



MAX-PLANCK-GESELLSCHAFT

MAX-PLANCK-INSTITUT FÜR WISSENSCHAFTSGESCHICHTE

Max Planck Institute for the History of Science

# Research Report 2015–2017







Horoscope of Prince Iskandar, grandson of Tamerlane, the Turkman Mongol conqueror. This horoscope shows the position of the heavens at the moment of Iskandar's birth on April 25, 1384. Wellcome Collection.

**MAX-PLANCK-INSTITUT FÜR WISSENSCHAFTSGESCHICHTE**

Max Planck Institute for the History of Science

# Research Report 2015–2017



# Introduction

The Max Planck Institute for the History of Science (MPIWG) was founded 25 years ago, as one of the 18 new institutes of the Max Planck Society in unified Germany. The history of science had for some time been a desideratum in the Max Planck Society, but earlier attempts to create a research institute had been unsuccessful. In the Federal Republic of Germany, the history of science was taught at merely a handful of universities; in the German Democratic Republic, however, the field was represented prominently, including in the Academy of Sciences. Internationally, the field had become increasingly significant as the point of intersection between the natural sciences, the social sciences, and the humanities. In the 1980s and 1990s, its potential to reflect on science in its cultural and social contexts made the history of science a forum for intense discussions about the place of science in modern societies. Insights from cultural history, philosophical epistemology, psychology, sociology, anthropology, and cognitive science had enriched an already highly interdisciplinary discipline. The decision of the Max Planck Society to create a new institute thus came at the right moment.

The founding directors, Lorenz Krüger, Lorraine Daston, and Jürgen Renn, contributed different backgrounds and research agendas. The Institute was to become a pluralistic place, fostering investigations of the development of many sciences in many times and places from many perspectives and using many approaches. The subject of these investigations was not to be a particular discipline or epoch, but rather science and technology in their manifold forms of existence, always conceived as being deeply embedded in their historical contexts. Dedication to rigorous historical inquiry came first and foremost, but research was also informed by reflections on how understanding past science might help meet present challenges.

Tragically, Lorenz Krüger, who had been deeply involved in the planning of the new institution, became seriously ill and died before he could begin work at the new Institute. He very generously bequeathed his library, which has since become a lasting commemoration of his decisive role in the founding and conception of the Institute. The two remaining directors took up their positions in March 1994 (Jürgen Renn) and in January 1995 (Lorraine Daston) in the premises of the Czech Embassy in Berlin Mitte, which served as a preliminary home for the Institute. They were joined by Hans-Jörg Rheinberger as a third director in 1997. In addition to the three departments headed by the directors, the Institute has hosted twelve independent Research Groups since its founding, as well as two Partner Groups in China (at the Chinese Academy of Sciences and at Capital Normal University, Beijing). Since 2006, the Institute has resided in its own building in Berlin Dahlem.

Over the years, the Institute has built up a large and diverse international community around its research projects, which have included “The Structure of Practical Knowledge,” “Sciences of the Archive,” and “The Experimentalization of Life.” It has also

succeeded in promoting the history of science in Berlin. New chairs have been created at all three Berlin universities; the Institute's Research Group Leaders have taken up temporary professorships at the Berlin universities, parallel to their research activities at the MPIWG; and common endeavors are being pursued under the aegis of the Berlin Center for the History of Knowledge, which has closely integrated research and teaching in Berlin since its beginnings in 2006. After the retirement of Hans-Jörg Rheinberger, Dagmar Schäfer was appointed director of Department III, reorienting the department toward the history of technology and material culture, especially in East Asia. As an external member of the Institute since 2012, Glenn W. Most (Scuola Normale Superiore, Pisa) has played an active role in the Institute's collaborative research, as has Gerd Graßhoff (Humboldt University, Berlin), a Max Planck Fellow since 2016.

In addition to its three main departments, the Institute is home to a varying number of independent research groups. The current groups are headed by Elaine Leong, Viktoria Tkaczyk, Alexander Blum, and Katja Krause (starting November 2018). The Institute has also hosted major independent research programs funded by the Max Planck Society: first the Program for the History of The Kaiser-Wilhelm Society under National Socialism (1997–2007), and now the Research Program for the History of the Max Planck Society (2014–2022), headed by Jürgen Kocka, Carsten Reinhardt, Jürgen Renn, and Florian Schmaltz. Within the Max Planck Society, the Institute is part of the Human Sciences Section and plays a notable role in building bridges between the natural sciences and the humanities.

The period covered by this report saw several major innovations, among them the rapid growth of the new department headed by Dagmar Schäfer and the consolidation of the Berlin Center for the History of Knowledge with a postdoctoral program (jointly funded by the Max Planck Society and the Berlin universities), as well as joint workshops, lecture series, and courses. The Institute's cooperation with universities has expanded to include teaching opportunities for early-career scholars at Indiana University Bloomington, the University of Chicago, Tel Aviv University, the University of Sydney, and Bard College Berlin. In cooperation with a number of international societies in the history of science and technology, the Institute has sponsored translations of key texts of the history of science from English into Chinese and vice versa, published in both languages in the form of a reader. Through this initiative, as well as its ongoing research projects, the Institute strives to be a center for dialogue between cultures and disciplines.

Dr. Ohad Parnes was appointed in February 2015 as the new Research Coordinator, curating internal exchanges within the Institute and fostering the development of common research themes. The Institute's colloquium has a new format, now combining lectures with workshops under a thematic focus. Esther Chen became the Head of the Library in April 2015, and, in cooperation with Dagmar Schäfer and her department, has overseen the expansion of the library's collection of non-European materials, as well as its increasing global engagement with digital sources and information management. With two additional IT positions granted following the evaluation and recommendation by the Scientific Advisory Board, the Institute is now in the position

to adequately support its IT-heavy research projects, and to consolidate and strengthen its leading position in the digital humanities. With its journalist-in-residence program, organized by Hansjakob Ziemer (Head of Cooperation and Communication), the Institute has not only achieved international media visibility, building on its well-established scholarly reputation, but has also contributed to addressing the urgent need for a reflective and occasionally critical dialogue between science and the public. By the end of 2017, the Institute had relaunched its website to make its research more accessible to scholars and the general public worldwide.

Twenty-five years after the Institute's foundation, the Institute sees itself as both a participant in and analyst of the far-reaching changes driven by science and technology. The digital transformation of all areas of life, climate change, shifting power balances, the fragility of democracies, and the menaces to the openness and freedom of science in many countries are only some of the current global developments that demand new responses, including a continuing debate on the role of science in society, politics, and the economy. The long historical and broad geographic perspective offered by the history of science and knowledge offers a rare resource for reflection on these challenges.





## Table of Contents

- 10 Structure and Organization of the Institute
- 11 Department I Structural Changes in Systems of Knowledge (Jürgen Renn)
- 12 Department II Ideals and Practices of Rationality (Lorraine Daston)
- 13 Department III Artifacts, Action, Knowledge (Dagmar Schäfer)
- 14 External Scientific Member Glenn W. Most
- 14 Max Planck Fellow Gerd Graßhoff
- 14 Emeritus Scientific Member Hans-Jörg Rheinberger
- 15 Max Planck Research Groups
- 16 Research Services, Coordination, and Administration

- 19 Department I DIRECTOR Jürgen Renn

### Structural Changes in Systems of Knowledge

- 21 Introduction
- 24 Global Perspectives of Knowledge
- 34 The Long-term Evolution of Mechanical Knowledge
- 42 Cosmological Knowledge from the Middle Ages to the Eighteenth Century
- 50 Rethinking Basic Science
- 60 Historical Theories of Knowledge
- 65 Knowledge in and of the Anthropocene
- 75 Digital and Computational History of Science
- 82 Publications

- 121 Department II DIRECTOR Lorraine Daston

### Ideals and Practices of Rationality

- 123 Introduction: The Long View
- 127 Science, History of Science, and Modernity
- 129 The Sciences of the Archive
- 147 Between the Natural and the Human Sciences
- 164 Gender Studies of Science
- 169 Science in Circulation: The Exchange of Knowledge, 9th–17th Centuries
- 178 Pre- and Postdocs
- 181 MPG Minerva Research Group: Reading and Writing Nature in Early Modern Europe
- 191 Publications

215 **Department III** DIRECTOR Dagmar Schäfer

### Artifacts, Action, Knowledge

217 Research Agenda

220 Overviews of the Reporting Period

229 Histories of Planning

230 The Art of Judgement

238 Scale and Scope

245 The Body of Animals

250 Infrastructural Research Initiatives, Sources in Sciences' Histories (IRISSH)

262 Individual Projects

279 Publications

289 **External Scientific Member** Glenn W. Most

293 **Max Planck Fellow** Gerd Graßhoff

301 **Emeritus Scientific Member** Hans-Jörg Rheinberger

311 **Max Planck Research Group** RESEARCH GROUP LEADER Viktoria Tkaczyk

### Epistemes of Modern Acoustics

313 Introduction

315 Testing Hearing

321 Betwixt and Between: Sound in the Humanities and Sciences

328 Sound Objects in Transition

333 Sound & Science: Digital Histories

338 Publications

343 **Max Planck Research Group** RESEARCH GROUP LEADER Alexander Blum

### Historical Epistemology of the Final Theory Program

347	<a href="#">Max Planck Research Group</a>	RESEARCH GROUP LEADER Katja Krause
	Experience in the Premodern Sciences of Soul and Body, ca. 800–1650	
351	<a href="#">Max Planck Research Group</a>	RESEARCH GROUP LEADER Sabine Arnaud
	The Construction of Norms in 17th- to 19th-Century Europe and the United States	
357	<a href="#">Max Planck Research Group</a>	RESEARCH GROUP LEADER Vincenzo De Risi
	Modern Geometry and the Concept of Space	
363	<a href="#">Research Services</a>	
363	<a href="#">Library</a>	
373	<a href="#">Digital Humanities</a>	
381	<a href="#">Cooperation and Communication</a>	
381	<a href="#">Berlin Center</a>	
386	<a href="#">Outreach</a>	
399	<a href="#">Joint Activities</a>	
408	<a href="#">Obituaries</a>	
410	<a href="#">Overviews 2015–2017</a>	
410	<a href="#">Workshops and Conferences</a>	
417	<a href="#">Academic Achievements, External Activities, and Collaborations</a>	
429	<a href="#">Preprints</a>	
432	<a href="#">Index</a>	

## Structure and Organization of the Institute

### Scientific Advisory Board

*Markus Asper*

Institut für Klassische Philologie, Humboldt-Universität zu Berlin, Germany

*Fabio Bevilacqua* (Chair)

Dipartimento di Fisica “A. Volta,” Università degli Studi di Pavia, Italy

*Angela N. H. Creager*

Department of History, Princeton University, USA

*Mareile Flitsch*

Völkerkundemuseum der Universität Zürich, Switzerland

*Beatrice Gruendler*

Seminar für Semitistik und Arabistik, Fachbereich Geschichts- und Kulturwissenschaften, Freie Universität Berlin, Germany

*Shigehisa Kuriyama*

Department of East Asian Languages, Harvard University, Cambridge, USA

*Martin Mulsow*

Forschungszentrum Gotha der Universität Erfurt, Germany

*Peter C. Perdue*

Department of History, Yale University, New Haven, Connecticut, USA

*Dominik Perler*

Institut für Philosophie, Humboldt-Universität zu Berlin, Germany

*Ana Simões*

Secção Autónoma de História e Filosofia das Ciências, Universidade de Lisboa, Portugal

*Karin Zachmann*

School of Education, Technische Universität München, Germany

## Department I

# Structural Changes in Systems of Knowledge

DIRECTOR Jürgen Renn

The work of Department I is dedicated to understanding the historical processes of structural changes in systems of knowledge. This goal comprises the reconstruction of central cognitive structures of scientific thinking, the study of the dependence of these structures on their experiential basis and on their cultural conditions, and the study of the interaction between individual thinking and institutionalized systems of knowledge. This theoretical program of an historical epistemology is the common core of the investigations and research projects pursued and planned by the Department. The projects range from ancient technologies to contemporary science, and include longitudinal studies and research undertaken on the globalization of knowledge. One current focus of the Department's investigations is a history of the knowledge relevant to pathways into the Anthropocene. The Department contributes to the development of computational humanities, in particular to new methods for the analysis of historical networks, and machine learning applied to historical sources.





## Department II

# Ideals and Practices of Rationality

DIRECTOR Lorraine Daston

Department II studies the history of scientific reason. Its topics are categories, concepts, and practices that are fundamental to modern science and culture—so fundamental that they seem to transcend history: evidence, proof, objectivity, observation. Because the hidden histories of these taken-for-granted topics only become visible when contexts vary, most projects have a comparative dimension, spanning many centuries, several cultures, and/or multiple disciplines. The Department's most recent major project, *Sciences of the Archive*, examines the memory of the sciences: how data is collected, classified, stored, and accessed, as well as the changing meaning of "data" in the human and natural sciences, including astronomy, climatology, history, geology, and philology. A new project on *Science and Modernity* asks about the relationship between modern science and other aspects of modernity, such as industrialization, democratization, or secularization, from a global perspective.



## Department III

# Artifacts, Action, Knowledge

DIRECTOR Dagmar Schäfer

Department III studies historical epistemologies of action. Within the research theme Histories of Planning, the focus is on the processes and structures that lead to varying configurations of collaborative and individual bodies of knowledge. The Department's second research theme, The Body of Animals, is developing investigations into the changing role of artifacts—texts, objects, and spaces—in the creation, diffusion, and use of scientific and technological knowledge. Individual projects are supplemented by Working Groups dedicated to gathering together scholars interested in specific issues within larger themes at different levels of detail.



## External Scientific Member



Glenn W. Most

## Max Planck Fellow



Gerd Graßhoff

## Emeritus Scientific Member



Hans-Jörg Rheinberger

## Max Planck Research Groups

### Epistemes of Modern Acoustics

RESEARCH GROUP LEADER Viktoria Tkaczyk (2015–2020)



### Historical Epistemology of the Final Theory Program

RESEARCH GROUP LEADER Alexander Blum (2018–2023)



### Experience in the Premodern Sciences of Soul and Body, ca. 800–1650

RESEARCH GROUP LEADER Katja Krause (2018–2023)



### The Construction of Norms in 17th- to 19th-Century Europe and the United States

RESEARCH GROUP LEADER Sabine Arnaud (Ended October 2016)



### Modern Geometry and the Concept of Space

RESEARCH GROUP LEADER Vincenzo De Risi (Ended September 2016)



## Research Services, Coordination, and Administration



### Research Coordination

RESEARCH COORDINATOR Ohad Parnes



### Cooperation and Communication

HEAD Hansjakob Ziemer



### Library

HEAD Esther Chen



### Digital Humanities

RESEARCH TECHNOLOGY OFFICER Florian Kräutli



### Administration

HEAD Claudia Paaß







Department I

# Structural Changes in Systems of Knowledge

DIRECTOR Jürgen Renn



Guests and members of Department I



Tapestry: Astronomy, from the Great Mogul series, Beauvais manufacture, 1722–1732. Inv.Nr. BSV.WA0140. Bamberg, Neue Residenz mit Rosengarten, Room 10 ©Bayerische Schlösserverwaltung, Rainer Hermann / Maria Scherf / Andrea Gruber, Munich.

## Introduction

Department I continues to pursue its research on structural changes of systems of knowledge, both with a *longue durée* perspective and against the background of global history. Scientific and technological knowledge is conceived of as part of broader knowledge traditions, involving practical experiences as well as locally situated knowledge. All research endeavors take into account the mental, material, and social dimensions of knowledge systems. The overall aim is to understand historical changes in scientific and technological knowledge in the context of a larger, global history of knowledge. Historical investigations are complemented with efforts to conceptualize this larger history in terms of a historical epistemology that moves beyond mere taxonomy and seeks explanations for such phenomena as the stability or instability of knowledge systems, their changes in intercultural transmission processes, and their restructuration in response to new challenges.

From this novel perspective, the research projects of the Department have tackled some of the canonical topics of the history of science, such as the emergence of science in antiquity, the so-called Scientific Revolution of the early modern period, and the “revolutions” of science in the nineteenth and twentieth centuries. But the research has gone significantly beyond traditional borders, extending the perspective beyond classical antiquity to Babylonian science, broadening the view from Europe to include Chinese, Indian, and Arabic science, and reexamining modern science by combining epistemological analysis with global-scale studies of its institutional and



political contexts. New fields have come into focus, such as the history of anthropology or the history of the earth sciences. The *longue durée* and global character of our framework has encouraged us to delve even more deeply into the history of knowledge, investigating major innovation processes in Bronze Age civilizations, knowledge exchange in the world of post-antiquity and the Iberian colonial world, or the role and consequences of hybrid experts during times of industrialization. Major book publications and articles published in prominent journals have been dedicated to these achievements.

The emerging overall picture points to science and technology taking on, in a millennial process, an increasingly decisive role in shaping not only our civilization but also our planet. This impression was pointedly formulated by the Nobel Prize winner Paul Crutzen as the claim that we have entered the Anthropocene, a new period of earth history that has been profoundly shaped by the human global impact on practically all dimensions of the earth system, the climate, as well as the lithosphere, hydrosphere, and biosphere. Have humans created a new sphere of the earth system: the technosphere? When did the Anthropocene actually begin and what social, cultural, and epistemic dynamics were responsible for it? These are some of the questions currently at the heart of the Department's new research endeavors. This shift of emphasis has also given new meaning to some of the research long undertaken by the Department's more established projects. How are the dynamics of knowledge production and circulation affected by societal contexts and in turn how do they drive economic and cultural developments? What role has knowledge played in shaping the formation of worldviews and what makes them convincing? How and why do fundamental scientific concepts change? These and other questions have been central also to ongoing research projects on the long-term evolution of mechanical and cosmological knowledge, the latest results of which are reported here.

The report outlines the major research projects of the Department, beginning with recent work on global perspectives on knowledge, then moving to the projects on the development of mechanical and cosmological knowledge from the ancient world to the Renaissance. Major progress has been made in studying the mechanisms that drive the transformations of basic science, in particular, its accelerated expansion during the Cold War period due to a combination of economic, political, institutional, and epistemic factors. New insights into the complex fabric of the so-called quantum revolution are also reported here. The transformations of basic and applied science since the end of the nineteenth century have been accompanied by reflections on the social and philosophical meaning of science. Various research endeavors of the Department deal with these reflections, taking them as a source of inspiration for developing a historical theory of knowledge evolution that aims to overcome the split between rationalistic and historicist accounts that continue to characterize current debates. The most recent major research project presented here deals with the history of knowledge in and of the Anthropocene. All of our research relies on the resources and methods of digital humanities, which are presented in the final part of this report. With contributions by the Department, the field of digital humanities has evolved into computational humanities, which explores new interfaces between traditional and computerized methods of historical scholarship. The focus has shifted

from building digital libraries to digital publishing, and includes interactive facilities and data publication. Our activities have been sponsored with a major grant from the Federal Ministry for Research and Education. Several projects have engaged in transforming social network analysis into historical network analysis, in developing GIS and semantic web technologies, and in exploring the potential of machine learning for a history of knowledge.

International and national collaborations, also in the context of third-party funded projects, have augmented the activities of the Department. The history of ancient knowledge is pursued in the context of the Excellence Cluster TOPOI and the Berliner Antike Kolleg, and a new framework, funded by the Einstein Foundation, has been established for projects dealing with the history of time. The perspective on antiquity was profoundly influenced by a decade of collaborations within the Collaborative Research Center “Transformations of Antiquity,” which has now concluded. Research within the Collaborative Research Center “Episteme in Motion” continues, with an emphasis on the concept of knowledge economies, which was coined in the Department. The intense collaboration with the Haus der Kulturen der Welt on the Anthropocene Curriculum Project has meanwhile found global resonance and serves as a model for similar projects involving scholars, artists, politicians, students, and civil society on virtually all continents. The long-term collaboration with the Institute for the History of Exact Sciences of the Chinese Academy of Science has resulted in the foundation of an international journal serving as a new platform to disseminate the work of Chinese and international scholars in the English language. A new Max Planck Partner Group has been set up jointly with Beijing National University.

The Department has been instrumental in creating a Europe-wide network of institutions interested in Renaissance scholarship. One of its achievements is the creation of a new center for Telesio studies at the University of Calabria. Together with the Museo Galileo in Florence, the group is currently preparing events to celebrate the Leonardo Year 2019. Strong collaborations also connect the Department with various institutions in Israel, including a newly created exchange program with Tel-Aviv University. Guest scholars and postdoctoral students from all over the world, in particular from Latin America, have taken part. The establishment of a large, independent research program dedicated to the history of the Max Planck Society resulted from an earlier initiative by the Department; it offers new opportunities for collaboration, especially in the areas of recent science and novel research technologies. This collaboration is particularly relevant to the Department’s future plans to more closely investigate the intertwinement of societal and epistemic dynamics of science. This is part of a larger quest to understand the global transformation processes that have brought us into the Anthropocene.

## Research Theme

## Global Perspectives of Knowledge

Globalization can be traced back to the beginnings of human history. Its processes typically involve several layers, such as the migration of populations, the spread of technologies, and the dissemination of languages, religious ideas, or political and economic structures. Several investigations have been dedicated to studying the global history of knowledge. These investigations are united by a common epistemological framework that makes use of a classification of different forms of knowledge and different forms of representation, as well as of transmission and transformation processes, and the role of this framework in interrelating these different layers.

## Atlas of Innovations



The entry page of the Digital Atlas of Innovations (<https://atlas-innovations.de>).

A comprehensive representation of technological innovations in the ancient world has been developed and was made publicly available in 2017 as the *Digital Atlas of Innovations* (<https://atlas-innovations.de>). This online tool, which integrates and provides open access to a large range of data and supports new types of research, has been developed in view of the many unconnected collections of data about archaeological finds relevant for a global history of knowledge. The first appearances of important innovations over broad geographical areas have been recorded. Whereas rich collections of data already exist for some innovations, such as the use of copper and gold, or such pottery techniques as the wheel and furnace, other innovations, for example balances and weights or the use of silver, are much less documented. Archaeological, iconographical, and (where applicable) literary evidence has been collected and enhanced for the following key technologies of the fourth and early third millennium BCE: wheel and wagon, plow, silver and lead extraction, halberds, copper alloys, balances, glass, flint daggers, swords, and domesticated donkeys. The underlying approach has been outlined in *The Digital Atlas of Innovations (eTopoi, 2016)* (Jochen Büttner, Svend Hansen, Florian Klimscha, Jürgen Renn).

Research questions addressed include where, when, and why some innovations prevail, which regions do not adopt certain developments, or only belatedly, and where innovations, after an initial phase, disappear again. Based on this approach, the innovation process governing the deployment of the technical exploration of animal traction and the wheel has been investigated and the results published as “Transforming Technical Know-how in Time and Space: Using the Digital Atlas of Innovations to Understand the Innovation Process of Animal Traction and the Wheel” (*eTopoi*, 2017). This paper argues that experimentation with the use of animal traction started as early as the late sixth millennium BCE. However, it was the significantly better-connected networks established during the early fourth millennium that enabled the innovation-diffusion of the wheel from the Black Sea to the Baltic areas.

The theme of innovation was discussed in three related conferences. The results will be published as *From Artificial Stone to Mass-Produced Translucence. Use and Production of Glass in Bronze Age and Antiquity*. A German book publication summarizing some of the results, *Innovationen der Antike*, is now in print with Zabern Verlag.

## The Origin of Theoretical Science in Ancient China

While all ancient societies produced artifacts from which one can infer the practices and knowledge associated with them, few witnessed an emergence of theoretical knowledge from reflections on practical and elementary experiences. Of particular interest are experiences related to orientation in space and time and the handling of such cultural artifacts as mechanical and optical devices. While reflections on such experiences are well known in ancient Greek society, a parallel case in Chinese antiquity is much less familiar. Roughly at the same time as the writings of Aristotle, Euclid, and Archimedes, but probably independent of them, there is one particular document, the so-called *Mohist Canon*, a Chinese source from around 300 BCE contained in the Mohist corpus, that documents this type of reflection.

A book on *Theoretical Knowledge in the “Mohist Canon”* is nearing completion. It contains a new annotated English translation of the 68 sections that deal with matters of mechanics, optics, and spatial relations, as well as commentaries and interpretative chapters that deal, in particular, with the position of the *Mohist Canon* in the wider context of a global long-term history of knowledge.

Later Mohist science can be viewed as an independent emergence of a particular type of theoretical knowledge, and by way of comparison with the Greek case, the defining characteristics of the rise of theoretical science can be distinguished from contingent ones. One such characteristic consists in the shared interest in paradoxical mechanical or optical phenomena. At the same time, the discursive backgrounds against which

the paradoxes are resolved differ widely, yielding distinct patterns of explanation and the emergence of diverging theoretical terms (William G. Boltz, Matthias Schemmel).

## The Encounter of Two Systems of Knowledge in Seventeenth-Century China

Despite the striking parallels between ancient Chinese and Greek theoretical knowledge, their subsequent histories turned out very differently. The Later Mohist knowledge tradition appears to have vanished less than a century after it flourished, while the revival of Greek science in the Renaissance became one of the starting points for the Scientific Revolution. When comprehensive theoretical knowledge about subjects such as mechanics, optics, and astronomy was brought to China between the sixteenth and the eighteenth centuries, it did not cause a similar transformation of the Chinese knowledge system and society.

The transmission of European science to China in the seventeenth century came about through the partial alignment of the ambitions of Jesuit missionaries in China and Chinese scholar-officials. The texts produced in this context were therefore jointly shaped by the diverging agendas and intellectual traditions of these two groups. The

Transmission of engineering knowledge: a treadmill in the *Qiqi tushuo* from 1627 (left) and in Agostino Ramelli's *Le Diverse et artificiose machine*, 1588 (right).



first Chinese book on Western mechanics in the Chinese language, *Yuanxi qiqi tushuo luzui* (a record of the best illustrations and explanations of remarkable machines from the Far West), compiled and written by the German Jesuit Johann Schreck and the Chinese scholar Wang Zheng and published in 1627, documents this combination of different influences in the field of mechanics and machine building. A scholarly translation of this text into English with a thorough analysis of its sources has been completed and will be published as a commented edition of this unique source. Interpretative essays on different contexts will be included, such as the networks of Jesuit and Chinese scholarly

actors, the role of deductive structures in the presentation of knowledge, and the double origins (Chinese and Western) of the engineering knowledge reflected in the illustrations and descriptions of machines (William G. Boltz, Lindy Divarci, Jürgen Renn, Matthias Schemmel, Tian Miao, Baichun Zhang).



Drawing made by Baichun Zhang in relation to the above manuscripts during a workshop in Shanghai, 2016.

## Mathematical Practices and Education

While the origins of technological and mechanical knowledge in societal practices appear obvious, it is less so in the case of mathematics. The apparent theoretical character of mathematics is also a consequence of a traditional focus on theoretical texts in the history of mathematics. In the case of South Asian historiography, this goes along with a linguistic bias: the history of mathematics in India has thus far primarily been an engagement with a corpus of texts recorded in Sanskrit. But in the South Asian context, the study of knowledge transmission is particularly complex and offers promising insights because of its diverse regions, languages, and landscapes, along with deeply entrenched structures of oppression and social hierarchies marked by caste.

The project, launched by the French Institute of Pondicherry, the ETH Zurich, and the MPIWG, aims at a social history of mathematical practices situating the transmission of knowledge between the realms of learning and work through the activities of different practitioners, such as school teachers, students, revenue accountants, scribes, artisans, and craftsmen. Texts are studied as records of their practice and as products of the traffic between institutions of learning and working, often bringing in a “measuring public,” which participated in the making of a computational culture.

An important aspect of the project is the identification and preservation of the huge corpus of relevant extant vernacular sources spread all over India, and the creation of an online archive of these sources to enable further research. A pilot digitization project, supported by the Endangered Archives Programme of the British Library and a seed grant from the ETH Zurich, has been completed. A first study on mathematical practices and its practitioners in the early modern and colonial Tamil-speaking region of South India is in press (Oxford University Press). In addition, ethnographic studies of today’s practitioners are carried out within the project to understand the transmission of mathematics as work (D. Senthil Babu, Roi Wagner, Matthias Schemmel).





Pongilakkam, the elementary number primer used in elementary schools in the early modern Tamil-speaking region.

The close connection between mathematical education and practices was also the focus of a project, in cooperation with the Berlin Center for the History of Knowledge, on professional numeracy in the Old Babylonian period in southern Mesopotamia. Primary research interests concerned the society and economy of Old Babylonian southern Mesopotamia, including cuneiform mathematics, calculation practices, technology, as well as craft industries and archives. It was found that, while scribal education in the Old Babylonian period reflected a uniform mathematical culture, superficial differences in the measurement values learned in various scribal centers suggest that scribes evaluated both measured and calculated data differently, which would in turn impact economic activity. The results have been submitted to Springer Publishing as a monograph, *The Making of a Scribe: Errors, Mistakes, and Rounding Numbers in the Old Babylonian Kingdom of Larsa*. A second publication, *Old Babylonian Texts Dealing with Fields, Canals, and Brick*, is also in production (Yale University Press) (Robert Middeke-Conlin).

Horoscope of Prince Iskandar, grandson of Tamerlane, the Turkman Mongol conqueror. This horoscope shows the position of the heavens at the moment of Iskandar's birth on 25th April 1384. Wellcome Collection.

## Creation of an Image Database for Eurasia and North Africa (4000 BCE–1700 CE)



Preparatory work to create an annotated image database has been pursued by Departments I and III. This database collects images of the heavens as a whole or of celestial phenomena, documenting the multiple materials employed for those visualizations. The database will serve to investigate processes of knowledge formation and exchange in Eurasia and North Africa with regard to astronomy, astrology, meteorology, the formation of myths, political and religious rituals, healing and medical theories, and the organization of time (Sonja Brentjes, Dagmar Schäfer).

## Convivencia. Iberian to Global Dynamics (500–1750)

The Convivencia project, supported by central funds from the Max Planck Society since 2013, is a collaboration with the Kunsthistorisches Institut in Florence (Max Planck Institute), the Max Planck Institute for European Legal History, and the Max Planck Institute for Social Anthropology, together with their international partners, in particular the University of Chicago. This cross-disciplinary research project aims to investigate, for the period following antiquity and reaching to the end of the early modern period, cross-cultural processes of knowledge transfer and transformation in various domains (the sciences, medicine, philosophy, technology, the arts, the humanities). It focuses on the Mediterranean, and in particular on the Iberian Peninsula, as well as the Iberian colonial world. The project is concerned with Visigothic, Byzantine, Jewish, Islamicate, and Roman Catholic communities and also includes comparative explorations of North Africa and islands in the western and central Mediterranean.

Activities since September 2015 saw a series of meetings organized by each member institute of the project. Three workshops organized at the MPIWG discussed the role of knowledge and knowledge transmission in different contexts of Convivencia: 1) *Convivencia: Projects and Debates*; 2) *Practical and Pragmatic Literature in Legal and Science History*, organized with the MPI for European Legal History in 2016; and 3) *Open Access to Convivencia: People and Their Representations in the Iberian World and Beyond*. It is planned to publish the results of all workshops in a co-authored volume.

Six main research activities were pursued at the MPIWG in the frame of the Convivencia project. The first concerned the post-antique Mediterranean around 700–1500. In the centuries often characterized as “post-antiquity,” people, material objects, ideas, and knowledge migrated across vast geographical spaces. Knowledge exchange took place in an increasingly heterogeneous political, economic, and cultural landscape, involving immense losses but also striking innovations. The volume *Globalization of Knowledge in the Post-Antique Mediterranean, 700–1500* (Routledge, 2016) presents some of the results of the studies, investigating knowledge exchange processes and their consequences. It is the outcome of a conference held in October 2012, organized by Matteo Valleriani and Helge Wendt (Sonja Brentjes, Jürgen Renn).

The second activity studied the role of natural philosophy in the religious polemics of the medieval Muslims of Spain who were subjected to Christian rule, in particular, the role of scientific knowledge within the processes of identity construction and transmission of knowledge of the Mudejars in competition with the Christian majority and the other important religious minority in the Christian territories of the Iberian Peninsula, the Jews. One source in particular could be identified: a treatise relying on the authority of a judge from Alcalá de Henares (Castile), who was also doctor to the Aragonese King—that is to say, a member of the elite engaged in the refutation



of Christianity but at the same time in charge of the Christian king's health. This text offers insights into the uses of religious polemics grounded in natural philosophy by a minority in close contact with the dominant Christian elite. The source provides further evidence of the fact that some of its members were professionals in various fields—in this case health (regardless of the patient's religion) and the implementation of Islamic law—and that they succeeded in integrating both and in transferring their knowledge not only across religious borders but also across political ones (Castile-Aragon). These new insights will be presented in the volume: *The Religious Polemics of the Muslims of Late Medieval Christian Iberia: Identity and Religious Authority in Mudejar Islam* (Brill) (Mònica Colominas Aparicio).

The third activity dealt with scholarly networks in the Islamic world between the eighth and thirteenth centuries. The translations of Syriac, Middle Persian, Sanskrit, and Greek philosophical, medical, mathematical, and other scholarly texts and the flourishing engagement with these disciplines by scholars from a broad range of religious and linguistic communities in the early period of the Abbasid caliphate (c. 750–950) made Baghdad a hub of knowledge. The aim was to extend the scope of existing research by exploiting a broad range of little known eastern sources. Geographical works, historical literature, and literary works in Arabic by Muslim authors were investigated. The texts show, for the eighth and ninth centuries, the existence of an extended scholarly network connecting Baghdad with Central Asia and India on the one hand and Syria and North Africa, on the other. This network comprised practitioners in several fields of knowledge: medicine, surveying, canal, dam and bridge building, astronomy, astrology, arithmetic, and philosophy. The discovery of new groups of knowledge producers, from the newly emerging scholarly elite, enriches the known material on which the analysis of knowledge dissemination in Islamicate societies rests (Imad Samir). These results were presented in 2016 at the conference *Convivencia: Projects and Debates*.

The fourth activity looked specifically at cross-cultural knowledge transfer through translation. In cooperation with the Department of Philosophy and Logic at the University of Seville scholars were brought together from a wide range of disciplines. The aim was to reach beyond the traditional focal points of medieval translations from Greek into Latin, Syriac, and Arabic, or from Arabic into Latin and Hebrew. The institutional, geographical, political, professional, and linguistic conditions of translation processes were analyzed. While a culture of translation has been traditionally perceived as homogeneous, the research focused on variations and differences impacting translational practices and the larger culture within which and for which the translations were made. The results will be presented in two co-edited volumes entitled *Practices, Contexts and Consequences of Translations, and Narratives on Translations* (Sonja Brentjes). Modern histories of translations of scientific, medical, and philosophical texts were also analyzed with regard to channeling effects due to biased selections of sources (Sonja Brentjes, José-Luis Mancha).

A fifth activity has looked at how the diffusion of knowledge is connected with the spread of languages and the conceptual systems they carry by translation. It has been shown that this diffusion takes place also across linguistic borders. A given receiving

language may also absorb systems of knowledge from languages that are linguistically quite unrelated but culturally connected with respect to knowledge transfer. Thus we find that Sumerian concepts with considerable impact were moved into the Akkadian language, along with writing-systems, religion, science, and literature, even though linguistically the languages are completely unrelated. The same case can be made for Buddhist thinking when it was clothed in the garb of Chinese or Tibetan, or one of the other languages along the Silk Road. The results of this project will be published in *Studies in Multilingualism, Lingua Franca and Lingua Sacra* (Edition Open Access) (Jens Braarvig, Markham Geller).

In a sixth activity the history of science and technology in Latin America, was studied from two perspectives: a global perspective that situates Latin America in a context of exchange with other world regions; and a transnational perspective that emphasizes the relations between different American nations after independence with regard to developments in science and technology. Various examples of global and transnational networks of knowledge transfers were studied in both a global setting of colonial asymmetries and within the limits of Iberian colonial domination. The interdependencies of colonial metropolises and so-called peripheries were identified as early manifestations of knowledge globalization and selective modes of adaptation. Despite the colonial settings, some autonomy of knowledge formation in the colonies was revealed in debates about taxonomies and the search for new matters and production modes. The results were published in *The Globalization of Knowledge in the Iberian Colonial World* (Edition Open Access, 2016) (Helge Wendt).



A plate showing New World plants in order to make them understandable and comparable for a European audience. D. Francesco Clavijero (1780) *Storia antica del Messico* (1780). Biblioteca Nacional de España, GMM/3015.

## Global Transfers of Knowledge after 1700

Further research activities highlighted different aspects of globalization after 1700. One study explored how ethnography originated from field research by German-speaking historians and naturalists in Siberia (Russia) during the 1730s and 1740s, was generalized as ethnology by scholars in Göttingen (Germany) and Vienna (Austria) during the 1770s and 1780s, and was subsequently adopted by researchers in other countries. The results, presented in *Before Boas: The Genesis of Ethnography and Ethnology in the German Enlightenment* (University of Nebraska Press, 2015), show that anthropology and ethnology were separate sciences during the Age of Reason, studying racial and ethnic diversity, respectively. Ethnography and ethnology focused not on “other” cultures but on all peoples of *all* eras (Hans Vermeulen).

During the eighteenth century, a group of Spanish women (female “improvers”) participated in a global exchange of the latest news on scientific, technological, or dietary

improvements (textiles, chemistry, medicine, agriculture, and education). They hosted *tertulias* (a kind of salon) and translated texts considered relevant for the reform of Spain in topics such as agriculture, medicine, and education. They also contributed to the spread of a new type of literature, science for women and for children, which was instrumental in anchoring certain types of knowledge and values in Spanish society. The results of a study of these women have been presented at various international conferences and in an article “*Mujeres y ciencia en la España de la Ilustración. Ciencia en sitios insospechados,*” which received the 2015 award for feminist popularization *Premio Divulgación Feminista Carmen de Burgos* (Elena Serrano).

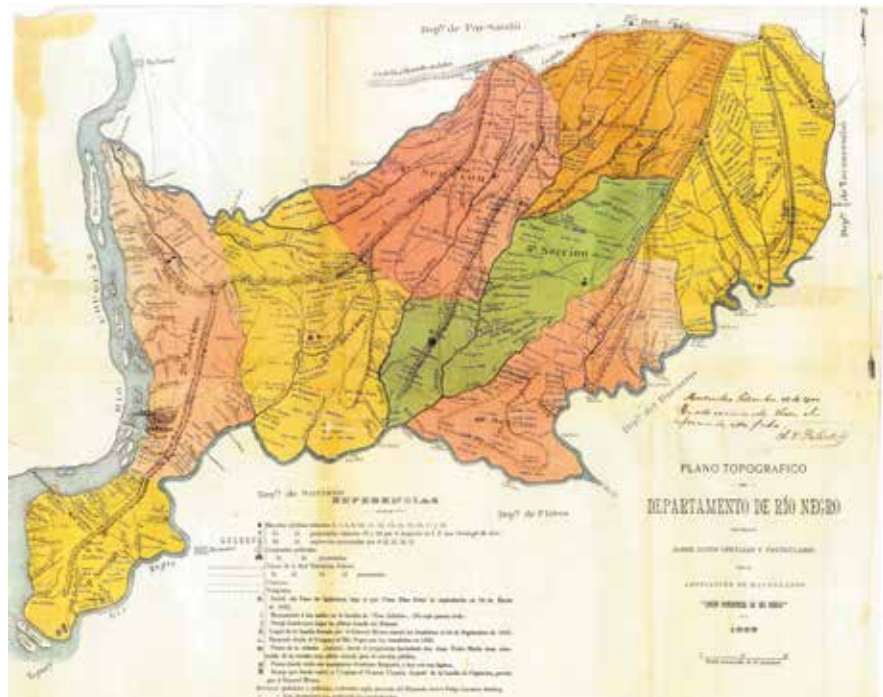
Around 1900, art history found itself at a key point in its history, when it critically deliberated over its objects and methodologies and argued for a transgression of its disciplinary boundaries. The discussion about “world art” or “global art history” concerned not only the extension of the discipline from a cultural-geographical perspective, but also included questions on the applicability of art-historical methods. The epistemology of the history of art was examined not only from the perspective of art-historical writing but also from exhibition practices in museums (Maria Teresa Costa).

After the independence of most Latin American states during the nineteenth century, new networks for the transfer of knowledge were established, often with ties to the Anglophone world. The establishment of scientific institutions and the emergence of specialized institutions for educa-



A painting of the first pier built by Liebig's Extract of Meat Company Ltd (LEMCO). This site was chosen for the company by A. W. Hoffmann, the first financial manager, and Georg Christian Giebert, general manager and founder of the company (left).

The map shows the first locations—within Uruguayan territory—that supplied cattle to LEMCO (on the banks of the Uruguay River), who also owned these locations. In 1865, towns in this area tripled and also occupied Argentine territory (right).



tion in technologies adapted European and US-American models of science to national and local environments. The exchange with other Latin American nations furthermore formed part of an exchange of ideas, scholars, and engineers. In the field of new economic developments, industrial enterprises and new modes of production based on local resources provide examples of the processes of global, regional, and local transformations of knowledge. One example is the foundation of LEMCO, a company that used Justus von Liebig's formula to produce meat extracts on an industrial scale (Lucía Lewowicz). During the twentieth century, global and multilateral entanglements of national scientific systems adapted further to new developments in world politics. The history of physics and biotechnology in Cuba is one example of how global and local scientific and intellectual networks generated new knowledge, and a volume is in preparation to present the research on such networks (Angelo Baracca, Jürgen Renn, Carlos Sanhueza, Helge Wendt).



## SELECTED PUBLICATIONS

Boltz, William G. and Matthias Schemmel. "Theoretical reflections on elementary actions and instrumental practices: the example of the Mohist canon." In *Spatial thinking and external representation: towards a historical epistemology of space*, ed. Matthias Schemmel. 121–144. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/studies/8/5/index.html>

Brentjes, Sonja. "Fourteenth-century Portolan charts: challenges to our understanding of cross-cultural relationships in the Mediterranean and Black Sea regions and of (knowledge?) practices of chart-makers." *Journal of Transcultural Medieval Studies* 2 (1 2015): 79–112.

Brentjes, Sonja. "Wilbur R. Knorr on Thābit ibn Qurra: a case-study in the historiography of premodern science." *Interpretatio: Sources and Studies in the History of Sciences A1* (2016): 1 – 63: <http://jps.library.utoronto.ca/index.php/interpretatio/article/view/26322>

Brentjes, Sonja and Jürgen Renn, eds. *Globalization of knowledge in the post-antique Mediterranean, 700–1500*. London: Routledge, 2016.

Hansen, Svend, Jürgen Renn, Florian Klimscha, Jochen Büttner, Barbara Helwing, and Sebastian Kruse. "The digital atlas of innovations: a research program on innovations in prehistory and antiquity." *eTopoi: Journal for Ancient Studies* 6 (2016): 777–818: <http://journal.topoi.org/index.php/etopoi/article/view/278>

Høyrup, Jens. *Algebra in cuneiform: introduction to an old Babylonian geometrical technique*. Berlin: Edition Open Access, 2017: <http://edition-open-access.de/textbooks/2/index.html>

Lewowicz, Lucía. *LEMCO: ein Koloss der Fleischindustrie in Fray Bentos, Uruguay. The meat industry's colossus in Fray Bentos, Uruguay*. Montevideo: INAC, 2017.

Vermeulen, Hendrik Frederik. *Before Boas: the genesis of ethnography and ethnology in the German Enlightenment*. Critical studies in the history of anthropology. Lincoln: University of Nebraska Press, 2015.

Wendt, Helge, ed. *The globalization of knowledge in the Iberian colonial world*. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/proceedings/10/index.html>.

## Research Theme

# The Long-term Evolution of Mechanical Knowledge

The history of mechanics is a paradigmatic field of historical and epistemological inquiry into the entanglement of theory and practice, science and society. Our investigation of the *longue durée* evolution of mechanical knowledge from antiquity up to the early modern period has aimed to demonstrate the continuity of basic cognitive models, their rearrangement, and their transformation in connection with material and intellectual processes of knowledge codification, transfer, circulation, institutionalization, and transformation.

The overall project is articulated with regard to three conceptual frameworks: the globalization of mechanics since antiquity, the epistemology of preclassical mechanics, and the social and cognitive matrix of modern mechanics. The first framework concerns the global dimension of practical knowledge and material technology that since antiquity has constituted the broad experiential basis upon which theoretical knowledge could be established. The second framework has been developed on the premise that mechanical knowledge has always been an integral part of complex cultural systems. Mechanical knowledge is embedded in ancient and modern philosophical traditions and has historically formed alliances with fields as various as medicine or music. The third framework helps to understand the complexity of the social and cognitive structuring of mechanics, best evidenced in times of major cultural shifts, most prominently during the passage from the economical-political context of Renaissance Europe to the age of capital and industry.

# The Impact of Practical Knowledge on Theoretical Traditions since Antiquity

The practical art of weighing fundamentally influenced the development of early civilizations and also the long-term development of theoretical knowledge. Using scales and weights, objects could be compared in an entirely new way. Equivalencies measured and expressed as the weight of precious metals created the preconditions for a new method of estimating value, setting the course for historical developments that continue to have effects even today. In the framework of the Excellence Cluster Topoi, an independent research group “Between Knowledge and Innovation: The Unequal Armed Balance” investigated the long-term history of weighing with a special focus on the question of how the developments of weighing technology and the cultural evolution of knowledge have affected one another.



Weighing emerged almost 2,500 years before becoming a subject of scientific reflection. However, external representations associated with weighing technology led to a transformation and extension of social and cognitive structures long before that. The project focuses in particular on balances with arms of variable length, the most familiar of which is the Roman steelyard. The design and fabrication of steelyards involved the solution of problems for which no solution was available in the realm of theoretical knowledge. Such problems subsequently became the subject of theoretical reflections in mechanics.



An outstanding result was the identification of a hitherto unknown facet of ancient technology: the production of artifacts according to complex rules that determine these objects with their essential properties. The reconstruction of such rules discloses the specific technological knowledge intrinsic to the construction of particular technological objects. The differentiation and development of the rules over time, moreover, characterizes the innovation processes of these objects (Jochen Büttner).

Taking a metal sample from a Roman steelyard. The samples were analyzed to probe the alloy composition. By means of Lead Isotope Analysis the geographical origin of lead used in manufacture was determined, allowing the possible site of production to be inferred. Photo Frank Willer, CC BY-SA.

In the Arabic literature, the practical and theoretical aspects of weighing were merged in a novel way. A prominent example is provided by the book *'Abd al-Rahman al-Khazini's Kitab Mizan al-hikma* (The book of the balance of wisdom). An English translation using manuscripts omitted from earlier translations is nearing completion. It includes a study of al-Khazini as well as the history of balances in the medieval Islamic sciences (Sonja Brentjes, Imad Samir).

