *Schriftbildlichkeit. Über Wahrnehmbarkeit, Materialität und Operativität von Notationen*. Berlin: Akademie Verlag.

Krämer, Sybille. Forthcoming. »Roots and Media of Computational Power. Some Remarks on the Genesis and Genius of Quantification in Early European Modernity«. In Gabriele Gramelsberger (ed.), *From Science to Computational Sciences. Studies in the History of Computing and Its Influence on Today's Science and Society*. Zürich/Berlin: Diaphanes.

Krämer, Sybille. Forthcoming. »The ›Eye of the Mind‹ and the Eyes of the Body: Descartes and Leibniz on Truth, Mathematics and Visuality«. In Friedrich G. Barth – Patrizia Giampieri-Deutsch – Hans-Dieter Klein (eds.), *Sensory Perception. Mind and Matter*. Wien/New York: Springer.

Krämer, Sybille. Forthcoming. »Zwischen Anschauung und Denken. Überlegungen zur epistemologischen Bedeutung des Graphismus«. In Joachim Bromand – Guido Kreis (eds.), *Was sich nicht sagen lässt. Das Nicht-Begriffliche in Wissenschaft, Kunst und Religion*. Berlin: Akademie Verlag.

Wöpking, Jan. 2010. »Logoklasmus? Konrad Fiedler über Sprache und Sichtbarkeit«. In Cornelia Temesvari – Roberto Sanchiño Martínez (eds.), *Wovon man nicht sprechen kann... Ästhetik und Mystik im 20. Jahrhundert. Philosophie – Literatur – Visuelle Medien*. Bielefeld: Transcript. 175–204.

Wöpking, Jan. 2010. »Space, Structure, Similarity. On Representationalist Theories of Diagrams«. In Olga Pombo – Alexander Gerner (eds.), *Studies in Diagrammatology and Diagram Practice*. London: College Publications. 39–56.

3 Events

In October 2008, the interdisciplinary DFG research training group *Notational Iconicity: On the Materiality, Perceptibility, and Operativity of Notation* presented its research to 15 doctoral candidates at the Institute for Philosophy. Sybille Krämer is the group's spokesperson. The associate spokesperson is Eva Cancik-Kirschbaum. Six doctoral candidates and three postdocs are working on topics which could be characterized as »diagrammaticological«. In winter semester 2008/2009, the lecture series: *Schrift, Schriftgebrauch, Schriftreflexion* (Writing, the Practice of Writing, Reflections on Writing) took place in collaboration with the research training group and in particular with Eva Cancik-Kirschbaum. In summer semester 2009, the lecture series: *DarstellungsRäume: Schrift Bild Tanz Klang* (Spaces of Display: Text Image Dance Sound) was organized in collaboration with Topoi and the research training group and with Eva Cancik-Kirschbaum and Rainer Totzke as co-organizers. These lectures will be published in a volume entitled *Schriftbildlichkeit* (Akademie Verlag/Berlin 2011). On October 29–30 the workshop *Diagramm und Diagrammatik* took place, organized by the research training group. The speakers discussed their research in various fields, such as art history and the history of science. Gerhard Dirmoser (Linz), who is in possession of one of the largest collections worldwide of (reproduced) diagrams, presented key samples of his collection. On June 16, 2010, Prof. Sun-Joo Shin (Yale University) gave a lecture on the topic *The Forgotten Individual: Diagrammatic Reasoning in Mathematics*, with a concluding workshop. This was organised in collaboration with the research training group *Notational Iconicity*.

The *Diagrammatic Study Group* has met on a regular basis since spring 2009. Participants included – alongside Sybille Krämer and Jan Wöpking – a number of Topoi members and external researchers. The group established itself as a wide-ranging forum for diagrammaticological questions in the broadest sense. The group promotes the integration of the to some extent heterogeneous research which is being conducted by Topoi.

In summer semester 2009, renowned Peirce expert Professor Frederik Stjernfelt (Aarhus University) was a Topoi fellow working on *Diagrammatology*.

In winter semester 2009/2010, Sybille Krämer delivered a public lecture entitled *Das Auge des Denkens. Visuelle Epistemologie am Beispiel der Diagrammatik* (The Eye of Thought: Visual Epistemology with Reference to Diagrammatics).

Jan Wöpking collaborated with Janne Arp (Egyptology; former fellow with Topoi, presently Göttingen University) to organize the symposium *Bilder vom Nirgendwo. Über Utopie und Kartographie*, June 11–12, 2010 at the Topoi Haus of the Freie Universität Berlin.

The research group collaborated with the research training group *Notational Iconicity* to organize a workshop on the topic *Warum Diagrammatik? Was will, kann, und soll die neue Disziplin?*, which took place on July 2–3, 2010.

4 Externally Funded Projects

The DFG provided a research grant to support one year of research by Sybille Krämer (October 2010 – September 2011).

5 Citation

Sybille Krämer – Jan Wöpking, »Plenary Agenda Report for Research Group D-III-1 ›Diagrams‹.«
In Friederike Fless – Gerd Graßhoff – Michael Meyer (eds.), *Reports of the Research Groups at the Topoi Plenary Session 2010*. eTopoi. Journal for Ancient Studies, Special Volume 1 (2011).
<http://journal.topoi.org>.