Technology, technological innovations, and diffusion processes of technological knowledge represent a constant and continuous impulse towards theoretical development, as is particularly apparent in the case of hydraulics. Research projects, undertaken in cooperation with the research group A3 "Ancient Water Management Group" of the Excellence Cluster Topoi, have investigated the emergence of hydromechanics in the context of water management systems. The objective was the systematic mapping of water technology to be used as a proxy for an investigation into the course of technological knowledge diffusion processes in diverse epochs and regions of the ancient world. A comprehensive database for the diffusion of water technologies has been created (<https://drupal.mpiwg-berlin.mpg.de/watermachines/>, Gül Sürmeli-hindi, Matteo Valleriani).

Water-lifting devices played an essential role in water management. The ancient hotspot of their technological development was Hellenistic Alexandria. Later important advancements were made in the frame of Arabic science and technology. Some of these water-lifting mechanisms and technologies became a matter of everyday life whereas others remained impractical or of minor importance. Various ancient hydraulic machines and diverse explanations of the rising motion of water inside small pipes and tubes—for instance, in the context of use of the siphon—have been analyzed. The research has shown how, in a Greek context, mechanical knowledge emerged from such practical contexts (Elio Nenci).



Juliane Schmidt on a field trip at the Temple of Jupiter in Baalbek, Lebanon.

The practical knowledge involved in historical problems of water management was also the central focus of a dissertation project undertaken in cooperation with a research project on the historic urban development of Baalbek, carried out by the Directorate General of Antiquities of Lebanon (DGA) together with the German Archaeological Institute (DAI) and the Department of Building History at the BTU Cottbus. A geochemical analysis was undertaken of carbonate deposits from the Ain Juj water channel and contextualized in Baalbek's historic development. This has provided new information concerning the dating and estimated service life of the water channel and hence provides valuable data for the reconstruction of Baalbek's urban development (Juliane Schmidt).

A study of the long-term development of ancient theoretical mechanical knowledge examined the transmission processes of the treatise *Mechanics Problems*, traditionally ascribed to Aristotle. The research has led to new insights by focusing on diagrams. These diagrams are not

only significant for a reconstruction of the text but can also be considered as a commentary on the text. This becomes especially relevant when they are compared with those in later printed editions and commentaries from the early modern period. The results were published as *The Aristotelian Mechanics: Text and Diagrams* (Springer, 2016), a book that includes a first critical edition of the diagrams contained in the Greek manuscripts of the treatise, as well as its Byzantine reception history (Joyce van Leeuwen).

A parallel study of a long-term textual transmission is concerned with geometry, whose development is closely entwined with that of mechanics. The tradition of Euclidean geometry in the medieval and early modern period is reflected in the transmission, translations, and transformation of Euclid's *Elements*. In the Middle Ages, the Arabic translation, interpretation, and modification of Euclid's text played an enormous role in shaping a new understanding of elementary geometry, based on the mathematical practices elaborated (often in reference to astronomical and cosmological problems) by the scientists of Islamic societies. Taking hundreds of different editions of Euclid's *Elements* published in the Renaissance and early modern period into account, a comparison of the axioms and postulates employed to ground elementary mathematics has been conducted. It is planned to extend the study into the modern period (Vincenzo De Risi).

As a parallel to the investigation of practical mechanical knowledge, the role of practical optical knowledge has also been studied. In particular, a research activity has been undertaken on the camera obscura and its evolution in Western culture. This examines its uses and applications for the observation and representation of the "photographic" image prior to photography, from the earliest references in antiquity to the invention of photography in the nineteenth century. In connection with the documentary work, research, and experimental work undertaken with the experimental historical camera obscura (housed at the MPIWG), an exhibition was created and shown in several locations (at the MPIWG, in Spain, and in Brazil) (Montserrat de Pablo).



Portraits of visitors and members of staff of the MPIWG created with the Institute's *camera obscura* and displayed at the MPIWG and at exhibitions in Berlin and Brazil.

## Preclassical Mechanics between Ancient Roots and Challenges of Innovation

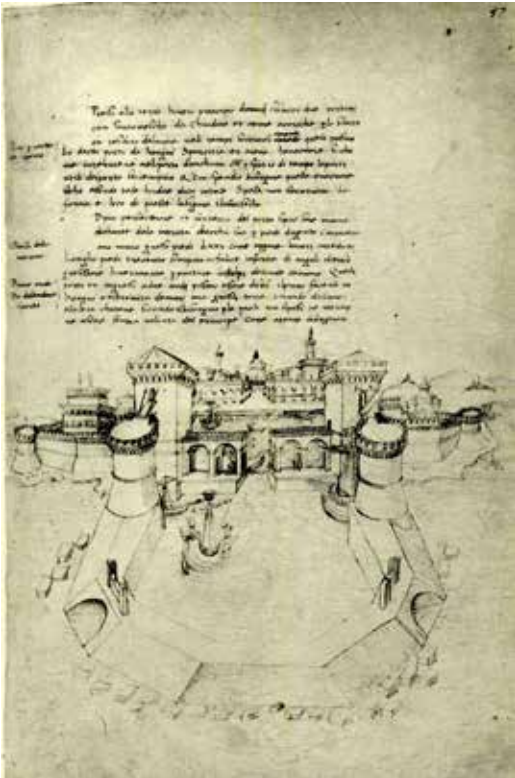
Preclassical mechanics is understood as a heterogeneous knowledge system emerging around the period between the fifteenth and the seventeenth centuries, before classical mechanics was formulated, in continuation of Newton's work, as a coherent and comprehensive mechanical theory. Preclassical mechanics is characterized by the investigation of problems, often resulting from disparate technological challenges that were at first isolated from each other. In the course of their exploration by a growing community of engineer-scientists, the solutions to these problems increasingly cohered within a broad intellectual framework. The distinctive cognitive and social architecture of this intellectual framework of preclassical mechanics is analyzed in the contributions to the fourth and final volume of a series dedicated to preclassical mechanics: *Emergence and Expansion of Preclassical Mechanics* (Rivka Feldhay, Jürgen Renn, Matthias Schemmel, Matteo Valleriani, eds.). The third volume, offering a new analysis of Galileo's science of motion, is also in press (Jochen Büttner).

Next to the science of motion, another crucial domain of preclassical mechanics was hydrostatics. Its emergence has been analyzed in close parallel to that of the preclassical science of motion. The concept of pressure emerged at that time from the work of such figures as Simon Stevin, Pascal, Boyle, and Newton, whose work has been compared with Galileo's and Descartes's, neither of whom recognized the need for a new conception of pressure. Newton articulated a technical notion of pressure, the



subtleties of which throw light on the way in which developments in seventeenth-century science simultaneously involved mathematization and experimentation. The results have been published as *One Hundred Years of Pressure: Hydrostatics from Stevin to Newton* (Springer, 2017) (Alan Chalmers).

Through the working group “The Structures of Practical Knowledge” (Matteo Valleriani), a variety of research endeavors were compared in order to address questions related to a) the relation between management of knowledge and its codification, b) the mobility—both social and epistemic—of knowledge, depending on how it is codified and externalized, and c) the formation of new knowledge systems as abstract systems able to link areas of previously separated knowledge. The results of this project were published in Matteo Valleriani (ed.) *The Structures of Practical Knowledge*, (Springer, 2017).



Francesco di Giorgio Martini, illustration of a fortified harbor, *Tratatto di architettura*, folio 87r (c. 1495), Codex Magliabechiana II.I.141, Biblioteca Nazionale Centrale, Florence.

During the early modern period, architecture in Italy underwent a profound transformation. Renaissance architects, among their many achievements, revived ancient Roman forms, developed modern fortifications, and created and codified sophisticated systems of visual representation. Quadrature and stereometry, once disregarded as the tacit know-how of the uneducated builder, became canonized as the learned, yet practically applicable knowledge of the building designer. Research undertaken on Francesco di Giorgio’s work relates the manifold nature of mechanically based, architectural knowledge in fifteenth-century Italy. Focus on this highly influential figure has offered insights into the discipline of architecture in a crucial, transitional period, but has also identified an important episode within the greater, long-term evolution of mechanical knowledge (Elizabeth Merrill). Further research was dedicated to the Vitruvian tradition, the birth of structural mechanics, and the connections between practical and theoretical knowledge in architecture and engineering in the sixteenth to twentieth centuries (Antonio Becchi).

The changing foundations of mathematics in the sixteenth and seventeenth centuries were investigated, looking at ratio and proportionality, practical geometry, and the new notions of number and

magnitude, with a focus on practical geometry as a set of practices that generate conceptual change. Early modern practical geometries with paradigmatic texts from the High Middle Ages (Johannes de Muris, Dominicus de Clavasio, and the anonymous *Artis cuiuslibet consummatio*) were compared. It turned out that practical geometries sanctioned a numerical understanding of magnitudes that went against the Euclidean ideas of number and geometrical magnitude. Practical geometries spread a materialistic understanding of geometrical magnitudes that opened the way to new methods in the sciences. New numerical ideas were connected with such widely spread practices as measuring through the mediation of geometrical instruments. The new professions that emerged in Renaissance Europe related to measuring show how the political and social authority embodied in the new professions was a major factor in

lending authority to new, heterodox mathematical concepts that were inconsistent with Euclid's *Elements* (Antoni Malet).

The structural transformations in the theory of ratios in the context of music theory in early modern times and the consequent transformation of the number concept has been the subject of a research activity on the arithmetization of theories of ratio (Oscar Abdounur).

The relation between practical and theoretical mathematics at the turn of the fifteenth century was also examined using the example of barrel gauging. The award-winning dissertation project *Zwei Gulden vom Fuder: Mathematik der Fassmessung und praktisches Visierwissen im 15. Jahrhundert* provided an overview of the sophisticated methods of medieval volume measurement, describing the experts dealing with these methods and analyzing the status attributed to gauging knowledge. Gauging knowledge has been shown to be related to a wide range of factors, from mathematical skills to the gauger's social authority, for example, when serving as a crucial figure in the entire procedure of wine taxation (Gunthild Peters).

Another dissertation project was dedicated to a detailed study of Thomas Alvarus's *Liber de triplici motu* (1509), which represents one of the final high points of scholastic discussion of the Aristotelian doctrine of motion before the rise of preclassical mechanics. Of particular historical importance was the theory of proportions and the related quantification of qualities, for example velocity, using the methods of the Oxford calculators. The results are presented in two volumes, comprising a facsimile and transcription, as well as an extended commentary (Edition Open Sources, 2016) (Stefan Paul Trzeciok).

The profound transformation in practices of empirical inquiry was also reflected in epistemological theories and accompanied by innovative visions. The inner connection between the investigations of nature and philosophy is particularly evident in the Renaissance. A project on science and philosophy in the Italian Renaissance, pursued in the context of the Collaborative Research Center 980 *Episteme in motion*, has focused on Bernardino Telesio, seen as an embodiment of the Renaissance aspiration toward universality (Pietro Daniel Omodeo). His thought and its reception bear witness to the inseparability of the natural sciences, cosmology, medicine, and philosophy in the early modern period. He accomplished this ambitious program as an explicit polemic against the Aristotelian-scholastic tradition, which was still the reference point for university curricula at the time. The pillars of Telesio's conception were an epistemology based on the reliability of the senses and a dynamic view of nature. A collection of essays has been dedicated to Telesio and the place of his thought at the crossroads of the natural sciences, the medical arts, philosophy, and philology (Pietro Daniel Omodeo, Nuccio Ordine, Roberto Bondi, Miguel Angel Granada) and will be presented in *Bernardino Telesio and the Natural Sciences in the Renaissance*, in the series *Medieval and Early Modern Science* (Leiden: Brill, in press).

The growing significance of mechanics in the early modern period raised, under a new perspective, fundamental questions, for instance, with regard to the relations of

material and immaterial entities that had a long philosophical tradition going back to antiquity. Beginning in the third century CE, Greco-Roman philosophers assumed that only immaterial entities can be causally efficacious. Focusing on Alexander of Aphrodisias's *De fato*, his account of the respective roles of external causes and internal dispositions in animal and human action has been reconstructed. It could be shown that the evidence does not support the prevailing interpretation that human beings differ from animals in their ability to act independently from their internal dispositions. According to Alexander, human beings instead shape the internal dispositions that lead, in turn, to action. Human beings are free agents, in Alexander's view, because they not only initiate a course of events, but also determine its goal. The assumption that only immaterial entities are causally efficacious may thus have been introduced in an attempt to secure teleologically successful causal chains (Orna Harari).

For the early modern period, the connection between mechanics and the investigation of living beings was studied in the context of a dissertation project on the emergence of iatromechanical medicine. The point of departure is the work of the Istrian physician Sanctorius Sanctorius (1561–1636), who developed instruments to measure and to quantify physiological change. The emergence and establishment of quan-

tification in science, specifically in the frame of iatro-sciences, were analyzed. The aim was to reposition Sanctorius's work in the historical line of late medieval and early modern commentators of medical works, to determine whether a mathematical tradition of Galenic medicine provided the intellectual framework upon which Sanctorius elaborated his theories. First results are in press (*NTM Journal*) (Teresa Hollerbach). Further research focused on an understudied aspect of Hobbes's natural philosophy: his approach to the domain of life (Rodolfo Garau).

Preclassical mechanics emerged in a period in which "artist-engineers" were transformed into "scientist-engineers" and eventually, at court,

"mathematical philosophers." This aspect can be best understood against the background of the formation of a court society, bridging feudal universalism and the global particularism of the modern national states. Research on Giovanni Battista Benedetti's major work in pre-Galilean physico-mathematics, *Diversarum speculationum mathematicarum et physicarum liber* (Turin, 1585), aims to bring out the sociopolitical roots, strengths, and limitations of the science that emerged in court society (Pietro Daniel Omodeo, Jürgen Renn). This was characterized by the dialogical openness typical of the court literati, the technical accuracy necessitated by a centralized administration, and the volatility of a personally patronized enterprise. A new edition (Edition Open Sources, forthcoming) discusses Benedetti's most daring insights on mechanics, the mathematical approach to natural investigation, and the connection



Left: Illustration of Sanctorius's most famous instrument: a weighing chair to measure the so-called *perspiratio insensibilis*, the insensible perspiration of the human body. Sanctorius, Sanctorius. *Ars Sanctorii Sanctorii Olim in Patavino Gymnasio Medicinam Theoricam ...* (1642).



Right: A reconstruction of the Sanctorian Chair. This project was undertaken in collaboration with the workshops of the Technische Universität Berlin (Institute of Vocational Education and Work Studies).

of celestial and terrestrial dynamics in a post-Copernican perspective (Pietro Daniel Omodeo, Jürgen Renn).

In his *Principia*, Newton explicitly referred to the authority of Euclidean geometry as a justification for the conservative form of proofs and avoided the use of analytic geometry and infinitesimal calculus, the central innovations of seventeenth-century mathematics. Rather, he modeled his treatise as closely as possible on Euclid's geometry. A century later, Joseph-Louis Lagrange announced in his *Mécanique analytique* that no geometrical diagrams would be found therein and Newtonian mechanics was presented exclusively in the form of analytic equations. A research activity, pursued in the context of the Collaborative Research Center 644 "Transformations of Antiquity," analyzed the relation of this radical change in the theoretical methodology of mechanics to the actors' ideas about ancient science and its authority. It has revealed how the actors' perception was shaped by the "*querelle des anciens et modernes*," a debate that was crucial for both the self-understanding of modernity and the construction of an ancient world of ideas as a reference for it (Christoph Lehner, Helge Wendt).



#### SELECTED PUBLICATIONS

Büttner, Jochen and Jürgen Renn. "The early history of weighing technology from the perspective of a theory of innovation." *eTopoi: Journal for Ancient Studies* 6 (2016): 757–776: <http://journal.topoi.org/index.php/etopoi/article/view/277>

Chalmers, Alan. *One hundred years of pressure: hydrostatics from Stevin to Newton*. Archimedes: new studies in the history and philosophy of science and technology 51. Cham: Springer, 2017.

Garau, Rodolfo. "Springs, nitre, and conatus: the role of the heart in Hobbes's physiology and animal locomotion." *The British Journal for the History of Philosophy* 24 (2 2016): 231–256.

Lehner, Christoph and Helge Wendt. "Mechanics in the *Querelle des Anciens et des Modernes*." *Isis* 108 (1 2017): 26–39.

Merrill, Elizabeth. "The 'professione di architetto' in Renaissance Italy." *Journal of the Society of Architectural Historians* 76 (1 2017): 13–35.

Trzeciok, Stefan Paul. *Alvarus Thomas und sein 'Liber de triplici motu'*. Edition Open Sources 7 and 8 (2 volumes). Berlin: Edition Open Access, 2016: <http://www.edition-open-sources.org/sources/7/index.html>; and <http://www.edition-open-sources.org/sources/8/index.html>

Valleriani, Matteo, ed. *The structures of practical knowledge*. Cham: Springer, 2017.

Van Leeuwen, Joyce. *The Aristotelian mechanics: text and diagrams*. Boston Studies in the Philosophy and History of Science 316. Cham: Springer, 2016.

Research Theme

## Cosmological Knowledge from the Middle Ages to the Eighteenth Century

The creation and development of epistemic networks from the late Middle Ages to the early modern period have become a central concern of Department I, also because research in this area complements previous work on the long-term history of mechanics in important ways. Research mainly focuses on two areas: the spread and transformation of astronomical knowledge and the emergence of scientific institutions.

Concerning the first area, scientific developments that emerged from the geocentric worldview during the early modern period form the core subject. A close investigation has been made of the tradition of treatises commonly known as *De sphaera*, based on the original work by Johannes de Sacrobosco, which is linked to the world of the quadrivium as taught at the early European universities. Two research activities dealt with Sacrobosco's treatise, known in English as *The Sphere*: the first examined the spread of such treatises in Europe from the mid-fifteenth to the mid-seventeenth century, and the second focused on the cosmological debate surrounding a sub-group of such treatises that were produced in the milieu of the university of Padua. Moreover, a comparative study has investigated what can be seen as a kind of antagonist to Sacrobosco's treatise, namely, a treatise compiled during antiquity by Geminus. This treatise experienced a great revival during the early modern period, particularly during the sixteenth century as a book ascribed to Proclus.

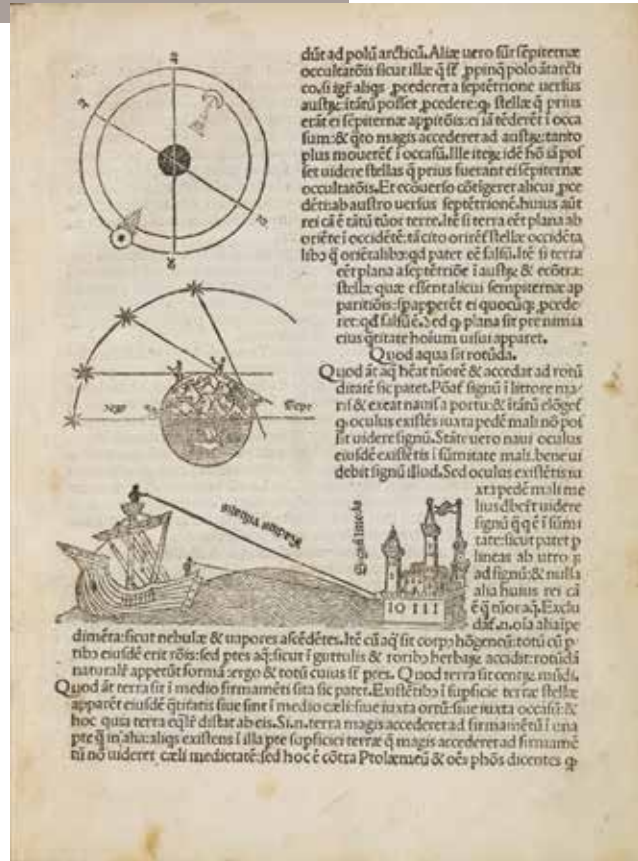
Two further areas of study, closely linked to the previous research activities, investigated cosmology from the perspective of knowledge transformation: the first dealt with the practical use of cosmological and astronomical knowledge in the frame of astrology and medicine; the second with the use of this knowledge as a background to the early modern debates (on astronomy, religion, and astrology) that pivoted around questions surrounding the nature of comets.

In accordance with Department I's tradition of analyzing scientific knowledge systems in their specific contexts, a particular focus was placed on early modern scientific institutions, such as universities and academies, in whose frame cosmology and astronomy were taught, discussed, and developed. From this perspective, particular attention was given to the relation between cosmology (as a discipline at institutions that emerged in the cultural frame of Protestant scholasticisms) and the universities (operating in the broad geographic context of the Baltic area). The mechanisms of such institutions were compared to those of a scientific academy with strong ties to a court, namely, the Accademia del Cimento.



## The Sphere: The Creation of Shared Scientific Knowledge in Europe

During the thirteenth century, ancient geocentric cosmological knowledge was reframed in the process of an elaboration of both ancient and Arabic scientific knowledge. Thirteenth-century authors engaged in the production of new treatises, which built on Johannes de Sacrobosco's treatise *The Sphere* and were characterized by their restructuring of its content rather than the introduction of new content. Sacrobosco's treatise inaugurated a new tradition of knowledge that continued for four centuries. Taking into consideration the period that spans the diffusion of printing technology up until the end of the seventeenth century, over 330 editions of *The Sphere* were printed in Europe. This impressive number testifies to a growing audience (both inside and outside of universities), while the treatise itself, which was originally short, underwent profound transformations due to continuous expansion and enrichment with more and more topics. The enduring influence of the treatise shaped the shared knowledge underlying European science in significant ways.



An analysis of the complete collection of treatises has produced a substantial amount of data, which was modeled to mirror the transformative process effected upon the treatise throughout its history. The distribution of the bibliographic metadata was first explored over time and space using visualization tools. It was then determined that the structure assumed by the network of treatises was centered mainly around four major hubs that were able to influence the entire continent. In a next step, analytical tools (developed in the frame of social network analysis) were implemented to investigate the multiplex network that is constituted, on the one hand, by the relations between authors and printers, as well as the economic and educational institutions involved in the creation, production, and diffusion of the treatises, and, on the other hand, by the semantic relations between the treatises. Their content in fact changed over time according to a local-universal mechanism: new subjects were created on a geographic local level and then transformed (i. e. through translations into Latin) and distributed by the great hubs throughout the network (Matteo Valleriani).

This research was expanded by focusing on the relations between cosmological knowledge (as transmitted by the commentaries on *The Sphere* of Sacrobosco) and the mathematical and social practices of early modern Latin and vernacular astronomy. By examining the astronomical content of early printed annual almanacs, calendars,

Johannes de Sacrobosco, *Sphaera mundi compendium soeliciter inchoat*, Octavianus Scotus, 1490, p. 19. MPIWG Library.

and astrological practica, the work of a large number of mostly anonymous protagonists was examined. These included calendar makers, astrologers, blood-letting surgeons, and clergy members who were interested in the medical, religious, and astrological worlds that were founded on astronomical tables and computational practices. In particular, the mathematical and visual content of the broadside of an astronomical instrument (made in 1515 for Emperor Maximilian I) was investigated with the aim of illuminating the role of astronomy in the politics of early modern court culture, especially concerning the rhetorical context of the debates in the 1610s about Galileo's telescopic discoveries and the priority of his work over that of German observers such as Simon Marius (Richard L. Kremer).

## The Transmission of Cosmological Conceptions in the Paduan Sacrobosco Tradition from the Fifteenth to the Sixteenth Century

A specific case of the diffusion of knowledge innovation, namely, the cosmological conceptions of the intellectual circle in Padua, was investigated through the production of commentaries on Sacrobosco's *De sphaera* during the early modern period. In particular, the commentaries of two professors of astrology at the University of Padua from the fifteenth and the sixteenth centuries, Prosdocimo de' Beldomandi (*Super tractatu sphaerico commentaria*, ca. 1418) and Bartolomeo Vespucci (*Glossulae in plerisque locis sphaerae*, ca. 1506), were taken into consideration. These two commentaries were published in a compendium of astronomical treatises edited by the astrologer Luca Gaurico and printed in Venice by Lucantonio Giunta in 1531. The investigation focused in particular on questions related to the nature and structure of the cosmos as expressed in the work of these two authors. For instance, each of them conceived of the relation between the geometrical notion of sphere and the ontological conception of the cosmos very differently: Vespucci was more inclined than Beldomandi to set forth the distinction between geometrical and physical spheres with respect to their ontological status, and to distinguish the approach of the geometer from that of the astronomer (in their use of the geometrical notion of sphere). The results of this investigation will be published in the frame of the Edition Open Sources initiative (Angela Axworthy).

## The Context of Commentaries on the Astronomy Textbook “Pseudo-Proclus’s *Sphaera*” during the Renaissance

This research activity investigated the networks of the professors of astronomy and Greek (and their students) in sixteenth-century European cities who used the original Greek, humanistic astronomy textbook, Pseudo-Proclus’s *Sphaera*. To understand the context of Pseudo-Proclus’s *Sphaera* in the Renaissance, the commentaries on and translations of the text were compared to the standard textbook of astronomy of the time—Sacrobosco’s *Sphaera*—especially its content, structure, and cited authorities. In spite of the humanistic character of this work, it was determined that it also underwent a process of transformation due to the “practical turn” of astronomy in the second half of the sixteenth century (Johanna Biank, *Pseudo-Proklos’ Sphaera: Die Sphaera-Gattung im 16. Jahrhundert*). This dissertation project was developed and supported in the frame of the Collaborative Research Center “Episteme in Motion” of the Freie Universität Berlin. The research was complemented by an investigation concerned with new forms of education in astronomy, as conceived by the renowned Byzantine polymath Bessarion (1400–ca.1472) (Alberto Bardi).



Frontispiece of Pseudo-Proclus’s *Sphaera* (Paris: Iuvenis, 1553). Library MPIWG.

## The Early Modern Discourse on Comets as Reflected in Vernacular Tracts

This study aimed at a historical reconstruction of the discourse on comets through an analysis of German vernacular pamphlets on comets from the sixteenth and seventeenth centuries. A comparative approach was taken in order to tackle the following questions: Why did comets acquire such great relevance in early-modern conceptions of the relationships between nature, man, and God, as reflected in numerous pamphlets? Why did the cultural influence of these works end quite abruptly at the end of the seventeenth century? Indeed, from the mid-seventeenth century onward, the integrated image of comets as causes (of natural phenomena) and as signs (of divine phenomena) was dissolved in the context of debates concerning different and specific aspects related to the appearance of a comet as a natural phenomenon.

The results of this dissertation project show that the determination of the causes and of the meaning of comets came to fall within the exclusive but complementary do-



Anonymous broadsheet depicting the observation of the great comet of 1680 at the Eimmart observatory in Nürnberg. (Sandrart, 1681). MPIWG Library.



mains of natural philosophy and theology, respectively. In an epistemological shift that changed the boundaries of these domains, astrology progressively lost its function as a support to both dimensions and was therefore gradually marginalized. Comets were finally seen as heavenly bodies revolving around the Sun and as such were dealt with in the framework of a physicalized astronomy, while their semiotic dimension lived on in the frame of an increasingly marginalized physico-theology and a teleological understanding of their cosmological role (Anna Jerratsch, *Der frühneuzeitliche Kometendiskurs im Spiegel deutschsprachiger Flugschriften*).

A further in-depth study was dedicated to two unpublished works that were written after the appearance in 1618 of three comets: the first—*Astronomischer Discurs von dem Kometen, so in Anno 1618, im Nouembri zu erscheinen angefangen und bis inn Februar dis 1619 Jars am Himmel noch gesehen wirt*—by Michael Maestlin (1550–1631); and the second—*Cometen Beschreibung In zwen unterschiedliche Partes abgetheilt, deren Erster Von denselbigen ins gemein: der Ander Von allen Insonderheit, sonderlich aber denen drey Jüngsten, In abgeloffenen 1618 Jahr erschienen, ausführlich handelt*—by Wilhelm Schickard (1592–1635), both written in Württemberg. Given the importance of these two personalities in the course of the contemporary astronomical and cosmological revolution, the aim was to return their manuscripts, along with their respective interpretations of the comets, to the context of early modern cometary theory, and at the same time to prepare a critical edition featuring a commentary and historical introduction to both manuscripts. While this work is currently in preparation, an introductory paper has already appeared (Miguel A. Granada).

## European Institutions of Science and Scholarly Networks of Knowledge Transfer in the Early Modern Period

This research activity investigated the interactions between cosmology and Protestant scholasticism from the mid-sixteenth to the late seventeenth century. It focused in particular on institutions and knowledge transfer within a network of universities and gymnasia in a northern European area, initially centered in Middle Europe (Wittenberg, Leipzig, Rostock, Frankfurt on Oder, Helmstedt, Rostock, Szczecin), then ranging from England and Scotland (e.g. Aberdeen) to the Netherlands (Utrecht, Leiden, Groningen), Denmark (Copenhagen), Sweden (Uppsala), and Poland (Gdańsk), and including Eastern Prussia (Königsberg).

The investigations focused on the mechanisms of assimilation, transformation, and establishment of novel cosmological and natural doctrines (namely, Copernican planetary models, geo-heliocentrism, and “Cartesio-Copernicanism”) in well-established academic curricula and cultural traditions. It could be shown how such mechanisms were marked by specific practices of teaching and of knowledge dissemination (notably *lectio*, *commentary*, *disputatio*, *quaestio*, and *exercitatio*), by customary forms of recruitment by professors, and by disciplinary separations linked to faculty hierarchies (e.g., the subordination of professors of philosophy to those of medicine or theology), as well as by the constant reference to a codified corpus of canonical texts (and textbooks) prescribed in the Statutes. A conference was organized in 2017 on *Aristotelianism and Natural Sciences at Early-modern Protestant Universities*, in collaboration with Collaborative Research Center “Episteme in Motion” at the Freie Universität Berlin. An edited book *Natural Knowledge and Aristotelianism at Early Modern Protestant Universities* is due to appear in 2019 (Harrassowitz) (Pietro Daniel Omodeo, Volkhard Wels). An investigation was undertaken on the transfer of knowledge between Germany and Scotland, focusing on the Scottish mathematician and physician Duncan Liddel of Aberdeen. A contextualized study of his life and work in the cultural and institutional frame of the northern European Renaissance, together with a reconstruction of his scholarly networks and of the scientific debates in the time of post-Copernican astronomy, Melanchthonian humanism, and Paracelsian controversies, has been published as *Duncan Liddel (1561–1613): Networks of Polymathy and the Northern European Renaissance* (Pietro Daniel Omodeo) (Leiden: Brill, 2016).

An in-depth study has been made of “Baltic astronomy,” the designation of a group of scholars, professors, astrologers, and printers who from around 1580 to 1680 developed a distinctive, anti-Copernican and anti-Keplerian approach to mathematical astronomy. This Northern European constellation of scholars, unnoticed by previous historians, built their approach to astronomy on the work of Tycho Brahe and his best-known assistant (after Kepler), Longomontanus. An essay on Longomontanus, a professor of mathematics at the University of Copenhagen, will appear in a volume co-edited with the Ptolemaeus Arabus et Latinus group in Munich (Brill) (Richard L. Kremer).



Eighteenth-century engraving of the Renaissance mathematician, physician, and natural philosopher Duncan Liddel, who acted as a mediator between German and British universities.

The evolution of the basic concepts used in the description of celestial phenomena (such as the definition of the arctic circle or of angular anomalies) and the mathematical constructions used for the prediction of the planetary ephemerides was a further subject of investigation. It was shown why the planetary theories of Ptolemy, Copernicus, and Brahe (which differ in respect to the number of deferents and epicycles, and their alignment) behaved so differently with respect to the possible improvements of their precision. Ptolemy's introduction of the equant was an ingenious solution and, thanks to its precision, helped to reduce the number of circles necessary to approximate true planetary motion. From a modern viewpoint, however, it reduced the adaptability of this model for representing planetary motion with any desired precision (Pietro Daniel Omodeo, Irina Tupikova).



A meeting of the *Accademia del Cimento*, fresco by Gaspero Martellini (1785–1857), Tribuna di Galileo, Florence, 1840ca. Photo: Saulo Bambi, Museo di Storia Naturale/Florence.

Parallel to this research endeavor, the process of the emergence of the first scientific academies in Europe was investigated. Building on the rich secondary literature, but also on a study of new sources, two lines of research were developed: a) the birth, activities, and publishing policies of the first modern scientific academies; and b) the character, role, and functioning of the Renaissance academies. In the frame of the first, the focus was on the *Accademia del Cimento*. The academy, founded in Florence in 1657 under the protection of Ferdinand II de' Medici, Grand Duke of Tuscany, and his brother Prince Leopold, was one of the first to pay increased and exclusive attention to the study of natural phenomena through the systematic use of experiments.

Concerning the second and more general research perspective, the aim was to compare the “academy mode” of the Renaissance with the model of the first modern scientific academies. The expression “scientific academies” traditionally refers to those state-supported learned societies which, from the second half of the seventeenth century, carried out collective, experimental research and were regulated by a system of

norms or by a formal charter. The emergence of such academies as the *Royal Society*, the *Académie Royale des Sciences*, or the *Kurfürstlich Brandenburgische Societät der Wissenschaften* is closely connected with a progressive specialization of the different types of investigations that were foreign to Renaissance conceptions of knowledge. And yet, it is precisely during the Renaissance that the model for future academies was developed and disseminated. On the basis of the examination of this first model of an academy, the needs that led to the birth of the first state-supported scientific academies have been identified (Giulia Giannini).



## SELECTED PUBLICATIONS

Axworthy, Angela. *Le mathématicien renaissant et son savoir: le statut des mathématiques selon Oronce Fine*. Histoire et philosophie des sciences 11. Paris: Classiques Garnier, 2016.

Feldhay, Rivka and F. Jamil Ragep, eds. *Before Copernicus: the cultures and contexts of scientific learning in the fifteenth century*. McGill-Queen's studies in the history of ideas series 71. Montreal: McGill-Queen's University Press, 2017.

Giannini, Giulia. "Un'esperienza gentile': fumo nel vuoto e leggerezza positiva all'Accademia del Cimento." *Galilaeana* 13 (2016): 77–109.

Granada Martínez, Miguel Ángel. "Michael Maestlin and the Comet of 1618." In *Unifying heaven and earth: studies in the history of early modern cosmology*, eds. Miguel Ángel Granada Martínez, Patrick J. Boner, and Dario Tessicini. 239–290. Barcelona: Edicions de la Universitat de Barcelona, 2016.

Kremer, Richard L. "Incunable almanacs and practica as practical knowledge produced in trading zones." In *The structures of practical knowledge*, ed. Matteo Valleriani. 333–369. Cham: Springer, 2017.

Omodeo, Pietro Daniel with Karin Friedrich, ed. *Duncan Liddel 1561–1613: networks of polymathy and the northern European Renaissance*. Scientific and learned cultures and their institutions 17. Leiden: Brill, 2016.

Omodeo, Pietro Daniel and Anna Jerratsch. "Mathematics, cosmology and natural philosophy: Christoph Rothmann's place in the Renaissance debate on comets." *Galilaeana* 12 (2015): 203–215.

Omodeo, Pietro Daniel and Jürgen Renn. "Das Prinzip Kontingenz in der Naturwissenschaft der Renaissance." In *Contingentia: Transformationen des Zufalls*, eds. Hartmut Böhme, Werner Röcke, and Ulrike C. A. Stephan. 115–148. Berlin: De Gruyter, 2016.

Valleriani, Matteo. "The tracts on the 'Sphere': knowledge restructured over a network." In *The structures of practical knowledge*, ed. Matteo Valleriani. 421–473. Cham: Springer, 2017.



Research Theme

## Rethinking Basic Science



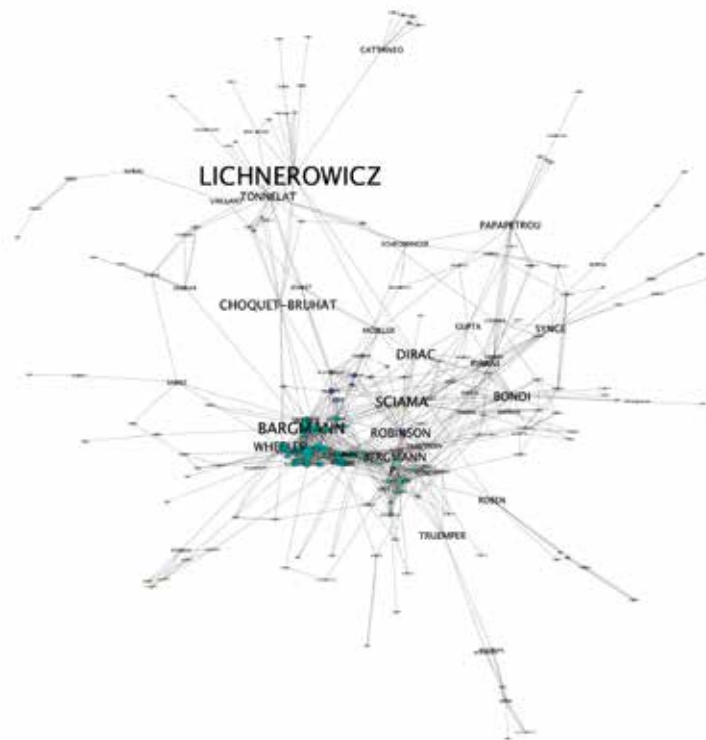
Photo of the reception at the GR6 conference taken by the firm Atelier Bache at the Town Hall (Rådhuset), Copenhagen, July 6, 1971. NORDITA Collection, Niels Bohr Archive.

The central aim of this project is to provide the first major historical study of fundamental physics after World War II that does not exclusively focus on the massive changes in social status and institutional structure, but also includes epistemic development. In this manner, the project aims to understand how the changing social environment influenced not only the content of science, but also the complex interactions and counterreactions, for instance how epistemic changes further strengthened the drive toward big science.

## The Renaissance of General Relativity in the Post-World War II Period

The complex development of general relativity presents intriguing challenges for historians of science. After an initial burst of excitement about its extraordinary implications, the theory underwent a thirty-year period of stagnation, during which only a few specialists—mostly mathematicians—worked on it. In the aftermath of World War II, however, general relativity gradually re-entered the mainstream of physics, attracting an increasing number of practitioners and becoming the basis for the current standard theory of gravitation and cosmology—a process that Clifford Will coined the “renaissance” of general relativity.

Therefore, to investigate the transformation of general relativity from a marginal theory to a building block of modern physics, a project was initiated in 2014 involving scholars from different institutions and different fields of expertise. An integrated historiographical framework (Alexander Blum, Roberto Lalli, Jürgen Renn) has already been developed, in which this historical process is interpreted as resulting from the deep interconnection of epistemic and social factors. Our main claim is that only in the post-WWII era did Einstein’s theory of gravitation become a field of study in its own right, whereas earlier it had only served as a theoretical framework related to different and dispersed research agendas.



Network of collaboration of scientists working on general relativity and gravitation in 1962.

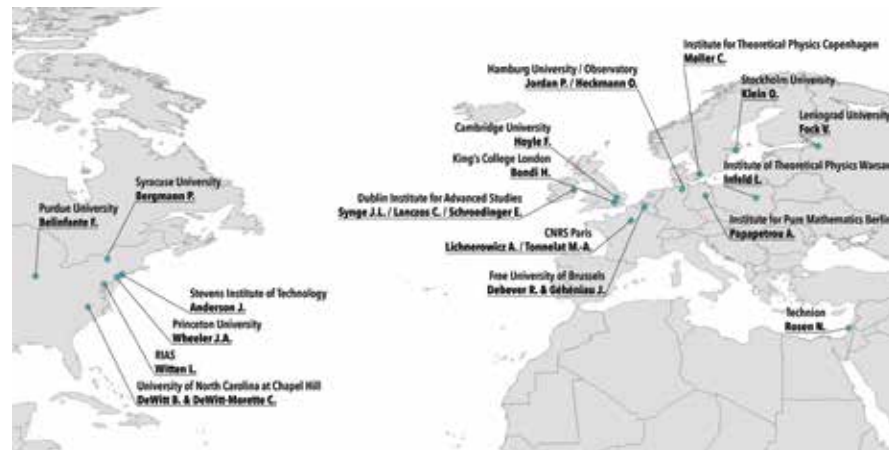
In December 2015, the scholars involved in the project were joined by a number of eminent experts on general relativity and its history to discuss the renaissance of general relativity during the historical sessions of the large conference *A Century of General Relativity*, organized jointly with the Albert Einstein Institute (Alexander Blum, Roberto Lalli, Jürgen Renn). The conference was accompanied by the world premier of a play dramatizing Einstein's trajectory from his first work on general relativity in Prague to his Nobel Prize in 1921 (Robert Marc Friedman).

In a special open-access issue of the *European Physical Journal H* entitled “The Renaissance of Einstein's Theory of Gravitation” (Alexander Blum, Domenico Giulini, Roberto Lalli, Jürgen Renn) several of the more physical aspects of the renaissance process were tackled from a variety of perspectives: the role of research on the quantization of gravitational theory through the analysis of a previously unpublished report of a meeting held in Copenhagen in 1957 (Alexander Blum, Thiago Hartz); the emergence of experimental research on gravitational physics initiated by Robert Dicke's group in Princeton in the late 1950s (Jim Peebles); a personal recollection of Joseph Weber's pioneering role in sparking experimental research on gravitational waves (Virginia Trimble); the role of the discovery of binary pulsars in the developments of the theoretical controversy on gravitational wave emission (Daniel J. Kennefick); and, finally, the evolution of theoretical analysis on stellar collapse in the pre-WWII period, which led, after the discovery of quasars, to the emergence of a new scientific field: relativistic astrophysics (Luisa Bonolis).

The social dimension of the formation of the field of “General Relativity and Gravitation” (GRG) is being investigated employing the concepts and tools of social network theory (Roberto Lalli, Dirk Wintergrün). By mapping the network of collaborations

in the research fields related to general relativity from 1930 to the early 1970s, the dramatic changes in the connectivity of this network in the post-WWII period are shown. The topological transitions of the network of collaboration provide an unambiguous method to define the historical process of the renaissance of general relativity as well as its periodization. Network analysis also enables the definition of some specific features of the process which would otherwise be incomprehensible, such as the role of specific actors in the dynamics of knowledge production in general relativity in connecting different disciplines and research agendas. This research shows the specific ways in which the phenomenon of the “postdoc cascade” increased the connectivity among the different research groups and, therefore, different research agendas, allowing for the emergence of a common field pursued by a network of practitioners with a shared arsenal of tools and research questions. In addition, a study of the activities of community building and institutionalization in the GRG field in the international arena between the 1950s and the 1970s has been completed (Roberto Lalli). The book, *Building the General Relativity and Gravitation Community During the Cold War* (Springer 2017), shows how intertwined the epistemic, cultural, social, and political aspects were in the attempt to build an international community of “relativists” during the Cold War. It emerges that features specific to the field of general relativity first favored such an international exchange in the 1950s and then allowed scholars to overcome a number of tensions of a different nature, eventually leading to the formation of the International Society on General Relativity and Gravitation, which had quite a unique structure in the landscape of international scientific organizations at that time.

Research centers based in North America and Europe that were working on different research agendas related to general relativity in 1955. Under the names of the institutions, one finds the names of the leading scientists in general-relativity related research projects in 1955. Image by Florian Kräutli.



A complementary approach focuses on one central actor of the renaissance, John Archibald Wheeler, who was the leader of one of the major centers of general relativity in the 1950s and 1960s at Princeton; but even more importantly, his personal career is a micro-image of the renaissance at large, as he switched from mainstream nuclear physics to research in general relativity in the early 1950s. Through an in-depth study of his detailed notebooks, this surprising conversion is reconstructed and compared with the social and epistemic factors identified in the overall historiographical framework (Alexander Blum, Dieter Brill).

Focusing on a specific research strand in the renaissance, rather than on a specific individual, the project has now also begun to pursue a detailed study of the history of gravitational wave research, in particular examining the question of the relation between theory (abstract existence proofs), phenomenology (source simulation), and experiment (gravitational wave detection) in the development that ultimately led to the first detection of gravitational waves in September 2015 (Alexander Blum, Roberto Lalli, Jürgen Renn). Another conceptual issue first intensively discussed during the renaissance period is the so-called problem of time, namely how to understand the passage of time in the four-dimensional space-time framework of general relativity. This problem was studied by looking at a particular solution to the problem—the assumption that the passage of time in the relativity theories is indeed an irreversible, but entirely local succession of events (Mauro Dorato). A major book project, mapping the various roles that time has played in modern science, is currently underway (Kurt Sundermeyer).

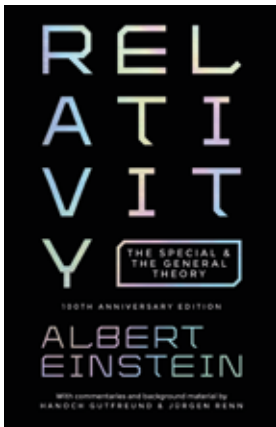
The various studies currently pursued will be part of an edited volume in the series *Einstein Studies*, to be published in 2019 (Alexander Blum, Roberto Lalli, Jürgen Renn). The volume critically discusses the general historiographical framework by articulating it or by openly challenging it through new perspectives and case studies. Authors will be Luisa Bonolis, Alexander Blum, Dieter Brill, Jean Eisenstaedt, Juan-Andres Leon, Jürgen Renn, Donald Salisbury, Brian Pitts, Roberto Lalli, Dean Rickles, Jean-Philippe Martinez, Jaco de Swart, Tilman Sauer, and Adele De La Rana.

To mark the centenary of the publication of the Einstein field equations of general relativity in November 2015, Jürgen Renn and Michel Janssen gave a number of talks, both in Europe and in North America, published several articles in high-profile journals (*Nature*, *Science*, *Physics Today*), and started working on a source book on Einstein's path to these celebrated equations, under contract with Springer. The preparation of these talks and articles and the responses to them informed a detailed introduction to the aforementioned source book, which gives an up-to-date account of the scholarship on the question of how Einstein found his field equations. This introduction also extends an important distinction made in *The Genesis of General Relativity* (Renn, ed., 2007) between two strategies, dubbed the mathematical and the physical strategy, used in the search for the field equations—to Einstein's work on cosmology and gravitational waves in 1916–1918. Complementing this introduction is a careful selection of excerpts from Einstein's papers, letters, and manuscripts documenting his search for these equations. The finished volume is scheduled to be submitted to Springer in 2018.

Hanoch Gutfreund and Jürgen Renn revisited four canonical texts by Albert Einstein:

- The Seminal Paper— “The Foundation of the General Theory of Relativity” (1916)
- *Relativity: The Special and the General Theory* (1917)
- *The Meaning of Relativity* (1922), and
- *The Autobiographical Notes* (1946)

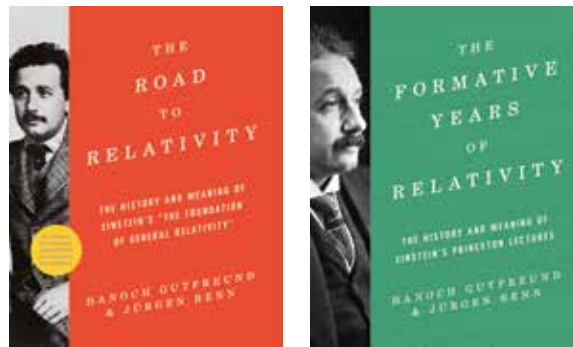




Left: A Centennial Edition of “Relativity: The Special and the General Theory” with extensive commentaries (2015) (a Russian translation of this book is underway).

Center: *The Road to Relativity: The History and Meaning of Einstein’s “The Foundation of General Relativity”* (2015) (this book has been translated into Spanish and a Chinese translation is underway).

Right: *The Formative Years of Relativity: The History and Meaning of Einstein’s Princeton Lectures* (2017).



They studied and presented these texts in broad historical and scientific contexts. Three of the four parts of this project have already been published by Princeton University Press. A fourth book on Einstein’s *Autobiographical Notes* is in preparation.

Although he was not an active player in the renaissance process, Albert Einstein continued to constitute an inspiration and a model for many “relativists,” especially in the pursuit of international community building well after his death in 1955. It therefore seemed appropriate to deepen the understanding of Einstein’s social and political activities and thoughts before the renaissance began. A monograph is in preparation, centered on Einstein’s place in academic and political life during the period 1914 to 1939 (David Rowe, Robert Schulmann). While Einstein will stand at the center of the account, it will also illuminate many surrounding people and events in order to give a far more contextualized account of his political thoughts and activities over the course of the period.

## History and Foundations of Quantum Field Theory

The other major pillar of the “Rethinking Basic Science” theme is the study of the history of quantum field theory, which focuses on the attempts to bring together the two new great theoretical structures of the early twentieth century: the relativity theories and quantum mechanics. This study thus draws on both the work on the history of relativity, discussed in the last section, as well as on the ongoing work on the foundations and early history of quantum mechanics.

In further studying the early history of quantum mechanics, the project complements earlier work on Erwin Schrödinger’s creation of wave mechanics through its in-depth study of the other transition from classical physics to quantum mechanics: Werner Heisenberg’s creation of matrix mechanics. By studying this transition, the project has moved away from considering the old quantum theory as a more or less consistent

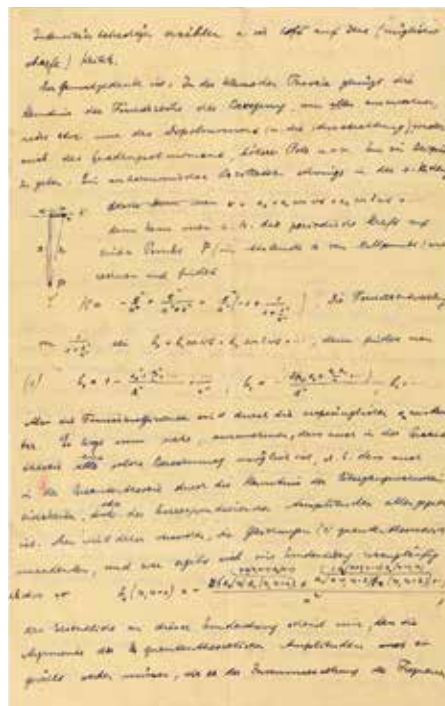
theoretical framework. Instead it is argued that quantum physics during the 1920s is better understood as a patchwork of concrete physical problems. These problems were loosely connected with each other through the concept of a quantum system in which physical processes were described by means of transitions between stationary states. This generic description needed to be explicated to account for specific problems, and here physicists used several independent theoretical tools, which are usually identified with the old quantum theory in the literature, in particular the so-called correspondence principle.

In several case studies (Martin Jähnert), it was shown that the application of the correspondence principle to specific problems led to the integration of the principle into different theoretical representations and ultimately to its adoption as a research tool. This process of *transformation through implementation* was central for the conceptual development of the correspondence principle and played a key role in the emergence of quantum mechanics.

This, in turn, allowed for a reassessment of the context of Werner Heisenberg's work leading to matrix mechanics. Heisenberg's work was fuelled by applications of the correspondence principle in the context of multiplet spectroscopy, which had not been taken into account before, and relied heavily on the representations and techniques of problem-solving developed in this context. As such, the transition from classical physics to quantum mechanics can be reinterpreted as a conceptual reflection on the adaptation of the principle and as a transition from problem-solving in a patchwork to the development of an overarching theoretical framework (Alexander Blum, Martin Jähnert, Christoph Lehner, Jürgen Renn).

Building on the new perspective on the creation of quantum mechanics, the project investigates the early history of quantum field theory (the merger of special relativity and quantum theory). It has managed to show how, initially, this was considered an integral part of the new quantum mechanics, but then, through the development of several novel concepts and methods specific to it alone, it became a theory apart (Alexander Blum, Christoph Lehner). For this reason, quantum field theory and quantum mechanics, while generally considered to be parts of the same overarching framework, are taught and practiced very differently to this day. This observation has allowed a re-evaluation of much of the historiography of quantum field theory, which had underestimated this separation and thus failed to identify essential epistemic obstacles, instead blaming mere calculational mistakes for certain delayed developments (Alexander Blum).

It was only in the ongoing debate over the interpretation of quantum mechanics that the divorce between quantum mechanics and quantum field theory remained incom-



A letter from Werner Heisenberg to Ralf Kronig documenting the emergence of *Umdeutung*, June 5, 1925, p. 4 (ETH-Bibliothek, Hochschularchiv, Hs 1045:132.).

plete. In this context, the project is pursuing a detailed study of the Schrödinger *Nachlass*, in particular his early work on the concept of entanglement, providing a reassessment of the history of this important theme and highlighting Schrödinger's work not as a mere reaction to Einstein, Podolski, and Rosen's famous work of 1935 (the EPR paradox), but as an original innovation in which EPR arguments were developed prior to Einstein (Jos Uffink, Christoph Lehner). The project further pursues the interpretation debate after World War II, in particular in its relation to quantum field theory, and studies how novel interpretations of quantum mechanics, such as the Bohmian particle interpretation, fared when faced with the rapidly expanding theoretical structures of quantum field theory (Alexander Blum, Andrea Oldofredi).

The project also studies the early attempts at merging quantum theory and general relativity and how this search for a theory of quantum gravity emerged (much later than is usually assumed) as the central unsolved problem of theoretical physics. We have reconstructed the origins of the different approaches to the problem and shown how the attempts to bring these approaches together to form a coherent quantum gravity community in the 1950s failed due to the lack of a unifying theoretical and formal framework (Alexander Blum, Thiago Hartz).

The search for a quantum theory of gravity brings the historical investigations of the project very close to current research. In another study of recent developments in quantum field theory, the project has studied processes of discovery of elementary particles such as the Higgs boson, which was discovered in 2012 at the Large Hadron Collider (LHC) at the European Organization for Nuclear Research (CERN). A specific methodological challenge here is to find ways of adequately documenting relevant parts of the research processes that lead to such discoveries, for example, by studying the email exchange of scientists involved in the experiment (Adrian Wüthrich).

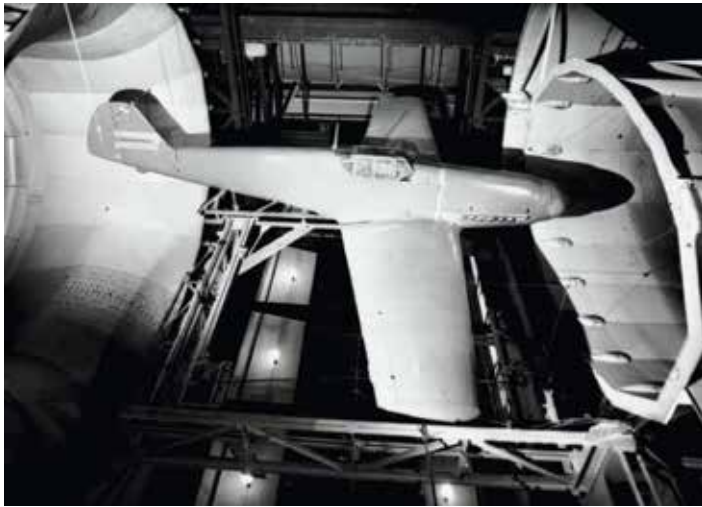
Concerning the history of quantum field theory, the project has also initiated a collaboration with a new Max Planck Partner Group, set up in 2017 at the Capital Normal University (CNU) in Beijing, led by Yin Xiaodong. The aim of the Partner Group is to form a new basis for understanding how knowledge of modern physics was transferred to China and was further developed there, for example, in the attempt to set up a non-atomistic alternative to the Western quark model.

## Changing Contexts and Practices of Basic Science during the Twentieth Century

Throughout the twentieth century the social and cultural dimension of basic science changed dramatically. These changes affected the daily practices of the sciences in multiple ways, from the increasing level of cooperation among practitioners to the definition of shared standards for communicating research products and certifying their validity. One major change concerned editorial practices. The peer review, for instance, only became the ubiquitous, pervasive practice we know today—where a review by external referees is a requirement for editors to publish papers—in the late 1960s. A project has been initiated to investigate the historical transformations of editorial strategies and refereeing practices and evaluate the impact of these transformations on the evolution of research agendas in twentieth-century physics (Roberto Lalli). The project focuses on the journal *Physical Review* and other publishing venues of the American Physical Society (APS). A first phase of the project focused on the historical process that led to the standardization of the refereeing practices in the *Physical Review* in the 1930s and the introduction of innovations. These transformations were caused, on the one hand, by the competition between the American community and leading European physics communities, and, on the other hand, by the specific needs of the dynamic American physics community at the time, which underwent a deep transformation of its own during that period.

The increasing number of students of physics required new methods of teaching that involved, for instance, demonstration experiments that could be attended by large groups of students. Research on the extant documents of the physicist Robert Wichard Pohl (1884–1976) and reconstruction of his spectacular experiments at Göttingen University are both being pursued by Ekkehard Sieker in collaboration with the University and the Department. Video films of the experiments have been produced in collaboration with the first physical institute of Göttingen University and will be made available online at the website of the MPIWG.

The twentieth century saw massive political upheavals, which had a profound impact on scientific practice. A research activity was dedicated to the role of science and scientists in World War I. In collaboration with the Fritz Haber Institute of the MPG, Department I took the initiative to organize an international symposium on the one hundredth anniversary of the first deployment of chemical weapons on April 22, 1915. The focus lay on ethical, legal, and political issues of chemical weapons research and deployment—including the issue of dual use—as well as the ongoing effort to control the possession of chemical weapons and to ultimately achieve their elimination (Dieter Hoffmann, Jürgen Renn, Florian Schmaltz). Other, less destructive technologies also played an important role in the war. Another research activity has studied the development of sonar, from its origins in scientific knowledge and in the need for improved navigation and locating submarines in the war effort. This study involved examining the technological research on sonar during the war and the role of



Measurement of a full-scale Me 109 warplane by Messerschmitt in the large wind tunnel 6 of the Aerodynamische Versuchsanstalt in 1941. Zentrales Archiv des Deutschen Luft- und Raumfahrt-zentrums Göttingen.

theory, mathematics, and different kinds of empirical findings on the formation of knowledge and usable technology (Shaul Katzir).

Straddling the two world wars, a further research activity was to perform a comprehensive institutional study (Florian Schmaltz) of the history of the Aerodynamic Research Establishment (Aerodynamische Versuchsanstalt—AVA) in Göttingen and its predecessor organizations (1907–1950). One result was the discovery that Germany, in the context of the armament policy of the Nazi regime between 1933 and 1943, invested 3.4 times more on aeronautical research and development than the National Advisory Committee for Aeronautics

(NACA) in the United States. In addition to that, the Nazi aggression against European neighbors enabled the regime to mobilize additional resources from the occupied countries and territories for aeronautical research. The AVA Göttingen played a central role in this acquisition process.

The project further studied the impact of Nazi rule on science. One case study was the mathematical community in Vienna between 1930 and 1945. The project analyzed the variety of epistemological (and general philosophical) and political opinions (Robert Frühstückl). The observed diversity was further analyzed through historical network analysis. It could be demonstrated how distinct political networks among the Viennese mathematicians, already established in the early 1930s, shaped the discipline throughout the entire Nazi period. The project also organized a conference in 2015 in collaboration with the Center for Contemporary History to foster discussion on the relationship of the sciences and politics in National Socialism, with a specific and novel focus on the international European perspective and the spatial expansion and forced mobilization of resources in Europe under Nazi hegemony between 1938 and 1945, asking how “efficient” this appropriation and exploitation really was (Florian Schmaltz).

Ivan Malek, C. F. Powell and Eugene Rabinowitch (senior figures within Pugwash, from the Czech, British, and American Pugwash groups, respectively) in conversation during a Pugwash symposium in Marienbad in May 1969.



Going beyond the focus on Europe, the project studied the American influence on Chinese physics in the early twentieth century, finding that the dominant American influence on Chinese physics development during the early twentieth century was due to two main factors: the Boxer Scholarship (1909–1940s) and the successful physics education at many American mission colleges in China (Danian Hu).

Moving into the second half of the twentieth century, the project is analyzing how elite scientists involved in the Pugwash Conferences on Science and World Affairs (Pugwash) contributed to conflict moderation in the period 1957–1977, taking Pugwash in the two Germanys as a case study to explore its distinctive mode of operation. The results will be published as *Science, Peace, and Commu-*

nism: *The Pugwash Conferences on Science and World Affairs in the Early Cold War* (Brill) (Alison Kraft, Carola Sachse).



## SELECTED PUBLICATIONS

Badino, Massimiliano. *The bumpy road: Max Planck from radiation theory to the quantum (1896–1906)*. SpringerBriefs in history of science and technology. Cham: Springer, 2015.

Blum, Alexander S., Roberto Lalli, and Jürgen Renn. “The reinvention of general relativity: a historiographical framework for assessing one hundred years of curved space-time.” *Isis* 106 (3 2015): 598–620.

Blum, Alexander S., Roberto Lalli, and Jürgen Renn. “The renaissance of general relativity: how and why it happened.” *Annalen der Physik* 528 (5 2016): 344–349.

Blum, Alexander S. “The state is not abolished, it withers away: how quantum field theory became a theory of scattering.” *Studies in History and Philosophy of Science. Part B, Studies in History and Philosophy of Modern Physics* 60 (2017): 46–80.

Blum, Alexander S., Domenico Giulini, Roberto Lalli, and Jürgen Renn, eds. *The Renaissance of Einstein’s Theory of Gravitation. The European Physical Journal H: special issue*; 42/2 (2017): 95–393: [https://link.springer.com/journal/13129/topical-collection/AC\\_c8e77d746f18aada03b0b55ee26e5155](https://link.springer.com/journal/13129/topical-collection/AC_c8e77d746f18aada03b0b55ee26e5155)

Blum, Alexander S., Martin Jähnert, Christoph Lehner, and Jürgen Renn. “Translation as heuristics: Heisenberg’s turn to matrix mechanics.” *Studies in History and Philosophy of Science. Part B, Studies in History and Philosophy of Modern Physics* 60 (2017): 3–22.

Friedrich, Bretislav, Dieter Hoffmann, Jürgen Renn, Florian Schmaltz, and Martin Wolf, eds. *One hundred years of chemical warfare: research, deployment, consequences*. SpringerOpen. Heidelberg: Springer International Publishing, 2017: [https://link.springer.com/content/pdf/10.1007%2F978-3-319-51664-6\\_4.pdf](https://link.springer.com/content/pdf/10.1007%2F978-3-319-51664-6_4.pdf)

Gutfreund, Hanoch and Jürgen Renn. *The road to relativity: the history and meaning of Einstein’s “The Foundation of General Relativity”: featuring the original manuscript of Einstein’s masterpiece*. Princeton: Princeton University Press, 2015.

Gutfreund, Hanoch and Jürgen Renn. *The formative years of relativity: the history and meaning of Einstein’s Princeton Lectures*. Princeton: Princeton University Press, 2017.

Hoffmann, Dieter, Birgit Kolboske, and Jürgen Renn, eds. *‘Dem Anwenden muss das Erkennen vorausgehen’: auf dem Weg zu einer Geschichte der Kaiser-Wilhelm/Max-Planck-Gesellschaft*. Second extended edition. Berlin: Edition Open Access, 2015: <http://www.edition-open-access.de/proceedings/6/index.html>

Janssen, Michel and Jürgen Renn. “Arch and scaffold: how Einstein found his field equations.” *Physics Today* 68 (11 2015): 30–36.

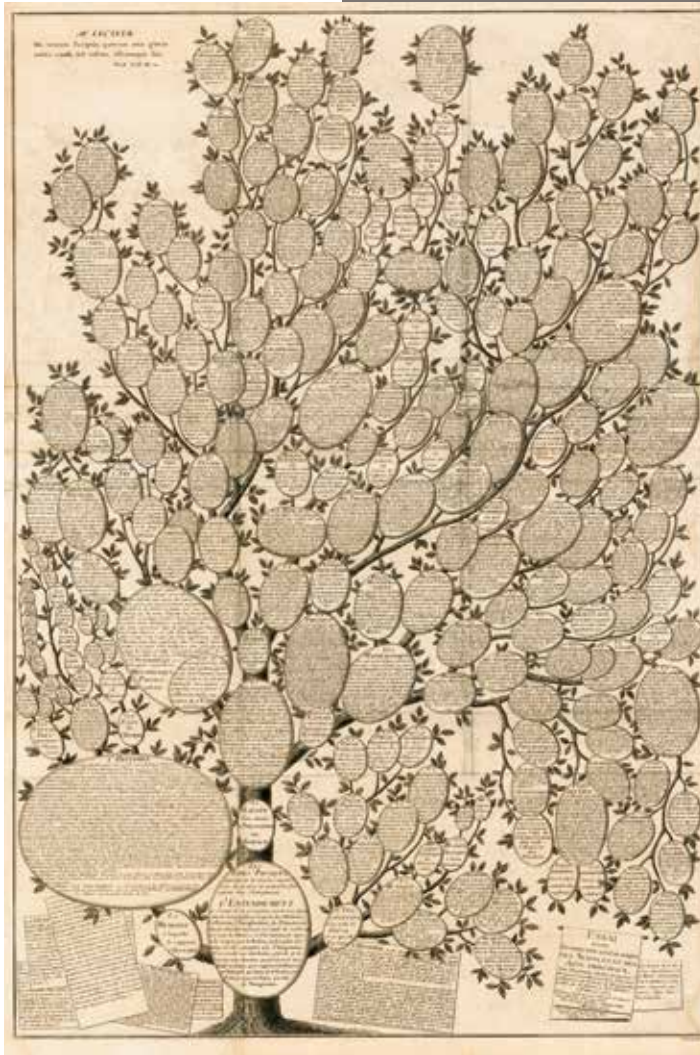
Lalli, Roberto. *Building the general relativity & gravitation community during the Cold War*. SpringerBriefs in history of science and technology. Cham: Springer International Publishing, 2017.

Lalli, Roberto. “‘Dirty work,’ but someone has to do it: Howard P. Robertson and the refereeing practices of *Physical Review* in the 1930s.” *Notes and Records* 70 (2 2016): 151–174.



## Research Theme

## Historical Theories of Knowledge



A figurative system of human knowledge, from the fold-out frontispiece of Pierre Mouchon, *Table analytique et raisonnée* [...], vol. 1 (Paris: Panckoucke, 1780).

the philosopher Salomon Maimon (1753–1800). The analysis focuses on the moral value Maimon ascribes to an understanding (rational and autonomous) that controls sensibility, which is opaque to reason, passive, and a source of carnal temptations (Gideon Freudenthal).

In the larger frame of this project area, four major investigations are being pursued: the first pivots around the notion of “contingency”; the second deals with the “split of rationality” in the twentieth century, that is, the split between normative and historical reflections on science; the third is directed at an evolutionary understanding of knowledge; and the fourth is concerned with the future design of higher education.

Within the Department, various concepts and methods of historical theories of knowledge have been explored by research activities dedicated to the analysis of the relation between the history and philosophy of science. Historical investigations have been accompanied by efforts to develop further the theoretical framework common to all major projects of the Department, aiming at a historical theory of the evolution of knowledge, which comprises different forms of knowing and learning as well as their contexts. Projects within this research umbrella include investigations of theories of knowledge and knowledge production from a wider historical perspective, as well as investigations zooming in on specific case studies. To the former belongs a textbook project offering, on the basis of selected sources and their interpretations, a comprehensive history of scientific thought from the Bronze Age until 1900, in the geographical space between the Indus and the Atlantic (Jens Høyrup). Among the in-depth studies, one study analyzes the historical emergence of a self-disciplined subjectivity capable of systematically acquiring empirical knowledge. The history of this subjectivity stretches from medieval literature and theology to early modern philosophy (Gabriel Motzkin). A second in-depth study is a research endeavor that investigates the work of

## The Notion of Contingency in the History of Science

The notion of *contingency* is at the core of a *longue durée* study that includes epistemological and ontological ramifications from the Middle Ages onwards (Pietro Daniel Omodeo). In their efforts to specify mechanistic and mathematical laws governing nature, late medieval and early modern scholars addressed the apparent lack of absolute regularity among natural phenomena. Following Aristotle, scholastic philosophers understood nature in general, and the sublunary world in particular, as the domain of a restricted rather than an absolute necessity. According to this view, matter conditioned a lack of perfection in the natural realm. Though aiming to emancipate themselves from scholasticism, Renaissance scholars still maintained a conception of nature in which contingency played a major role. They considered a certain degree of imperfection in natural phenomena to be necessary. Over the course of the sixteenth and seventeenth centuries, the rise of mechanics, experimental practice, new instruments of observation, and innovations in measurement, as well as the growing application of mathematical heuristics to the study of nature, challenged the traditional ways of understanding the predictability and unpredictability of natural phenomena. Contingency increasingly—but not exclusively—took on an epistemological rather than an ontological cast. The unpredictability or apparent irregularity of natural phenomena prompted critical reflection on the limit of the human ability to find comprehensive causal explanations—or, in other words, to reach a full understanding of the necessary causal concatenation determining each and every natural phenomenon. An edited volume titled *Contingency and Natural Order in Early Modern Science* will be published in 2018 in the Springer series *Boston Studies in the Philosophy and History of Science* (Pietro Daniel Omodeo, Rodolfo Garau).

## Theories of Knowledge in the Twentieth Century: The “Split of Scientific Rationality”

Of special interest for the understanding of the mutual relations between science, philosophy, and the history of science is the period of the so-called scientific philosophy, extending approximately from the late nineteenth century to the 1930s. This period is characterized in particular by the interaction of the revolutionary transformations of physics with philosophical perspectives on science, but also by the interaction of the philosophy of science with developments in experimental psychology and biology. In the course of this development, radically different perspectives on science emerged, alternatively emphasizing normative versus contingent perspectives, or collective versus individualistic perspectives on rationality, amounting to what one might call “a split of scientific rationality” which continues to shape epistemological debates until today. In this context, a research activity specifically investigated con-

flicts between the history, philosophy, and sociology of science as a result of this split of rationality, but also their integration into the concepts and methods of a historical epistemology. A survey of these developments is now in press: *Die Spaltung der Vernunft* (Mattes & Seitz) (Olaf Engler, Jürgen Renn).

During the same period, the works of Antonio Gramsci (1891–1937) offered a new approach to the field of culture and politics that can also be fruitfully applied to an investigation of scientific categories and practices. Gramsci’s category of “cultural hegemony” has been used to introduce the dimension of intentionally directed collective action and political struggle into the realm of the history and philosophy of science. In his *Prison Notebooks* of the 1920s and 1930s, Gramsci provided scholars with an effective conceptual arsenal to critically grasp interactions between culture, including science, and society. An edited volume, which examines how science has been shaped by values stemming from political and cultural agendas, is currently under review with Brill: *Cultural Hegemony in a Scientific World: Gramscian Concepts for the History of Science* (Massimiliano Badino, Pietro Daniel Omodeo).

Edgar Wind: frontispiece and dedication to Samuel Sambursky (a teacher of Yehuda Elkana) from: *Das Experiment und die Metaphysik. Zur Auflösung der kosmologischen Antinomien* (Tübingen, 1934). Gideon Freudenthal bought this copy at a sale of the National Library of Jerusalem and bestowed it to John Krois. From the estate of John Michael Krois, Berlin.



The work of the Soviet physicist and historian of science Boris Hessen (1893–1936) has provided a fundamental contribution to the social understanding of science. The investigation and translation of texts by Hessen, in particular his classic essay *The Social and Economic Roots of Newton Mechanics* (delivered in London at the 1931 International Congress of History of Science and Technology) has shown that, contrary to conventional interpretations relegating his contribution to the realm of historiography of science and technology, Hessen’s work represents an antecedent to the social studies of science, later acknowledged in the West, in the 1960s, as “science and technology studies.” Hessen’s work has been examined both in

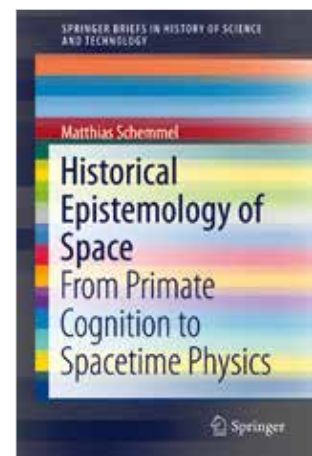
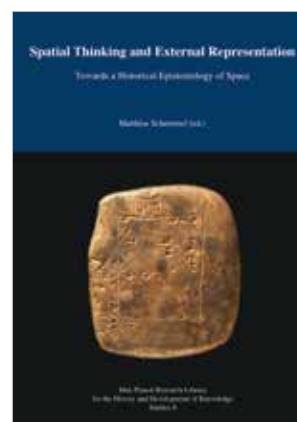
the political context of the Soviet Stalinization of science, to which he fell victim, and in its international reception (Pietro Daniel Omodeo, Giulia Rispoli).

A parallel study focuses on the work of the historian of art and philosopher Edgar Wind (1900–1971). Wind’s work shows points of contact between historical and scientific methodologies and investigates the presuppositions underlying such concepts as “nature” or “symbolism” in cultural research. The study has shown that Wind can be understood as a pragmatist who continued the approach of the German philosopher Ernst Cassirer (1874–1945). It also evaluates the reception and influence of Cassirer’s work on the development of historical epistemology in the twentieth century, taking into consideration not only Western science and thought, but also work done in the Soviet human sciences, especially in the so-called “cultural historical school and activity theory of psychology” (Sascha Freyberg).

The legacy of Cassirer’s work for historical epistemology is being analyzed, focusing on the work of Yehuda Elkana (1934–2012). Elkana’s approach to the relation between the philosophy and the history of science has been considered from the perspective of the “split of scientific rationality” mentioned above. In the 1980s, Elkana began a book project on Cassirer’s political epistemology, relating it to his concepts of “images of knowledge” and “two-tier thinking” and in particular to a program which he titled “Rethinking the Enlightenment.” A research activity has been dedicated to the analysis of the extensive collection of unpublished manuscripts and notes left by Elkana, who had planned a joint publication with the philosopher and Cassirer expert John Michael Krois (1943–2010). Elkana and Krois read Cassirer as a thoroughly political thinker whose works are implicit reactions to concrete historical-political events of his time, such as the rise of Nazism in Germany in the 1930s. A publication is being prepared to compile the texts that present Elkana’s main arguments and thoughts (Ohad Parnes, Sascha Freyberg).

## Evolution of Knowledge

The historical evolution of knowledge is being analyzed from a long-term perspective by developing a theoretical framework and pursuing longitudinal studies. The aim is to develop an evolutionary theory of knowledge and innovations in their social and cultural contexts. A research activity is currently exploring concepts from regulatory network and niche construction theories (Manfred Laubichler, Jürgen Renn). An exemplary longitudinal study was dedicated to the historical evolution of the concept and representations of space, and its results have now been published. A monograph *Historical Epistemology of Space: From Primate Cognition to Spacetime Physics* (Springer, 2016) and an edited volume *Spatial Thinking and External Representation: Towards a Historical Epistemology of Space* (Edition Open Access, 2016) are the main output of these studies (Matthias Schemmel).



## Toward a New Deal for Research and Higher Education in Europe

A further research activity deals with current challenges and explores the possibility of a “New Deal” for European research and higher education. It starts from the affirmation that the “right to be” is worth more than the “right to have,” where quality dominates quantity. Knowledge should be at the foundation of a new social contract, and not only serve as a purely technical tool to promote additional material enrichment. In particular, five dimensions of freedom are defined for the knowledge community—freedom of choice, of movement, education, research, and self-administration—which should then be translated into political proposals. The first results of this study have been published in *University World News* as “Universities must rise to the challenges of globalisation.” A proposal for a special issue has also been submitted to *Higher Education Quarterly*: “Towards a New Deal for Research and Higher Education in Europe” (Stefano Paleari).



### SELECTED PUBLICATIONS

Arabatzis, Theodore, Jürgen Renn, and Ana Simões, (eds.). *Relocating the history of science: essays in honor of Kostas Gavroglu*. Dordrecht: Springer, 2015.

Blum, Alexander S. “The literature review as imagined past.” *Isis* 108 (4 2017): 827–829.

Blum, Alexander S., Kostas Gavroglu, Christian Joas, and Jürgen Renn, eds. *Shifting paradigms: Thomas S. Kuhn and the history of science*. Max Planck Research Library for the History and Development of Knowledge, Proceedings 8. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/proceedings/8/index.html>

Freyberg, Sascha. “Ereignis und Objekt: zur Whitehead-Kritik von Edgar Wind und John Dewey.” In *Das entgegenkommende Denken: Verstehen zwischen Form und Empfindung*, eds. Franz Engel and Sabine Marienberg. 39–54. Berlin: De Gruyter, 2016.

Ienna, Gerardo and Giulia Rispoli. eds. *Boris Hessen: Le radici sociali ed economiche della meccanica di Newton*. Rome: Castelvechi, 2017.

Klein, Ursula. “A revolution that never happened.” *Studies in History and Philosophy of Science. Part A* 49 (2015): 80–90.

Renn, Jürgen. “From the history of science to the history of knowledge – and back.” *Centaurus* 57 (1 2015): 37–53.

Renn, Jürgen and Manfred Dietrich Laubichler. “Extended evolution and the history of knowledge.” In *Integrated history and philosophy of science*, ed. F. Stadler. 109–125. Cham: Springer International Publishing, 2017.

Schemmel, Matthias. *Historical epistemology of space: from primate cognition to spacetime physics*. SpringerBriefs in history of science and technology. Cham: Springer International Publishing, 2016.

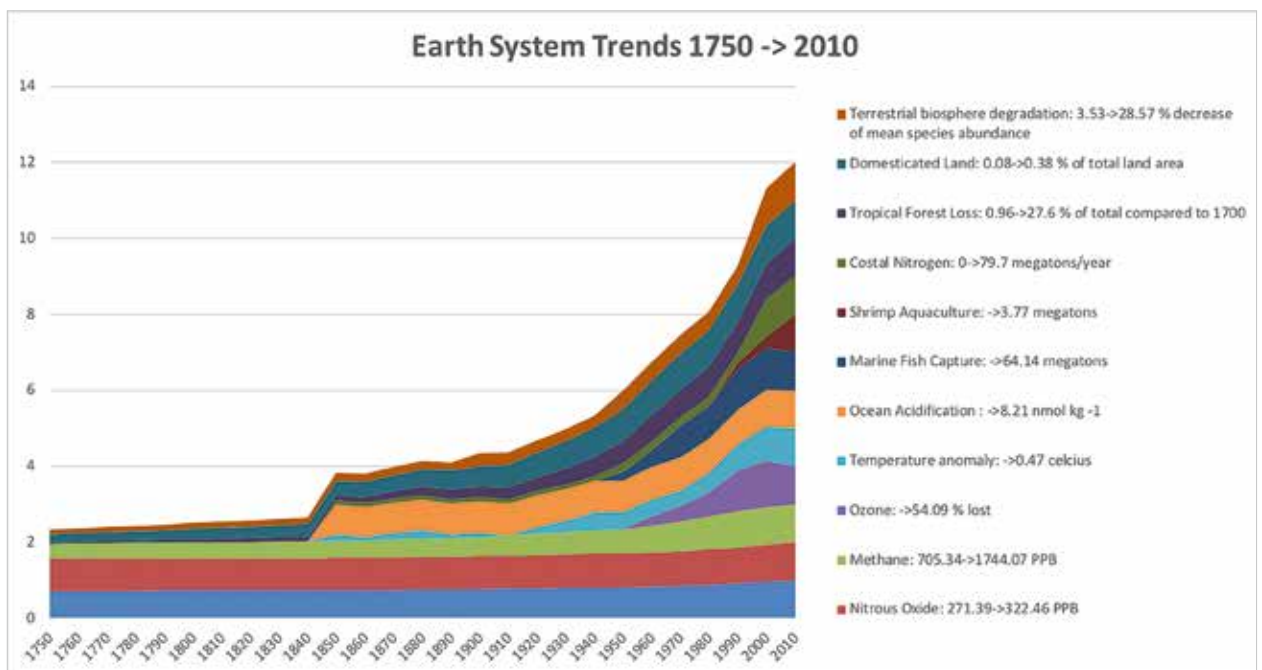
Schemmel, Matthias, ed. *Spatial thinking and external representation: towards a historical epistemology of space*. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/studies/8/index.html>



Research Theme

# Knowledge in and of the Anthropocene

This project aims at a comprehensive understanding of the long-term historical dynamics that have given shape to the current anthropogenic alteration of fundamental geo-biophysical parameters—pointedly captured by the term “Anthropocene.” Specifically, it looks at the socio-epistemic and technological frameworks that have co-evolved in the interplay of material practices and specific knowledge economies throughout many centuries of intensified human-environment interaction. The project is now at the core of the Department’s research emphasis on the long-term developments of material practices and knowledge diffusion that involve the exploitation of natural resources and the creation of man-made environments. With the Anthropocene, such research has found a recent conceptual convergence, but also an epistemic challenge.



The Anthropocene denotes the proposed new geological epoch of humankind that presents an entirely novel, non-analogous situation in the Earth’s history. Capturing the profound and long-lasting impact of human activities on the entire Earth system, the Anthropocene is a powerful concept for investigating the deep biophysical and sociotechnical changes that tie the local to the global as well as the historical to the geohistorical and back. Thus, the notion of the Anthropocene allows different historical horizons to be banded together, in particular *longue durée* and recently accelerating environmental and socio-epistemic changes, but also changing geographies in the production of technical and scientific knowledge in core areas and peripheries.

Earth System Trends of the Great Acceleration of the Anthropocene from 1750 to 2010. The data graphically displayed is scaled for each datum’s 2010 value. Source data is from the International Geosphere-Biosphere Programme: [www.igbp.net](http://www.igbp.net).

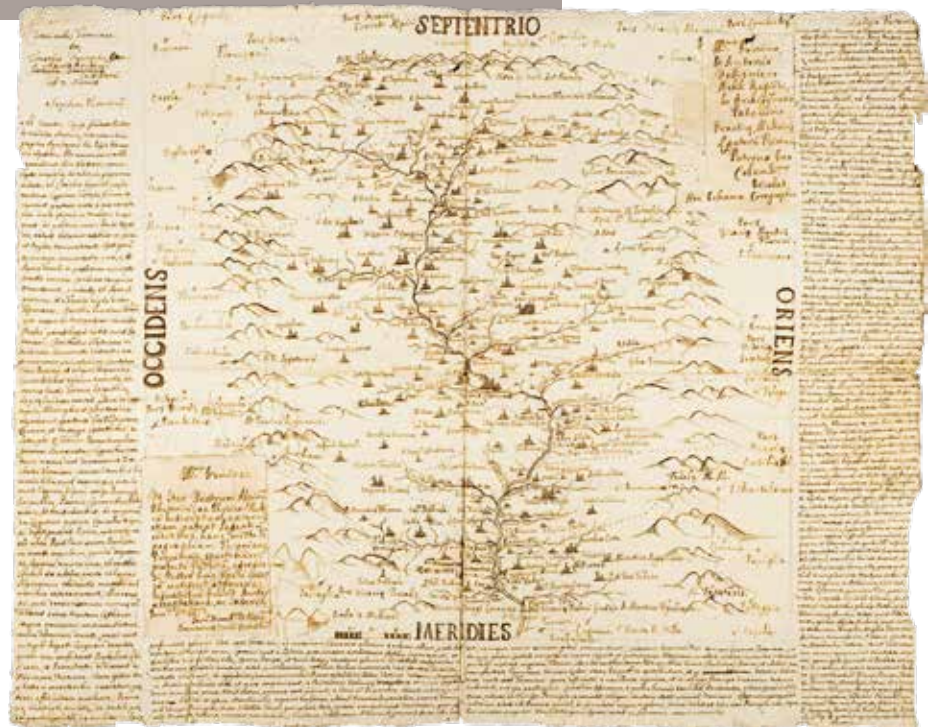


The project thus firstly aims to adequately describe and uncover the historical matrix of epistemic and technological practices that together constitute potent drivers for the current transition into a new geological epoch. At this junction, the interaction between environments, both ancient and modern, and knowledge production can be conceptualized as a process of co-evolution, including the interplay between knowledge economies and accelerated industrialization. Secondly, this matrix of practices is also key in understanding the specific forms of reflection upon this very transition, for example, in the conceptualization of the Earth as an evolving system characterized by a natural—and now increasingly artificial—circulation of matter and energy within this system. At this epistemic level, histories of key disciplines such as the Earth and climate sciences provide crucial insights into the co-production of knowledge, for example, into the relation between modeling and observation. With the Anthropocene, a changing temporal and spatial configuration of epistemological frameworks is currently underway. The aim of the project is therefore not only to reflect on historical lineages but also, together with a range of national and international partners, to help find new grounds for research and education in a highly interdisciplinary twenty-first-century setting.

A survey of current discussions on the Anthropocene, based on a collaboration between the MPIWG and the Haus der Kulturen der Welt (HKW) was published as *Das Anthropozän. Zum Stand der Dinge* (Matthes & Seitz 2015) (Jürgen Renn, Bernd Scherer). The essays in this book range from a look back at the invention of writing four millennia ago, to the decisive historical-cultural threshold of the modern era and current diversifications of the Anthropocene, including the chasm between global character and regional interests, case studies such as that on international maritime law, the economization of nature as capital, or the question of the rights of animals as persons. Such a variety of perspectives is also captured by the “Anthropocene Lecture” series that began in 2016 as a joint program between the HKW, the MPIWG, and the Institute for Advanced Sustainability Studies (Potsdam). A number of distinguished speakers were invited to further accentuate the Anthropocene debate (Christoph Rosol).

The project’s activities are organized around two major research areas: “Material Practices” and “Anthropocene Knowledge.” The first investigates the development of particular knowledge economies that concern resource extraction, respective resource flows, and transformations of energy systems, as well as the changing interfaces between human bodies and the environment and the particular human-environment interaction within agricultural practices and traditions. The second addresses questions of relevance for a historical epistemology of Anthropocene-related practice fields, such as (pre-)industrial chemistry, Earth system and climate sciences, risk assessment, historiography, and the current transformation of scholarship.

## Material Practices: Earth in the Making



The first major research area of the project lies in the material practices and knowledge infrastructures that constitute resource and energy systems, both historical and current. Mining practices, in particular, have been a decisive driving force behind economic and technological dynamics in early modern Europe (Tina Asmussen, Francesco Luzzini). Sixteenth- and seventeenth-century mining was a crucial context for the interlocking of geological and economic processes and therefore an area of keen scientific interest. Antonio Vallisneri's *Primi Itineris per Montes Specimen Physico-Medicum* (1705) is probably the earliest and best-documented attempt to define an experimental and systematic approach to naturalistic explorations. A critical edition of Vallisneri's detailed description of the extraction activities in the iron mines of Garfagnana and sulfur and gypsum mines of Scandiano, together with the many experiments, explorations, and observations that he made on countless specimens and natural phenomena in the northern Apennines, is now published in the Edition Open Sources (Francesco Luzzini).

Map of the Tuscan region of Garfagnana, from Antonio Vallisneri's *Primi Itineris per Montes Specimen Physico-Medicum* (1705). Image courtesy of the State Archive of Reggio Emilia, Italy.

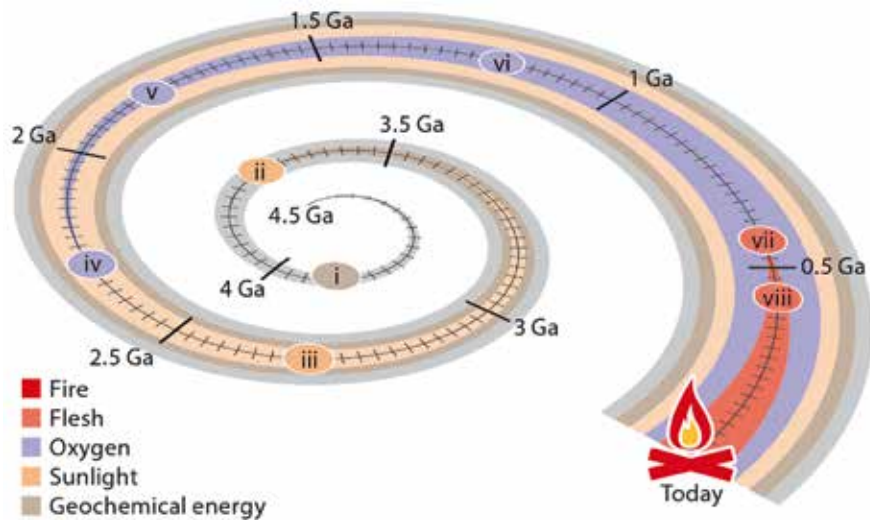
The sudden transformation of hitherto uncultivated mountain areas, such as the Harz Mountains and the Tyrolean Alps, into populated and prospering mining regions starting in the second half of the fifteenth century led contemporaries to coin the term *Berggeschrey* (mining clamor). The term gives name to a process of economic dynamism, with faster cycles of booms and busts, and the circulation of people, knowledge, materials, and money at a quickened pace. It provides a case for studying the historical linkage between the history of political economy—broadly understood as the set of practices of making and exchanging value in a given culture—and ques-

tions about knowledge, acceleration, and the ways in which contemporaries of the early modern age already reflected on forms of the destruction of nature (Tina Asmussen).

The context of resource history helps in understanding why coal became the main agent in the energy transition from organic to fossil combustibles and what consequences this transition entailed on a global scale. Local conditions of energy transitions changed from place to place depending on a range of factors that included environmental conditions (especially the geology and topography of the area), available capital, political and administrative restrictions and encouragement, and the practical knowledge required to detect and mine coal. Such critical issues were discussed during a workshop on “Resources and Economies of Knowledge in the Anthropocene” at the MPIWG in September 2016. The question of how societies developed in relation to knowledge systems of extraction, including the recognition of non-human processes, were presented at a symposium at the ICHST-Congress in Rio de Janeiro in July 2017. The results of this research, which focuses on the first industrial revolution and the subsequent industrial alteration of natural carbon cycles by humans, will be presented in an edited volume, as well as in a monograph on the *Global History of Mineral Coal: Knowledge and Energy Transitions 1700–1920* (Helge Wendt).

Most definitions of the Anthropocene connect the new epoch to the industrial use of fossil resources. Interestingly, however, crude oil, coal, and natural gas have had a historic impact not just as natural resources but as resources that are highly processed. One of the key factors or players in the “Great Acceleration,” the dramatic escalation of several key indicators of global change since the mid-twentieth century, is the chemical industry, and in particular the industrial technicality of energy storage. Here, a new cultural theory of industry can find a suitable anchor. A research activity has been engaged in a cultural history of energy and acceleration as well as in the industrial history and theory of the materials of modernity, foremost both raw and refined fossil materials and fuels (Benjamin Steininger).

Key events in the energetic history of life and Earth. For further information see Olivia P. Judson. “The Energy Expansions of Evolution.” *Nature Ecology & Evolution* 1 (2017): 0138. Figure drawn by Ferenc Zsolnai.



Within the field of energy studies, the subfield of “energy transition research” has grown increasingly prominent, mostly from an economic perspective. These studies show that energy transitions must be considered as much an intellectual endeavor as a material process, meaning that shifting conceptions of energy have derived from changes in material circumstance, as occurred in periods of crisis in energy supply, but also that in some instances conceptual shifts have conditioned material practices. Analysis of canonical histories of energy transition has detailed historians’ role in this endeavor. The canonical understandings of transition (models) that they produced were informed by and actively applied to past energy crises. This research has termed the study of such interventions “historiographies of energy transition.” A paper to be submitted to *Energy Research & Social Science* argues that the study of these past interventions is critical if energy history is to be applied to the ongoing low-carbon energy transition. This argument is reaffirmed in a forthcoming review essay for the first issue of the *Journal of Energy History* (Thomas Turnbull).

To survey current research on energy transitions an international, two-day symposium was held in January 2017 representing a joint undertaking of the Max Planck Institute for Chemical Energy Conversion (Mülheim/Ruhr) and Department I. Historians, chemists, anthropologists, political scientists, and architectural historians met to discuss the current role of the humanities in studying energy systems and their transformations. The symposium has shown that an integrated approach to the question of the emergence and maintenance of different kinds of energy and resource regimes is ripe for development. It has become clear that a historiography of energy transitions has to deal with new types of theoretical and methodological frameworks that systematically go beyond case study-based microhistories. While these studies allow for close insights into the materiality of history, the macro-scale processes of resource transformations demand a wider understanding of the mutual interactions and dependencies between essentially co-evolutionary processes of human, bio-, and geohistory. A second symposium directly addressing these methods was held under the aegis of the Human Sciences Section of the Max Planck Society (Jürgen Renn, Robert Schlögl, Benjamin Steininger, Christoph Rosol).

Material practices in light of the Anthropocene also touch on more intimate and embodied forms of a general human-environment interaction. For instance, artifacts that mediate between the body and the air attain epistemological, social, and political significance. In a research cooperation with Marie-Thebaud Sorger (CNRS-Paris), the mechanical and chemical artifacts that attempted to make breathing safer and healthier are examined. Moving beyond texts, the research aims to gain new insights into the intimate connections between science—particularly in the fields of chemistry and medicine—and technology, economics, and political ideologies (Elena Serrano).

Agricultural production and food consumption are another case in point because they are as significant to human health and well-being as it is to the environment. Agriculture reflects what Philippe Descola describes as a community of practices expressing a particular sifting of the qualities of the world. In this sense, it indicates different kinds of environmental experience and knowledge. A research area brings recent scholarship in anthropology, archeology, archaeobotany, ethnobotany, cultural



Postcards from ca. 1915 depicting the effectiveness of the new synthetic fertilizer.

ecology, and related subdisciplines to bear on the question of whether “agricultural sustainability” depends on humankind achieving a “final” and “sustainable” mastery of agroecosystems, and by extension, of the biosphere as a whole (Daniel Niles). A further research focus is related to the intricate link between the Anthropocene and the question of sustainability and global futures as well as the evolutionary transformations underlying these fundamental systems dynamics (Manfred Laubichler). A study of the transformation of agriculture through the use of chemically produced fertilizers and of the genesis of the Haber-Bosch process making this transformation possible was published as “Ammoniak und seine Synthese” (Benjamin Johnson, Benjamin Steininger, Jürgen Renn).

## Anthropocene Knowledge: Earth History in the Making

The idea that the face of the Earth is fundamentally transformed through human activities is nothing new. In fact, in the recent popularization of the term Anthropocene a list of prominent “precursors” of the Anthropocene concept quickly became canonized, with figures from the naturalist Georges-Louis Leclerc, Comte de Buffon in the eighteenth century, via the philologist George Perkins Marsh in the nineteenth century, to the Russian biogeochemist Vladimir I. Vernadsky in the first half of the twentieth century. This established folklore neglects not only the immediate insights of practitioners, more technically-oriented scientists, and natural philosophers at the fringes of this canon, but also the more systematic turns in knowledge production over longer historical periods in thinking about the global environment in conjunction with understanding and articulating the human imprint on it. A longer-term publication endeavor has started to document and comment on the works and historical contexts of people and places that have either fallen into oblivion or deserve re-evaluation in light of the Anthropocene thesis. Reconstructing and contextualizing the works of scholars such as the ethnographer Dmitriy Nikolaevich Anuchin, the geographer Radim Kettner, or the chemist Alwin Mittasch helps to consistently evaluate the historical and epistemological foundations of the Anthropocene (Giulia Rispoli, Benjamin Steininger, Christoph Rosol).

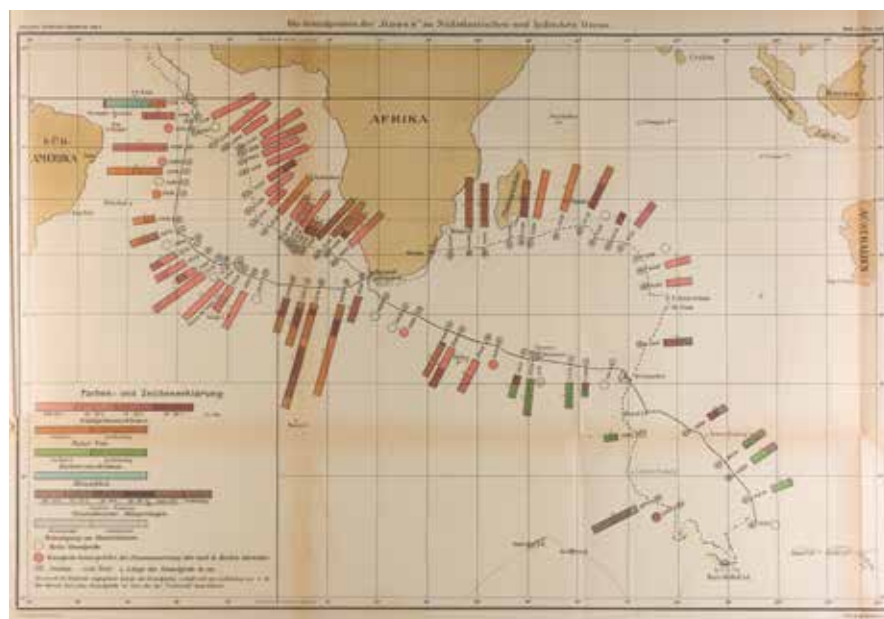


Much of the theoretical concept of the Anthropocene emerged in the context of systems theory and cybernetics, which became institutionalized with the development of Earth system science and the establishment of the International Geosphere-Biosphere Programme (IGBP). One research activity is being undertaken to understand key transitions in the rise of Earth system science by delving into early biosphere studies in the crucial period ranging from the end of the nineteenth century through the immediate aftermath of World War II. This research further attempts to clarify such issues as Valdimir Vernadsky’s thinking and explore the ways in which his ideas and approaches were instrumentalized, employed, and even manipulated by scientific advocates of the Anthropocene over the last decades (Giulia Rispoli).

Stark disruptions of the Earth system, as are currently underway, have already happened in the deep past. The reconstruction of previous climates and climatic changes by combining proxy data Earth system models is a cardinal activity for gauging the sensitivity of the Earth and climate system to our current anthropogenic perturbation. As a peculiar and largely unacknowledged scientific practice at the border between an empirical and an exact science, paleoclimatology plays a key role in assessing the boundary conditions of the global climate’s future. One research activity studies the historical lineage and peculiar epistemic configuration of empirical data, computer models, and numerical simulation experiments within the Earth and climate sciences. By considering the conjunction between the early history of General Circulation Models (GCMs) and the simultaneous developments in paleoclimatological methods, a historiographic reframing of the objects, techniques, and *longue durée* ideals of rationally modeling a climatic history of the Earth is being undertaken (Christoph Rosol).

From the broader perspective of the almost 4.6 billion years of Earth history, it could be argued that the Anthropocene concept requires a revision of the notion of history itself and, in addition, a new view on historical processes and dynamics. By employ-

Drilling sites of the “Gauss Expedition” of 1901–1903 in the Southern Atlantic and Indian Ocean. Emil Philippi, *Die Grundproben der Deutschen Südpolar-Expedition 1901–1903* (Berlin: Reimer, 1910).





ing a comparative method of historical epistemology, three notions are guiding this research area with the aim of revealing the significance of the Anthropocene discourse as a historical narrative: the Aristotelian notion of energy (*ενέργεια*) or potentiality/actuality (*δύναμις/ενέργεια*); the Japanese notion of becoming (*naru*), which appears in the ancient Japanese historiography in the eighth century CE; and the modern notion of process (Masahiro Terada).

In considering the Anthropocene, the history of Japan is a contrast medium for the path dependencies of global modernity. Japan has both profited from the resources of the ocean and suffered from its dangers. With industrial modernity and urbanization increasing the risk of large-scale natural disasters, disaster preparedness has become seen as vital to success on the global stage. Around 1900, Japan became an internationally trusted source for disaster-related knowledge, especially concerning earthquakes and tsunamis. On the other hand, Japan imported European and American scientific knowledge concerning flood control and coastal protection. A dissertation project is tracing the global circulation of disaster knowledge from a Japanese perspective and analyzes what kind of knowledge was selected for dissemination and how this was adapted to the natural environment. The increasingly planned nature of Japanese disaster prevention has created path dependencies towards technological and invasive strategies to the environment (Mariko Jacoby).

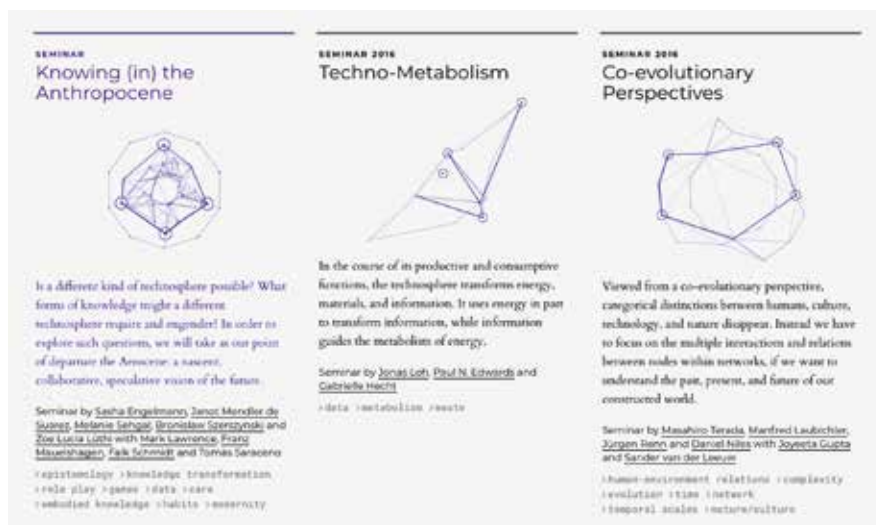
The trajectory and timing of disaster research deviates quite frequently from the “normal” pathways of disciplinary knowledge formation. One project has focused on the formation and elaboration of disaster research centers in Germany in universities, government research labs, law enforcement agencies, the military, and private firms or organizations. These centers exist in accordance with their ability to react to societal demands for “disaster knowledge.” Tracing the ways that disaster knowledge makes its way (or not) into the built environment and public policy has been a key output of this research (Scott Gabriel Knowles).

Practice and technology-based expertise, such as in disaster research, is a crucial form of knowledge generation in both understanding environmental change and adapting to it. In continuation of research on eighteenth-century scientific-technological experts, useful knowledge, and “useful sciences,” this endeavor follows the hybrid experts in nineteenth-century industrial Europe. It reconstructs the epistemological, socio-political, and institutional factors that drove the development of the technological sciences as well as the consequences for the field of the natural sciences. In so doing, it also aims to uncover deeper cultural changes concerning the understanding of “science” and its role in society. The goal of this research is to achieve a broader, more global picture of the role of science, both natural and technological, in European industrialization. Its method is comparative, covering Prussia and other German states, France, and England (Ursula Klein).

Directly correlated to the Anthropocene is the concept of the “technosphere.” Although the term has a longer history extending at least back to the 1970s, recent debates about the Anthropocene have given it new traction and urgency. Reintroduced by the geoscientist Peter K. Haff and his colleagues, the technosphere describes the

system that has emerged throughout the modern era to harvest, metabolize, and also squander energy and materials. A globe-spanning mesh of technological, ecological, and social complexes of circulation, this system has achieved functional parity with natural geospheres such as the biosphere or hydrosphere. The technosphere thesis raises the question of technological agency in the Anthropocene and how technologies act to shape our world in ways that are not direct elaborations of human intention. A publication venture encompassed two special issues of the peer-reviewed journal *The Anthropocene Review*, collecting a wide range of contributions from the history of science, Earth system science, geology, chemistry, social sciences, and the arts. Together, these papers highlight both the need to think of technological agency as a systemic phenomenon and the limitations of this paradigm (Jürgen Renn, Christoph Rosol, Sara Nelson).

Last but not least, the Anthropocene demands a new form of engagement, also for the history of science. The profession cannot stop at mere historical analysis but has the opportunity, if not duty, to use its insights and reflexive potential to productively engage with knowledge production as it is formed. A reorientation of the current knowledge economy towards global responsibility, including a greater integration of local perspectives and new ways of combining problem-oriented research with teaching and learning inside and outside of academia is necessary. Following the principle of such a “history of science in action,” a co-evolutionary model approach to knowledge formation is put into practice in a long-term research project that the department is undertaking with its cooperation partner HKW. Since 2012 the Department has maintained a close working relationship with the HKW in its two-year “Anthropocene Project” as well as its follow-up program “Technosphere 2015–2019.” The central anchor of the collaboration is the joint platform “Anthropocene Curriculum,” a continuous experiment in education design and practice, which involves more than 300 international scholars and artists and which has resulted in two large “Anthropocene Campuses” in Berlin and several spin-off projects around the globe (Lyon, London, Montreal, Chicago, Philadelphia, Lisbon, Kyoto, Cape Town, Delhi, Melbourne, Minneapolis, New Orleans, and Bogota). Curating new forms of engagement at the intersection of the natural sciences, humanities, design, and the arts enables the



Screenshot from the Anthropocene Curriculum website showing three seminars of the second stage of its Anthropocene Campus series, focusing on the “technosphere” (<https://www.anthropocene-curriculum.org/pages/root/campus-2016/>).

Department to engage productively with the numerous facets of Anthropocene research while also studying its epistemological underpinnings and fostering the understanding of its historical momentum (Christoph Rosol, Jürgen Renn, Manfred Laubichler).



## SELECTED PUBLICATIONS

Asmussen, Tina. “The Kux as a site of mediation: economic practices and material desires in the early modern German mining industry.” In *Sites of mediation: connected histories of places, processes, and objects in Europe and beyond, 1450–1650*, eds. Susanna Burghartz, Lucas Burkart, and Christine Göttler. 159–182. Leiden: Brill, 2016.

Klein, Ursula. *Nützliches Wissen: die Erfindung der Technikwissenschaften*. Göttingen: Wallstein, 2016.

Luzzini, Francesco. “The Edition Open Sources project: towards a critical edition of Antonio Vallisneri’s manuscript ‘Primi Itineris Specimen’ (1705).” In *Geosciences on a changing planet: learning from the past, exploring the future*, eds. D. Calcaterra, S. Mazzoli, F. M. Petti, B. Carmina, and A. Zuccari. 905–905. Rome: Società Geologica Italiana, 2016.

Nelson, Sara, Christoph Rosol, and Jürgen Renn. *Perspectives on the technosphere (Parts 1 and 2)*. 4. 2017: <http://journals.sagepub.com/toc/anra/4/1>, and <http://journals.sagepub.com/toc/anra/4/2>

Niles, Daniel and Sander van der Leeuw. “The material order.” *Technosphere Magazine* published online November 2017: <https://technosphere-magazine.hkw.de/p/The-Material-Order-4gK5EMpZ3SzB79aTePfo7>

Renn, Jürgen. “On the construction sites of the Anthropocene.” In *Out there: Landscape architecture on the global terrain*, ed. Andres Lepik. 16–19. Berlin: Hatje Cantz, 2017.

Renn, Jürgen and Bernd Scherer, eds. *Das Anthropozän: zum Stand der Dinge*. Berlin: Matthes & Seitz, 2015.

Renn, Jürgen, Benjamin Johnson, and Benjamin Steininger. “Ammoniak und seine Synthese: wie eine epochale Erfindung das Leben der Menschen und die Arbeit der Chemiker veränderte.” *Naturwissenschaftliche Rundschau* 70 (10 2017): 507–514.

Renn, Jürgen, Robert Schlögl, Christoph Rosol, and Benjamin Steininger. “A rapid transition of the world’s energy systems.” *Nature Outlook* (2017): 133–180: [https://www.mpiwg-berlin.mpg.de/sites/default/files/2017-12/natureoutlookenergytransitions2017\\_0.pdf](https://www.mpiwg-berlin.mpg.de/sites/default/files/2017-12/natureoutlookenergytransitions2017_0.pdf)

Rispoli, Giulia “Sharing in action: Bogdanov, the living experience and the systemic concept of the environment.” In *Culture as organization in early Soviet thought*, eds. Pia Tikka et al. 1–18. Helsinki: Aalto University, 2016.

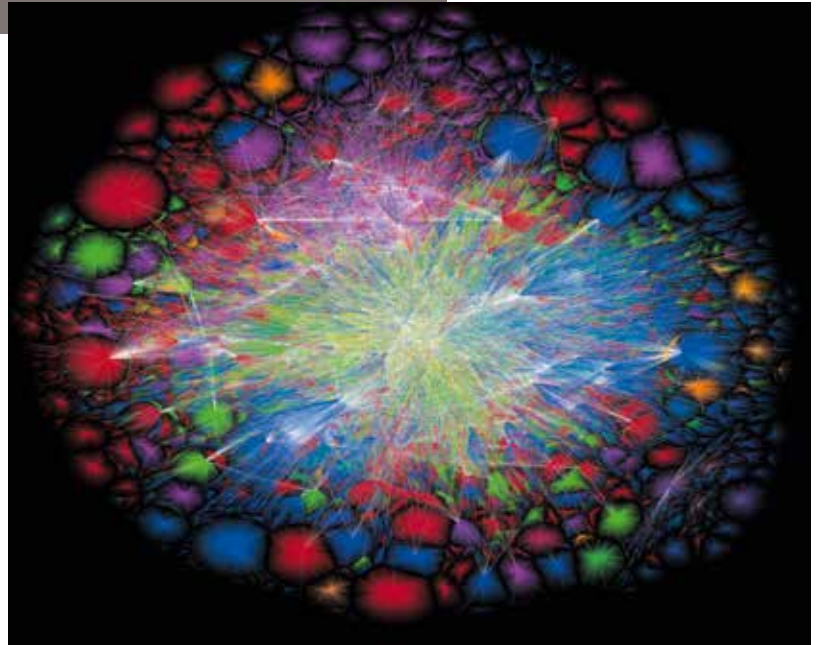
Rosol, Christoph. “Data, models and earth history in deep convolution: paleoclimate simulations and their epistemological unrest.” *Berichte zur Wissenschaftsgeschichte* 40 (2 2017): 120–139.

Terada, Masahiro. “Shita karano ansoroposhiin no tameni” (Towards a bottom up approach to the Anthropocene). *Humanity & Nature*, 65 (2017): 4 (in Japanese).

Wendt, Helge. “Coal mining in Cuba: knowledge formation in a transcolonial perspective.” In *The globalization of knowledge in the Iberian colonial world*, ed. Helge Wendt. 261–296. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/proceedings/10/12/index.html>.

## Research Theme

## Digital and Computational History of Science



In the age of big data, computational linguistics, and machine learning, the history of science has followed a larger trend in the humanities and has rapidly adopted computational methods. These methods allow us to address well-established research questions at different scales and resolutions. But they also facilitate novel questions that cannot be addressed with traditional historical methods alone. Department I has been at the forefront of these trends in the history of science for many years, but more recently computational approaches based on an increasingly large and sophisticated digital infrastructure have become an overarching methodological umbrella for many individual research projects.

A 2015 Map of the Internet by the Opte Project (<http://www.opte.org/the-internet>).

In addition, Department I with its national and international partners, especially the Digital Innovation Group at Arizona State University, has also contributed to the development of computational methods and tools. (See <http://diging.asu.edu> for a list of open source software packages.) Below we describe a few select case studies, and the questions and methods they used. But firstly we would like to briefly summarize the main categories that make up the core of a computational history of science:

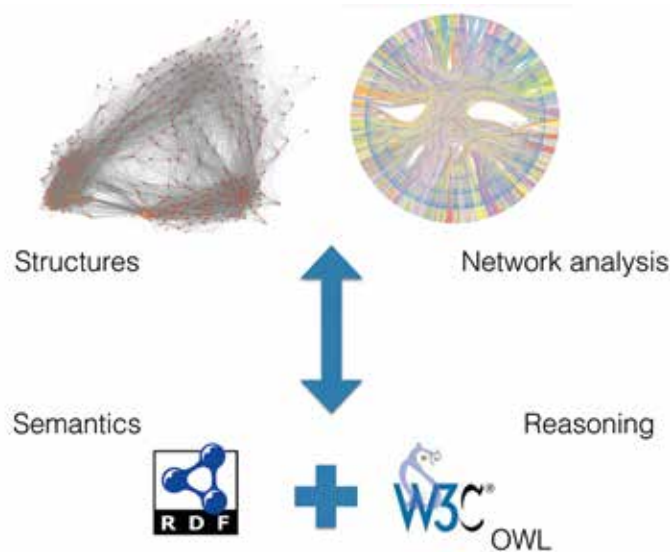
1. **Data.** The first challenge for a computational history of science is to provide adequate structured data. This requires infrastructure, both in-house and within a network of partners. Here the focus of activities has been on further developing the MPIWG expertise and local infrastructure, the participation in national and international networks, and the development of data models for our specific research projects and research questions.

2. **Patterns.** A main focus of a computational history of science is the detection and analysis of patterns at different scales, especially on larger scales that go beyond the capacities of individual researchers or research groups. The analysis of patterns involves, in particular, a number of network representations linking different types of networks (social, semantic, semiotic) at different scales as well as statistical approaches such as topic modeling.
3. **Dynamics.** The ultimate goal of any computational analysis is to explain underlying dynamics in the evolution of knowledge. This involves the analysis of time series as well as the development of causal models of scientific change, including agent-based models that combine what we know about the behavior of participants in knowledge generation and dissemination with information about specific contexts (place, time, culture).

These categories are central to all of our research projects.

## Historical Network Studies

The image reflects the approach taken in the historical network studies project where semantic modeling is combined with mathematical network theory. Research data from the Department's projects are modeled using such standards as RDF and OWL, which were developed in the context of the semantic web. This allows inference and consistency checks to be undertaken and, moreover, data to be enriched with external sources that are coded in a similar way and provided as linked open data in the Web. Such enriched, checked, and semantically meaningful data can be exported into formats that then allow structural analysis of the data to be made by applying methods from mathematical network theory. In this way, historical contexts, sources, and quantitative analysis can be kept closely connected so that all conclusions drawn from this analysis can be verified by consulting the original historical sources.



We have identified three fundamental types of networks: semantic networks, social networks of actors, and semiotic networks of external material representations of knowledge. These network types correspond to the basic dimensions of systems of knowledge, that is, their cognitive, social, and material dimensions, including the external representations employed (Roberto Lalli, Manfred Laubichler, Jürgen Renn, Matteo Valleriani, Dirk Wintergrün). The complex interaction of these three networks defines the dynamics of historical structural changes. Case studies range from the development of trade networks in antiquity to the formations of research fields in the post-war era.

### Spatio-Temporal Analysis Using Data Visualization

Generating and testing hypotheses about the spread of innovative ideas through time and space using geographical visualization tools has proven to be a valuable method for investigating historical change. Spatio-temporal visualization helps to uncover connections between different technological and theoretical developments. It also shows dynamic changes and trends of centralization and decentralization. The development of an ecosystem of tools for analyzing spatial connections is centered around PLATIN, an interdisciplinary and multi-institutional endeavor supported by the Excellence Cluster Topoi and the European infrastructure initiative DARIAH (Jochen Büttner).

→ pp. 70, 71

### The *Sphaera* of Sacrobosco—Modeling Data and Analyzing Diffusion

A novel, computer-based research environment has been developed within the Research Project on the *Sphaera* of Sacrobosco. The starting point was the question of how to transfer bibliographical and structural data into a model in order to enable their structural analysis. The result is a database that is fully represented in structures given by the Resource Description Framework (RDF), with an ontology-based approach compatible with the Concept Reference Model (CRM) developed in the context of museums and libraries. This database can be queried using a traditional web browser, while also generating machine-readable data. The stringent use of normed data for persons and places allows this database to be directly connected to external resources such as encyclopedic websites. This data was used to create structural networks of authors or publishers, which were then analyzed with network tools. These network analysis tools have helped to find central actors in the process of spreading the system of knowledge connected to the *Sphaera*. This example has proven the usefulness of standard digital tools, such as Gephi or Cytoscape, in combination with advanced mathematical network analysis adapted to historical research, for discovering hidden structures (Matteo Valleriani, Florian Kräutli, Dirk Wintergrün).

→ p. 43

### The Formation of the Research Field of General Relativity—Social Networks and Semantic Modeling

Social network analysis enables the identification of relevant actors in complex, inter-linked social settings. Recent extensions of this approach to multi-level and multiplex networks have supported research on the interconnection of social networks with other structures, such as institutions and concepts. An exemplary application of this methodology is the investigation of the so-called “renaissance” of general relativity after World War II. For this research activity, data concerning general relativity from 1920 to 1980 was gathered from sources and entered into a database.

→ p. 50

The network analysis of biographical and bibliographical data has allowed us to quantitatively analyze the claim that general relativity became part of mainstream research in physics only after World War II. This approach provided robust evidence of changes



occurring between the 1950s and the 1970s at both the social and epistemic levels. This network analytical approach revealed the social relations shaping this scientific field, clarified the topics around which the scientific field coalesced, and uncovered the fundamental role that institutions played as bridges between the social world and the new knowledge represented by the epistemic web. A dynamic model was also developed that takes institutional memory into account when weighing links between persons and the likelihood of changes in the network (Roberto Lalli, Dirk Wintergrün).

### **The Role of Institutions and Commissions in Forming Research Agendas: Networks and Mass-Digitization**

A digital infrastructure has been developed for the analysis of digitized sources of the project on the History of the Max Planck Society (GMPG) [linkto: <http://gmpg.mpiwg-berlin.mpg.de/de/>]. This includes the development of a database that contains relevant information about actors and organizations, the application of OCR (optical character recognition) to make the documents searchable, and text-mining methods both to pinpoint the relevant sources as well as to direct the process of selecting and prioritizing sources for digitization. Network analytical tools, combined with text mining tools, have been applied to biographical and bibliographical data in order to uncover the collaborative and decision-making structures within the Max Planck Society as well as the position of the scientific production of the Max Planck Society within the international scientific landscape, with special focus on the fields of astrophysics and astronomy (Roberto Lalli, Dirk Wintergrün).

### **Research Websites as Research Data**

In the past, the Department has developed innovative ways of publishing research data so that it is openly available on the Internet. Prominent examples are:

- the digital publication of annotated manuscripts, such as “Galileo Galilei’s Notes on Motion” in 1999 [[https://www.mpiwg-berlin.mpg.de/Galileo\\_Prototype/INDEX.HTM](https://www.mpiwg-berlin.mpg.de/Galileo_Prototype/INDEX.HTM)]
- the extensive presentation of the manuscripts of Thomas Harriot [[http://echo.mpiwg-berlin.mpg.de/content/scientific\\_revolution/harriot](http://echo.mpiwg-berlin.mpg.de/content/scientific_revolution/harriot)]
- complex databases bringing analytical data and sources together, such as “The Years of the Cupola (1417–1436)” [[http://duomo.mpiwg-berlin.mpg.de/home\\_eng.HTML](http://duomo.mpiwg-berlin.mpg.de/home_eng.HTML)]
- database machine drawings [<http://dmd.mpiwg-berlin.mpg.de/home>]
- the Cuneiform Digital Library Initiative (CDLI) [<https://cdli.ucla.edu/>]
- the collection of cuneiform tablets and archive of the Hilprecht Collection in Jena [<https://hilprecht.mpiwg-berlin.mpg.de/>].

These research websites provide input for ongoing and future research in the history of science. It is therefore vital that the structure of the data is regularly updated to maintain compatibility with new hardware, analytical tools, and research agendas. A flexible data model was developed in an early stage of the *Sphaera* project (see

above/link), which has led to the ongoing development of transformation strategies for other highly visible websites (e. g. “The Years of the Cupola”). This allows for the conceptual re-framing of research websites, from vehicles for publishing results to platforms for data open for interactive work, and provides a forum for peer review.

## Interactive Tools and Publications

Current work is therefore focused on a stronger integration of the publication of research results with the sources and methods used to obtain these results. This includes the provision of interactive tools that enable the reader to follow, revise, and extend arguments based on computational methods. Taking up the idea of a digital scrapbook, the focus is now on the development of “Digital Notebooks,” which serve as intermediaries between traditional publication outputs and interactive tools. In collaboration with Gerd Graßhoff (Max Planck Research Fellow), the Department is developing an infrastructure to integrate the presentation of source materials, the publication of the data created and used in the process of research, and the writing of interpretive articles (Malte Vogl). This allows other users to undertake their own analyses based on those sources and data, and will eventually enable these contributions to be added to the research environment. The prototype is now openly accessible in cooperation with the GWDG, allowing access for a wider audience of users from the scientific community in cooperation with the German infrastructure project DARIAH-DE.

The screenshot shows a Jupyter notebook with the following content:

- Table of Contents:**
  - 1. Modularity, time-slices and institutional memory
    - 1.1 Berechnung der Netzwerke
    - 1.2 Berechnung Grundparameter
    - 1.3 Cluster
    - 1.4 Modularity
    - 1.5 Disziplin
    - 1.6 Vergleich Disziplin und Nation
    - 1.7 Visualisation with cytoscape
  - 2. Untersuchung der Abhängigkeit
    - 2.1 Field
    - 2.2 Zusammenhang zwischen Disziplin und Nation
      - 2.2.1 Netzwerke pro Jahr
      - 2.2.2 Interdisziplinäre Netzwerke
      - 2.2.3 Netzwerke pro Jahr
    - 2.3 Forschungsgebiete
      - 2.3.1 Computerwissenschaften
      - 2.3.2 Cybernetik
      - 2.3.3 New heading
- Section 2: Modularity, time-slices and institutional memory**
  - We have to choose the length of a time-slice. Each network created later will contain all edges from the given year and all years before depending on the length of the time-slice.
  - Code cell:
 

```

def create_networks(years, time_slice):
    """Create a list of networks for each year and time slice"""
    networks = []
    for year in years:
        # Create network for the given year and time slice
        network = create_network(year, time_slice)
        networks.append(network)
    return networks

```
  - Length of time slice: 2
  - We define a attenuation function which is multiplied with the weight of every relation and models the strength of the connection depending on the length of the collaboration of two persons we also allow a small effect if people are just not meet in an institution.
 
$$f(d) = \begin{cases} \frac{1}{d} & \text{wenn } d < 0 \\ \frac{1}{d^2} & \text{wenn } d \geq 0 \end{cases} \quad (1)$$

$$f(d) = \int_0^{\infty} \frac{2}{\sqrt{x}} e^{-x} dx \quad (2)$$
  - Code cell:
 

```

def weight(delta_t, t):
    """Weight function"""
    if delta_t < 0:
        return 1/abs(delta_t)
    else:
        return 2/abs(delta_t)**2

```

Jupyter notebooks as an interactive tool for research in history of science.

## Anthropocene and Digital Technologies

The emerging field of Anthropocene research aims to understand how human intervention shapes the surfaces of the Earth and its ecosystems, and is grounded in new perspectives generated by inter-disciplinary approaches in the arts, humanities, and sciences. A new web resource makes the relations between these various ideas visible, shaping the “Anthropocene Curriculum.” By relying on the use of keywords chosen by the authors and editors of articles to combine a set of heterogeneous topics, there is a danger of not revealing any new interconnections between different fields, and representing only those that are already known. These hidden relations are crucial, however, in representing the dynamics of a research field in formation. A prototypical way of navigating through the website was therefore developed that combines traditional keyword searches with the results of network analysis. Based on search results, the user is presented with a network of possible connections to their own search. On every page, the possible relations between the search results and other themes can be seen (Christoph Rosol, Dirk Wintergrün).

→ p. 65

## Open Access to Publications, Sources, and Research Data



The Edition Open Access (EOA) platform was founded in 2010 to open up and disseminate the results of scholarly work in innovative new formats. It hosts the publications of the “Max Planck Research Library for the History and Development of Knowledge” (MPRL) (comprising the sub-series “Studies,” “Proceedings,” and “Textbooks”) and “Edition Open Sources” (EOS). EOS is a joint venture of Department I, the Library of the MPIWG, and

the University of Oklahoma Libraries and publishes academic editions of primary sources in the history and development of knowledge alongside facsimile reproductions of the original source, transcriptions, and/or translations. Nine new volumes were published during the report period (Lindy Divarci, Klaus Thoden, Matteo Valleriani). The EOA project was awarded a grant in 2017 by the BMBF (Federal Ministry for Research and Education) for the further development of its publishing platform as a research resource.

## Cooperation and Outreach

The Department supports a European and national cooperation to set up a digital infrastructure for the arts and humanities (DARIAH) and has led a cluster within DARIAH that focuses on the usability of tools for research and in particular on the role of new forms of digital publication (Klaus Thoden). The Department also chairs one of the Virtual Competence Centers (VCC) of the European umbrella organization DARIAH-EU (Dirk Wintergrün). On the level of the Berlin State, members of the Department are involved in efforts to coordinate common digital developments as in the Interdisziplinärer Forschungsverbund for Digital Humanities (ifDH), (Dirk Wintergrün).



### SELECTED PUBLICATIONS

- Bulatovic, Natasa, Timo Gnadt, Matteo Romanello, Juliane Stiller, and Klaus Thoden. "Usability in Digital Humanities — Evaluating user interfaces, infrastructural components and the use of mobile devices during research process." In *Research and advanced technology for digital libraries*, eds. Norbert Fuhr, László Kovács, Thomas Risse, and Wolfgang Nejdl. 335–346. Cham: Springer, 2016.
- Casties, Robert and Dirk Wintergrün. "Bilder als Quelle in TextGrid." In *TextGrid: von der Community – für die Community ; eine virtuelle Forschungsumgebung für die Geisteswissenschaften*, eds. Heike Neuroth, Andrea Rapp, and Sibylle Söring. 153–163. Glückstadt: Hülsbusch, 2015: [https://univerlag.uni-goettingen.de/bitstream/handle/3/Neuroth\\_TextGrid/TextGrid\\_book.pdf](https://univerlag.uni-goettingen.de/bitstream/handle/3/Neuroth_TextGrid/TextGrid_book.pdf)
- Defaux, Olivier. *The Iberian peninsula in Ptolemy's geography: origins of the coordinates and textual history*. Berlin Studies on the Ancient World 51. Berlin: Edition Topoi, 2017: <http://www.edition-topoi.org/books/details/1249>
- Gnadt, Timo, Viola Schmitt, Juliane Stiller, and Klaus Thoden. *Faktoren und Kriterien für den Impact von DH-Tools und Infrastrukturen*. DARIAH-DE Working Papers 21. Göttingen: DARIAH-DE, 2017. URN: urn:nbn:de:gbv:7-dariah-2017-1-7
- Kräutli, Florian and Matteo Valleriani. "CorpusTracer: a CIDOC database for tracing knowledge networks." *Digital Scholarship in the Humanities* (2017): 1–11.
- Renn, Jürgen, Dirk Wintergrün, Roberto Lalli, Manfred Laubichler, and Matteo Valleriani. "Netzwerke als Wissensspeicher." In *Die Zukunft der Wissenspeicher: Forschen, Sammeln und Vermitteln im 21. Jahrhundert*, eds. Jürgen Mittelstraß and Ulrich Rüdiger. 35–79. München: UVK Verlagsgesellschaft Konstanz, 2016.
- Stiller, Juliane, Timo Gnadt, Matteo Romanello, and Klaus Thoden. "Anforderungen ermitteln, Lösungen evaluieren und Erfolge messen: Begleitforschung in DARIAH-DE." *Bibliothek: Forschung und Praxis* 40 (2 2016): 250–258: <https://www.degruyter.com/view/j/bfup.2016.40.issue-2/bfp-2016-0025/bfp-2016-0025.xml?format=INT>
- Thoden, Klaus, Juliane Stiller, Natasa Bulatovic, Hanna-Lena Meiners, and Nadia Boukhelifa. "User-centered design practices in digital humanities: experiences from DARIAH and CENDARI." *ABI Technik* 37 (1 2017): 2–11.

## Department I

## Publications 2015–2017

Abdounur, Oscar João. “Crisis of incommensurability in mathematics/music: a historic/ cognitive/educational approach.” In *Horizons in neuroscience research*, vol. 22, eds. Andres Costa and Eugenio Villalba. 225–236. New York: Nova Science Publishers, 2015.

- 1 Abdounur, Oscar João. *Matemática e música*. São Paulo: Editora Livraria da Física, 2015.

Abdounur, Oscar João. “Emergence of geometry and conceptual changes in theory of ratios in theoretical music in the 16th century.” *Khronos: Revista de História da Ciência*, 3 (2016): 81–92.

Abdounur, Oscar João. “The emergence of the idea of irrationality in theoretical music contexts in the Renaissance.” In *History and pedagogy of mathematics*, eds. L. Radford, F. Furinghetti, and T. Hausberger. 257–265. Montpellier: IREM de Montpellier, 2016: <https://hal.archives-ouvertes.fr/hal-01349247/document>

Abdounur, Oscar João. “Structural transformations in the relationships between mathematics and music up to the Renaissance and the emergence of the idea of number as a continuous quantity.” In *Advances in mathematics research*, vol. 21, ed. Albert R. Baswell. 149–164. New York: Nova Publishers, 2017.

Abdounur, Oscar João. “Theories of ratio in competition in theoretical music in the late Middle Ages.” In *Advances in mathematics research*, vol. 24, ed. Albert R. Baswell. 33–43. New York: Nova Science Publishers, 2017.

- 2 Arabatzis, Theodore, Jürgen Renn, and Ana Simões, (eds.). *Relocating the history of science: essays in honor of Kostas Gavroglu*. Dordrecht: Springer, 2015.

Asmussen, Tina. “‘Wir werden ja vmb deinen willen teglich erwürget vnd sind geacht wie Schlachtschaffe’: Medialisierung und Funktionalisierung von Gewalt in Flugblättern der Wickiana.” In *Intermedialität des frühneuzeitlichen Flugblatts*, eds. Alfred Messerli and Michael Schilling. 113–133. Stuttgart: Hirzel, 2015.

Asmussen, Tina. “Glück Auf! Fortuna und Risiko im frühneuzeitlichen Bergbau.” *FKW, Zeitschrift für Geschlechterforschung und Visuelle Kultur* 60 (2016): 30–41: <https://www.fkw-journal.de/index.php/fkw/article/view/1374/1377>



- 3 Asmussen, Tina. *Scientia Kircheriana: die Fabrikation von Wissen bei Athanasius Kircher*. Affalterbach: Didymos-Verlag, 2016.

Asmussen, Tina. “The Kux as a site of mediation: economic practices and material desires in the early modern German mining industry.” In *Sites of mediation: connected histories of places, processes, and objects in Europe and beyond, 1450–1650*, eds. Susanna Burghartz, Lucas Burkart, and Christine Göttler. 159–182. Leiden: Brill, 2016.

- 4 Axworthy, Angela. *Le mathématicien renaissance et son savoir: le statut des mathématiques selon Oronce Fine*. Histoire et philosophie des sciences 11. Paris: Classiques Garnier, 2016.

- 5 Badino, Massimiliano. *The bumpy road: Max Planck from radiation theory to the quantum (1896–1906)*. SpringerBriefs in history of science and technology. Cham: Springer, 2015.

Becchi, Antonio. “Eugene Goostman et les pierres de Saint-Pétersbourg.” *Re-Vue Malaquais* 2 (2015): 46–49.

Becchi, Antonio. “L’histoire de la construction: un chantier européen.” In *Construction history: a european Meridian / L’histoire de la construction: un Méridien européen*, eds. Antonio Becchi, Robert Carvais, and Joël Sakarovitch. 11–17. Paris: Association Francophone d’Histoire de la Construction, 2015: <http://www.histoire-construction.fr/rapport2015/>

Becchi, Antonio. “Oltre la ‘Scientia de Ponderibus’” In *Scienze e rappresentazioni: saggi in onore di Pierre Souffrin; Atti del convegno internazionale (Vinci, Biblioteca Leonardiana, 26–29 settembre 2012)*, eds. Pierre Caye, Romano Nanni, and Pier Daniele Napolitani. 389–403. Florence: Olschki, 2015.

Becchi, Antonio. “Vitruvius zu Zeiten der reinen Vernunft: Giovanni Poleni, Simone Stratico und ihre Exercitationes.” In *Lehrbuchdiskurs über das Bauen*, ed. Uta Hassler. 78–92. Zürich: vdf Hochschulverlag, 2015.

Becchi, Antonio. “Drawing proofs: lo sguardo cinematografico di Robert Willis.” In *Robert Willis: science, technology and architecture in the nineteenth century*;





*proceedings of the International Symposium held in Gonville and Caius College, Cambridge UK, 16th–17th September 2016*, eds. Alexandrina Buchanan, James W. P. Campbell, Javier Girón, and Santiago Huerta. 141–165. Alcobendas: Instituto Juan de Herrera, 2016.

Becchi, Antonio. “Learning from falling stones: autobiografie scientifiche between mechanics and architecture.” *Sciences et Techniques en Perspective, IIe Série* 18 (2 2016): 3–18.

Becchi, Antonio. “I commenti di Daniele Barbaro al ‘Proemio’ della ‘terza parte principale dell’Architettura’ (1556–1567).” In *Daniele Barbaro 1514–1570: vénitien, patricien, humaniste*, eds. Frédérique Lemerle, Vasco Zara, Pierre Caye, and Laura Moretti. 187–198. Turnhout: Brepols, 2017.

Becchi, Antonio. “La lezione di Salmacide: Vitruvio e il potere delle acque.” In *Wasserversorgung in Toledo und Wissensvermittlung von der Antike ins Mittelalter*, eds. Thomas G. Schattner and Fernando Valdés Fernández. 371–385. Tübingen: Wasmuth, 2017.

- 1 Becchi, Antonio. *Naufragi di terra e di mare: da Leonardo da Vinci a Theodor Mommsen alla ricerca dei codici Albani; edizione del manoscritto XIII.F.25, cc. 129–136 della Biblioteca Nazionale di Napoli a cura di Oreste Trabucco*. Between mechanics and architecture: temi e testi 158. Rome: Edizioni di Storia e Letteratura, 2017.

Becchi, Antonio, Roberto Carvais, and Joël Sakarovitch, eds. *Construction history: a european Meridian / L’histoire de la construction: un Méridien européen*. Paris: Association Francophone d’Histoire de la Construction, 2015: <http://www.histoire-construction.fr/rapport2015/>

Biank, Johanna. “Clavius, Christophorus.” In *Encyclopedia of Renaissance philosophy*, ed. Marco Sgarbi. Online. Cham: Springer International Publishing, 2016: [https://doi.org/10.1007/978-3-319-02848-4\\_54-1](https://doi.org/10.1007/978-3-319-02848-4_54-1)

Blum, Alexander S. see also Navarro and Blum

Blum, Alexander S. “QED and the man who didn’t make it: Sidney Dancoff and the infrared divergence.” *Studies in History and Philosophy of Science. Part B, Studies in History and Philosophy of Modern Physics* 50 (2015): 70–94.

Blum, Alexander S. “Review of: Hagar, Amit: Discrete or continuous? The quest for fundamental length in modern physics. Cambridge: Cambridge University Press 2014.” *Isis* 107 (2 2016): 424–425.

Blum, Alexander S. “The literature review as imagined past.” *Isis* 108 (4 2017): 827–829.

Blum, Alexander S. “The state is not abolished, it withers away: how quantum field theory became a theory of scattering.” *Studies in History and Philosophy of Science. Part B, Studies in History and Philosophy of Modern Physics* 60 (2017): 46–80.

Blum, Alexander S., Luisa Bonolis, Roberto Lalli, and Jürgen Renn. “La relatività dopo la guerra.” *Le Scienze: Edizione Italiana di Scientific American* 567 (2015): 48–53.

- 2 Blum, Alexander S., Kostas Gavroglu, Christian Joas, and Jürgen Renn, eds. *Shifting paradigms: Thomas S. Kuhn and the history of science*. Max Planck Research Library for the History and Development of Knowledge, Proceedings 8. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/proceedings/8/index.html>

Blum, Alexander S., Domenico Giulini, Roberto Lalli, and Jürgen Renn. “Editorial introduction to the special issue “The Renaissance of Einstein’s Theory of Gravitation.”” *The European Physical Journal H* 42 (2 2017): 95–105: <https://link.springer.com/article/10.1140/epjh/e2017-80023-3>.

- 3 Blum, Alexander S., Domenico Giulini, Roberto Lalli, and Jürgen Renn, eds. *The Renaissance of Einstein’s theory of gravitation. The European Physical Journal H: special issue*; 42/2 (2017): 95–393: [https://link.springer.com/journal/13129/topicalCollection/AC\\_c8e77d746f18aada03b0b55ee26e5155](https://link.springer.com/journal/13129/topicalCollection/AC_c8e77d746f18aada03b0b55ee26e5155)

Blum, Alexander S. and Thiago Hartz. “The 1957 quantum gravity meeting in Copenhagen: an analysis of Bryce S. DeWitt’s report.” *The European Physical Journal H* 42 (2 2017): 107–157 <https://link.springer.com/article/10.1140%2Fepjh%2Fe2017-80015-8>

Blum, Alexander S., Martin Jähnert, Christoph Lehner, and Jürgen Renn. “Translation as heuristics: Heisenberg’s turn to matrix mechanics.” *Studies in History and Philosophy of Science. Part B, Studies in History and Philosophy of Modern Physics* 60 (2017): 3–22.

Blum, Alexander S. and Christian Joas. “From dressed electrons to quasiparticles: the emergence of emergent entities in quantum field theory.” *Studies in History and*

*Philosophy of Science. Part B, Studies in History and Philosophy of Modern Physics* 53 (2016): 1–8.

Blum, Alexander S., Roberto Lalli, and Jürgen Renn. “The reinvention of general relativity: a historiographical framework for assessing one hundred years of curved space-time.” *Isis* 106 (3 2015): 598–620.

Blum, Alexander S., Roberto Lalli, and Jürgen Renn. “The renaissance of general relativity: how and why it happened.” *Annalen der Physik* 528 (5 2016): 344–349.

Blum, Alexander S., Jürgen Renn, and Matthias Schemmel. “Experience and representation in modern physics: the reshaping of space.” In *Spatial thinking and external representation: towards a historical epistemology of space*, ed. Matthias Schemmel. 191–212. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/studies/8/8/index.html>

Boltz, William G. and Matthias Schemmel. “Theoretical reflections on elementary actions and instrumental practices: the example of the Mohist canon.” In *Spatial thinking and external representation: towards a historical epistemology of space*, ed. Matthias Schemmel. 121–144. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/studies/8/5/index.html>

Bonah, Christian, and Florian Schmaltz. “From witness to indictee: Eugen Haagen and his Court Hearings from the Nuremberg Medical Trial (1946–47) to the Struthof Medical Trials (1952–54).” In *From clinic to concentration camp: reassessing Nazi medical and racial research, 1933–1945*, ed. Paul Weindling. 293–315. Abingdon: Routledge, 2017.

Bonolis, Luisa *see also* Blum and Bonolis

Bonolis, Luisa. “L’emergere dell’astrofisica relativistica nel secondo dopoguerra.” *Giornale di Astronomia* 43 (4 2016): 38–44.

Bonolis, Luisa. “Stellar structure and compact objects before 1940: towards relativistic astrophysics.” *The European Physical Journal H* 42 (2017) 311–393: <https://epjh.epj.org/articles/epjh/abs/first/h170014/h170014.html>

Bonolis, Luisa, Adele La Rana, and Roberto Lalli. “The renaissance of general relativity in Rome: main actors, research programs and institutional structures.” In *The fourteenth Marcel Grossmann meeting: on recent developments in theoretical and experimental general relativity, astrophysics, and relativistic field theories. Part D*, eds. Massimo Bianchi and Robert T. Jantzen. 3372–3377. Singapur: World Scientific, 2017: [http://www.worldscientific.com/doi/abs/10.1142/9789813226609\\_0433](http://www.worldscientific.com/doi/abs/10.1142/9789813226609_0433)

Bonolis Luisa, and Adele La Rana. “The beginning of Edoardo Amaldi’s interest in gravitation experiments and in gravitational wave detection.” In: *On recent developments in theoretical and experimental general relativity, astrophysics, and relativistic*

*field theories. Proceedings of the MG14 Meeting on General Relativity University of Rome 'La Sapienza', Italy, 12–18 July 2015.* eds. Massimo Bianchi, Robert T. Jantzen. Singapore: World Scientific, 2017: [http://www.worldscientific.com/doi/abs/10.1142/9789813226609\\_0434](http://www.worldscientific.com/doi/abs/10.1142/9789813226609_0434)

Bonolis, Luisa and Joel L. Lebowitz. “A life in statistical mechanics. Part 1: From Chedar in Taceva to Yeshiva University in New York, oral history interview.” *European Physical Journal H* 42 (2017) 1–21: <https://epjh.epj.org/articles/epjh/abs/2017/01/h170006/h170006.html>

Bonolis, Luisa and Luciano Maiani. “The charm of theoretical physics (1958–1993), oral history interview.” *European Physical Journal H* 42 (4-5 2017) 611–661: <https://link.springer.com/article/10.1140%2Fepjh%2Fe2017-80040-9>

Bonolis, Luisa and Luciano Maiani. “The LHC timeline: a personal recollection (1980–2012), Oral history interview.” *European Physical Journal H* 42 (4-5 2017) 475–505: <https://link.springer.com/article/10.1140%2Fepjh%2Fe2017-80052-8>

Bougleux, Elena. “Economy and knowledge: practices of appropriation.” *Human Affairs* 25 (1 2015): 3–15.

Brentjes, Sonja see also Livesey and Brentjes

Brentjes, Sonja see also Renn and Brentjes

Brentjes, Sonja. “Abu Nasr Mansur b. 'Ali b. 'Iraq (lived circa 950–1036) and Abu l-Rayhan al-Biruni (lived from 973–after 1050) as students, teachers, and companions.” *Models & Optimisation and Mathematical Analysis Journal* 3 (1 2015): 28–35.

Brentjes, Sonja. “Fourteenth-century Portolan charts: challenges to our understanding of cross-cultural relationships in the Mediterranean and Black Sea regions and of (knowledge?) practices of chart-makers.” *Journal of Transcultural Medieval Studies* 2 (1 2015): 79–112.

Brentjes, Sonja. “Participant and observer narratives about medieval cross-cultural knowledge transfer: missing, single or multiple translations.” *Journal of Transcultural Medieval Studies* 2 (2 2015): 325–334.

Brentjes, Sonja. “Relationships between early modern Christian and Islamic societies in Eurasia and North Africa as reflected in the history of science and medicine.” *Confluence: Journal of World Philosophies* 3 (2015): 85–121: <https://scholarworks.iu.edu/iupjournals/index.php/confluence/article/view/546/52>

Brentjes, Sonja. “Review of: Emiralioglu, Pinar: Geographical knowledge and imperial culture in the early modern Ottoman Empire. Farnham: Ashgate 2014.” *Journal of Historical Geography* 48 (2015): 77–78



1

Brentjes, Sonja. "Cartography." In *Encyclopaedia of Islam*, 3th edition, eds. Kate Fleet, Gudrun Krämer, Denis Matringe, John Nawas, and Everett Rowson. 15–29. Leiden: Brill, 2016.

Brentjes, Sonja. "Introduction: On narratives of amateurs and professionals." In *1001 distortions: how (not) to narrate history of science, medicine, and technology in non-western cultures*, eds. Sonja Brentjes, Taner Edis, and Lutz Richter-Bernburg. 9–15. Würzburg: Ergon, 2016.

- 1 Brentjes, Sonja, Taner Edis, and Lutz Richter-Bernburg, eds. *1001 distortions: how (not) to narrate history of science, medicine, and technology in non-western cultures*. Würzburg: Ergon, 2016.

Brentjes, Sonja. "Issues of best historiographical practice: Garcia da Orta's Colóquios dos simples e drogas e cousas medicinais da India (Goa, 1563) and their conflicting interpretation." In *The globalization of knowledge in the Iberian colonial world*, ed. Helge Wendt. 95–137. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/proceedings/10/6/index.html>

Brentjes, Sonja. "Practicing history of mathematics in Islamic societies in 19th-century Germany and France." In *Historiography of mathematics in the 19th and 20th centuries*, eds. Volker R. Remmert, Martina R. Schneider, and Henrik Kragh Sørensen. 25–52. Cham: Birkhäuser, 2016.

Brentjes, Sonja. "Sains Islam dan kerjasama lintas agama." In *Islamic science: paradigma, fakta dan agenda*, eds. Zarkasyi Hamid Fahmy, Osman Bakar, Adi Setia, Budi Handrianto, and Syamsuddin Arif. 138–155. Jakarta: Institute for the Study of Islamic Thought and Civilizations, 2016.

Brentjes, Sonja. "Science, religion, and education." In *1001 distortions: how (not) to narrate history of science, medicine, and technology in non-western cultures*, eds. Sonja Brentjes, Taner Edis, and Lutz Richter-Bernburg. 133–149. Würzburg: Ergon, 2016.

Brentjes, Sonja. "Translation and transmission of ancient scientific texts." In *A companion to science, technology, and medicine in Ancient Greece and Rome*, vol. 2, ed. Georgia L. Irby. 988–1008. Malden: Wiley-Blackwell, 2016.

Brentjes, Sonja. "The vocabulary of 'Unbelief' in three biographical dictionaries and two historical chronicles of the 7th/13th and 8th/14th centuries." In *Accusations of unbelief in Islam: a diachronic perspective on Takfir*, eds. Camilla Adang, Hassan Ansari, Maribel Fierro, and Sabine Schmidtke. 105–154. Leiden: Brill, 2016.

Brentjes, Sonja. "Wilbur R. Knorr on Thābit ibn Qurra: a case-study in the historiography of premodern science." *Interpretatio: Sources and Studies in the History of Sciences A1* (2016): 1–63: <http://jps.library.utoronto.ca/index.php/interpretatio/article/view/26322>

Brentjes, Sonja. "Algebra." In *Encyclopaedia of Islam Three*, eds. Kate Fleet, Gudrun Krämer, Denis Matringe, John Nawas, and Everett Rowson. Leiden: BrillOnline, 2017: [http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-3/algebra-COM\\_0030?s.num=191&s.start=180](http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-3/algebra-COM_0030?s.num=191&s.start=180)

Brentjes, Sonja. "Algorithm." In *Encyclopaedia of Islam Three* eds. Kate Fleet, Gudrun Krämer, Denis Matringe, John Nawas, and Everett Rowson. Leiden: BrillOnline, 2017: [http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-3/algorithm-COM\\_0154?s.num=194&s.start=180](http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-3/algorithm-COM_0154?s.num=194&s.start=180)

Brentjes, Sonja. "Arithmetic." In *Encyclopaedia of Islam Three*, eds. Kate Fleet, Gudrun Krämer, Denis Matringe, John Nawas, and Everett Rowson. Leiden: BrillOnline, 2017: [http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-3/arithmetic-COM\\_22875?s.num=79&s.start=60](http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-3/arithmetic-COM_22875?s.num=79&s.start=60)

Brentjes, Sonja. "Learning to write, read and speak Arabic outside of early modern universities." In *The teaching and learning of Arabic in early modern Europe*, eds. Jan Loop, Alastair Hamilton, and Charles Burnett. 252–271. Leiden: Brill, 2017.

Brentjes, Sonja. "On four sciences and their audiences in Ayyubid and Mamluk societies." In *Inhiṭāt — The decline paradigm: its influence and persistence in the writing of Arab cultural history*, ed. Syrinx von Hees. 139–171. Würzburg: Ergon, 2017.

Brentjes, Sonja. "Practitioners of the mathematical and medical sciences and their relationship to the Jazira from the ninth to the fourteenth centuries." In *Central periphery? Art, culture and history of the medieval Jazira (Northern Mesopotamia, 8th–15th centuries)*, eds. Lorenz Korn and Martina Müller-Wiener. 97–110. Wiesbaden: Reichert Verlag, 2017.

Brentjes, Sonja. "Teaching the sciences in ninth-century Baghdad as a question in the history of the book: the case of Abū Yūsuf Ya‘qūb b. Ishāq al-Kindī (d. after 256/870)." *Intellectual History of the Islamic World* 5 (1–2 2017): 1–27.

Brentjes, Sonja and G. De Young. "al-Ḥajjāj b. Yūsuf b. Maṭar." In *Encyclopaedia of Islam*, vol. 4, 3th edition, eds. Kate Fleet, Gudrun Krämer, Denis Matringe, John Nawas, and Everett Rowson. 75–77. 4. Leiden: Brill, 2016.





Brentjes, Sonja, Taner Edis, and Lutz Richter-Bernburg, eds. *1001 distortions: how (not) to narrate history of science, medicine, and technology in non-western cultures*. Bibliotheca academica: Orientalistik 25. Würzburg: Ergon, 2016.

Brentjes, Sonja and Jürgen Renn. “A re-evaluation of the ‘Liber de canonio.’” In *Scienze e rappresentazioni: saggi in onore di Pierre Souffrin; Atti del convegno internazionale (Vinci, Biblioteca Leonardiana, 26–29 settembre 2012)*, eds. Pierre Caye, Romano Nanni, and Pier Daniele Napolitani. 119–150. Florence: Olschki, 2015.

Brentjes, Sonja and Jürgen Renn. “Contexts and content of Thābit ibn Qurra’s (died 288/901) construction of knowledge on the balance.” In *Globalization of knowledge in the post-antique Mediterranean, 700–1500*, eds. Sonja Brentjes and Jürgen Renn. 67–99. London: Routledge, 2016.

- 1 Brentjes, Sonja and Jürgen Renn, eds. *Globalization of knowledge in the post-antique Mediterranean, 700–1500*. London: Routledge, 2016.

Brentjes, Sonja and Jürgen Renn. “Postface.” In *Globalization of knowledge in the post-antique mediterranean, 700–1500*, eds. Sonja Brentjes and Jürgen Renn. 205–213. London: Routledge, 2016.

Bulatovic, Natasa, Timo Gnadt, Matteo Romanello, Juliane Stiller, and Klaus Thoden. “Usability in Digital Humanities — Evaluating user interfaces, infrastructural components and the use of mobile devices during research process.” In *Research and advanced technology for digital libraries*, eds. Norbert Fuhr, László Kovács, Thomas Risse, and Wolfgang Nejdl. 335–346. Cham: Springer, 2016.

Büttner, Jochen see also Hansen, Renn, Klimscha and Büttner

Büttner, Jochen. “Shooting with ink.” In *The structures of practical knowledge*, ed. Matteo Valleriani. 115–166. Cham: Springer, 2017.

Büttner, Jochen and Jürgen Renn. “The early history of weighing technology from the perspective of a theory of innovation.” *eTopoi: Journal for Ancient Studies* 6 (2016): 757–776: <http://journal.topoi.org/index.php/etopoi/article/view/277>

Casties, Robert and Dirk Wintergrün. "Bilder als Quelle in TextGrid." In *TextGrid: von der Community — für die Community; eine virtuelle Forschungsumgebung für die Geisteswissenschaften*, eds. Heike Neuroth, Andrea Rapp, and Sibylle Söring. 153–163. Glückstadt: Hülsbusch, 2015: [https://univerlag.uni-goettingen.de/bitstream/handle/3/Neuroth\\_TextGrid/TextGrid\\_book.pdf](https://univerlag.uni-goettingen.de/bitstream/handle/3/Neuroth_TextGrid/TextGrid_book.pdf)

- 2 Chalmers, Alan. *One hundred years of pressure: hydrostatics from Stevin to Newton*. Archimedes: new studies in the history and philosophy of science and technology 51. Cham: Springer, 2017.

Colominas Aparicio, Monica and Gerard A. Wiegers. "The religion of the muslims of medieval and early modern Castile: interdisciplinary research and recent studies on Mudejar Islam (2000–2014)." *Edad Media: Revista de Historia* 17 (2016): 97–108.

Costa, Maria Teresa. "Benjamins 'Kapitalismus als Religion' und seine Wirkung auf die gegenwärtige Kunst." *Kunst und Kirche* 1 (2017): 8–11.

Damerow, Peter see also Renn and Damerow

Damerow, Peter. "The impact of notation system: from the practical knowledge of surveyors to Babylonian geometry." In *Spatial thinking and external representation: towards a historical epistemology of space*, ed. Matthias Schemmel. 93–119. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/studies/8/4/index.html>

Damerow, Peter. "Space and matter in early modern science: the impenetrability of matter." In *Spatial thinking and external representation: towards a historical epistemology of space*, ed. Matthias Schemmel. 175–190. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/studies/8/7/index.html>

de Pablo, Montserrat. "Cartographies, photographing the Silk Road and its cultures: cross roads of cuisine and image." In *Qazaq khandyghynyng qurylynyng 550 zhilydyghina oray uymdastyrylghan 'Qazaq Khandyghy: Tarikh, Teoria zhane Bugingy Kun' atty khalyqaralyq gylmyy-teoriyalyq konferentsia Materialdary*, 26–28. Almaty: Qazaq University, 2015.

de Pablo, Montserrat. "La historical Camera Obscura como cámara fotográfica." In *La Gran Guerra 1914–1918: la primera guerra de les imatges = The Great War 1914–1918: the first war of images = La Gran Guerra 1914–1918: la primera guerra de las imágenes*, eds. Ángel Quintana and Jordi Pons i Busquet. 225–230. Girona: Fundació Museu del Cinema-Collecció Tomás Mallol, 2016.

de Pablo, Montserrat. "Über die Camera Obscura." In *EMOP Berlin, European Month of Photography*, eds. Harald Olkus and Martin Hager. 139–180. Berlin: Kulturprojekte Berlin, 2016.

de Pablo, Montserrat and Ana Navarrete. "Desarrollo de competencias transversales a través de cartografías visuales." In *Experiencias de innovación docente en enseñanza*



*superior de Castilla-La Mancha*, eds. José Manuel Chicharro Higuera, Óscar Jerez García, and María Isabel López Solera. 87–89. Ciudad Real: Universidad de Castilla-La Mancha, 2015.

- 1 Defaux, Olivier. *The Iberian peninsula in Ptolemy's geography: origins of the coordinates and textual history*. Berlin studies on the ancient world 51. Berlin: Edition Topoi, 2017: <http://www.edition-topoi.org/books/details/1249>

Duncan, Anthony and Michel Janssen. “The Stark effect in the Bohr-Sommerfeld theory and in Schrödinger’s wave mechanics.” In *One hundred years of the Bohr atom: proceedings from a conference*, eds. Finn Aaserud and Helge Kragh. 217–271. Copenhagen: Det Kongelige Danske Videnskabernes Selskab, 2015.

Echterhölter, Anna. “Review of: Finkelstein, Gabriel: Emil du Bois-Reymond: neuroscience, self, and society in nineteenth-century Germany. Cambridge, Mass.: MIT Press 2013.” *Isis* 106 (2 2015): 467–468.

Engler, Fynn Ole and Jürgen Renn. “Two encounters.” In *Shifting paradigms: Thomas S. Kuhn and the history of science*, eds. Alexander Blum, Kostas Gavroglu, Christian Joas, and Jürgen Renn. 139–147. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/proceedings/8/11/index.html>

Feldhay, Rivka. “The global and the local in the study of the humanities.” In *Relocating the history of science: essays in honor of Kostas Gavroglu*, eds. Theodore Arabatzis, Jürgen Renn, and Ana Simões. 253–267. Cham: Springer, 2015.

Feldhay, Rivka. “Literary knowledge between transition and migration: the case of Dostoevsky in Israel.” In *What reason promises: essays on reason, nature and history*, eds. Wendy Doniger, Peter Galison, and Susan Neiman. 195–205. Berlin: De Gruyter, 2016: <https://www.degruyter.com/viewbooktoc/product/466351>

Feldhay, Rivka and Raz Chen-Morris. “Framing the appearances in the fifteenth century: Alberti, Cusa, Regiomontanus, and Copernicus.” In *Before Copernicus: the cultures and contexts of scientific learning in the fifteenth century*, eds. Rivka Feldhay and F. Jamil Ragep. 110–140. Montreal: McGill-Queen’s University Press, 2017.

- 2 Feldhay, Rivka and F. Jamil Ragep, eds. *Before Copernicus: the cultures and contexts of scientific learning in the fifteenth century*. McGill-Queen's studies in the history of ideas series 71. Montreal: McGill-Queen's University Press, 2017.

Feldhay, Rivka. "The humanities through the lens of migration: Richard Koebner's transition from Germany to Jerusalem." *Naharaim - Zeitschrift für deutsch-jüdische Literatur und Kulturgeschichte* 11 (1–2 2017): 13–23: <https://www.degruyter.com/downloadpdf/j/naha.2017.11.issue-1-2/naha-2017-frontmatter1-2/naha-2017-frontmatter1-2.pdf>

Flachowsky, Sören, Rüdiger Hachtmann, and Florian Schmaltz. "Editorial: Wissenschaftspolitik, Forschungspraxis und Ressourcenmobilisierung im NS-Herrschaftssystem." In *Ressourcenmobilisierung: Wissenschaftspolitik und Forschungspraxis im NS-Herrschaftssystem*, eds. Sören Flachowsky, Rüdiger Hachtmann and Florian Schmaltz. 7–32. Göttingen: Wallstein Verlag, 2016.

Flachowsky, Sören, Rüdiger Hachtmann, and Florian Schmaltz, eds. *Ressourcenmobilisierung: Wissenschaftspolitik und Forschungspraxis im NS-Herrschaftssystem*. Göttingen: Wallstein Verlag, 2016.

Freyberg, Sascha. "Zen und die Logik des Symbolbegriffs. Review of: Müller, Ralf: *Dôgens Sprachdenken*. Freiburg: Alber 2013." *polylog* 33 (2015): 131–134: [http://www.polylog.net/fileadmin/docs/polylog/33\\_rez\\_Freyberg\\_Mueller.pdf](http://www.polylog.net/fileadmin/docs/polylog/33_rez_Freyberg_Mueller.pdf)

Freyberg, Sascha. "Ereignis und Objekt: zur Whitehead-Kritik von Edgar Wind und John Dewey." In *Das entgegenkommende Denken: Verstehen zwischen Form und Empfindung*, eds. Franz Engel and Sabine Marienberg. 39–54. Berlin: De Gruyter, 2016.

Friedrich, Bretislav and Dieter Hoffmann. "Clara Haber, nee Immerwahr (1870–1915): life, work and legacy." *Zeitschrift für anorganische und allgemeine Chemie* 642 (6 2016): 437–448: <https://onlinelibrary.wiley.com/doi/10.1002/zaac.201600035>

Friedrich, Bretislav and Dieter Hoffmann. "Clara Immerwahr: a life in the shadow of Fritz Haber." In *One hundred years of chemical warfare: research, deployment, consequences*, eds. Bretislav Friedrich, Jürgen Renn, Dieter Hoffmann, Florian Schmaltz, and Martin Wolf. 45–67. Springer Open. Heidelberg: Springer International Publishing, 2017: [https://link.springer.com/content/pdf/10.1007/978-3-319-51664-6\\_4.pdf](https://link.springer.com/content/pdf/10.1007/978-3-319-51664-6_4.pdf)

- 2 Friedrich, Bretislav, Dieter Hoffmann, Jürgen Renn, Florian Schmaltz, and Martin Wolf, eds. *One hundred years of chemical warfare: research, deployment, consequences*. SpringerOpen. Heidelberg: Springer International Publishing, 2017: <https://link.springer.com/book/10.1007/978-3-319-51664-6>

Gambini, Rodolfo, Lucía Lewowicz, and Jorge Pullin. "Quantum mechanics, strong emergence and ontological non-reducibility." *Foundations of Chemistry* 17 (2 2015): 117–127.

Garau, Rodolfo. "Springs, nitre, and conatus: the role of the heart in Hobbes's physiology and animal locomotion." *The British Journal for the History of Philosophy* 24 (2 2016): 231–256.

Giannini, Giulia. "Gianantonio Tadini and falling bodies: a new documentary source for the reconstruction of the history of experimental proofs on the rotation of the Earth." *History of Science* 53 (3 2015): 320–337.

Giannini, Giulia. "Scientific academies." In *Encyclopedia of Renaissance philosophy*, ed. Marco Sgarbi. Online. Cham: Springer International Publishing, 2015.

Giannini, Giulia. "'Un'esperienza gentile': fumo nel vuoto e leggerezza positiva all'Accademia del Cimento." *Galilaeana* 13 (2016): 77–109.

- 1 Godel, Rainer, Dieter Hoffmann, Joachim Kaasch, Michael Kaasch, and Florian Steger, eds. *Vorträge und Abhandlungen zur Wissenschaftsgeschichte 2013/2014*. Acta historica Leopoldina 65. Stuttgart: Wissenschaftliche Verlagsgesellschaft, 2016.

Gnadt, Timo, Viola E. Schmitt, Juliane Stiller, Klaus Thoden. *Faktoren und Kriterien für den Impact von DH-Tools und Infrastrukturen*. DARIAH-DE Working Papers 21. Göttingen: DARIAH-DE, 2017. URN: urn:nbn:de:gbv:7-dariah-2017-1-7

Goulding, Robert, Matthias Schemmel & Dedicated to the memory of Jacqueline Stedall. "The manuscripts of Thomas Harriot (1560–1621)." *BSHM Bulletin: Journal of the British Society for the History of Mathematics* 32 (1 2017): 17–19.

Granada Martinez, Miguel Ángel. "Michael Maestlin and the Comet of 1618." In *Unifying heaven and earth: studies in the history of early modern cosmology*, eds. Miguel Ángel Granada Martinez, Patrick J. Boner, and Dario Tessicini. 239–290. Barcelona: Edicions de la Universitat de Barcelona, 2016.

Graßhoff, Gerd, Elisabeth Rinner, Mathieu Ossendrijver, Olivier Defaux, Marvin Schreiber, and Emilie Villey. "Longitude." *eTopoi: Journal for Ancient Studies* 6 (2016): 634–677: <http://journal.topoi.org/index.php/etopoi/article/view/267/274>

- 2 Gutfreund, Hanoch and Jürgen Renn, eds. *Albert Einstein: Relativity, the special and the general theory, 100th anniversary edition*. Princeton: Princeton University Press, 2015.
- 3 Gutfreund, Hanoch and Jürgen Renn. *The road to relativity: the history and meaning of Einstein's "The Foundation of General Relativity": featuring the original manuscript of Einstein's masterpiece*. Princeton: Princeton University Press, 2015.
- 4 Gutfreund, Hanoch and Jürgen Renn. *El camino hacia la relatividad: el artículo de Einstein que camió la ciencia*. Translated by Alfonso García-Parrado Gómez-Lobo and Ambrosio García Leal. Metatemas 140. Barcelona: Tusquets Editores, 2017.



- 5 Gutfreund, Hanoch and Jürgen Renn. *The formative years of relativity: the history and meaning of Einstein's Princeton Lectures*. Princeton: Princeton University Press, 2017.

Hansen, Svend, Jürgen Renn, Florian Klimscha, and Jochen Büttner. "Wie das Rad erfunden wurde." *Spektrum der Wissenschaft: Spezial Archäologie, Geschichte, Kultur* (4 2017): 50–53.

Hansen, Svend, Jürgen Renn, Florian Klimscha, Jochen Büttner, Barbara Helwing, and Sebastian Kruse. "The digital atlas of innovations: a research program on innovations in prehistory and antiquity." *eTopoi: Journal for Ancient Studies* 6 (2016): 777–818: <http://journal.topoi.org/index.php/etopoi/article/view/278>

Hoffmann, Dieter *see also Friedrich and Hoffmann*

Hoffmann, Dieter *see also Godel and Hoffmann*

Hoffmann, Dieter *see also Scheffler and Hoffmann*

Hoffmann, Dieter. "Versöhnende Wissenschaft: 50 Jahre deutsch-israelische Beziehungen." *Spektrum der Wissenschaft* (4 2015): 56–65.

Hoffmann, Dieter. "In den Fußstapfen von Einstein: der Physiker Achilles Papapetrou in Ost-Berlin." In *Deutsch-griechische Beziehungen im ostdeutschen Staatssozialismus (1949–1989): politische Migration, Realpolitik und interkulturelle Begegnung*, eds. Marco Hillemann and Miltos Pechlivanos. 179–204. Berlin: Edition Romiosini, 2016.

Hoffmann, Dieter. "Rudolf Tomaschek." In *Neue Deutsche Biographie. Bd. 26*, 514–515. Berlin: Duncker & Humblot, 2016.

Hoffmann, Dieter. "Ernst Mach in Prag: eine Wissenschaftskarriere im Zeichen des böhmischen Nationalitätenkonflikts." In *Licht und Schatten: Ernst Mach — Ludwig Mach*, eds. Wilhelm Füßl and Johannes-Geert Hagmann. 26–36. München: Deutsches Museum, 2017.





Hoffmann, Dieter. “‘... und was wäre er nicht’: zum Leibniz-Bild der Preußischen Akademie der Wissenschaften.” In: *Gottfried Wilhelm Leibniz: ein unvollendetes Projekt*, ed. Hartmut Hecht. Abhandlungen der Leibniz-Societät der Wissenschaften 48. 199–212. Berlin: trafo Wissenschaftsverlag, 2017.

- 1 Hoffmann, Dieter, Birgit Kolboske, and Jürgen Renn, eds. *‘Dem Anwenden muss das Erkennen vorausgehen’: auf dem Weg zu einer Geschichte der Kaiser-Wilhelm/Max-Planck-Gesellschaft*. Second extended edition. Berlin: Edition Open Access, 2015: <http://www.edition-open-access.de/proceedings/6/index.html>

Hoffmann, Dieter and Ruth Lewin Sime. “Freundschaft, Interdisziplinarität, Ausgrenzung: Lise Meitner und Otto Hahn.” In *Berlins wilde Energien: Porträts aus der Geschichte der Leibnizschen Wissenschaftsakademie*, eds. Stephan Leibfried, Christoph Marksches, Ernst Osterkamp, and Günter Stock. 390–417. Berlin: De Gruyter, 2015.

Hoffmann, Dieter and Helmuth Trischler. “Die Helmholtz-Gemeinschaft in historischer Perspektive.” In *20 Jahre Helmholtz-Gemeinschaft 1995–2015*, eds. Jürgen Mlynek and Angela Bittner. 9–47. Berlin: Helmholtz-Gemeinschaft, 2015: [http://www.helmholtz.de/fileadmin/user\\_upload/03\\_ueber\\_uns/20\\_Jahre/epaper-Festschrift\\_der\\_Helmholtz/index.html](http://www.helmholtz.de/fileadmin/user_upload/03_ueber_uns/20_Jahre/epaper-Festschrift_der_Helmholtz/index.html)

- 2 Høyrup, Jens. *Algebra in cuneiform: introduction to an old Babylonian geometrical technique*. Berlin: Edition Open Access, 2017: <http://edition-open-access.de/textbooks/2/index.html>

Ienna, Gerardo and Giulia Rispoli. “Boris Hessen al bivio tra scienza e ideologia.” In *Boris Hessen: Le radici sociali ed economiche della meccanica di Newton*, eds. Gerardo Ienna and Giulia Rispoli. 5–43. Rome: Castelvecchi, 2017.

- 3 Ienna, Gerardo and Giulia Rispoli, eds. *Boris Hessen: Le radici sociali ed economiche della meccanica di Newton*. Rome: Castelvecchi, 2017.

Inaba, Hajime see Okamoto, Ariga and Inaba

Jähnert, Martin see also Blum and Jähnert

Jähnert, Martin. “Practising the correspondence principle in the old quantum theory: Franck, Hund and the Ramsauer effect.” In *One hundred years of the Bohr atom: proceedings from a conference*, eds. Finn Aaserud and Helge Kragh. 200–216. Copenhagen: Det Kongelige Danske Videnskabernes Selskab, 2015.

Janssen, Michel see also Duncan and Janssen

Janssen, Michel. “Review of: Dongen, Jeroen van: Einstein’s unification. Cambridge: Cambridge University Press 2010.” *Science* 347 (6226 2015): 1078–1078.

Janssen, Michel and Jürgen Renn. “Arch and scaffold: how Einstein found his field equations.” *Physics Today* 68 (11 2015): 30–36.

Janssen, Michel and Jürgen Renn. “Ce que l’on doit aux mathématiques.” *La Recherche (Les dossiers de la Recherche)* 16 (2015): 18–21.

Janssen, Michel and Jürgen Renn. “Einstein was no lone genius.” *Nature* 527 (7578 2015): 298–301.

Janssen, Michel and Jürgen Renn. “Einsteins Weg zur allgemeinen Relativitätstheorie.” *Spektrum der Wissenschaft* (10 2015): 48–55.

Janssen, Michel and Jürgen Renn. “Von verbogenen Räumen und krummen Zeiten.” *Kultur & Technik* 4 (2015): 10–15.

Jerratsch, Anna see Omodeo and Jerratsch

Kaiser, Simone M. and Matteo Valleriani. “The organ of the Villa d’Este in Tivoli and the standards of pneumatic engineering in the Renaissance.” In *Gardens, knowledge and the sciences in the early modern period*, eds. Hubertus Fischer, Volker R. Remmert, and Joachim Wolschke-Bulmahn. 77–102. Cham: Birkhäuser Springer, 2016.

Kant, Horst see also Renn and Kant

Kant, Horst. “Edward Teller.” In *Neue Deutsche Biographie. Bd. 26*, 19–20. Berlin: Duncker & Humblot, 2016.

Kant, Horst. “Einsteins Weg nach Berlin.” *Leibniz Online* 22 (2016): 1–8: <http://leibnizsozietaet.de/internetzeitschrift-leibniz-online-nr-22-2016/>

Kant, Horst. “Hans-Jürgen Walter Treder.” In *Neue Deutsche Biographie. Bd. 26*, 389–389. Berlin: Duncker & Humblot, 2016.

Kant, Horst. “Walter Gustav Johannes Tollmien.” In *Neue Deutsche Biographie. Bd. 26*, 341–342. Berlin: Duncker & Humblot, 2016.



Kant, Horst. “Die Entdeckung der nuklearen Energie: einige wissenschaftshistorische Betrachtungen.” In *Technik & Technologie techne cum episteme et commune bonum. Ehrenkolloquium anlässlich des 70. Geburtstages von Gerhard Banse, 189–207*. Berlin: trafo Verlag, 2017: <https://leibnizsozietat.de/wp-content/uploads/2012/10/SB-Jhg.-2017-Band-131.pdf>

Kant, Horst. “Karl Schwarzschild — Anmerkungen zu Leben und Werk.” *Leibniz Online* 26 (2017): 1–10: <https://leibnizsozietat.de/wp-content/uploads/2017/02/Kant.pdf>

Kant, Horst. “Werner Siemens — Erfinder, (Technik-)wissenschaftler, Unternehmer und Begründer der Elektrotechnik.” *Leibniz Online* 26 (2017): 1–12: [https://leibnizsozietat.de/wp-content/uploads/2017/02/Kant\\_Siemens.pdf](https://leibnizsozietat.de/wp-content/uploads/2017/02/Kant_Siemens.pdf)

- 1 Kirkhusmo Pharo, Lars. *Concepts of conversion: the politics of missionary scriptural translations*. Religion and society 70. Berlin: De Gruyter, 2017.
- 2 Klein, Ursula. *Humboldts Preußen: Wissenschaft und Technik im Aufbruch*. Darmstadt: Wissenschaftliche Buchgesellschaft, 2015.

Klein, Ursula. “A revolution that never happened.” *Studies in History and Philosophy of Science. Part A* 49 (2015): 80–90.

Klein, Ursula. “Abgesang on Kuhn’s ‘Revolutions.’” In *Shifting paradigms: Thomas S. Kuhn and the history of science*, eds. Alexander Blum, Kostas Gavroglu, Christian Joas, and Jürgen Renn. 223–231. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/proceedings/8/18/index.html>

Klein, Ursula. “Alexander von Humboldt: Vater der Umweltbewegung?” In *Achtsamer Umgang mit Ressourcen und miteinander — gestern und heute*, 115–129. Roßdorf: TZ-Verlag, 2016.

Klein, Ursula. “Antoine-Laurent Lavoisier.” In *Kindler Kompakt: Klassiker der Naturwissenschaften*, ed. Michael Hagner. 88–90. Stuttgart: Metzler, 2016.

Klein, Ursula. “John Dalton.” In *Kindler Kompakt: Klassiker der Naturwissenschaften*, ed. Michael Hagner. 95–96. Stuttgart: Metzler, 2016.

Klein, Ursula. "Justus Liebig." In *Kindler Kompakt: Klassiker der Naturwissenschaften*, ed. Michael Hagner. 113–114. Stuttgart: Metzler, 2016.

Klein, Ursula. "Kuhn in the Cold War." In *Shifting paradigms: Thomas S. Kuhn and the history of science*, eds. Alexander Blum, Kostas Gavroglu, Christian Joas, and Jürgen Renn. 115–121. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/proceedings/8/9/index.html>

Klein, Ursula. "Kuhns Theorie wissenschaftlicher Revolutionen in der neueren Wissenschaftsgeschichte." *Acta Historica Leopoldina* 65 (2016): 207–220.

- 3 Klein, Ursula. *Nützliches Wissen: die Erfindung der Technikwissenschaften*. Göttingen: Wallstein, 2016.

Klein, Ursula. "Review of: Fors, Hjalmar: The limits of matter: chemistry, mining & Enlightenment. Chicago: University of Chicago Press 2015." *Technology and Culture* 57 (3 2016): 668–670.

Klein, Ursula. "Chemists for the common good." *Bulletin for the History of Chemistry* 42 (2017): 1–6.

Klein, Ursula. "Hybrid experts." In *The structures of practical knowledge*, ed. Matteo Valleriani. 287–306. Cham: Springer, 2017.

Klein, Ursula. "Wissenschaftlich-technische Expertise in der Porzellanherstellung (um 1800)." *FERRUM: Nachrichten aus der Eisenbibliothek* 89 (2017): 6–13: <http://www.eisenbibliothek.ch/content/gf/ironlibrary/de/ferrum/ferrum/aktuelleausgabe/klein.html>

Kräutli, Florian and Matteo Valleriani. "CorpusTracer: a CIDOC database for tracing knowledge networks." *Digital Scholarship in the Humanities* (2017): 1–11.

Kremer, Richard L. "Playing with geometrical tools: Johannes Stabius's *Astrolabium imperatorium* (1515) and its successors." *Centaurus* 58 (1–2 2016): 104–134.

Kremer, Richard L. "Simon Marius als tychonischer Kalendermacher." In *Simon Marius und seine Forschung*, eds. Hans Gaab and Pierre Leich. 311–360. Leipzig: Akademische Verlagsanstalt, 2016.

Kremer, Richard L. "Incunable almanacs and practica as practical knowledge produced in trading zones." In *The structures of practical knowledge*, ed. Matteo Valleriani. 333–369. Cham: Springer, 2017.

Lalli, Roberto *see also Blum, Bonolis and Lalli*

Lalli, Roberto *see also Blum, Giulini and Lalli*

Lalli, Roberto *see also Blum and Lalli*

Lalli, Roberto *see also Bonolis, La Rana and Lalli*

Lalli, Roberto *see also Renn, Wintergrün and Lalli*

Lalli, Roberto. "Einstein as founding father of quantum theory. Review of: Stone, Douglas S.: Einstein and the quantum: the search of the valiant Swabian. Princeton: Princeton Univ. Press 2013." *Metascience* 24 (1 2015): 119–122.

Lalli, Roberto. " 'The Renaissance of physics': Karl K. Darrow (1891–1982) and the dissemination of quantum theory at the Bell Telephone Laboratories." In *A bridge between conceptual frameworks: sciences, society and technology studies*, ed. Raffaele Pisano. 249–273. Cham: Springer, 2015.

Lalli, Roberto. " 'Dirty work,' but someone has to do it: Howard P. Robertson and the refereeing practices of *Physical Review* in the 1930s." *Notes and Records* 70 (2 2016): 151–174.

Lalli, Roberto. "La rinascita della relatività generale nel secondo dopoguerra." *Il Giornale di Astronomia* 42 (4 2016): 32–37.

- 1 Lalli, Roberto. *Building the general relativity & gravitation community during the Cold War*. SpringerBriefs in history of science and technology. Cham: Springer International Publishing, 2017.

Laubichler, Manfred Dietrich *see also Renn and Laubichler*

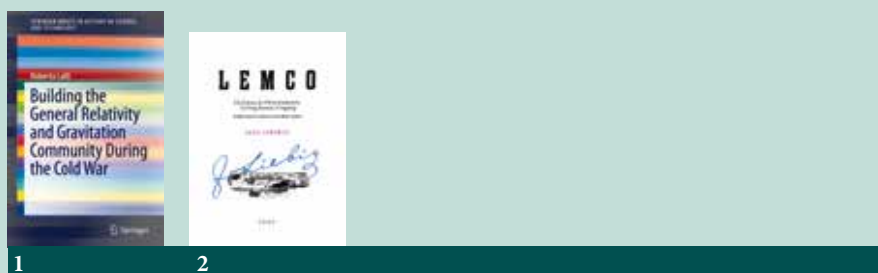
Laubichler, Manfred Dietrich *see also Renn, Wintergrün, Lalli and Laubichler*

Laubichler, Manfred Dietrich and Jürgen Renn. "Extended evolution: a conceptual framework for integrating regulatory networks and niche construction." *Journal of Experimental Zoology. Part B: Molecular and Developmental Evolution* 324 (7 2015): 565–577.

Lefèvre, Wolfgang. "Jean-Baptiste de Lamarck." In *Kindler Kompakt: Klassiker der Naturwissenschaften*, ed. Michael Hagner. 97–99. Stuttgart: Metzler, 2016.

Lefèvre, Wolfgang. "Review of: Ertl, Gerhard and Jens Soentgen (Eds): N.: Stickstoff – ein Element schreibt Weltgeschichte. München: oekom Verlag 2015." *BIO Spektrum* 22 (2 2016): 223–223.

Lefèvre, Wolfgang. "Review of: Kelm, Holden: Hegel und Foucault: die Geschichtlichkeit des Wissens als Entwicklung und Transformation. Berlin: De Gruyter 2015." *Theologische Literaturzeitung* 141 (9 2016): 959–961.



Lefèvre, Wolfgang. “Architectural knowledge.” In *The structures of practical knowledge*, ed. Matteo Valleriani. 247–269. Cham: Springer, 2017.

Lehner, Christoph *see also* Blum, Jähnert and Lehner

Lehner, Christoph *see also* Navarro, Blum and Lehner

Lehner, Christoph. “Review of: Everett, Hugh: The Everett interpretation of quantum mechanics: collected works, 1955–1980, with commentary. Ed. by Jeffrey A. Barrett and Peter Byrne. Princeton: Princeton University Press 2012.” *Isis* 106 (1 2015): 220–221.

Lehner, Christoph and Helge Wendt. “Mechanics in the *Querelle des Anciens et des Modernes*” *Isis* 108 (1 2017): 26–39.

Lehner, Christoph and Helge Wendt. “Mechanik in der Querelle des Anciens et des Modernes.” In *Antike als Transformation: Konzepte zur Beschreibung kulturellen Wandels*, eds. Johannes Helmuth, Eva Marlene Hausteiner, and Ulf Jensen. 179–195. Berlin: De Gruyter, 2017.

Lewowicz, Lucía *see also* Gambini and Lewowicz

Lewowicz, Lucía. “A demarcation between good and bad constructivism: the case of chemical substances as artifactual materials.” *DoisPontos* 12 (1 2015): 197–206.

Lewowicz, Lucía. *LEMCO: un coloso de la industria cárnica en Fray Bentos, Uruguay. The meat industry’s colossus in Fray Bentos, Uruguay*. Montevideo: INAC, 2016.

2 Lewowicz, Lucía. *LEMCO: ein Koloss der Fleischindustrie in Fray Bentos, Uruguay. The meat industry’s colossus in Fray Bentos, Uruguay*. Montevideo: INAC, 2017.

Livesey, Steven J. and Sonja Brentjes. “Science in the medieval Christian and Islamic worlds.” In *The Oxford illustrated history of science*, ed. Iwan Rhys Morus. 72–107. Oxford: Oxford University Press, 2017.



Luzzini, Francesco. "Ad venandam veritatem: nuove ricerche sulle scienze della Terra nel 'Giornale de' Letterati d'Italia.'" *Physis: Rivista Internazionale di Storia della Scienza* 51 (1–2 2016): 129–140.

Luzzini, Francesco. "Da Apollo alla Serenissima: le terme dei Colli Euganei." *Acque Sotterranee: Italian Journal of Groundwater* 5 (1 2016): 49–50.

Luzzini, Francesco. "Description, analogy, symbolism, faith: Jesuit science and iconography in the early modern debate on the origin of springs." *Acque Sotterranee: Italian Journal of Groundwater* 5 (2 2016): 65–67.

Luzzini, Francesco. "L'Itale terre a vagheggiare inteso: la regolazione dell'Adige nel XVIII secolo tra storia e scienza." In *Il fiume, le terre, l'immaginario: l'Adige come fenomeno storiografico complesso*; atti del convegno, Rovereto, 21–22 febbraio 2013, ed. Vito Rovigo. 287–312. Rovereto (TN): Edizioni Osiride, 2016.

Luzzini, Francesco. "Per tingere i panni in nero: le fonti di Vitriola." *Acque Sotterranee: Italian Journal of Groundwater* 5 (3 2016): 79–80.

Luzzini, Francesco. "Review of: Tortora, Alfonso: L'eruzione vesuviana del 1631: una storia d'età moderna. Roma: Carocci editore 2014." *Aestimatio* 11 (2016): 364–369.

Luzzini, Francesco. "The Edition Open Sources project: towards a critical edition of Antonio Vallisneri's manuscript 'Primi Itineris Specimen' (1705)." In *Geosciences on a changing planet: learning from the past, exploring the future*, eds. D. Calcaterra, S. Mazzoli, F. M. Petti, B. Carmina, and A. Zuccari. 905–905. Rome: Società Geologica Italiana, 2016.

Luzzini, Francesco. "Agordo fu fatale: le ricerche e l'ultimo viaggio di Friedrich Mohs (1773–1839)." *Natura Alpina: Bollettino della Società di Scienze Naturali del Trentino-Alto Adige* 68 (2017): 99–102.

Luzzini, Francesco. "Caronte in Val d'Intelvi: l'Orrido di Osteno. Charon in the Intelvi Valley: the Gorge of Osteno." *Acque Sotterranee: Italian Journal of Groundwater* 6 (1 2017): 1–2.

Merrill, Elizabeth. "Architect." In *Encyclopedia of Renaissance philosophy*, ed. Marco Sgarbi. Online. Cham: Springer Reference, 2015.

Merrill, Elizabeth. "Review of: Lanzarini, Orietta and Roberta Martinis: 'Questo libro fu di Andrea Palladio': il codice Destailleur B dell'Ermitage. Rome: L'Erma di Bretschneider 2015." *Journal of the Society of Architectural Historians* 75 (2 2016): 234–236.

Merrill, Elizabeth. "The migration of early-modern architectural prints." *Print Quarterly* 33 (2016): 297–300.



1

Merrill, Elizabeth. “Pocket-size architectural notebooks and the codification of practical knowledge.” In *The structures of practical knowledge*, ed. Matteo Valleriani. 21–54. Cham: Springer, 2017.

Merrill, Elizabeth. “The ‘professione di architetto’ in Renaissance Italy.” *Journal of the Society of Architectural Historians* 76 (1 2017): 13–35.

Mousavi, Razieh-Sadat. “Jāme Gītīnomā (introducing an Islamic instrument for finding Qibla).” *Tārīkh-e ‘elm: Iranian Journal for the History of Science* 16 (2016): 17–40.

Navarro, Jaume. “Plum puddings and Bohr’s atom.” In *One hundred years of the Bohr atom: proceedings from a conference*, eds. Finn Aaserud and Helge Kragh. 75–94. Copenhagen: Det Kongelige Danske Videnskabernes Selskab, 2015.

Navarro, Jaume, Alexander S. Blum, and Christoph Lehner, eds. On the history of the quantum, HQ4. *Studies in History and Philosophy of Science. Part B, Studies in History and Philosophy of Modern Physics: special issue*; 60. Elsevier, 2017.

Navarro, Jaume, Alexander S. Blum, and Christoph Lehner. “On the history of the quantum. Introduction to the HQ4 special issue.” *Studies in History and Philosophy of Science. Part B, Studies in History and Philosophy of Modern Physics* 60 (2017): 1–2.

- 1 Nelson, Sara, Christoph Rosol, and Jürgen Renn. *Perspectives on the technosphere (Part 1)*. *The Anthropocene Review: special issue*; 4/1. Sage, 2017: <http://journals.sagepub.com/toc/anra/4/1>

Nelson, Sara, Christoph Rosol, and Jürgen Renn. *Perspectives on the technosphere (Part 2)*. *The Anthropocene Review: special issue*; 4/2. Sage, 2017: <http://journals.sagepub.com/toc/anra/4/2>

Niles, Daniel “Learning from GIAHS landscapes.” *Japan Institute of Landscape Architecture* 18 (3 2017): 260–263 (in Japanese).

Niles, Daniel and Sander van der Leeuw. “The material order.” *Technosphere Magazine* published online November 2017: <https://technosphere-magazine.hkw.de/p/The-Material-Order-4gK5EMpZ3SzB79aTePfo7>



- 1 Okamoto, Takuji, Nobumichi Ariga, Hajime Inaba, Daisuke Konagaya, Yuki Sugimoto, Atsuko Yamaguchi, Koji Kanayama, and Maika Nakao. Kragh, Helge: 20世紀物理学史: 理論・実験・社会上 (*History of physics in the twentieth century: theory, experiment, and society*). Translated by Takuji Okamoto, Nobumichi Ariga, Hajime Inaba, Daisuke Konagaya, Yuki Sugimoto, Atsuko Yamaguchi, Koji Kanayama, and Maika Nakao. Nagoya 名古屋: Nagoya Daigaku Syuppankai 名古屋大学出版会, 2015.

Omodeo, Pietro Daniel. "Astronomy." In *Encyclopedia of Renaissance philosophy*, ed. Marco Sgarbi. Online. Cham: Springer International Publishing, 2015.

Omodeo, Pietro Daniel. "The 'Impiety' of Kepler's shift from mathematical astronomy to celestial physics." *Annalen der Physik* 527 (7/8 2015): A71–A75.

Omodeo, Pietro Daniel. "Institutionalised metaphysics of astronomy at early modern Melanchthonian universities." In *Wissen in Bewegung: Institution – Iteration – Transfer*, eds. Eva Cancik-Kirschbaum and Anita Traninger. 65–91. Wiesbaden: Harrassowitz, 2015: [http://www.harrassowitz-verlag.de/title\\_1330.html?NKLN=23\\_B](http://www.harrassowitz-verlag.de/title_1330.html?NKLN=23_B)

Omodeo, Pietro Daniel. "Review-Interview with Roger Cooter: critical intellectual in the age of neoliberal hegemony." *Journal of Interdisciplinary History of Ideas* 4 (7 2015): 5:1–5:19: <http://dx.doi.org/10.13135/2280-8574/1038>

Omodeo, Pietro Daniel. "Riflessioni sul moto terrestre nel Rinascimento: tra filosofia naturale, meccanica e cosmologia." In *Scienze e rappresentazioni: saggi in onore di Pierre Souffrin; Atti del convegno internazionale (Vinci, Biblioteca Leonardiana, 26–29 settembre 2012)*, eds. Pierre Caye, Romano Nanni, and Pier Daniele Napolitani. 285–299. Florence: Olschki, 2015.

Omodeo, Pietro Daniel. "After Nikolai Bukharin: history of science and cultural hegemony at the threshold of the Cold War era." *History of the Human Sciences* 29 (4–5 2016): 13–34.

Omodeo, Pietro Daniel. "Central European polemics over Descartes: Johannes Placentinus and his academic opponents at Frankfurt on Oder (1653–1656)." In *History of universities, vol. XXIX/1*, ed. Mordechai Feingold. 29–64. Oxford: Oxford University Press, 2016.

Omodeo, Pietro Daniel. "Copernicanism." In *Encyclopedia of Renaissance philosophy*, ed. Marco Sgarbi. Online. Cham: Springer International Publishing, 2016.

- 2 Omodeo, Pietro Daniel with Karin Friedrich, ed. *Duncan Liddel 1561–1613: networks of polymathy and the northern European Renaissance*. Scientific and learned cultures and their institutions 17. Leiden: Brill, 2016.

Omodeo, Pietro Daniel. "Egemonia e scienza: temi gramsciani in epistemologia e storia della scienza." *Gramsciana: Rivista Internazionale di Studi su Antonio Gramsci* 2 (2016): 59–86.

Omodeo, Pietro Daniel. "Geocentrism." In *Encyclopedia of Renaissance philosophy*, ed. Marco Sgarbi. Online. Cham: Springer International Publishing, 2016.

Omodeo, Pietro Daniel. "Heliocentrism, plurality of worlds and ethics: Anton Francesco Doni and Giordano Bruno." In *Literature in the age of celestial discovery: from Copernicus to Flamsteed*, ed. Judy A. Hayden. 23–43. New York: Palgrave Macmillan, 2016.

Omodeo, Pietro Daniel. "Kuhn's paradigm of paradigms: historical and epistemological coordinates of 'The Copernican revolution.'" In *Shifting paradigms: Thomas S. Kuhn and the history of science*, eds. Alexander Blum, Kostas Gavroglu, Christian Joas, and Jürgen Renn. 71–104. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/proceedings/8/7/index.html>

Omodeo, Pietro Daniel. "Liddel's 'Oratio de praestantia mathematicarum.'" In *Duncan Liddel 1561–1613: networks of polymathy and the northern European Renaissance*, ed. Pietro Daniel Omodeo with Karin Friedrich. 218–236. Leiden: Brill, 2016.

Omodeo, Pietro Daniel. "Medizinische und dämonologische Abhandlungen über den psychophysischen Dualismus im deutschen Cartesianismus des 17. Jahrhunderts." *Paragrana* 25 (1 2016): 130–153.

Omodeo, Pietro Daniel. "Metaphysics meets Urania: Daniel Cramer and the Foundations of Tyconic Astronomy." In *Unifying Heaven and Earth: essays in the history of early modern cosmology*, eds. Miguel Á Granada, Patrick J. Boner, and Dario Tessicini. 159–185. Barcelona: Edicions de la Universitat de Barcelona, 2016.

Omodeo, Pietro Daniel. "Review of: Turek, Marian (Ed.): Johannes Hevelius and his Gdańsk. Gdańsk: Gdańskie Towarzystwo Naukowe, 2013." *Isis* 107 (1 2016): 166–167.

Omodeo, Pietro Daniel. "Science and medicine in the humanistic networks of the northern European Renaissance." In *Duncan Liddel 1561–1613: networks of polymathy and the northern European Renaissance*, ed. Pietro Daniel Omodeo with Karin Friedrich. 3–21. Leiden: Brill, 2016.

Omodeo, Pietro Daniel. "The European career of a Scottish mathematician and physician." In *Duncan Liddel 1561–1613: networks of polymathy and the northern European Renaissance*, ed. Pietro Daniel Omodeo with Karin Friedrich. 35–90. Leiden: Brill, 2016.

Omodeo, Pietro Daniel. "L'eredità di Boris Hessen: per un approccio socio-politico alla scienza in età moderna." In *Boris Hessen: Le radici sociali ed economiche della meccanica di Newton*, eds. Gerardo Ienna and Giulia Rispoli. 119–150. Rome: Castelvecchi, 2017.

Omodeo, Pietro Daniel. "Laukhards Dissertation über Giordano Bruno im Kontext der frühneuzeitlichen Bruno-Rezeption." In *Friedrich Christian Laukhard (1757–1822): Schriftsteller, Radikalaufklärer und gelehrter Soldat*, ed. Guido Naschert. 39–68. Paderborn: Schöningh, 2017.

Omodeo, Pietro Daniel. "Lodewijk de Bils' and Tobias Andreae's Cartesian bodies: embalment experiments, medical controversies and mechanical philosophy." *Early Science and Medicine* 22 (4 2017): 301–332.

Omodeo, Pietro Daniel. "Modelli esplicativi delle maree nel Rinascimento: una rassegna." *Galilaeana* 14 (2017): 97–114.

Omodeo, Pietro Daniel. "The scientific culture of the Baltic mathematician, physician, and calendar-maker Laurentius Eichstadt (1596–1660)." *Journal for the History of Astronomy* 48 (2 2017): 135–159. <http://journals.sagepub.com/doi/10.1177/0021828617703847>

Omodeo, Pietro Daniel. "'Utilitas astronomiae' in the Renaissance: the rhetoric and epistemology of astronomy." In *The structures of practical knowledge*, ed. Matteo Valleriani. 307–331. Cham: Springer, 2017.

Omodeo, Pietro Daniel and Anna Jerratsch. "Mathematics, cosmology and natural philosophy: Christoph Rothmann's place in the Renaissance debate on comets." *Galilaeana* 12 (2015): 203–215.

Omodeo, Pietro Daniel and Jonathan Regier. "Liddel on the geo-heliocentric controversy: his letter to Brahe from 1600." In *Duncan Liddel 1561–1613: networks of polymathy and the northern European Renaissance*, ed. Pietro Daniel Omodeo with Karin Friedrich. 203–217. Leiden: Brill, 2016.

Omodeo, Pietro Daniel and Jürgen Renn. "Das Prinzip Kontingenz in der Naturwissenschaft der Renaissance." In *Contingentia: Transformationen des Zufalls*, eds. Hartmut Böhme, Werner Röcke, and Ulrike C. A. Stephan. 115–148. Berlin: De Gruyter, 2016.

Omodeo, Pietro Daniel and Irina Tupikova. "Cosmology and epistemology: a comparison between Aristotle's and Ptolemy's approaches to geocentrism."



1

In *Spatial thinking and external representation: towards a historical epistemology of space*, ed. Matthias Schemmel. 145–174. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/studies/8/6/index.html>

- 1 Padova, Thomas de. *Allein gegen die Schwerkraft: Einstein 1914–1918*. München: Hanser, 2015.

Peters, Gunthild. “Fibonacci, Leonardo.” In *Encyclopedia of Renaissance philosophy*, ed. Marco Sgarbi. Online. Cham: Springer International Publishing, 2015.

Renn, Jürgen *see also Arabatzis and Renn*

Renn, Jürgen *see also Blum, Bonolis, Lalli and Renn*

Renn, Jürgen *see also Blum, Gavroglu, Joas and Renn*

Renn, Jürgen *see also Blum, Giulini, Lalli and Renn*

Renn, Jürgen *see also Blum, Jähnert, Lehner and Renn*

Renn, Jürgen *see also Blum, Lalli and Renn*

Renn, Jürgen *see also Blum and Renn*

Renn, Jürgen *see also Brentjes and Renn*

Renn, Jürgen *see also Büttner and Renn*

Renn, Jürgen *see also Engler and Renn*

Renn, Jürgen *see also Friedrich, Hoffmann and Renn*

Renn, Jürgen *see also Gutfreund and Renn*

Renn, Jürgen *see also Hansen and Renn*

Renn, Jürgen *see also Hoffmann, Kolboske and Renn*





Renn, Jürgen see also Janssen and Renn

Renn, Jürgen see also Laubichler and Renn

Renn, Jürgen see also Nelson, Rosol and Renn

Renn, Jürgen see also Omodeo and Renn

Renn, Jürgen see also Rosol, Nelson and Renn

Renn, Jürgen see also Salisbury and Renn

Renn, Jürgen see also Simões, Arabatzis and Renn

Renn, Jürgen. “Die Globalisierung des Wissens in der Geschichte.” In *Welt-Anschauungen: interdisziplinäre Perspektiven auf die Ordnungen des Globalen*, eds. Olaf Breidbach, Andreas Christoph, and Rainer Godel. 137–148. Halle: Deutsche Akademie der Naturforscher Leopoldina, 2015.

Renn, Jürgen. “From the history of science to the history of knowledge – and back.” *Centaurus* 57 (1 2015): 37–53.

Renn, Jürgen. “The history of science and the globalization of knowledge.” In *Relocating the history of science: essays in honor of Kostas Gavroglu*, eds. Theodore Arabatzis, Jürgen Renn, and Ana Simões. 241–252. Dordrecht: Springer, 2015.

Renn, Jürgen. “Was wir von Kuschim über die Evolution des Wissens und die Ursprünge des Anthropozäns lernen können.” In *Das Anthropozän: zum Stand der Dinge*, eds. Jürgen Renn and Bernd Scherer. 184–209. Berlin: Matthes & Seitz, 2015.

- 1** Renn, Jürgen. “Q Quest.” In *Wissen Macht Geschlecht: ein ABC der transnationalen Zeitgeschichte*, eds. Birgit Kolboske, Axel C. Hüntelmann, Ina Heumann, Susanne Heim, Regina Fritz, and Roman Birke. 95–104. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/proceedings/9/18/index.html>

Renn, Jürgen. “Auf den Baustellen des Anthropozäns.” In *Draußen: Landschaftsarchitektur auf globalem Terrain*, ed. Andres Lepik. 16–19. Berlin: Hatje Cantz, 2017.

- Renn, Jürgen. "Introduction." In *One hundred years of chemical warfare: research, deployment, consequences*, eds. Bretislav Friedrich, Jürgen Renn, Dieter Hoffmann, Florian Schmaltz, and Martin Wolf. 1–8. Cham: Springer International Publishing, 2017: [https://link.springer.com/content/pdf/10.1007%2F978-3-319-51664-6\\_1.pdf](https://link.springer.com/content/pdf/10.1007%2F978-3-319-51664-6_1.pdf)
- 2 Renn, Jürgen. "On the construction sites of the Anthropocene." In *Out there: landscape architecture on the global terrain*, ed. Andres Lepik. 16–19. Berlin: Hatje Cantz, 2017.
- Renn, Jürgen and Sonja Brentjes. "Introduction." In *Globalization of knowledge in the post-antique Mediterranean, 700–1500*, eds. Sonja Brentjes and Jürgen Renn. 1–6. London: Routledge, 2016.
- Renn, Jürgen and Peter Damerow. "Scientific revolution, history and sociology of." In *International encyclopedia of the social and behavioral sciences*, vol. 21, ed. James D. Wright. 318–321. Oxford: Elsevier, 2015: <http://www.sciencedirect.com/science/referenceworks/9780080970875>
- Renn, Jürgen, Benjamin Johnson, and Benjamin Steininger. "Ammoniak und seine Synthese: wie eine epochale Erfindung das Leben der Menschen und die Arbeit der Chemiker veränderte." *Naturwissenschaftliche Rundschau* 70 (10 2017): 507–514.
- Renn, Jürgen, Horst Kant, and Birgit Kolboske. "Stationen der Kaiser-Wilhelm-/Max-Planck-Gesellschaft." In "*Dem Anwenden muss das Erkennen vorausgehen*": *auf dem Weg zu einer Geschichte der Kaiser-Wilhelm/Max-Planck-Gesellschaft*, eds. Dieter Hoffmann, Birgit Kolboske and Jürgen Renn. 5–120. Berlin: Edition Open Access, 2015: <http://www.edition-open-access.de/proceedings/6/2/index.html>
- Renn, Jürgen and Manfred Dietrich Laubichler. "Extended evolution and the history of knowledge." In *Integrated history and philosophy of science*, ed. F. Stadler. 109–125. Cham: Springer International Publishing, 2017.
- Renn, Jürgen, Manfred Dietrich Laubichler, and Helge Wendt. "Energietransformationen zwischen Kaffee und Koevolution." In *Willkommen im Anthropozän: unsere Verantwortung für die Zukunft der Erde; Katalog zur Sonderausstellung am Deutschen Museum*, eds. Nina Möllers, Christian Schwägerl, and Helmuth Trischler. 79–82. München: Deutsches Museum, 2015.
- Renn, Jürgen and Matthias Schemmel. "Wie oft sind die Naturwissenschaften entstanden?" *Nova Acta Leopoldina*, NF 414 (2017): 47–60: <http://www.leopoldina.org/de/publikationen/wissenschaftliche-zeitschriften/nova-acta-leopoldina/>
- 3 Renn, Jürgen and Bernd Scherer, eds. *Das Anthropozän: zum Stand der Dinge*. Berlin: Matthes & Seitz, 2015.

Renn, Jürgen and Bernd Scherer. "Wissenschaft als Menschheitsgedächtnis und Handlungspotential." In *Prekäre Humanität*, ed. Gregor Maria Hoff. 77–97. Innsbruck: Tyrolia Verlag, 2016.

Renn, Jürgen, Robert Schlögl, Christoph Rosol, and Benjamin Steininger. "A rapid transition of the world's energy systems." *Nature Outlook* (2017): 133–180: [https://www.mpiwg-berlin.mpg.de/sites/default/files/2017-12/natureoutlookenergytransitions2017\\_0.pdf](https://www.mpiwg-berlin.mpg.de/sites/default/files/2017-12/natureoutlookenergytransitions2017_0.pdf)

- 1 Renn, Jürgen and Robert Schulmann, eds. *Albert Einstein Mileva Maric: Erotikes epistoles. Ερωτικές επιστολές*. Thessaloniki: Ropi Publ., 2016.
- 2 Renn, Jürgen, Dirk Wintergrün, Roberto Lalli, Manfred Laubichler, and Matteo Valleriani. "Netzwerke als Wissensspeicher." In *Die Zukunft der Wissensspeicher: Forschen, Sammeln und Vermitteln im 21. Jahrhundert*, eds. Jürgen Mittelstraß and Ulrich Rüdiger. 35–79. München: UVK Verlagsgesellschaft Konstanz, 2016.

Rickles, Dean and Alexander S. Blum. "Paul Weiss and the genesis of canonical quantization." *The European Physical Journal H* (2015): 1–19.

Rispoli, Giulia see also Ienna and Rispoli

Rispoli, Giulia see also Tagliagambe and Rispoli

Rispoli, Giulia. "A red, green planet: Alexander Bogdanov's interplanetary utopia." In *Ciència i ficció: l'exploració creativa dels mons reals i dels irrealis*, eds. Pasqual Bernat et al. 32–39. Barcelona: Societat Catalana d'Història de la Ciència i de la Tècnica, Edicions Talaiots, 2016.

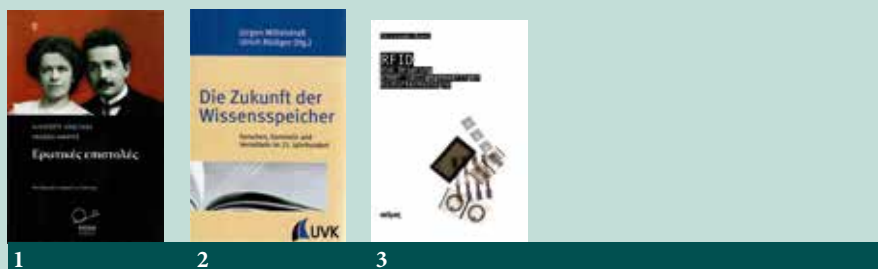
Rispoli, Giulia "Sharing in action: Bogdanov, the living experience and the systemic concept of the environment." In *Culture as organization in early Soviet thought*, eds. Pia Tikka et al. 1–18. Helsinki: Aalto University, 2016.

Rispoli, Giulia. "Uno sguardo alle teorie sistemiche: Ludwig von Bertalanffy e Alexander A. Bogdanov." In *Percorsi evolutivi: lezioni di filosofia della biologia*, eds. Elena Gagliasso, Federico Morganti, and Alessandra Passariello. 87–99. Milan: Franco Angeli, 2016.

Rispoli, Giulia and Federica Turriziani Colonna. "Intersezioni tra biologia dello sviluppo ed ecosistemica: nuove prospettive per l'evoluzione" *Paradigmi* (1 2016): 129–139.

Rispoli, Giulia. "Serghey S. Chetverikov (1880–1959): drawing a synthesis between genetics and evolution." In *Evolutionary developmental biology*, eds. Laura Nuno de la Rosa and Gerd Müller, 1–11. Cham: Springer.

Rosol, Christoph see also Nelson and Rosol



Rosol, Christoph see also Renn, Schlögl and Rosol

Rosol, Christoph. “Hauling data: Anthropocene analogues, paleoceanography and missing paradigm shifts.” *Historical Social Research* 40 (2 2015): 37–66.

- 3 Rosol, Christoph. *RFID – Vom Ursprung einer (all)gegenwärtigen Kulturtechnologie*. Berliner Programm einer Medienwissenschaft 4. Second edition. Berlin: Kulturverlag Kadmos, 2016.

Rosol, Christoph. “Data, models and earth history in deep convolution: paleoclimate simulations and their epistemological unrest.” *Berichte zur Wissenschaftsgeschichte* 40 (2017): 120–139.

Rosol, Christoph. “Which design for a weather predictor? Speculating on the future of electronic forecasting in post-war America.” In *Cultures of prediction in atmospheric and climate science: epistemic and cultural shifts in computer-based modelling and simulation*, eds. Matthias Heymann, Gabriele Gramelsberger, and Martin Mahony. 68–84. London: Routledge, 2017.

Rosol, Christoph, Sara Nelson, and Jürgen Renn. “In the machine room of the Anthropocene.” *The Anthropocene Review* 4 (1 2017): 2–8: <http://journals.sagepub.com/doi/10.1177/2053019617701165>

Sachse, Carola. “Tiere und Geschlecht: ‘Weibchen’ oder ‘Männchen’? Geschlecht als Kategorie in der Geschichte der Beziehungen von Menschen und anderen Tieren.” In *Tiere und Geschichte: Konturen einer ‘Animate History’*, eds. Gesine Krüger, Aline Steinbrecher, and Clemens Wischermann. 79–104. Stuttgart: Steiner, 2015.

Sachse, Carola. “From the Kaiser Wilhelm Institute of Anthropology, Human Heredity and Eugenics to the Max Planck Institute for Molecular Genetics.” In *Genes and men, 50 years of research at the Max Planck Institute for Molecular Genetics*, ed. Martin Vingron. 18–28. Berlin: Max Planck Institute for Molecular Genetics, 2015: [https://www.molgen.mpg.de/3507794/50\\_Jahre\\_MPIMG\\_screen\\_komplett\\_eng.pdf](https://www.molgen.mpg.de/3507794/50_Jahre_MPIMG_screen_komplett_eng.pdf)



Sachse, Carola. “Eckpunkte einer guten wissenschaftlichen Praxis der historischen Aufarbeitung schlimmer Vergangenheiten.” In *Produktive Imitationen*, eds. Gleb J. Albert and Wendelin Brühwiler. 85–99. Essen: Klartext, 2017: <http://werkstattgeschichte.de/abstracts/nr-74-carola-sachse/>

Salisbury, Donald, Jürgen Renn, and Kurt Sundermeyer. “Restoration of four-dimensional diffeomorphism covariance in canonical general relativity: an intrinsic Hamilton-Jacobi approach.” *International Journal of Modern Physics A* 31 (6 2016): 1–21: <http://arxiv.org/pdf/1508.01277v1.pdf>

Salisbury, Donald C. and Kurt Sundermeyer. “Léon Rosenfeld’s general theory of constrained Hamiltonian dynamics.” *The European Physical Journal H* 42 (1 2017): 23–61: <https://link.springer.com/article/10.1140/epjh/e2016-70042-7>

Salisbury, Donald C. and Kurt Sundermeyer. “On the quantization of wave fields.” *The European Physical Journal H* 42 (1 2017): 63–94: <https://link.springer.com/article/10.1140%2Fepjh%2Fe2016-70041-3>

Samir, Imad. “Banu Musa ibn Shakir: A programmable universal musical automaton: two translations.” In *Allah’s automata: artifacts of the Arab-Islamic renaissance (800–1200)*, eds. Siegfried Zielinski and Peter Weibel. 68–86. Ostfildern: Hatje Cantz, 2015.

Scheffler, Matthias and Dieter Hoffmann. “Obituary: Walter Kohn (1923–2016).” *Nature Materials* 15 (7 2016): 704.

Schemmel, Matthias *see also Blum, Renn and Schemmel*

Schemmel, Matthias *see also Boltz and Schemmel*

Schemmel, Matthias *see also Goulding and Schemmel*

Schemmel, Matthias *see also Renn and Schemmel*

Schemmel, Matthias. “Review of: Smith, A. Mark: From sight to light: the passage from ancient to modern optics. Chicago: The University of Chicago Press 2014.” *Centaurus* 57 (2 2015): 126–128.

Schemmel, Matthias. "Harriot, Thomas: Renaissance Philosophy." In *Encyclopedia of Renaissance Philosophy*, ed. Marco Sgarbi. Online. Cham: Springer International Publishing, 2016.

- 1 Schemmel, Matthias. *Historical epistemology of space: from primate cognition to spacetime physics*. SpringerBriefs in history of science and technology. Cham: Springer International Publishing, 2016.

Schemmel, Matthias, ed. *Spatial thinking and external representation: towards a historical epistemology of space*. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/studies/8/index.html>

Schemmel, Matthias. "Towards a historical epistemology of space: an introduction." In *Spatial thinking and external representation: towards a historical epistemology of space*, ed. Matthias Schemmel. 1–33. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/studies/8/2/index.html>

Schirrmacher, Arne. "Bohr's genuine metaphor: on types, aims and uses of models in history of quantum theory." In *One hundred years of the Bohr atom: proceedings from a conference*, eds. Finn Aaserud and Helge Kragh. 111–140. Copenhagen: Det Kongelige Danske Videnskabernes Selskab, 2015.

Schmaltz, Florian *see also Bonah and Schmaltz*

Schmaltz, Florian *see also Flachowsky, Hachtmann and Schmaltz*

Schmaltz, Florian *see also Friedrich, Hoffmann, Renn and Schmaltz*

Schmaltz, Florian. "Chemical weapons research on soldiers and concentration camp inmates in Nazi Germany." In *One hundred years of chemical warfare: research, deployment, consequences*, eds. Bretislav Friedrich, Dieter Hoffmann, Jürgen Renn, Florian Schmaltz and Martin Wolf. 229–258. Cham: Springer Open, 2017.

Schmaltz, Florian. "'Fritz Haber war nicht der Erste, der chemische Waffen vorschlug' [Interview]." *Nachrichten aus der Chemie* 63 (11 2015): 1073–1075.

- 2 Schmaltz, Florian. "Luftfahrtforschung auf Expansionskurs: die Aerodynamische Versuchsanstalt in den besetzten Gebieten." In *Ressourcenmobilisierung: Wissenschaftspolitik und Forschungspraxis im NS-Herrschaftssystem*, eds. Sören Flachowsky, Rüdiger Hachtmann and Florian Schmaltz. 326–382. Göttingen: Wallstein Verlag, 2016.

Schmaltz, Florian. "Review of: Maier, Helmut: Chemiker im 'Dritten Reich'. Weinheim: Wiley-VCH 2015." *Angewandte Chemie* 127 (47 2015): 14058–14059.

Schmaltz, Florian. "Ypern." In *Wissen Macht Geschlecht: ein ABC der transnationalen Zeitgeschichte*, eds. Birgit Kolboske, Axel C. Hüntelmann, Ina Heumann,



Susanne Heim, Regina Fritz and Roman Birke. 141–51. Berlin: Edition Open Access, 2016. <http://edition-open-access.de/proceedings/9/26/index.html>

Serrano, Elena. “Review of: Lykknes, Annette, Donald L. Opitz and Brigitte Van Tiggelen (eds): For better or for worse? Collaborative couples in the sciences. Dordrecht: Springer 2012.” *Ambix* 62 (2 2015): 197–198.

Serrano, Elena. “Spreading the revolution: Guyton’s fumigating machine in Spain; politics, technology, and material culture (1796–1808).” In: Roberts, Lissa L. and Simon Werrett (eds.) *Compound histories: materials, governance, and production, 1760–1840*. 106–130. Leiden: Brill, 2017.

Shea, William R. “Galileo and Milton.” *Galilaeana* 13 (2016): 1–27.

Simões, Ana, Theodore Arabatzis, and Jürgen Renn. “Introduction.” In *Relocating the history of science: essays in honor of Kostas Gavroglu*, eds. Theodore Arabatzis, Jürgen Renn, and Ana Simões. 1–5. Cham: Springer, 2015.

Steininger, Benjamin see also Renn, Johnson and Steininger

Steininger, Benjamin see also Renn, Schlögl, Rosol and Steininger

Steininger, Benjamin. “Berührungswirkungen: Katalyse als Kontaktforschung.” In *Auf Tuchfühlung: eine Wissensgeschichte des Tastsinns*, ed. Karin Harrasser. 25–37. Frankfurt am Main: Campus, 2017.

Steininger, Benjamin. “Lubricants as liquid machine parts.” In *Raw flows: fluid mattering in arts and research*, ed. Roman Kirschner. 30–47. Berlin: De Gruyter, 2017.

Stiller, Juliane, Timo Gnadt, Matteo Romanello, and Klaus Thoden. “Anforderungen ermitteln, Lösungen evaluieren und Erfolge messen: Begleitforschung in DARIAH-DE.” *Bibliothek: Forschung und Praxis* 40 (2 2016): 250–258: <https://www.degruyter.com/view/j/bfup.2016.40.issue-2/bfp-2016-0025/bfp-2016-0025.xml?format=INT>

- 1 Tagliagambe, Silvano and Giulia Rispoli. *La divergenza nella Rivoluzione: filosofia, scienza e teologia in Russia (1920–1940)*. Brescia: La Scuola, 2016.

Terada, Masahiro. “Floating and anthropos: a lesson in / from Aerocene.” *Anthropocene Curriculum (Website): Campus 2016, Knowing (in) the Anthropocene* (01.11.2016): 1–5: <http://www.anthropocene-curriculum.org/pages/root/campus-2016/knowning-in-the-anthropocene/floating-and-anthropos/>

Terada, Masahiro. “The reed, slime mold, and sprout: on becoming and the form of time.” *Anthropocene Curriculum (Website): Campus 2016, Co-Evolutionary Perspectives on the Technosphere* (01.11.2016 2016): 1–6: <http://www.anthropocene->



curriculum.org/pages/root/campus-2016/co-evolutionary-perspectives-on-the-technosphere/the-reed-slime-mold-and-sprout/

Terada, Masahiro. “Shita karano ansoroposhiin no tameni (Towards a bottom up approach to the Anthropocene).” *Humanity & Nature*, 65 (2017): 4 (in Japanese).

Thiering, Martin. *Spatial semiotics and spatial mental models: figure-ground asymmetries in language*. Applications of cognitive linguistics 27. Berlin: De Gruyter Mouton, 2015.

Thiering, Martin and Wulf Schiefenhövel. “Spatial concepts in non-literate societies: language and practice in Eipo and Dene Chipewyan.” In *Spatial thinking and external representation towards a historical epistemology of space*, ed. Matthias Schemmel. 35–92. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/studies/8/3/index.html>

Thoden, Klaus see also Bulatovic, Gnadt, Romanello, Stiller and Thoden

Thoden, Klaus see also Gnadt, Schmitt, Stiller and Thoden

Thoden, Klaus see also Gnadt, Romanello and Thoden

Thoden, Klaus, Juliane Stiller, Natasa Bulatovic, Hanna-Lena Meiners, and Nadia Boukhelifa. “User-centered design practices in digital humanities: experiences from DARIAH and CENDARI.” *ABI Technik* 37 (1 2017): 2–11.

**2 + 3** Trzeciok, Stefan Paul. *Alvarus Thomas und sein ‘Liber de triplici motu’*. Edition Open Sources 7 and 8 (2 volumes). Berlin: Edition Open Access, 2016: <http://www.edition-open-sources.org/sources/7/index>; and <http://www.edition-open-sources.org/sources/8/index.html>

Tupikova, Irina see Omodeo and Tupikova

Valleriani, Matteo see also Kaiser and Valleriani

Valleriani, Matteo see also Kräutli and Valleriani



Valleriani, Matteo see also Renn, Wintergrün, Lalli, Laubichler and Valleriani

Valleriani, Matteo. “Review of: Bowen, Alan C.: *Simplicius on the planets and their motions: in defense of a heresy*. Leiden: Brill 2012.” *Isis* 106 (1 2015): 170–171.

Valleriani, Matteo. “Review of: Galluzzi, Paolo: “Libertà di filosofare in naturalibus”: i mondi paralleli di Cesi e Galileo. Roma: Scienze e Lettere 2014.” *Isis* 106 (4 2015): 919–920.

Valleriani, Matteo. “Sixteenth-century hydraulic engineers and the emergence of empiricism.” In *Conflicting values of inquiry: ideologies of epistemology in early modern Europe*, eds. Tamás Demeter, Kathryn Murphy, and Claus Zittel. 41–68. Leiden: Brill, 2015.

Valleriani, Matteo. “Forms and functions of codification of knowledge: an example from the work of Joseph Furtenbach.” *Zeitsprünge: Forschungen zur Frühen Neuzeit* 20 (3–4 2016): 457–469.

Valleriani, Matteo. “Galileo Galilei.” In *Kindler Kompakt: Klassiker der Naturwissenschaften*, ed. Michael Hagner. 72–74. Stuttgart: Metzler, 2016.

Valleriani, Matteo. “Hydrostatics and pneumatics in antiquity.” In *A companion to science, technology, and medicine in Ancient Greece and Rome*, vol. 1, ed. Georgia L. Irby. 145–160. Malden: Wiley-Blackwell, 2016.

Valleriani, Matteo. “Review of: Alertz, Ulrich, Haster Frank, Thomas Kreft and Dietrich Lohrmann: Electronic commented edition of Leonardo da Vinci, Codex Madrid I, Madrid Biblioteca Nacional, MS 8937. [www.codex-madrid.rwth-aachen.de](http://www.codex-madrid.rwth-aachen.de). Project of the Historisches Institut des RWTH Aachen. Supported by the Deutsche Forschungsgemeinschaft.” *Isis* 107 (1 2016): 160–161.

Valleriani, Matteo. “Review of: Lipking, Lawrence: *What Galileo saw: imagining the scientific revolution*. Ithaca: Cornell University Press 2014.” *The American Historical Review* 121 (2 2016): 637–638.

1 Valleriani, Matteo, ed. *The structures of practical knowledge*. Cham: Springer, 2017.

Valleriani, Matteo. "The epistemology of practical knowledge." In *The structures of practical knowledge*, ed. Matteo Valleriani. 1–19. Cham: Springer, 2017.

Valleriani, Matteo. "The tracts on the 'Sphere': knowledge restructured over a network." In *The structures of practical knowledge*, ed. Matteo Valleriani. 421–473. Cham: Springer, 2017.

Valleriani, Matteo. "Israel and Europe: building bridges via the history of science." *Centaurus* 59 (1–2 2017): 160–165.

Van Leeuwen, Joyce. "Manuscripts." In *A companion to the history of science*, ed. Bernard Lightman. 331–343. Malden: Wiley-Blackwell, 2016.

- 2 Van Leeuwen, Joyce. *The Aristotelian mechanics: text and diagrams*. Boston studies in the philosophy and history of science 316. Cham: Springer, 2016.

Van Leeuwen, Joyce. "Antike Mechanik im 16. Jahrhundert." In *Antike als Transformation: Konzepte zur Beschreibung kulturellen Wandels*, eds. Johannes Helmuth, Eva Marlene Hausteiner, and Ulf Jensen. 197–208. Berlin: De Gruyter, 2017.

- 3 Vermeulen, Hendrik Frederik. *Before Boas: the genesis of ethnography and ethnology in the German Enlightenment*. Critical studies in the history of anthropology. Lincoln: University of Nebraska Press, 2015.

Wahsner, Renate. "'Die Gattung erhält sich nur durch den Untergang der Individuen': das Verhältnis von Individuum und Gattung, Einzelem und Allgemeinem im Tierreich." In *Sterben und Tod bei Hegel*, ed. Dietrich von Engelhardt. 69–78. Würzburg: Königshausen & Neumann, 2015.

Wahsner, Renate. "Mechanismus." In *Schlüsselbegriffe der Philosophie des 19. Jahrhunderts*, eds. Christian Bermes, Ulrich Dierse, and Annika Hand. 283–302. Hamburg: Meiner, 2015.

Wahsner, Renate. "Zur Aufhebung des Gegensatzes von Bewusstsein und Gegenstand des Bewusstseins bzw. von Denken und Sein." In *Hegel-Jahrbuch. Hegel gegen Hegel II*, eds. Andreas Arndt, Myriam Gerhard, and Jure Zovko. 488–494. Berlin: De Gruyter, 2015.

Wahsner, Renate. "Das Prinzip der neueren Philosophie: Denken – Sein, Geist – Natur." In *Natur und Geist*, eds. Wolfgang Neuser and Pirmin Stekeler-Weithofer. 9–23. Würzburg: Königshausen & Neumann, 2016.

Wahsner, Renate. "Zum Verhältnis der neuzeitlichen Naturwissenschaft zu einer modernen Naturphilosophie." *Wiener Jahrbuch für Philosophie* XLVII /2015 (2016): 9–29.

Wahsner, Renate. "Bedarf die Lösung der höchsten Aufgabe des spekulativen Denkens der Naturphilosophie?" In *Natur zwischen Logik und Geschichte: Beiträge zu Hegels Naturphilosophie*, eds. Wolfgang Neuser and Steffen Lange. 11–25. Würzburg: Königshausen & Neumann, 2016.

Wahsner, Renate. "Review of: Chiba, Kiyoshi: Kants Ontologie der raumzeitlichen Wirklichkeit: Versuch einer anti-realistischen Interpretation der 'Kritik der reinen Vernunft'." Berlin: De Gruyter 2012." *Kant-Studien* 107 (2 2016): 389–390.

Wendt, Helge see also Lehner and Wendt

Wendt, Helge see also Renn, Laubichler and Wendt

Wendt, Helge. "Review of: Heumann, Ina: Gegenstücke: populäres Wissen im transatlantischen Vergleich (1948–1984). Wien: Böhlau 2014." *German History* 33 (4 2015): 687–689.

Wendt, Helge. "Review of: Sánchez-Menchero, Mauricio: El corazón de los libros, Alzate y Bartolache: lectores y escritores novohispanos (s. XVIII). México: UNAM 2012." *Revista europea de estudios latinoamericanos y del Caribe = European review of Latin American and Caribbean studies* 99 (2015): 165–167.

Wendt, Helge. "Becoming global: difficulties for European historiography in adopting categories of global history." In *1001 distortions: how (not) to narrate history of science, medicine, and technology in non-western cultures*, eds. Sonja Brentjes, Taner Edis, and Lutz Richter-Bernburg. 39–51. Würzburg: Ergon, 2016.

Wendt, Helge. "Coal mining in Cuba: knowledge formation in a transcolonial perspective." In *The globalization of knowledge in the Iberian colonial world*, ed. Helge Wendt. 261–296. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/proceedings/10/12/index.html>.

Wendt, Helge. "Epilogue: The Iberian way into the anthropocene." In *The globalization of knowledge in the Iberian colonial world*, ed. Helge Wendt. 297–314. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/proceedings/10/13/index.html>.

Wendt, Helge. "Introduction: Competing scientific cultures and the globalization of knowledge in the Iberian colonial world." In *The globalization of knowledge in the Iberian colonial world*, ed. Helge Wendt. 7–27. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/proceedings/10/3/index.html>.

Wendt, Helge. "Kohle in Akadien: Transformationen von Energiesystemen und Kolonialregimen (ca. 1630–1730)." *Francia* 43 (2016): 119–136.

- 1 Wendt, Helge, ed. *The globalization of knowledge in the Iberian colonial world*. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/proceedings/10/index.html>.



Wendt, Helge. “Licht und Schatten des europäischen Kolonialismus: Reinhard’s ‘Die Unterwerfung der Welt’ als Fortschreibung einer globalen Europäisierung.” *Neue Politische Literatur* 62 (1 2017): 5–20.

Wintergrün, Dirk see Casties and Wintergrün

Wintergrün, Dirk see Renn and Wintergrün

Wunderlich, Falk. “Eight days of darkness in 1600: Hume on whether testimony can establish miracles.” In *Conflicting values of inquiry: ideologies of epistemology in early modern Europe*, eds. Tamás Demeter, Kathryn Murphy, and Claus Zittel. 125–152. Leiden: Brill, 2015.

Wüthrich, Adrian. “The Higgs discovery as a diagnostic causal inference.” *Synthese* 194 (2 2017): 461–476.

- 2 Yavetz, Ido. *Bodies and media: on the motion of inanimate objects in Aristotle’s “Physics” and “On the Heavens”*. SpringerBriefs in History of Science and Technology. Cham: Springer, 2015.

Zhang, Baichun. “Analysis and annotation of Leibniz’s questions and Grimaldi’s answers.” In *“Für unser Glück oder das Glück anderer”: Vorträge des X. Internationalen Leibniz-Kongresses. Bd. 5*, ed. Li Wenchao. 449–487. Hildesheim: Olms Verlag, 2016.

Zhang, Baichun. “The professionalization of research on the history of science in China and the influence of Eurocentrism on Chinese historians of science.” In *Shifting paradigms: Thomas S. Kuhn and the history of science*, eds. Alexander S. Blum, Kostas Gavroglu, Christian Joas, and Jürgen Renn. 329–335. Berlin: Edition Open Access, 2016: <http://edition-open-access.de/proceedings/8/26/index.html>

Zhang, Baichun. “Transmission, cooperation and competition in device construction between China and Europe in 16th–18th centuries.” *Nova Acta Leopoldina, NF* 414 (2017): 99–112.

- 3 Zhang, Baichun and Jürgen Renn. “Editorial.” *Chinese Annals of History of Science and Technology* 1 (1 2017): i–ii.





Department II

# Ideals and Practices of Rationality

DIRECTOR Lorraine Daston



Members of Department II, fall 2017

## Introduction: The Long View

In 1995 Department II began its research on “The Ideals and Practices of Rationality” with a simple but daunting question: How to write the history of reason? In June 2019, Department II under the directorship of Lorraine Daston will complete its work. This report, covering the last reporting period throughout which the Department was active in its present configuration, provides a welcome opportunity to take a long view of the research program inspired by that initial question over more than two decades ago.

*What the research was about.* “Reason” is one of those mind-numbing abstractions that seem to defy history. Yet for at least the last four hundred years the most striking examples of the exercise of reason have come from the sciences, and the sciences have been the most dynamic of all forms of knowledge, regularly reinventing themselves at a breathless pace. Scientific novelty ticks according to at least three different clocks. Fastest are the new empirical discoveries that overflow the pages of weekly journals. New theoretical insights evolve more slowly, reshaping understanding on a scale of decades or even centuries. Slowest of all but also most enduring is the emergence of new ways of knowing, such as the controlled experiment, systematic long-term observation, statistical inference, or computer simulation, and new categories of thought and practice, such as probability, precision, or objectivity. Department II has focused on this basso continuo of scientific reason—the slowest paced but also the most fundamental in terms of its broad influence in many fields and deep impact on how abstract reason is made concrete in the scientific practices of the astronomical observatory, the chemical laboratory, the botanical garden, but also the library, the workshop, the ship, and the home.

Key to the project of writing a history of reason has been a recognition that “reason,” especially in the natural and human sciences, is a composite of many different ideals and practices, each with its own distinct history. Department II did not tackle a history of Reason writ large; rather, its research projects have addressed specific topics and episodes in the long and variegated history of reason’s components. Among these



Christa Donner, *The Redistribution of Curiosity*. Selection of postcards produced as artist-in-residence project between September 2015 and January 2016. Courtesy of the artist.

The drawings resulted from conversations with scholars of Dept. II working in diverse areas, from medieval astronomy to postwar Big Science. The act of drawing allowed for creative re-categorization and unexpected visual connections.



projects were investigations into what can be an object of scientific inquiry and why, the spread of systematic scientific observation, the emergence of objectivity, the rise of algorithmic rationality, and the long-lived and increasingly important data-heavy sciences of the archives.

Precisely because ways of knowing emerge on a slower timescale and penetrate to the deepest level of fundamental assumptions, they are often invisible to historical inquiry. They slip through the mesh of finely woven contextual studies, and by their very nature are taken for granted as the presuppositions for, rather than the products of, knowing. This is why the research projects of Department II have always been conceived comparatively along several dimensions: across disciplines, periods, and cultures.

*How the research was done.* No one scholar, no matter how erudite or diligent, could possibly do justice to historical developments that unfold on a scale of centuries and continents. Moreover, the solidity of historical work of all kinds depends on painstaking attention to the particulars of context. How to satisfy these competing demands of scope and specificity? Department II's solution was the Working Group, a collective of anywhere from six to eighteen scholars of diverse specialties who met multiple times to produce a joint publication. Over its twenty-odd-year history, Department II has published eighteen of these Working Group volumes. These volumes were intended to be the first, not the last word on their various topics, and if the evidence of

subsequent publications and conferences dedicated to these themes is any indication, the Working Group publications have succeeded in their aim to open up new fields of inquiry both within and beyond the history of science. These volumes include: *Biographies of Scientific Objects* (University of Chicago Press, 2000), *Things that Talk: Object Lessons from Art and Science* (Zone Books, 2004), *Thinking with Animals: New Perspectives on Anthropomorphism* (Columbia University Press, 2005), *Histories of Scientific Observation* (University of Chicago Press, 2011), and *How Reason Almost Lost Its Mind: The Strange Career of Cold War Rationality* (University of Chicago Press, 2014).

We continue to experiment with the format of the Working Groups. Most begin with an exploratory workshop to sharpen the contours of the topic and identify possible Working Group members, who then meet several times subsequently to



discuss drafts of papers and hammer out a shared analytical framework. Others have brought Working Group members together at the MPIWG for up to four months. In all cases, the objective is to produce a conceptually coherent and analytically focused volume that still preserves the virtues of textured specificity and the wide-ranging scope essential to comparative history.

*Who the researchers were.* Not all of the researchers in Department II have been members of Working Groups. We have been mindful of the fact that early career scholars, in particular, must concentrate on single-author publications in order to advance, and we have also been hopeful that the Working Groups would learn a great deal from other scholars working on kindred topics. For those reasons, every major Department II project has also hosted researchers, from predoctoral fellows to *éminences très grises*, pursuing individual projects on topics related to ongoing departmental themes. All scholars in residence in Department II—predocs, postdocs, Research Scholars, Visiting Scholars—gather at the semimonthly departmental colloquia to present and discuss work-in-progress. The colloquium's schedule during the reporting period, including paper titles and commentators, is available on Department II's website at <https://www.mpiwg-berlin.mpg.de/page/dept-ii>.

Especially in the past decade, as the career paths of early career scholars have become steeper and stonier all over the world, Department II has made it a priority that at least half of its scholars should be predocs and postdocs. All of them have left the MPIWG with the offer of a fellowship or position (often tenure-track) in hand; their destinations are recorded at the very end of this report. We are immensely proud of each and every one of them.

→ pp. 419ff.

*What we have learned.* Since 1995, the discipline of the history of science has rethought itself in mind-stretching ways. As a glance at the titles of articles published in leading history of science journals in the past two decades reveals, the understanding of what science is and who counts as a scientist has broadened and diversified to include household herbalists, imperial adventurers, women computers, Renaissance bibliographers, Victorian pigeon fanciers, artists depicting the flora and fauna of their native Mexico or India, and many other people lacking white coats, horn-rimmed spectacles, and a Ph.D. The sites of science now include not only the laboratory and the observatory but also the garden, the forge, the study, and the household hearth. Geography and chronology have also broadened: the Europe (in fact, never more than a few Western European countries and then only their leading cities) of the discipline's origins is now dwarfed by a map that embraces at least some parts of all continents and oceans; spectacular recent work on ancient China and Mesopotamia has exploded the discipline's time frame. The work of Department II has profited from all of these developments but also pondered their perplexities: if the history of science, once the most highly theorized branch of history, is to expand to become a history of knowledge, is there any topic, in any culture and any epoch, that it will *not* include? There is a beckoning future ahead in sharpening the contours of the vast and nebulous concept of knowledge with some of the same tools that have served Department II well in writing the history of reason: a focus on concrete practices and contexts but also on historical and cultural comparison.



The organization of this report follows that of the Department's five major research projects and the independent Minerva research group embedded in the Department. These rubrics are: I. Science, the History of Science, and Modernity; II. The Sciences of the Archive; III. Between the Natural and the Human Sciences; IV. Gender Studies of Science; V. Science in Circulation; and VI. Reading and Writing Nature in Early Modern Europe (MPG Minerva Research Group, headed by Elaine Leong.) Working Groups, conferences, and individual projects are listed under each project rubric, as is information on institutional cooperation partners. Short entries of publications resulting from the respective projects can be found under each project description.

Please note that bibliographical entries for individual researchers list the three most significant publications during the reporting period. A full bibliography of Department II publications 2015–17 is appended in the green section at the end of this Department's report.

→ pp. 191–214

## Project

## Science, History of Science, and Modernity



Ewald Thiel, Paris World Fair, Palais de l'Électricité. Print (1900). Bibliothèque nationale de France.

DURATION 2017–2019

ORGANIZER *Lorraine Daston* (MPIWG)

COOPERATION PARTNERS Columbia University (USA), Maastricht University (The Netherlands)

### Science, History of Science, and Modernity

What exactly does science have to do with modernity? The answer depends on what (and when) you think modernity was: The Enlightenment of the eighteenth century? The American and French Revolutions and subsequent democratic movements? The Industrial Revolution? The global reach of empire and commerce? The chemical and electromagnetic technoscience of the nineteenth century? Secularization? All these and more are components of the package deal loosely referred to as modernity, and even a cursory inspection of the diversity of content and smear of dates shows how hard it would be to fuse all these elements into a single coherent story—much less to figure out what science has to do with any and all of them.

In July 2018 historians of science, technology, economics, and law, specializing in India, Latin America, China, Russia, the Middle East, and Japan as well as Europe and North America, will gather for a seminar to examine the origins and influence of this narrative with an emphasis on primary sources in the relevant languages. The aim of this seminar is not to try, yet again, to debunk this narrative. Rather, it is to understand how it came about, assess what its consequences have been (and what the stakes still are), and explain why it won't die.

## Conference

### **“The Engine of Modernity”: Construing Science as the Driving Force of History in the Twentieth Century**

May 2–3, 2017, Columbia University (USA)

ORGANIZERS *Marwa Elshakry* (Columbia University, USA), *Geert Somsen* (Columbia University, USA/Maastricht University, The Netherlands); sponsored by Columbia University and MPIWG

Science has long been associated with modernity, but the belief that it was its engine, that the modern world owed its existence to modern science, arose only after the beginning of the twentieth century. The workshop examined the meanings and implications of the science-as-modernity’s-engine thesis. Where did the notion come from? What did its advocates try to achieve? How were science and modernity themselves reconfigured in the launch of the science studies disciplines? And how did the various ensembles of scholarly activity, discipline formation, and policy design relate to the great upheavals of the time, especially the First and Second World Wars?

#### **Participants**

*Elena Aronova* (University of California, Santa Barbara, USA)

*Elise Aurières* (Université de Paris 1, France)

*Deborah Coen* (Columbia University, USA)

*Alex Csiszar* (Harvard University, USA)

*Lorraine Daston* (MPIWG)

*Marwa Elshakry* (Columbia University, USA)

*Adriana Feld* (CONICET, Buenos Aires, Argentina)

*Steve Fuller* (University of Warwick, UK)

*Andrew Jewett* (Harvard University, USA)

*Matthew L. Jones* (Columbia University, USA)

*Whitney Laemmler* (Columbia University, USA)

*Eugenia Lean* (Columbia University, USA)

*Małgorzata Mazurek* (Columbia University, USA)

*Thomas Mougey* (Maastricht University, Netherlands)

*Jahnavi Phalkey* (King’s College, London, UK)

*George Reisch* (independent scholar, Chicago, USA)

*Kavita Sivaramakrishnan* (Columbia University, USA)

*Gabriela Soto Laveaga* (Harvard University, USA)

*Federico Vasen* (Universidad de Buenos Aires, Argentina)

#### **Short-Term Visiting Scholars**

*Stefanie Engelstein* (Duke University, USA)

*Meera Nanda* (Trinity College Hartford, USA)

*Geert Somsen* (Maastricht University, Netherlands)

*Alena Williams* (University of California, San Diego)

## Project

## The Sciences of the Archive

DURATION 2010–2019

ORGANIZERS *Elena Aronova* (MPIWG/University of California, Santa Barbara, USA), *Lino Camprubí* (MPIWG/ Universidad de Sevilla, Spain), *Lorraine Daston* (MPIWG), *Nélia Dias* (Universidade de Lisboa, Portugal), *Sebastian Felten* (MPIWG /Universität Wien, Austria), *Philipp Lehmann* (MPIWG/University of California Riverside, USA), *Christine von Oertzen* (MPIWG), *David Sepkoski* (MPIWG/University of Illinois, Urbana-Champaign, USA), *Fernando Vidal* (Catalan Institution for Research and Advanced Studies / Universitat Autònoma de Barcelona, Spain)

COOPERATION PARTNERS German Historical Institute Washington, DC (USA), Laboratoire SPHERE (CNRS, France), Universität Göttingen (Germany), University of Wisconsin at Madison (USA), Universität Hamburg (Germany), Universidade de Lisboa (Portugal), Universitat Autònoma de Barcelona (Spain)



### The Science of the Archive

“Data” (literally, “the givens”) is perhaps the most taken-for-granted word in all of the sciences: short and unpretentious, it expresses the simplest and apparently most straightforward elements of empirical research. Whether inscribed as jottings on notecards, traces on photographic emulsions, entries in lab notebooks, or digital information, data supply the essential raw materials for all further scientific activity, from observing to theorizing. It is a category considered too basic to merit a history, too innocent to deserve a philosophy. Yet no other aspect of science has commanded a greater commitment of ingenuity, resources, and sheer tenacity than the taking, making, and keeping of data, from the massive collections of astronomical observations in ancient China and Mesopotamia to Google Books. All sciences make some use of data, but the sciences of the archive are defined by it—and their practices in turn define what data means.

Six Working Groups were formed under the auspices of the *Sciences of the Archive* project: “Documenting the World” (completed, publication 2015), “Endangerment, Biodiversity, and Culture” (completed, publication 2015), “Historicizing Big Data” (completed, publication 2017), “Archives of the Sciences” (completed, publication 2017), “Experiencing the Global Environment” (completed, publication 2018), and “The History of Bureaucratic Knowledge” (in progress, completion in 2019).

G. F. Morrell, Pictorial representation of the successive strata of the earth’s crust, with suggestions of characteristic fossils. J. Arthur Thomson, *The Outline of Science*, New York 1928. Photo: Private Collection © Look and Learn/Bridgeman Images.

## Working Groups

### The History of Bureaucratic Knowledge

DURATION 2017–2019

MEETINGS Exploratory workshop, June 1–3, 2017, Washington, DC, in cooperation with and co-funded by the German Historical Institute; authors meeting:

May 24–26, 2018, MPIWG

ORGANIZERS *Sebastian Felten* (MPIWG/Universität Wien, Austria),  
*Christine von Oertzen* (MPIWG)

COOPERATION PARTNERS *Simone Lässig* (German Historical Institute,  
Washington, DC, USA)



Pieter Bruegel the Younger, *The Village Lawyer*, Oil on Panel (1816). Museum of Fine Arts, Ghent, Belgium.  
Photo: [https://commons.wikimedia.org/wiki/File:Pieter\\_Brueghel\\_the\\_Younger\\_-\\_Village\\_Lawyer\\_-\\_WGA3633.jpg](https://commons.wikimedia.org/wiki/File:Pieter_Brueghel_the_Younger_-_Village_Lawyer_-_WGA3633.jpg).

Defining bureaucracies as historically specific responses to the dialectic problem of power and epistemic paralysis (by knowing too little, too much, or being misinformed) allows this Working Group to take a fresh look at case studies from Latin America to China, from the Middle Ages to the 1900s. The group aims to better understand how bureaucracies know the world they aspire to govern. Techniques developed to produce bureaucratic knowledge, such as record-keeping, classifi-

cation, and retrieval, form the template for all subsequent information systems, including those of science.

In line with new approaches in the history of administration and information, the Working Group attends to the materiality of “little tools of knowledge” (from jade seals to paper to computer chips) as well as big tools of knowledge (archives, libraries, collections) and tracks the transits and transformations of data across technology, science, business, and the state to see how historical actors mapped domains and used them to shape bureaucratic visions and realities. The Working Group seeks answers to the fundamental questions of what kinds of knowledge bureaucracies produced, how and to what ends they did so, the ways in which knowledge was structured, and its impact on institutions and governance.

#### Members

*Maria Avxentevskaya* (MPIWG)

*Maura Dykstra* (Caltech, USA)

*Anna Echterhölter* (Humboldt-Universität zu Berlin, Germany/Universität Wien, Austria)

*Sebastian Felten* (MPIWG/Universität Wien, Austria)



Susanne Friedrich (Universität München, Germany)  
 Harun Küçük (University of Pennsylvania, USA)  
 Christine von Oertzen (MPIWG)  
 Kathryn Olesko (Georgetown University, USA)  
 Theodore Porter (UC Los Angeles, USA)  
 Renée Raphael (UC Irvine, USA)  
 John Sabapathy (University College London, UK)  
 Jacob Soll (University of Southern California, USA)  
 Sixiang Wang (Stanford University, USA)

## Experiencing the Global Environment

DURATION 2016–2017

MEETINGS February 4–6, 2016; August 2–4, 2016.

ORGANIZERS Lino Camprubí (MPIWG/Universidad de Sevilla, Spain),  
 Philipp Lehmann (MPIWG/University of California Riverside, USA)

Viewing the earth from a spaceship—or looking at the pictures taken by one—the observer can visualize the wholeness and interconnectedness of our planet. The Apollo photographs of 1972 symbolize the age of environmentalism and the new awareness of the fragility of the biosphere and of the chemical, geological, oceanic, and atmospheric systems that constitute the earth. Yet such a view demands a literal detachment from the earth itself. Other environmental and earth sciences display the same paradoxical tension: while they enable new ways of experiencing the world around us, they seem also to require us to go beyond—and perhaps leave behind—our local surroundings.



The apparent contradiction between the small-scale individual environment and the global environment poses new questions: Is it possible for single organisms to experience the environment at a global scale? What is the role of individual experience as mediated through new instruments and technologies in conceptualizing a global environment? Conversely, how do historically produced ideas about global as well as collective experience configure how individuals interact with their immediate surroundings? The question of the historicity of experiences and ideas is central to this Working Group volume, which will be published in a special issue of *Studies in the History and Philosophy of Science Part A* (2018).

Gibraltar from the International Space Station, Dec. 2011.  
 NASA, ISS030-E-030428.  
[https://commons.wikimedia.org/wiki/File:ISS-30\\_Strait\\_of\\_Gibraltar.jpg](https://commons.wikimedia.org/wiki/File:ISS-30_Strait_of_Gibraltar.jpg).

---

### Table of Contents

Lino Camprubí and Philipp Lehmann, *Introduction: The Scales of Experience*  
 Jeremy Vetter, *Experiential and Cosmopolitan Knowledge: The Transcontinental Field Practices of the U.S. Bureau of Biological Survey*



Philipp Lehmann, *Average Rainfall and the Play of Colors: Colonial Experience and Global Climate Data*

Lino Camprubi, *Experiencing Deep and Global Currents at a “Prototypical Strait,” 1870s and 1980s*

Etienne Benson, *Re-Situating Fieldwork and Re-Narrating Disciplinary History in Global Mega-Geomorphology*

Fa-ti Fan, *Can Animals Predict Earthquakes? Bio-Sentinels as Seismic Sensors in Communist China and Beyond*

Elena Aronova, *Earthquake Prediction, Biological Clocks, and the Cold War Psy-Ops: Using Animals as Seismic Sensors in 1970s California*

Angela Creager, *Human Bodies as Chemical Sensors: A History of Biomonitoring for Environmental Health and Regulation*

M. Norton Wise, *Afterword: Humboldt was Right*

**Completed Project** DURATION 2013–2017

**Working Group**

### The Archives of the Sciences

MEETINGS July 29–31, 2013 and July 28–29, 2014

ORGANIZER *Lorraine Daston* (MPIWG)



The type specimens enshrined by botanists, the core samples drilled by geologists, the ancient observations still referred to by astronomers, the data banks assembled by geneticists, the museum collections that hold the corpora of art historians and archaeologists, the case histories published in medical journals, the weather diaries and ship logs trawled by climate scientists, and, of course, the libraries and archives visited by historians: these are the archives of the sciences, both human and natural. Many but not all scientific archives are dedicated to phenomena that unfold on a superhuman timescale: geology, evolutionary biology, paleoanthropology, and astronomy are obvious examples. But other data-hungry sciences of the archive, such as genetics, see no need to reach back into the deep past: terabytes of information about the present will serve as well for their meta-analyses. What all these scientific archives have in common is not past- but rather future-consciousness: they imagine the archives that they have taken such pains to amass and conserve as a bequest to their successors, to the archaeologists, astronomers, geneticists, geologists, and climate scientists of the future. The Working Group met twice to produce the first volume devoted to the role of archives in the natural and the human sciences. *Science in the Archives: Pasts, Presents, Futures* was published by the University of Chicago Press in 2017.

#### PUBLICATION



Daston, Lorraine, ed. *Science in the archives: pasts, presents, futures*. Chicago: The University of Chicago Press, 2017.

---

**Table of Contents**

Lorraine Daston, *Introduction: Third Nature*

Part I. Nature's Own Canon: Archives of the Historical Studies

Florence Hsia, *Astronomy after the Deluge*

David Sepkoski, *The Earth as Archive: Contingency, Narrative, and the History of Life*

J. Andrew Mendelsohn, *Empiricism in the Library: Medicine's Case Histories*

Part II: Spanning the Centuries: Archives from Ancient to Modern

Liba Taub, *Archiving Scientific Ideas in Greco-Roman Antiquity*

Suzanne Marchand, *Ancient History in the Age of Archival Research*

Lorraine Daston, *The Immortal Archive: Nineteenth-Century Science Imagines the Future*

Part III: Problems and Politics: Controversies in the Global Archive

Bruno J. Strasser, *The "Data Deluge": Turning Private Data into Public Archives*

Catherine Gere, *Evolutionary Genetics and the Politics of the Human Archive*

Vladimir Janković, *Montage and Metamorphosis: Climatological Data Archiving and the U.S. National Climate Program*

Part IV: The Future of Data Archives in the New Millennium

Rebecca Lemov, *The Vicissitudes of Time and Self in a Technologically Deterministic Future*

Daniel Rosenberg, *An Archive of Words*

Matthew L. Jones, *Querying the Archive: Database Mining from A Priori to Page-Rank*

Epilogue

Lorraine Daston, *The Time of the Archive*

---

**Completed Project** DURATION 2013–2017

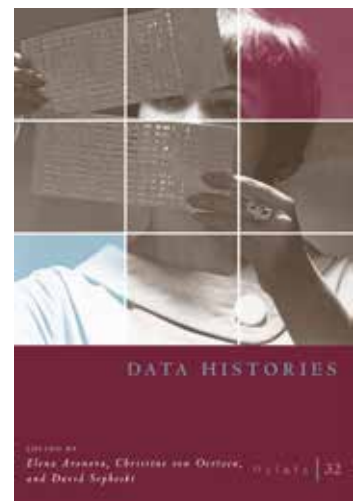
**Working Group**

### Historicizing Big Data

MEETINGS November 1–2, 2013 and October 16–18, 2014

ORGANIZERS *Elena Aronova* (MPIWG/University of California, Santa Barbara, USA), *Christine von Oertzen* (MPIWG), *David Sepkoski* (MPIWG/University of Illinois, Urbana-Champaign, USA)

In 2017, this Working Group concluded its activities with the publication of a volume of the annual journal *Osiris*. This publication was the culmination of several years of workshops and collaborations around historical inquiry into the development and impact of practices, material cultures, and epistemologies of data in the natural and human sciences. With contributions spanning topics from the seventeenth to late twentieth centuries, the volume represents one of the first attempts at a *longue durée* history of data in the sciences. While several of the chapters highlight the transformative influence of electronic computers on the history of data, one of the volume's most important collective conclusions is that the genealogy of recent data-driven science reveals important—and highly contingent—antecedents across a wide range of pre-electronic technologies and practices (e.g., large data collections, aggregative statis-



tics, visualization, and social organization) that inform how and why “Big Data” has such currency today. While its formal existence is now completed, a number of this Working Group’s members continue to actively research and publish on topics related to the history of data, indicating the project’s success in its goal of opening up new perspectives in the history of science and technology.



## PUBLICATION

Aronova, Elena, Christine von Oertzen, and David Sepkoski, eds. *Data histories*. Osiris: special issue; 32. Chicago: The University of Chicago Press, 2017.

---

**Table of Contents**

Elena Aronova, Christine von Oertzen, David Sepkoski, *Introduction: Historicizing Big Data*

## Part I: Personal Data

Rebecca Lemov, *Anthropology’s Most-Documented Man, ca. 1947: A Prefiguration of Big Data from the Big Social Science Era*

Joanna Radin, *“Digital Natives”: How Medical and Indigenous Histories Matter for Big Data*

Markus Friedrich, *Genealogy as Archive-Driven Research Enterprise in Early Modern Europe*

Dan Bouk, *The History and Political Economy of Personal Data over the Last Two Centuries in Three Acts*

## Part II: Epistemologies and Technologies of Data

Staffan Müller-Wille, *Names and Numbers: “Data” in Classical Natural History, 1758–1859*

Christine von Oertzen, *Machineries of Data Power: Manual versus Mechanical Census Compilation in Nineteenth-Century Europe*

Hallam Stevens, *A Feeling for the Algorithm: Working Knowledge and Big Data in Biology*

David Sepkoski, *The Database Before the Computer?*

Judith Kaplan, *From Lexicostatistics to Lexomics: Basic Vocabulary and the Study of Language Prehistory*

Markus Krajewski, *Tell Data from Meta: Tracing the Origins of Big Data, Bibliometrics, and the OPAC*

## Part II: Economies of Data

Patrick McCray, *The Biggest Data of All: Making and Sharing a Digital Universe*

Mirjam Brusius, *The Field in the Museum. Puzzling Out Babylon in Berlin*

Etienne Benson, *A Centrifuge of Calculation: Managing Data and Enthusiasm in Early Twentieth-Century Bird Banding*

Elena Aronova, *Geophysical Datascares of the Cold War: Politics and Practices of the World Data Centers in the 1950s and 1960s*

## Epilogue

Bruno J. Strasser and Paul N. Edwards, *Big Data Is the Answer ... But What Is the Question?*

---

Completed Project  
Working Group

**Endangerment, Biodiversity, and Culture**

DURATION 2011–2015

ORGANIZERS *Nélia Dias* (Universidade de Lisboa, Portugal), *Fernando Vidal* (ICREA-Catalan Institution for Research and Advanced Studies, and Universitat Autònoma de Barcelona, Spain)

The notion of endangerment stands at the heart of a network of concepts, values, and practices dealing with entities threatened by disappearance and with the devices, such as archives, catalogs, and databases, that aim to preserve them. The practices of protecting the endangered and memorializing the extinct assume that the objects to be safeguarded or remembered are valuable; these objects are often associated with a supposedly natural or original state, sometimes with a condition of primeval authenticity. Architectural patrimony conserved in photographs, extinct species in museum displays, and dead dialects in recordings nurture nostalgia for a more diverse world and may give rise to resuscitation fantasies. The notion of endangerment transforms natural objects into cultural ones. Its centrality to projects for the protection of languages, the preservation of biodiversity, the defense of architectural patrimony, and much more began to crystallize around the mid-nineteenth century in different European and American lands. An “endangerment sensibility” emerged that now perceives the world as essentially under threat.

The book that resulted from the Working Group collaboration examines some of the fundamental ways in which “endangerment” involves science—but also more than science: not only data and knowledge and institutions, but also affects and values.



PUBLICATION

Vidal, Fernando and Nélia Dias, eds. *Endangerment, biodiversity and culture*. Routledge environmental humanities. New York: Routledge, 2015.

**Table of Contents**

Fernando Vidal and Nélia Dias, *Introduction: The Endangerment Sensibility*

Part I: Affects and Values

Shaylih Muehlmann, “*Languages Die Like Rivers*”: *Entangled Endangerments in the Colorado Delta*

David Sepkoski, *Extinction, Diversity, and Endangerment*

Rebecca Lemov, *Anthropological Data in Danger, ca. 1941–1965*

Part II: Situated Politics

Stefan Bargheer, *Conserving the Future: UNESCO Biosphere Reserves as Laboratories for Sustainable Development*

Stefanie Gänger, *Indigenous Evanescence and Salvage in the Conquest of Araucanía, 1850–1930*

José Augusto Pádua, *Tropical Forests in Brazilian Political Culture: From Economic Hindrance to Ecological Treasure*

Part 3: Technologies of Preservation

Etienne Benson, *Endangered Birds and Epistemic Concerns: The California Condor*

Rodney Harrison, *World Heritage Listing and the Globalization of the Endangerment Sensibility*

Joanna Radin, *Planning for the Past: Cryopreservation at the Farm, Zoo, and Museum*  
Coda

Julia Adeney Thomas, *Who is the “We” Endangered by Climate Change?*

---

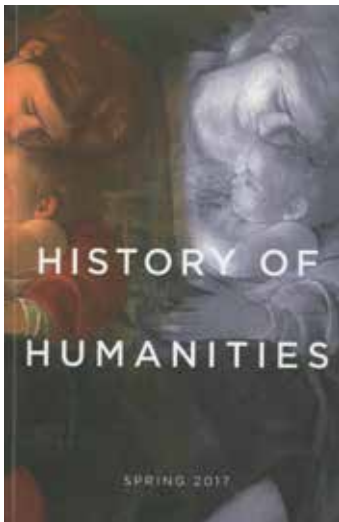
Workshops and Conferences

**The Practice of Historical Research: Continuity and Change in Making Historical Knowledge from the Eighteenth to the Nineteenth Century**

July 2–4, 2015

ORGANIZERS *Markus Friedrich* (Universität Hamburg, Germany), *Philipp Müller* (Universität Göttingen, Germany); funded by the Deutsche Forschungsgemeinschaft (DFG), Universität Hamburg, and Universität Göttingen

This conference explored the changes and continuities in the practice of historical research in archives and libraries during the transition period from the eighteenth to the nineteenth century. The emphasis on everyday practices draws explicitly on recent developments in the history of science. Traditionally, the history of historiography dwelled chiefly on the study of narratives and textual representations of the past. As an important addition to these established perspectives, the conference examined the performance of historical research and the circumstances under which historians generated knowledge about the past.



PUBLICATION

Friedrich, Markus, Philipp Müller, and Michael Riordan, eds. *Practices of historical research in archives and libraries from the eighteenth to the nineteenth century.*

History of the Humanities: special issue ; 2/1. Chicago: The University of Chicago Press, 2017.

---

**Table of Contents**

Markus Friedrich, Philipp Müller, Michael Riordan, *Practices of Historical Research in Archives and Libraries from the Eighteenth to Nineteenth Century*

Anthony Grafton, *Matthew Parker: The Book as Archive*

Michael Riordan, *Materials for History? Publishing Records as a Historical Practice in Eighteenth- and Nineteenth-Century England*

Maria Pia Donato, *A Science of Facts? Classifying and Using Records in the French Imperial Archives under Napoleon*

Marco Tomaszewski, *A Longue-Durée of Urban Historiography? Peter Ochs's "History of Basel" (1786–1822) from a Long-Term Perspective*

Andreas Erb, *Petitioners, Servants, Claimants: Archives Usage and Historiography in Anhalt from Early Modern Times to 1848*

Ulrich Präßler, *Lapsed into History: J. D. E. Preuß, the Prussian Academy of Sciences, and the Struggle for Access to State Archives in Mid Nineteenth-Century Berlin*

---

## The Intelligence of Algorithms

October 19–21, 2017

ORGANIZERS *Lorraine Daston* (MPIWG), *David Sepkoski* (MPIWG/University of Illinois, Urbana-Champaign, USA)

Can algorithms think for us? With us? Against us? Algorithms have already been devised to prove mathematical theorems, beat Grand Masters at chess, sequence DNA, compose music, and coordinate international airplane schedules. Visionaries foresee algorithms to generate and test scientific hypotheses, recognize faces, and automate human activities from car manufacture to psychotherapy. Whole research programs in the cognitive sciences depend on spelling out the analogy between human thought processes and algorithms. This workshop took a *longue durée* and cross-cultural look at how algorithms have interacted with human intelligence: how conceptions of both algorithms and intelligence have developed in tandem over centuries, in multiple domains, from astronomical calculation to factory production to mathematical proof to cognitive models.

### Participants

*Anna Maria Busse-Berger* (University of California, Davis, USA)

*Karine Chemla* (SPHERE, Université de Paris 7, France)

*Jamie Cohen-Cole* (George Washington University, USA)

*Lorraine Daston* (MPIWG)

*Stephanie Dick* (University of Pennsylvania, USA)

*Elena Esposito* (University of Modena and Reggio Emilia, Italy; University of Bielefeld, Germany)

*James A. Evans* (University of Chicago, USA)

*Fred Gibbs* (University of New Mexico, USA)

*Orit Halpern* (Concordia University, Canada)

*Matthew L. Jones* (Columbia University, USA)

*Michael Puett* (Harvard University, USA)

*David Sepkoski* (MPIWG/University of Illinois, Urbana-Champaign, USA)

*Hallam Stevens* (Nanyang Technical University, Singapore)



## Individual Projects

*Elena Aronova* (Research Scholar, MPIWG, as of Dec. 2015: Assistant Professor, University of California, Santa Barbara, USA)



Elena Aronova

Typesetting system for automatic data entry into a linotype machine, laboratory for the mechanization of information work at the Institute of Scientific Information Moscow (1959). Courtesy of Russian State Archive of Documentary Films and Photographs, Moscow.

### Do Data Have Politics?

The history of the International Geophysical Year or IGY (1957–1958) and its system of World Data Centers illustrates the ways in which data practices both shaped and were shaped by the political economy of the Cold War, beyond the militarization of research as a more direct consequence of the conflict. The study is informed by the idea of the co-production of the political and scientific-technological orders. Based on existing studies of science in the Cold War and on archival research of both Russian and American sources, it examines scientific practices during the Cold War era through the “data axis.” The IGY, which was conceived against a background of nuclear secrecy intensified by Cold War political tensions, enabled the emergence of a distinct data regime in geophysics—a regime that turned data into a form of currency, traded and exchanged by the political players of the Cold War.



### SELECTED PUBLICATIONS

Aronova, Elena and Simone Turchetti, eds. *Science studies during the Cold War and beyond: paradigms defected*. Palgrave studies in the history of science and technology. New York: Palgrave MacMillan, 2016.

Aronova, Elena. “Geophysical datascares of the Cold War: politics and practices of the world data centers in the 1950s and 1960s.” *Osiris* 32 (2017): 307–327.

Aronova, Elena. “Russian and the making of world languages during the Cold War.” *Isis* 108 (3 2017): 643–650.

*Jenny Bangham* (Research Scholar, MPIWG, as of September 2016 Wellcome Trust Medical Humanities Research Fellow, Department of History and Philosophy of Science, University of Cambridge, UK)



Jenny Bangham

### Blood Relations: Transfusion and the Rise of Human Genetics

Britain established its first national transfusion service during the Second World War, to mitigate the bloody effects of aerial bombardment. These infrastructures of blood transfusion ushered in a new kind of human genetics. Over the previous two decades, surgeons’ use of blood groups had turned transfusion from a perilous surgical procedure into a routine therapy. At the same time, geneticists had seized upon blood groups because, as the first human traits with clear genetic inheritance, they offered a path to mapping human chromosomes and a tool for studying diversity. *Blood Rela-*

tions examines how the transfusion services made vast quantities of data available for research on human heredity. In so doing the project ties the history of human genetics to practices of bloodletting, to technologies of bureaucratic planning, and to the racial politics of Europe. It is a history of genetics that puts blood, bodies, and bureaucracy at center stage.



British blood-group geneticist Robert Race taking blood from nurses during the Second World War. Photograph (ca. 1940). Courtesy of Wellcome Library, UK.



#### SELECTED PUBLICATIONS

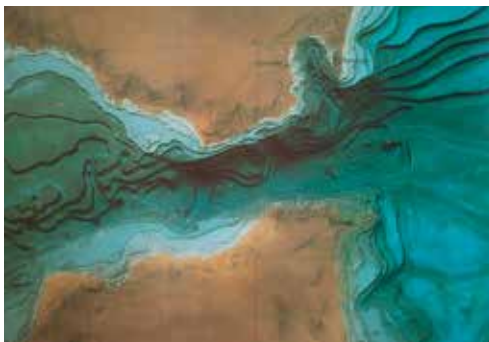
Bangham, Jenny. "What is race? UNESCO, mass communication and human genetics in the early 1950s." *History of the Human Sciences* 28 (5 2015): 80–107.

Bangham, Jenny. "Blood, paper and total human genetic diversity." *Limn* 6 (2016): <https://limn.it/articles/blood-paper-and-total-human-genetic-diversity/>.

Lino Camprubí (Research Scholar, MPIWG, as of Sept. 2017; Ramón y Cajal Research Tenure Track Fellow, Universidad de Sevilla, Spain)

### The Strait in the Cold War: Deep Science and Global Geopolitics in the Mediterranean

The recent history of underwater surveillance at Gibraltar, a disputed territory at the heart of today's European Union, brings together the geopolitics of the Global Cold War and deep ocean science, enabling new global visions of the Mediterranean Sea. Nuclear powered submarines armed with nuclear warheads transformed the underwater world into a Cold War battlefield. Because an invisible enemy could emerge by surprise from any point in the world's oceans, combatants aspired to global surveil-



lance, targeting chokepoints. Together with the northern GIUK (Greenland, Iceland, United Kingdom) gap, the Strait of Gibraltar was the most strategic bottleneck for the U.S. Navy's attempts to detect Soviet submarines entering the Atlantic. While the Strait's narrowness presented an opportunity for mounting detection barriers, its depth and complex hydrology

posed severe difficulties. These were matched by the political frictions existing with regard to the Rock of Gibraltar and North African decolonization.

*The Strait in the Cold War* explores the transnational mobilization of geopolitical and scientific resources in the context of anti-submarine warfare at Gibraltar. It focuses on the phenomenological, epistemological, and ontological transformation of this maritime space through sound technologies and acoustics.



Lino Camprubí

Bathymetry model of the Strait of Gibraltar (ca. 1932). Instituto Español de Oceanografía, Spain.



SELECTED PUBLICATIONS

Camprubí, Lino. “Resource geopolitics: Cold War technologies, global fertilizer, and the fate of Western Sahara.” *Technology and Culture* 56 (3 2015): 676–703.

Camprubí, Lino and Sam Robinson. “A gateway to ocean circulation: surveillance and sovereignty at Gibraltar.” *Historical Studies in the Natural Sciences* 46 (4 2016): 429–459.

Camprubí, Lino. *Los ingenieros de Franco: ciencia, catolicismo y Guerra Fría en el Estao franquista*. Barcelona: Crítica, 2017.

Lorraine Daston (Director, MPIWG)

**Timescales of Science**



Lorraine Daston

In choosing the relevant contexts in which to embed their studies, historians of science have largely followed the lead of general historians and tacitly accepted reigning periodizations and geographies: Victorian Britain, Renaissance Italy, Ming Dynasty China. However, the phenomena studied by both the natural and human sciences themselves sometimes unfold on timescales that are



longer, shorter, faster, or slower than those of political history. Astronomy and evolutionary biology require a timescale of centuries and millennia; elementary particle physics and molecular biology may track events on the scale of fractions of a second. These elongated or contracted timescales are consequential for the forms of scientific inquiry and the organization of disciplines. Whereas astronomy and classical philology create archives meant to serve their successors for centuries to come, just as they have drawn on records thousands of years old, cloud classifiers attempted to fix the evanescent shapes of clouds in international atlases to standardize observation. These and other studies are part of a larger attempt to rethink the geography and chronology of the history of science and the emergent field of the history of knowledge.

Fracto-Cumulus. H. Hildebrandsson et al. (eds.), *Atlas international des nuages*, Paris 1896, table XI, Fig. 21.



SELECTED PUBLICATIONS

Daston, Lorraine. “Cloud physiognomy.” *Representations* 135 (1 2016): 45–71.

Daston, Lorraine. “The immortal archive: nineteenth-century science imagines the future.” In *Science in the archives: pasts, presents, futures*, ed. Lorraine Daston. 159–182. Chicago: The University of Chicago Press, 2017.

Daston, Lorraine. “The history of science and the history of knowledge.” *KNOW: A Journal on the Formation of Knowledge* 1 (1 2017): 131–154.

*Sébastien Dutreuil* (Postdoctoral Fellow, MPIWG; as of October 2017 Chargé de Recherche, CNRS, Aix-Marseille University, France)

### Exploring the Origins of Earth System Science

Earth System Science underpins our contemporary collective and scientific representation of the Earth. It is grounded in the institutional work carried out in the 1980s by NASA and the International Geosphere-Biosphere Program (IGBP), which pinpointed the existence of a new object: the Earth System, composed of interlocking processes operating at different timescales. Prominent climatologists, oceanographers, geochemists, geophysicists, and ecologists presented the ESS as a revolutionary research program that would completely reorganize the earth sciences around the study of this new object.

This project traces the genealogy of the “Earth System” concept by following the works of savants and scientists studying the long-term chemistry of the earth’s surface from the late eighteenth century onwards. By the nineteenth century, chemists and geologists investigating living beings’ metabolisms, volcanoes’ exhalations, and the chemistry of soils and rocks had conceptions resembling those of the contemporary “Earth System.” The project analyzes the historical development of the methods and ontologies underlying the chemical studies of the earth and their interactions with the way the earth and its history are conceived.



Sébastien Dutreuil



#### PUBLICATION

Dutreuil, Sébastien. “James Lovelock, Gaïa et la pollution: un scientifique entrepreneur à l’origine d’une nouvelle science et d’une philosophie politique de la nature.” *Zilsel* 2 (2 2017): 19–61.

*Sebastian Felten* (Postdoctoral Fellow, MPIWG; as of June 2017: Research Scholar, MPIWG ; as of January 2019 Universitätsassistent, Universität Wien, Austria)

### The Environment of Note-Taking: Mining, ca. 1700–1900



Eighteenth-century silver mining in central Germany was a highly charged site of exchange between the emerging earth sciences—“useful sciences” which wedded theory with practice—and a mining state with its own protocols for knowledge production and use. Central to the investigation are questions of knowl-



Sebastian Felten

Underground surveyors holding a measuring chain, transporter, map, and compass. Detail from a depiction of a parade held near Dresden (1719). Courtesy of Bergakademie Freiberg, Germany.

edge management, including: Which observations counted as reliable data? How were relevant experiences stored and standardized for later use? Whose expertise was valued, and whose rejected? Labor-intensive, capital-hungry, and barely profitable, the mining business made for fraught epistemic collaboration between investors, administrators, and academics. By comparing and contrasting commercial, scientific, and administrative “fact-keeping,” this project contributes to a broadening discussion about the ways in which individuals, groups, and institutions used information technology — paper-based or otherwise—to engage with a complex social and natural environment. An article entitled, “The History of Science and the History of Bureaucratic Knowledge: Saxon Mining, ca. 1780” has been accepted for publication in *History of Science*.

*Jacob Gaboury* (Postdoctoral Fellow, MPIWG/Assistant Professor, Stony Brook University, USA; as of September 2017: Assistant Professor, University of California Berkeley, USA)



Jacob Gaboury

### Image Objects: An Archaeology of Computer Graphics, 1960–1980

*Image Objects* offers a material history of early computer graphics told through a set of five technical objects: an algorithm, an interface, an image standard, a programming language, and a hardware platform. Asking what it means to write a material history of a supposedly immaterial practice—visual simulation—the project explores how theories of visibility, memory, and textuality have been inscribed into the infrastructure of computer graphics as both a technical medium and a cultural practice. The project draws on extensive archival research, with particular focus on the ARPA-funded research center at the University of Utah, founded in 1965 as the first research program for computer graphics in the United States. Ultimately it argues for an ontological shift brought about by graphics, in which simulation is reoriented toward the object world through computation.



John Warnock and an IDI graphical display unit, University of Utah (1968). Courtesy of Deseret News, Salt Lake City, UT, USA.



#### SELECTED PUBLICATIONS

Gaboury, Jacob. “Other places of invention: computer graphics at the University of Utah.” In *Communities of computing: computer science and society in the ACM*, ed. Thomas J. Misa. 259–285. New York: ACM Books, 2017.

Gaboury, Jacob. “Sounding silence.” *Continent* 5 (3 2016): <http://continentcontinent.cc/index.php/continent/article/view/261>.



Hansun Hsiung (Postdoctoral Fellow, MPIWG)

### From Electrotpe to the Electric Image

Beginning with the consolidation of electrotype image banks by publishers such as Hachette, and ending with the establishment of global fax networks by major news agencies, the era from 1830–1920 witnessed an efflorescence of attempts to solve the twin problems of how images might be transmitted across long distances, and how this transmission might be regulated by international copyright regimes. In the process, these efforts birthed intense speculation over the respective roles of



Hansun Hsiung

Phenomenon of “speed drift” in a facsimile image transmitted via telegraphy from London to Berlin (1929) in preparation for the 1930 opening of a public picture telegraphy service between the two capitals. Courtesy of BT Archives, London, UK.

the verbal and the visual in fostering global communication, as well as over the possibility that a shared visual vocabulary might hold the key to improved international understanding. These are the technologies and economies that gave rise to “global vision.” Recovering this history offers a unique lens onto our current predicament, where images, despite their epistemic uncertainty, often displace words in the public sphere.



#### PUBLICATION

Hsiung, Hansun. “The ‘Circle of knowledge’: radical commensurability and the deaf textbook.” In *The global histories of books: methods and practices*, eds. Elleke Boehmer, Rouven Kunstmann, Priyasha Mukhopadhyay, and Asha Rogers. 161–187. Cham: Palgrave Macmillan, 2017.

Judith Kaplan (Postdoctoral Fellow, MPIWG; as of August 2016: Andrew W. Mellon Postdoctoral Fellow, University of Pennsylvania, USA; as of August 2017: Teaching Fellow, Integrated Studies Program, University of Pennsylvania, USA)

### Big Data and the Reconstruction of Linguistic Prehistory

Building on traditions in comparative philology and anthropological linguistics, researchers proposed competing “long-range” genealogies during the twentieth century, proposals that reached expansively across space and through time. This project analyzed this work—decidedly at the margins of North American academic linguistics—and the political, cultural, philosophical, and methodological stakes involved. What has constituted the “cutting edge” in (pre)historical linguistics? Does progress mean tackling bigger mysteries or specifying existing models with greater precision? Are there limits to what linguists can know scientifically? Can the Comparative Method yield trustworthy results at any time depth or not? Attuned to such questions,

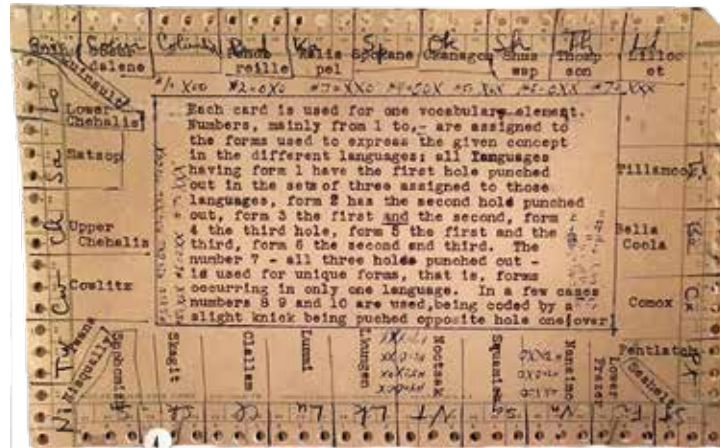


Judith Kaplan



the project contended that controversies engendered by long-range linguistic reconstruction can tell historians a great deal about standards of evidence and method that were long kept tacit in the language sciences.

Morris Swadesh, Instruction Card (ca. 1950). ACLS Committee on Native American Languages, American Philosophical Society. Mss. 497.3.B63c.



SELECTED PUBLICATIONS

Kaplan, Judith. "Avestan studies in Imperial Germany: sciences of text and sound." *History of the Human Sciences* 28 (1 2015): 25–43.

Kaplan, Judith. "Self-inscription and (in)visibility: the Oneida language and Folklore project." In *Invisibility and labour in the human sciences*, eds. Jenny Bangham and Judith Kaplan. 93–98. Berlin: Max-Planck-Institut für Wissenschaftsgeschichte, 2016.

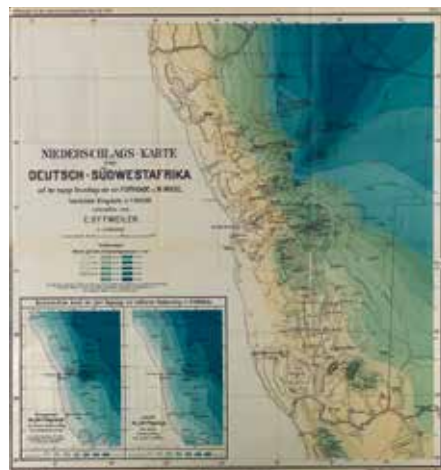
Kaplan, Judith. "From lexicostatistics to lexomics: basic vocabulary and the study of language prehistory." *Osiris* 32 (1 2017): 202–223.

Philipp Lehmann (Research Scholar, MPIWG; as of August 2017: Assistant Professor, University of California, Riverside, USA)

Data That Travel



Philipp Lehmann



Precipitation Map of German Southwest Africa, representing the average annual amount of rainfall and the number of days with rain in the German colony. From Emil Ottweiler, *Die Niederschlagsverhältnisse von Deutsch Südwestafrika*, Berlin: E. S. Mittler und Sohn, 1906.

"Climates Between Africa and Europe" examines the conditions of climatological data collection efforts in colonial Africa and the processes of selection and translation that occurred between the sites of recording and publication. The project focuses on the everyday practices and difficulties of both European and African practitioners in the colonies. While governmental policies aimed at producing standardized, and thus globally comparable and economically use-

ful data in different environments, these efforts often tended to break down in practice. Rather than being able to turn the field into a finely tuned laboratory, the data gatherers were confronted with complex and challenging infrastructural, institutional, and environmental realities—ranging from the lack of instruments to unknown meteorological phenomena—and had to develop place-specific strategies to deal with these issues. Ultimately, the project seeks to address the questions of what effects the increasing availability and dissemination of data from around the world had on definitions of climates around the turn of the twentieth century and how the spotty and diverse data from the colonies could eventually result in the smooth and gapless visualizations of climatic data in charts and on world maps.



#### SELECTED PUBLICATIONS

Lehmann, Philipp N. “Whither climatology? Brückner’s climate oscillations, data debates, and dynamic climatology.” *History of Meteorology* 7 (2015): 49–70.

Lehmann, Philipp N. “Infinite power to change the world: hydroelectricity and engineered climate change in the Atlantropa project.” *American Historical Review* 121 (1 2016): 70–100.

Lehmann, Philipp N. “Losing the field: Franz Thorbecke and (post-)colonial climatology in Germany.” *History of Meteorology* 8 (2017): 145–158.

David Sepkoski (Senior Research Scholar, MPIWG; as of August, 2018: Thomas M. Siebel Chair in the History of Science, University of Illinois, Urbana-Champaign, USA)

#### A Natural History of Data/Extinction and the Value of Diversity

These two projects explore different aspects of the technical and cultural production of knowledge in natural history disciplines (biology, paleontology, geology) over the nineteenth and twentieth centuries. On the one hand, “A Natural History of Data” investigates the co-construction of practices and epistemologies of quantitative and statistical rationality in nineteenth century natural and bureaucratic sciences through a study of the development of data collections, statistical analysis, and visual representation of aggregated datasets. A central conclusion is that crucial knowledge exchanges between ostensibly separate disciplines such as paleontology and *Kameralwissenschaft* (or cameralism) influenced the development of aggregative statistical practices—such as the abstraction of large quantities of data about individual examples into narrative visual summaries—long before the advent of electronic digital computers.



David Sepkoski



Spindle diagram, representing change in diversity of different lineages of organisms over time aggregated from taxonomic data. From Heinrich Georg Bronn, *Untersuchungen über die Entwicklungsgesetze der organischen Welt während der Bildungs-Zeit unserer Erd-Oberfläche*, Stuttgart 1858, p. 312.

On the other hand, “Extinction and the Value of Diversity” examines the scientific and cultural history of knowledge about extinction over the past 200 years. In particular, it historicizes current political and scientific interest in the conservation of “biodiversity” by tracing the relationship between scientific theories about extinctions in the past and contemporary debates around the endangerment of human and nonhuman cultures and species.



SELECTED PUBLICATIONS

Sepkoski, David. “The Earth as archive: contingency, narrative, and the history of life.” In *Science in the archives: pasts, presents, futures*, ed. Lorraine Daston. 53–83. Chicago: The University of Chicago Press, 2017.

---

Sepkoski, David. “Extinction and biodiversity: a historical perspective.” In *The Routledge handbook of philosophy of biodiversity*, eds. Justin Garston, Anya Plutynski, and Sahotra Sarkar. 26–39. London: Routledge, 2017.

---

Sepkoski, David. “The database before the computer?” *Osiris* 32 (2017): 175–201.

---

**Short-Term Visiting Scholars**

*David Aubin* (Université de Paris 6, France)

*Mirjam Brusius* (University of Oxford, UK)

*Markus Friedrich* (Universität Hamburg, Germany)

*Susanne Friedrich* (Universität München, Germany)

*Florence Hsia* (University of Wisconsin, Madison, USA)

*Markus Krajewski* (Universität Basel, Switzerland)

*Patrick McCray* (University of California, Santa Barbara, USA)

*Staffan Müller-Wille* (University of Exeter, UK)

*Omer Nasim* (University of Regensburg, Germany)

*Michael Ohl* (Museum für Naturkunde, Berlin, Germany)

*Joanna Radin* (Yale University, USA)

*Lukas Rieppel* (Brown University, USA)

*Joy Rohde* (University of Michigan, Ann Arbor, USA)

*Perrin Selcer* (University of Michigan, Ann Arbor, USA)

## Project

## Between the Natural and the Human Sciences

ORGANIZERS *Lorraine Daston* (MPIWG), *Glenn W. Most* (MPWIG/Scuola Normale Superiore di Pisa, Italy/University of Chicago, USA)

COOPERATION PARTNERS University of Chicago (USA), London School of Economics (UK), Freie Universität Berlin (Germany), Humboldt-Universität zu Berlin (Germany), Johns Hopkins University (USA), German Historical Institute, Washington D.C. (USA), Universität Bochum (Germany), Forschungszentrum Gotha der Universität Erfurt (Germany), Princeton University (USA), University of Oxford (UK), Wissenschaftskolleg zu Berlin (Germany), SPHERE, Université de Paris 7 (France)

Questions about the history of kinds of knowledge, evidence, and objects are common to all the sciences, from astronomy to psychology, from meteorology to sociology. Yet the natural sciences have received immeasurably more historical and philosophical scrutiny than the human sciences, with the result that conceptions of knowledge—what it is, how to get it, what to do with it—are correspondingly lopsided. The division between the natural and the human sciences and the resulting neglect of the latter by historians and philosophers of science are the products of late nineteenth-century shifts in the classification of knowledge, which remapped the disciplines in order to sharpen the distinction between the human and the natural realms and therefore between the sciences dedicated to each. Although the methods and forms of explanation of, for example, evolutionary biology and historical sociology had more in common than either of them had with physics, on the one hand, or demography, on the other, the newly drawn boundary between the natural and the human sciences divided disciplines once linked by shared histories and practices. The projects conducted under this rubric investigate the historical and contemporary interactions between the human and the natural sciences, as well as their shared epistemic values, practices, and institutions, in order to create new models for the history of both the natural and the human sciences.



Detail from Marcus Schinnagl's winged astronomical polyptych (1489). Photo: P. Frankenstein, H. Zwietasch. Courtesy of Landesmuseum Württemberg, Stuttgart, Germany.

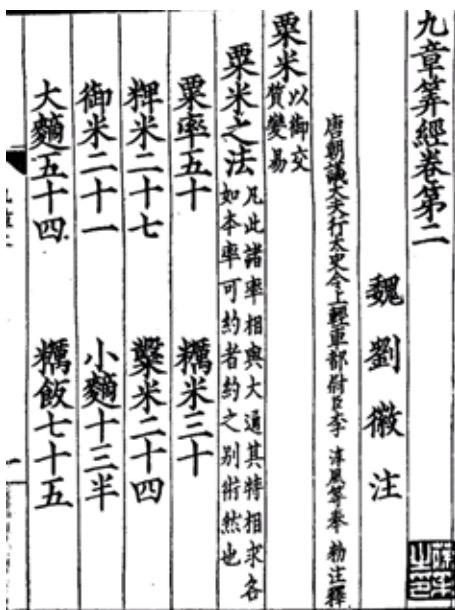


## Working Groups

**Commentaries on Ancient Texts Dealing with Mathematical and Medical Sciences**

MEETINGS Exploratory workshop: August 25–27, 2016; working group in residence: August 1–16, 2017. Follow-up workshop on medical commentaries: September 26–27, 2017.

ORGANIZERS Glenn W. Most (MPIWG/Scuola Normale Superiore di Pisa, Italy/University of Chicago, USA), Karine Chemla (SPHERE, Université de Paris, France), Lorraine Daston (MPIWG), Markham Geller (Freie Universität Berlin, Germany)



*The Nine Chapters on Mathematical Procedures*, Southern Song printed edition (1200). Postface of chapter 2.

This inter-disciplinary, inter-cultural research project examined the ways in which practitioners in the fields of medicine and mathematical sciences have used commentaries in the earliest extant evidence and in four linguistic areas: Mesopotamian, Greco-Roman, Sanskrit, and Chinese. The project began with a three-day exploratory workshop in August 2016, gathering junior and senior specialists. The meeting allowed the organizers to outline a book project on ancient mathematical commentaries and sub-commentaries, which was prepared during a two-week gathering at the MPIWG in August 2017. The collective book edited by Glenn W. Most and Karine Chemla with results from this part of the project is entitled *Proofs, Problems, and Procedures: Commentaries on Mathematical Texts*. The book deals with mathematical commentaries, in the sense of both using mathematical knowledge to comment upon a base text, and of commenting upon a mathematical text. Such writings have been almost completely absent from the general reflection on commentaries. Accordingly, modern historians have not benefitted from the study of these specific types of commentary in dealing with these genres of textual production. And yet, the book argues, mathematical commentaries teach us a lot about how ancient

scholars viewed, handled, and interpreted their base texts. Mathematical commentaries also enable us to analyze the materiality of such texts more closely. They shed light on the operations carried out for the sake of the commentary in different contexts and the techniques with which these operations were put in play.

**Table of Contents**

Glenn W. Most and Karine Chemla, *Introduction*

Part I: Commentaries and subcommentaries seen from the viewpoint of mathematical sciences

Zackary Wainer and John Steele, *Celestial-Divinatory Commentaries within the Mesopotamian Received Tradition: The Commentary to Enūma Anu Enlil 14 and Šumma Sîn ina Tāmartišu*

Karine Chemla and Zhu Yiwen, *Contrasting Commentaries and Contrasting Subcommentaries on Mathematical and on Confucian Canons*

Agathe Keller, *Characterizing a Sanskrit Mathematical Commentary: An Exploration of Prthūdaka's Vāsanābhāṣya on Progressions*

Part II: Commentaries in their social and institutional contexts

Daniel Morgan, *Calling out Zheng Xuan (127–200 CE) at the Crossroads of Ritual, Maths, Sport, and Classical Commentary*

Orna Harari, *Philosophical Commentaries on Mathematical Texts: The Case of Proclus's Commentary on the First Book of Euclid's Elements*

---

A third workshop, entitled *Medical Commentaries and Comment(aries) on Medicine* was organized in September 2017. The contributions to this workshop, together with some other contributions from the first meeting, will be edited by Markham Geller and be published as an MPIWG preprint.

**Participants**

Lorraine Daston (MPIWG)

Giulia Ecca (Berlin-Brandenburgische Akademie der Wissenschaften, Berlin, Germany)

Markham J. Geller (Freie Universität Berlin, Germany)

Nils P. Heeßel (Philipps-Universität Marburg, Germany)

Enrique Jiménez (Universidad Complutense Madrid, Spain)

Cale Johnson (Universiteit Leiden, Netherlands)

Glenn W. Most (MPIWG/Scuola Normale Superiore di Pisa, Italy/  
University of Chicago, USA)

Vivian Nutton (University College London, UK)

Heinrich v. Staden (Princeton University, USA)

Henry Stadhouders (Utrecht University, Netherlands)

Marten Stol (Universiteit Leiden, Netherlands)

Paul U. Unschuld (Charité Berlin, Germany)

Klaus Wagensohn (Yale University, New Haven, USA)

Frans Wiggermann (University of Amsterdam, Netherlands)

**Observing the Everyday: Journalist Practices and Knowledge Production in the Modern Era**

DURATION 2017–2019

MEETINGS Exploratory workshop, March 3–4, 2017, Washington DC, in cooperation with and co-funded by the German Historical Institute; authors' meeting: June 14–15, 2018, MPIWG

ORGANIZER Hansjakob Ziemer (MPIWG)

COOPERATION PARTNERS Kerstin von der Krone (German Historical Institute, Washington DC, USA), MPIWG Research Group Epistemes of Modern Acoustics

Journalism's claims to expert knowledge and its struggle to establish a professional identity, including mechanisms for training and criteria for entry into the profession, have traditionally been defined as precarious and tenuous. This working group shifts attention away from such classical professional tropes and refocuses on journalism's self-understanding as producing and transferring social knowledge for the public



sphere. Drawing on case studies from France, Russia, Germany, the United States, and the United Kingdom, and covering the period from the mid-nineteenth century until the 1970s, group members explore the newspaper as a site for negotiating the boundaries of the “true” and the “false” in foreign reporting; the changing concept of authenticity in human interest stories; how specific

journalistic *personae* were created; reporting as knowledge transfer from closed institutional spaces to the public or academia and back; and the emergence of standardized norms of observing in press photography. These individual studies demonstrate the diversity and complexity of journalistic knowledge practices and the evolution of hierarchies of journalistic knowledge. They trace the circuitous roads that lead from observing everyday experiences to the publishing of front-page headlines to the impact of journalistic articles on the creation of relevant social knowledge—the newspaper’s transformation into an “encyclopedia of the everyday” (Emil Löbl, 1902).



The editorial board of the illustrated daily newspaper “Deutsche Warte” (1910). Photo: bpk Berlin.

**Members:**

- Lisa Bolz* (GHI Paris, France)
- Eric J. Engstrom* (Humboldt-Universität zu Berlin, Germany)
- Tom Ewing* (Virginia Tech, USA)
- Kerstin von der Krone* (GHI Washington D.C.)
- Alexander Korb* (University of Leicester, U.K.)
- Elena Matveeva* (University of Heidelberg, Germany)
- Petra McGillen* (Dartmouth College, USA)
- Susanne Schmidt* (Freie Universität, Berlin, Germany)
- Heidi Tworek* (University of British Columbia, CA)
- Andie Tucher* (Columbia University, USA)
- Annie Rudd* (University of Calgary, CA)
- Hansjakob Ziemer* (MPIWG)
- Malte Zierenberg* (Humboldt-Universität zu Berlin, Germany)

**Completed Project** DURATION 2010–2016

**The Learned Practices of Canonical Texts**

MEETINGS Exploratory workshop: January 29–30, 2010; working group in residence: July–August 2012.

ORGANIZERS *Glenn W. Most* (MPIWG/Scuola Normale Superiore di Pisa, Italy/ University of Chicago, USA), *Anthony Grafton* (Princeton University, USA)

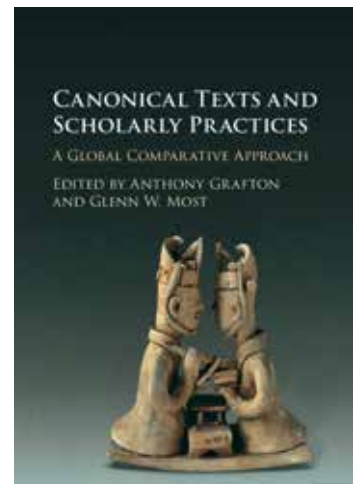
The creation of canons of written texts—religious, literary, philosophical, scientific—is a feature of numerous literate cultures from ancient times to the present. This working group examined historically and comparatively the scholarly practices associated

with canonical texts, especially in the following linguistic traditions: Ugaritic, ancient Greek, Latin, Coptic, Hebrew, Arabic, the languages of the Indian subcontinent, and Chinese. The group concluded its formal collective work in 2016. The studies drafted by participants and extensively discussed in Berlin were rewritten, with comprehensive advice from the editors and, in some cases, further discussion. The manuscript was an unusual and complicated one, since it consisted of technical studies that followed the conventions of multiple humanistic fields, each normally independent of the rest. The book was produced—a complex process in itself, since the indexes to a collection with no real precedent had to be designed and then executed—in 2016, and published by Cambridge University Press in September 2016.



## PUBLICATION

Grafton, Anthony and Glenn W. Most, eds. *Canonical texts and scholarly practices: a global comparative approach*. Cambridge: Cambridge University Press, 2016.

**Table of Contents**

Anthony Grafton and Glenn W. Most, *How to Do Things with Texts: An Introduction*

Guy Burak, *Reliable Books: Islamic Law, Canonization, and Manuscripts in the Ottoman Empire (Sixteenth to Eighteenth Centuries)*

Ineke Sluiter, *Obscurity*

Glenn W. Most, *Allegories and Etymology*

Paolo Visigalli, *Classifying the Rigveda on the Basis of Ritual Usage: The Deity-of-the-Formula System*

Christopher Minkowski, *Maryādām Ullāghya: The Boundaries of Interpretation in Early Modern India*

Robert Kaster, *Making Sense of Suetonius in the Twelfth Century*

Lianbin Dai, *From Philology to Philosophy: Zhu Xi as a Reader-Annotator*

Aaron Tugendhaft, *Gods on Clay: Ancient Near Eastern Scholarly Practices and the History of Religions*

Ronny Vollandt, *An Unknown Medieval Coptic Hebraism? On a Momentous Junction of Jewish and Coptic Biblical Studies*

Megan McNamee, *Picturing as Practice: Placing a Square above a Square in the Central Middle Ages*

Filippomaria Pontani, *Inimitable Sources: Canonical Texts and Rhetorical Theory in the Greek, Latin, Arabic, and Hebrew Traditions*

András Németh, *Excerpts versus Fragments: Deconstructions and Reconstructions of the “Excerpta Constantiniana”*

Anthony Grafton and Joanna Weinberg, *Johann Buxtorf Makes a Notebook*

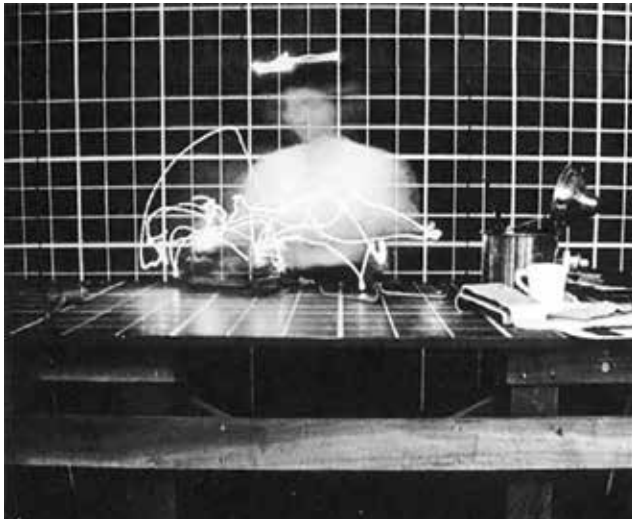
Paola Malino, *World Libraries: Libraries and the Reorganization of Knowledge in Late Renaissance Europe*

Workshops and Conferences

**(In)visible Labor: Knowledge Production in the Human Sciences**

June 11–12, 2015

ORGANIZERS *Jenny Bangham* (MPIWG/University of Cambridge, UK),  
*Judith Kaplan* (MPIWG/University of Pennsylvania, USA)



The workshop brought together historians of biomedicine, anthropology, linguistics, and social science to discuss the lost narratives, unrecorded people, and invisible labor of the disciplines they study. As we know from classic work on “invisible technicians,” on colonial and post-colonial science, and on women in science, there are powerful epistemological and political motives for concealing certain people, professions, and processes involved in the production of scientific knowledge. The workshop sought to recover the labor of fieldwork assistants, informants,

Frank and Lillian Gilbreth, *Motion Study* (1913). Reprinted with the permission of the Frank and Lillian Gilbreth Collection, Archives Center, National Museum of American History, Smithsonian Institution, USA.

translators, and other interlocutors who collect data and make it authentic, credibly social, and recognizably human, with the aim to encourage reflection on our own scholarly practices and their histories.



PUBLICATION

Bangham, Jenny and Judith Kaplan, eds. *Invisibility and labour in the human sciences*. Max-Planck-Institut für Wissenschaftsgeschichte: Preprint 484. Berlin: Max-Planck-Institut für Wissenschaftsgeschichte, 2016.

**Table of Contents**

Jenny Bangham and Judith Kaplan, *Editorial*

Part I. People

Laura Stark, *The Bureaucratic Ethic and the Spirit of Bio-Capitalism*

Boris Jardine, *Mechanical Subjectivity: Mass-Observation and the Scientific Citizen in Interwar Britain*

Josh Berson, *Making Things Incommensurable*

Christine von Oertzen, *Hidden Helpers: Gender, Skill, and the Politics of Workforce Management for Census Compilation in Late-Nineteenth-Century Prussia*

Part II: Power

Susan Lindee, *Invisible/Visible Radiation: Skin in the Game at Hiroshima and Fukushima*

Rosanna Dent, *Invisible Infrastructures: Xavante Strategies to Enroll and Manage Warazú Researchers*

Mihai Surdu, *Assembled Objectivity: Categorizing Roma in Censuses, Surveys, and Expert Estimates*

Caitlin Wylie, *Invisibility as a Mechanism of Social Ordering: Defining Groups among Laboratory Workers*

Part III: Process

Judith Kaplan, *Self-Inscription and (In)visibility: The Oneida Language and Folklore Project*

Whitney Laemmli, *An Uneasy Archive: Alan Lomax, Labanotation, and the Disappearing Body*

Lara Keuck, *Thinking With Gatekeepers: An Essay of Psychiatric Sources*

Kathleen Vongsathorn, *Translators as Informers, Mediators, and Producers of Knowledge: Reflections from Medical History Interviews in Uganda*

Comments

Joanna Radin, *The In/Visible Historian*

Donatella Germanese, *Notes on Inscription and the Archive*

Sally Gregory Kohlstedt, *Accounting for Knowledge Production*

### **Towards a History of Epistemic Genres: Textbook and Commentary, Case and Recipe in the Making of Medical Knowledge**

June 26–27, 2015

ORGANIZERS *Gianna Pomata* (John Hopkins University, USA), *Yvonne Wübben* (Freie Universität Berlin, Germany; Ruhr-Universität Bochum, Germany); sponsored by the Mercator Foundation

The workshop addressed the history and theory of epistemic genres in medicine, such as the recipe, the case study, the textbook, and the commentary. The main focus was on the early modern period. The workshop's goal was to deepen our understanding of cognitive practices and observation in the history of knowledge.

#### **Participants**

*Maria Böhmer* (University of Zurich, Switzerland)

*John Carson* (University of Michigan, USA)

*Lorraine Daston* (MPIWG)

*Rebecca Flemming* (Cambridge University, UK)

*John Forrester* (Cambridge University, UK)

*Carlo Ginzburg* (Scuola Normale Superiore, Pisa, Italy)

*Asaf Goldschmidt* (Tel Aviv University, Israel)

*Marta Hanson* (Johns Hopkins University, USA)

*John B. Henderson* (Louisiana State University, USA)

*Angela Ki Che Leung* (University of Hong Kong)

*Elaine Leong* (MPIWG)

*Efraim Lev* (University of Haifa, Israel)

*Rafael Mandressi* (Centre Koyré, CNRS-EHESS, Paris, France)  
*Andreas Mayer* (Centre Koyré, CNRS-EHESS, Paris, France)  
*Glenn W. Most* (MPIWG/Scuola Normale Superiore, Pisa, Italy/  
University of Chicago, USA)  
*Gianna Pomata* (Johns Hopkins University, USA)  
*Ahmed Ragab* (Harvard University, USA)  
*Stefan Reichmuth* (Ruhr-Universität Bochum)  
*Thomas Rütten* (Newcastle University, UK)  
*Liba Taub* (Cambridge University, UK)  
*Laurence Totelin* (Cardiff University, Wales)

### Toward a History of Error

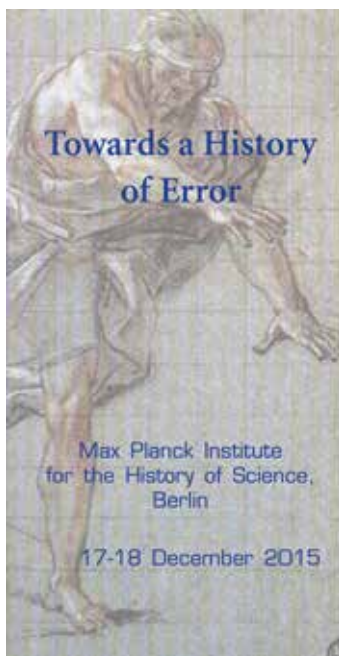
December 17–18, 2015

ORGANIZERS *Lorraine Daston* (MPIWG), *Fabian Krämer* (Ludwig-Maximilian-Universität, Munich, Germany), *Martin Mulrow* (Forschungszentrum Gotha, Universität Erfurt, Germany)

Error is a central concept in the history of epistemology; in the history of science, various concepts of error have generated equally various strategies for avoiding, diagnosing, and correcting it. The origins of both modern philosophy and modern science have been traditionally linked to sixteenth- and seventeenth-century texts (e. g., those of Bacon and Descartes) devoted in large part to the diagnosis and correction of certain kinds of errors. Starting with the late medieval and early modern periods and continuing through the nineteenth century and possibly beyond, this workshop aims to map the broad contours of a history of error, both in its concepts and its practices.

#### Participants

*David Bates* (University of California, Berkeley, USA)  
*Lorraine Daston* (MPIWG)  
*Sven Dupré* (University of Utrecht, Netherlands)  
*Svetlana Hautala* (Università degli Studi di Siena, Italy)  
*Susanne Heinicke* (Westfälische Wilhelms-Universität Münster, Germany)  
*Giora Hon* (University of Haifa, Israel)  
*Staffan Müller-Wille* (University of Exeter, UK)  
*Harriet Phillips* (Queen Mary University of London, UK)  
*Friedrich Steinle* (Technische-Universität Berlin, Germany)



## Citizen Science in Historical Perspective

February 19, 2016

ORGANIZERS *Sally Shuttleworth* (University of Oxford, UK), *Christine von Oertzen* (MPIWG)

COOPERATION PARTNER University of Oxford, Constructing Scientific Communities Project

<https://conscicom.org>

The recent rise of Citizen Science projects, which draw on the voluntary labor of members of the general public, seems to suggest new ways of doing science, and of breaking down the divisions between professional and non-professional science that have developed over the last 150 years. Does citizen science, as currently conceived, help throw new light on the activities of those armies of natural historians, astronomers, and child observers of the past? Does big data offer new models for scientific practice, or merely a radical scaling up of previous models of knowledge production? Can citizen science transform modes of scientific authorship and authority and models of scientific education?

### Participants

*Geoff Belknap* (University of Leicester, UK)

*Sarah Blacker* (MPIWG)

*Jamie Cohen-Cole* (George Washington University, USA)

*Lorraine Daston* (MPIWG)

*Gowan Dawson* (University of Leicester, UK)

*Sally Frampton* (University of Oxford, UK)

*Judith Kaplan* (MPIWG)

*Elaine Leong* (MPIWG/MPG Minerva Program/University College London, UK)

*Chris Lintott* (University of Oxford, UK; Zooniverse)

*Christine von Oertzen* (MPIWG)

*Lisa Smith* (University of Essex, UK)

*Bruno Strasser* (University of Geneva, Switzerland)

*Johannes Vogel* (Museum für Naturkunde, Berlin, Germany)



## The Material Culture of Citizen Science

May 12, 2017: University of Oxford

ORGANIZERS *Christine von Oertzen* (MPIWG), *Sally Shuttleworth* (University of Oxford, UK)

COOPERATION PARTNER University of Oxford, Constructing Scientific Communities Project

WEBSITE <https://conscicom.org>

This workshop reflected on the technologies and materials that enable citizen science to flourish: What are the practical means that allow the breaking down of the divisions



between professional and non-professional science which have developed over the last 150 years? What kinds of technologies and materials can be identified, and how did they shape the interactions among participants and thus, the production, circulation, and use of scientific knowledge, in the digital age and before? These questions were discussed in historical perspective, in particular by focusing on the use of paper as a central means to mediate between seemingly divergent actors and spaces—and on those digital technologies that have replaced paper.

### Participants

*Etienne Benson* (University of Pennsylvania, USA)

*Sian Bowen* (Northumbria University and Arts University Bournemouth, UK)

*Victoria van Hyning* (University of Oxford, UK)

*Elaine Leong* (MPIWG/MPG Minerva Program/University College London, UK)

*Anna Maerker* (Kings College, London, UK)

*Anna Marie Roos* (University of Lincoln, UK)

*Christine von Oertzen* (MPIWG)

*Sally Shuttleworth* (University of Oxford, UK)

*Lisa Smith* (University of Essex, UK)

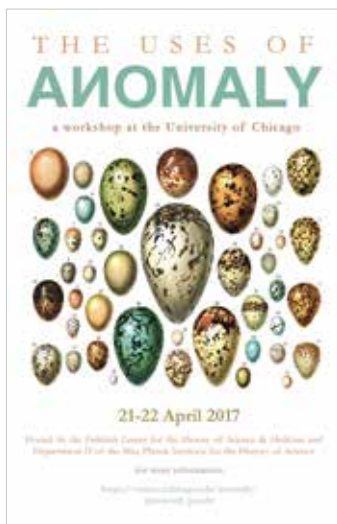
*Matthew Wale* (University of Leicester, UK)

### The Uses of Anomaly

April 21–22, 2017

ORGANIZER *Lily Huang* (University of Chicago, USA)

COOPERATION PARTNER University of Chicago



This workshop investigated the potencies and possibilities of the anomaly as an analytic category in a variety of disciplines. Researchers in the history and philosophy of science and medicine, paleontology, mathematics, and literary studies collectively asked: How do we think with anomalies? What do anomalies do across this disciplinary spectrum, and what assumptions are inherent in our various appeals to it as *explanans* or *explanandum*, as clue or portent? Each speaker provided an instance of an anomaly from a specific historical, scientific, or literary context for general discussion.

### Participants

*Heather Brink-Roby* (Stanford University, USA)

*James Chandler* (University of Chicago, USA)

*Joel Cohen* (Rockefeller University, USA)

*Lorraine Daston* (MPIWG)

*Caitjan Gainty* (King's College London, UK)

*Jan Goldstein* (The University of Chicago, USA)

*Adrian Johns* (La Trobe University, USA)

*Shigehisa Kuriyama* (Harvard University, USA)

*Scott Lidgard* (University of Chicago, USA)

*Glenn W. Most* (Scuola Normale, Italy/ MPIWG)  
*Theodore Porter* (University of California, Los Angeles, USA)  
*Robert J. Richards* (University of Chicago, USA)  
*Michael Rossi* (University of Chicago, USA)  
*David Sepkoski* (MPIWG)  
*Rosanna Warren* (University of Chicago, USA)

### Technology and the Self: E-Privacy

April 27–28, 2017

ORGANIZERS *Peter L. Galison* (Harvard University, USA), *Lorraine Daston* (MPIWG), Sponsored by the American Academy of Arts & Sciences

Worries about privacy in the age of surveillance and Internet data scraping are ubiquitous. But as in the case of previous media revolutions such as the rise of the printed book in early modern Europe, fundamental changes in the self are also at stake. Historians, journalists, geographers, computer scientists, and activists met to analyze and discuss the implications of new technologies of border surveillance, biometrics, drones, and smart cities for the ways in which we create and conceptualize the self.



Songdo, South Korea (2015). Photo: Orit Halpern.

### Participants

*Pierre Bellanger* (Founder & CEO, Skyrock; Founder, skyrock.com)  
*Lino Camprubí* (MPIWG)  
*Grégoire Chamayou* (Centre National de la Recherche Scientifique, Paris)  
*Lorraine Daston* (MPIWG)  
*Gemma Galdon-Clavell* (Universitat de Barcelona, Spain)  
*Peter Galison* (Harvard University, USA)  
*Mark Graham* (University of Oxford, UK)  
*Hugh Gusterson* (George Washington University, USA)  
*Caroline Jones* (Massachusetts Institute of Technology, USA)  
*Constanze Kurz* (Spokeswoman, Chaos Computer Club, Germany)  
*Evgeny Morozov* (Author, Contributing Editor, *The New Republic*)  
*Trevor Paglen* (Artist, Author, Geographer)  
*Thomas Rid* (King's College London, UK)  
*Frank Rieger* (Spokesman, Chaos Computer Club, Germany)  
*Andrew Harris Smith* (Harvard University, USA)  
*Sara Watson* (Harvard University, USA)

## Individual Projects

Maria Avxentevskaya (Postdoctoral Fellow, MPIWG/Berlin Center for the History of Knowledge)

### The Physician's Album Amicorum: Humanist Techniques in Knowledge Networking



Maria Avxentevskaya

*Album amicorum* of Johann Geort Volckamer, entry by medical student Lucas Schröttig (1638). Courtesy of HAAB Weimar, Germany.

*Album amicorum* manuscripts offer rich evidence on the literary, theological, musical, and medical cultures of the seventeenth–nineteenth centuries, exhibiting the vitality of the humanist legacy in verbal and visual quotations. This project focuses on a sample of *alba amicorum* kept by medical students and young practitioners during their *peregrinationes academicae* via various European universities. These “medical *alba amicorum*” came to be the *Bilderfahrzeuge*, to use Aby Warburg’s term, for fostering the expert perception of details in the *historiae* of the human body. Displaying the links between the liberal and mechanical arts, they feature ingenious poetry and prose, graphics, and paper technologies. These albums facilitated networking through informal communities and institutions, various disciplines, and national traditions. The project aims at a book-length monograph but also seeks to establish a research collective to explore the genre of *alba amicorum* in intellectual networking across Europe and beyond. It employs digital visualizations and sociological methods to investigate how the humanist cultures of medical networking helped create new values and ontologies of medicine.



These “medical *alba amicorum*” came to be the *Bilderfahrzeuge*, to use Aby Warburg’s term, for fostering the expert perception of details in the *historiae* of the human body. Displaying the links between the liberal and mechanical arts, they feature ingenious poetry and prose, graphics, and paper technologies. These albums facilitated networking through informal communities and institutions, various disciplines, and national traditions. The project aims at a book-length monograph but also seeks to establish a research collective to explore the genre of *alba amicorum* in intellectual networking across Europe and beyond. It employs digital visualizations and sociological methods to investigate how the humanist cultures of medical networking helped create new values and ontologies of medicine.



#### PUBLICATION

Avxentevskaya, Maria. “From inventio to invention: John Wilkins’s Mathematical magick.” In *English literature and the disciplines of knowledge, early modern to eighteenth century: a trade for light*, eds. Jorge Bastos da Silva and Miguel Ramalheite Gomes. 117–145. Leiden: Brill Rodopi, 2017.

Sietske Fransen (Postdoctoral Fellow, MPIWG/University of Cambridge, UK; as of March 2019, Max Planck Research Group Leader, Bibliotheca Hertziana, Italy)

### Visualization as Translation of Scientific Knowledge in Early Modern Europe



Sietske Fransen

This project explores the relationship between manuscripts and printed books in the field of medicine, as well as the fields of divination (geomancy) and alchemy, disciplines that exhibit striking similarities in this regard. These common practices allow us to compare the practices of the visualization of scientific knowledge and to investigate how visualizations were used as translations between book learning and practice and vice versa. The differences between the ways in which knowledge was visual-

ized in these disciplines resulted not only from the different subject matters. They also reflected the different methods of acquiring knowledge and the degree to which either bookish learning or practical experience played a role in this process.



Unknown artist, "Skinned rat's testicle in water." Grey-wash on paper (1680). Royal Society Archives EL/L1/52. Image © The Royal Society.



#### SELECTED PUBLICATIONS

Fransen, Sietske, Niall Hodson, and Karl Enenkel, eds. *Translating early modern science*. Intersections 51. Leiden: Brill, 2017.

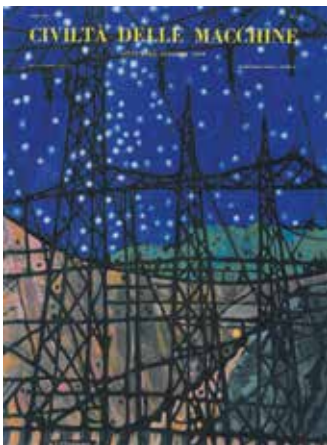
Fransen, Sietske. "Latin in a time of change: the choice of language as a signifier of new science?" *Isis* 108 (3 2017): 629–635.

Fransen, Sietske. "Anglo-Dutch translations of medical and scientific texts." *Literature Compass* 14 (4 2017): <https://doi.org/10.1111/lic3.12385>

Donatella Germanese (Research Scholar, MPIWG)

#### Science and Technology in Italian Postwar Cultural Journals

A myriad of newspapers and magazines revitalized the publishing market as soon as World War II was over, particularly in those countries that had experienced years of fascist rule. The popularization of science and technology was used for promoting but also critically discussing modern industrialization. In Italy, postwar cultural journals such as *Il Politecnico* (1945–1947) and *Il Menabò* (1959–1967) from the publishing house Giulio Einaudi Editore, as well as the corporate magazines *Civiltà delle Macchine* (1953–1979) and *Pirelli* (1948–1972), were published by large industrial firms. An "industrial literature" emerged in the 1950s and 1960s thanks to the involvement of writers and poets employed in advertising, press, public relations, and human resources departments. Artists contributed works on commission to the corporate magazines, which became tangible links between business, art, literature, science, and technology. The journals supported the country's reconstruction within a new European framework and also reflected the ideological battles of the Cold War and shed light on these postwar phenomena against the background of past fascist modernization policies by signaling different routes of transition to antifascism and democracy.



Donatella Germanese

Felice Casorati, Valgrisanche. Cover page of the journal, *Civiltà delle Macchine*, 7 (1959), No. 5.



PUBLICATION

Germanese, Donatella. “‘We will make Europe there’: Italian intellectuals in search of Europe and America in Hitler’s Germany.” *Modern Intellectual History* 14 (2 2017): 451–476.

*Katja Krause* (Postdoctoral Fellow, MPIWG; as of September 2016 Lecturer, Durham University, UK; as of June 2017 Postdoctoral Fellow, Harvard Divinity School; as of September 2018 MPIWG Research Group Leader and Professor for History and Philosophy of Science, Technische Universität Berlin, Germany)

**Coming to their Senses: The Averroist Turn and the Rise of “Empiricism” in the Thirteenth Century**



Katja Krause

All human knowing is grounded in sense experience. This may sound trivial to us, yet its recognition as a necessary condition for human knowing gained particular momentum among Latin learned thinkers in the thirteenth century, principally thanks to the translations of Averroes’s commentaries on major works of Aristotle. While this “Averroist turn” is well established in scholarship, its positive force as expressed in its coalescence of psychology, epistemology, and the scientific method has received

little attention. Historically speaking, the Latin Averroes broke with the established Augustinian and Latinized Avicennian noetic principle according to which true human knowledge must somehow be grounded in divine(-like) illuminations of the human intellect. Averroes’s commentaries enabled the Scholastics to appreciate Aristotle on a different level. The aim of this study is to establish the consequences of this first Latin “empiricism” and investigate how it altered the normative landscape and purpose of human knowing and science in its standards, practices, and ideals.



God the Geometer. Frontispiece of *Bible Moralisee* (ca. 1220–1230). Codex Vindobonensis 2554, Austrian National Library, Vienna, NB fol. 1v.

SELECTED PUBLICATIONS



Krause, Katja. “Transforming Aristotelian philosophy: Alexander of Aphrodisias in Aquina’s early anthropology and eschatology.” *Przegląd Tomistyczny* 21 (2015): 175–217.

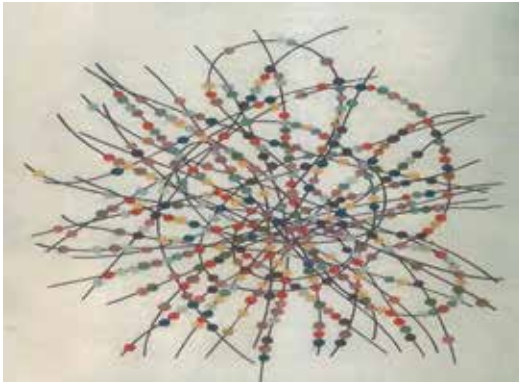
Krause, Katja. “Albert the Great on animal and human origin in his early works.” *Lo Sguardo* 18 (2 2015): 205–232.

Krause, Katja and Henryk Anzulewicz. “Appropriating traditions of totality: reality as a whole in Albert the Great.” In *Regards sur les traditions philosophiques (XIIe–XVIe siècles)*, eds. Dragos Calma and Zénon Kaluza. 99–125. Leuven: Leuven University Press, 2017.



Jung Lee (Postdoctoral Fellow, MPIWG; as of September 2017 Assistant Professor, Institute for the Humanities, Ewha Women's University, Korea)

### Beating Paper in Late Chosŏn Korea



Papermaking changed the mountains and fields, farming practices, social relations, and the ideas about artisanship and knowledge in late Chosŏn Korea. The slow transformation of a labor-intensive technique called *toch'im*, the repeated beating of just-produced paper, which provides sizing and fulling effects, was crucial to the fame of Korean paper among its East Asian

neighbors. Once dismissed as drudge work imposed on corvée farmers or prisoners, this process became a highly paid specialty of paper artisans in late Chosŏn Korea. By examining paper artisans' changing relationships with the paper mulberry, tools and facilities, central and local authorities, farmers, merchants, and scholar-officials, this project reveals how social, economic, and epistemic factors enabled the skilling and appreciation of such manual labor in late Chosŏn Korea, where papermaking became a most successful industry.



Jung Lee

Hayata Bunzo, *Icones Plantarum Formosanarum* (1910–1921), ed. Bureau of Productive Industries, Government of Formosa, Taihoku, Taiwan, vol. 10 (1921), p. 82.



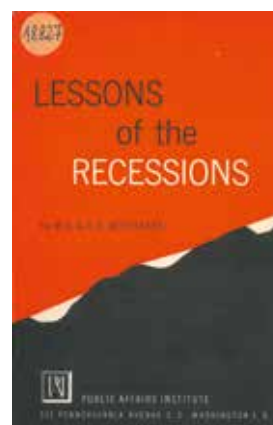
#### PUBLICATION

Lee, Jung. "Mutual transformation of colonial and imperial botanizing? The intimate yet remote collaboration in colonial Korea." *Science in Context* 29 (2 2016): 179–211.

Annette Vogt (Senior Research Scholar, MPIWG)

### The History of Statistics between Mathematics and Economics (1860–1961)

Considering population, social, and economic statistics on the one hand, and mathematical statistics, probability theory, and insurance mathematics on the other in the German context (particularly Berlin), the project aims to understand why these disciplines developed so differently, with mathematical statistics gaining far less traction. Combined institutional, cultural, and biographical approaches shed light on the assumed divide between continental (France and Germany) and Anglo-American (United Kingdom and United States) traditions. Statistics at Berlin's universities and colleges was often taught by academics who also held positions at sta-



Annette Vogt

Third publication by Wladimir S. and Emma S. Woytinsky (1959).



tistical offices, reinforcing links between the academic world and the application of scientific knowledge in these fields. German mathematicians with an interest in statistics, such as Emil Julius Gumbel (1891–1966), an expert on “Statistics of Extremes,” as well as Emma S. (1893–1968) and Wladimir S. (1885–1960) Woytinsky, had to go into exile in 1933. From the introduction of official state statistics to the popularization of statistics in the 1920s (Woytinsky’s “The World in Figures”) and the mathematization of statistics and their reception from 1910 to the 1960s, this project provides a broad account of statistics in Germany over half a century.



SELECTED PUBLICATIONS

Vogt, Annette. “Die Vertreibung jüdischer Mathematiker ab Frühjahr 1933 und ihre Wege ins Exil.” In *Von Maimonides bis Einstein — Jüdische Gelehrte und Wissenschaftler in Europa*, eds. Ingrid Kästner and Jürgen Kiefer. 363–386. Aachen: Shaker Verlag, 2015.

Härdle, Wolfgang Karl and Annette Vogt. “Ladislaus von Bortkiewicz — statistician, economist and a European intellectual.” *International Statistical Review* 83 (1 2015): 17–35.

Vogt, Annette. “Statistik versus Stochastik: zur Begriffsgeschichte der beiden Termini.” In *Namenspatrone und Taufpaten: wie mathematische Begriffe zu ihrem Namen kamen; XIII. Österreichisches Symposium zur Geschichte der Mathematik*, ed. Christa Binder. 181–189. Wien: Österreichische Gesellschaft für Wissenschaftsgeschichte, 2016.

*Benjamin Wilson* (Postdoctoral Fellow, MPIWG; as of September 2017: Assistant Professor for History of Science, Harvard University, USA)

**Strategies of Stability**



Benjamin Wilson

Standard interpretations hold that stability was a natural and necessary consequence of rational nuclear deterrence—a condition virtually dictated by the weapons themselves. This project digs into the intellectual biography of the American economist and strategist Thomas Schelling (who first formulated the stability idea in the late 1950s), yielding a radically different interpretation of stability’s origins. Schelling imported stability to nuclear analysis from Keynesian macroeconomic modeling—the field in which he had been trained as a graduate student in the 1940s. By modeling nuclear deterrence as a stable system, Schelling confidently asserted the safety of a tactic he called “threats that leave something to chance.” Among the most notorious examples of such threats was Schelling’s recommen-



U.S. and Soviet tanks face one another at Checkpoint Charlie, Berlin (October 1961). Photo: U.S. Army.

dation to John F. Kennedy, during the Berlin crisis of 1961, that the United States might seriously consider launching a “selective” nuclear strike to intimidate the Soviet Union. An article entitled, “Modeling with a Vengeance: Thomas Schelling and the Macroeconomic Origins of Strategic Stability,” is under review for publication in *International Security*, the leading U.S. journal of international relations and security studies.

#### Short-Term Visiting Scholars

*Ken Alder* (Northwestern University, USA)

*Gadi Algazi* (Tel Aviv University, Israel)

*Lydia Barnett* (Northwestern University, USA)

*Soha Bayoumi* (Harvard University, USA)

*Bruno Belhoste* (Université de Paris I, France)

*Marie-Noelle Bourguet* (Université de Paris 7, France)

*Robert Brain* (University of British Columbia, Canada)

*John Carson* (University of Michigan, Ann Arbor, USA)

*John Christie* (University of Oxford, UK)

*Kevin Chang* (Academia Sinica, Taiwan)

*Karine Chemla* (Université de Paris 7, France)

*Jamie Cohen-Cole* (George Washington University, USA)

*Henry M. Cowles* (Yale University, USA)

*Therese Cory* (Notre Dame University, USA)

*Angela Creager* (Princeton University, USA)

*Helen Curry* (University of Cambridge, UK)

*Steffen Dycheyne* (Vrije Universiteit Brussel, Belgium)

*Rose Ernst* (University of Seattle, USA)

*Isabel Iribarren* (Université de Strasbourg, France)

*Boris Jardine* (University of Cambridge, UK)

*Agathe Keller* (Université Paris 6, France)

*Susan Lindée* (University of Pennsylvania, USA)

*Andreas Mayer* (CNRS, Centre Alexandre Koyré Paris, France)

*Andrew Mendelsohn* (Queen Mary University London, UK)

*Philippe Mongin* (CNRS, HEC Paris, France)

*Glenn W. Most* (MPIWG/Scuola Normale Superiore di Pisa, Italy/University of Chicago, USA)

*Martin Mulsow* (Forschungszentrum Gotha der Universität Erfurt, Germany)

*Tara Nummedal* (Brown University, USA)

*Paul Herman* (Leiden University, The Netherlands)

*James Secord* (University of Cambridge, UK)

*Sally Shuttleworth* (University of Oxford, UK)

*Laura Stark* (Vanderbilt University, USA)

*Steve Sturdy* (University of Edinburgh, UK)

*Elly Truitt* (Bryn Mawr College, USA)

*Jaume Valentines-Álvares* (Nova University of Lisbon, Portugal)

*Fernando Vidal* (Catalan Institution of Research and Advanced Studies, Spain)

*Zachary Wainer* (Hebrew University Jerusalem, Israel)

*Paul White* (University of Cambridge, UK)

*Elaine Wise* (University of California, Los Angeles, USA)

*M. Norton Wise* (University of California, Los Angeles, USA)

*Andrew Yang* (School of the Art Institute of Chicago, USA)

*Zhu Yiwen* (Sun Yat-Sen University, China).

Project

## Gender Studies of Science



Henriette Brown, *The Pet Goldfinch*, Oil on Canvas (ca. 1870). Courtesy of Victoria and Albert Museum, London, UK.

ORGANIZER *Christine von Oertzen* (MPIWG), *Elaine Leong* (MPIWG/MPG Minerva Program/University College London, UK)

Research on the history of gender in science, technology, and medicine has transformed views on what science, technology, and medicine are, where they are done, and who counts as a practitioner. Challenging the bifurcated categories of popular versus professional, domestic versus public, inside versus outside science, two Department II projects in this area have brought to the fore households and offices, kitchens and laboratories, private rooms and public institutions to uncover previously unrecognized actors and forms of knowledge-making. *Beyond the Academy* (2010–2013) utilized the category of gender to recast the sites of knowledge production; *Working With Paper* (2015–2018), organized in cooperation with the Minerva Research Group *Reading and Writing Nature in Early Modern Europe*, analyzed entanglements of epistemic practices in everyday life.

An ongoing gender and science reading group open to scholars across the institute cross-fertilized conversations within and beyond the working groups. A schedule and the reading log of the group's meetings are available on Department II's website, at <https://www.mpiwg-berlin.mpg.de/page/reading-log-2012-16>.

## Working Group

## Working with Paper: Gendered Practices in the History of Knowledge

MEETINGS Exploratory conference: January 6–8, 2016; authors' workshops: September 26–27, 2016 and December 9–10, 2016; working group in residence: September–December 2016

ORGANIZERS *Carla Bittel* (Loyola Marymount University, USA), *Elaine Leong* (MPIWG/MPG Minerva Program/University College London, UK), *Christine von Oertzen* (MPIWG)

COOPERATION PARTNER MPG Minerva Research Group *Reading and Writing Nature in Early Modern Europe*.

→ pp. 181–190

This Working Group explored how paper—as material, meaning, and object—functioned as an epistemic material bridging quotidian and scholarly knowledge practices. Taking the notion of “paper tools” literally, the group examined a wide range of paper objects and practices, from the complex folding and sealing of early modern letters to the use of heavy-duty census cards in nineteenth-century Prussia, to early twentieth-century schematographs and questionnaires. By following the sociomaterial paper trail, the collective project highlights the ways in which different kinds of paper, such as tracing paper, cardboard, or recycled scraps, shaped epistemic practices. By utilizing gender as a category of historical analysis, the case studies dissect paper practices as technological transactions within the everyday power structures of a particular time and place. Taken as a whole, the Working Group volume provides a long-view history of working and knowing with paper in Europe and North America from around 1650–1960.

The Working Group met for an exploratory workshop in January 2016 followed by two authors' meetings in September and December 2016 respectively, in which first and second drafts of papers were discussed. Most of the group's members were in residence during the four months between the two authors' meetings, revising and finalizing their papers. Reading groups and more informal discussion yielded a novel framework, developed in the collective book's introduction, and insured thematic cohesiveness throughout the volume. *Working With Paper: Towards a Gendered History of Knowledge* is contracted with the University of Pittsburgh Press and scheduled for publication in spring 2019.

Burning curls with French brown paper. Caricature by Matthew Darly (printer), “Ridiculous Taste or the Ladies Absurdity” (London, 1771). © Trustees of the British Museum, UK.



---

**Table of Contents**

Carla Bittel, Elaine Leong, Christine von Oertzen, *Paper, Gender, and the History of Knowledge*

**Part I. Beyond the Page: The Sociomaterial History of Paper**

Heather Wolfe, *Letterwriting and Paper Connoisseurship in Elite Households in Early Modern England*

Elaine Leong, *Papering the Household: Paper, Recipes, and Everyday Technologies in Early Modern England*

Simon Werrett, *The Sociomateriality of Waste and Scrap Paper in Eighteenth-Century England*

Gabriella Szalay, *Paper Trials, Multiple Masculinities, and the Oeconomy of Honor in Eighteenth-Century Germany*

**Part II: Transcending Boundaries: Tools and Technologies**

Elena Serrano, *Changing the Regimen: Accounting Books, Parchment Slips, and Enlightened Medical Arithmetic in Madrid's Foundling House*

Carla Bittel, *Unpacking the Phrenological Toolkit: Knowledge and Identity in Antebellum America*

Christine von Oertzen, *Keeping Prussia's House in Order: Census Cards, Housewifery, and the State's Data Compilation*

Beth Linker, *Tracing Paper, the Posture Sciences, and the Mapping of the Female Body*

**Part III: Knowledge, Power, and the Everyday**

Elizabeth Yale, *A Letter is a Paper House: Home, Family, and Natural Knowledge*

Matthew D. Eddy, *Family Notebooks, Mnemotechnics, and the Rational Education of Margaret Monro*

Anna Maerker, *Papier-mâché Anatomical Models: The Making of Reform and Empire in Nineteenth-Century France*

Dan Bouk, *Women Who Worked with Documents to Rationalize Reproduction*

**Afterword**

Jacob Eyferth, *Making and Using Paper in Late Imperial China: Comparative Reflections on Working and Knowing Beyond the Page*

---

**Individual Projects**

Carla Bittel (Visiting Scholar, Loyola Marymount University, USA)

**Tools of the Phrenological Trade: Gender, Paper, and Practices in Antebellum America**



Carla Bittel

Phrenological paper tools measured, documented, evaluated, and even negotiated cranial characteristics, particularly in relation to gender in early nineteenth-century America. A popular but contested science of the mind, phrenology was based on evaluations and measurements of nodules on the head; it articulated a relationship between the brain and skull, the mental and the physical, the interior and exterior. It made certain characteristics normative and delineated differences of gender, race, ability, and disability. This project brings to light the intersection of gender and materiality in phrenological practice, by examining the role of paper as a social and epis-



temological intermediary. It unlocks the phrenological toolkit to discover how paper charts, individual analyses, notebooks, lecture notes, broadsides, letters, traced profiles, and even playing cards worked in tandem to constitute an accessible, transportable, marketable science. It shows how phrenology, on and through paper, reinforced gender duality and but also allowed some flexibility. Ultimately, phrenology's paper technologies, especially illustrated charts, were interactive platforms that often blurred the boundary between producers and users of knowledge.

Christine von Oertzen (Senior Research Scholar, MPIWG)

### Historicity of Data/Citizen Science of the Mind

Historical processes of at-home data compilation inform these two current projects, albeit in significantly different ways. *Historicity of Data* traces the emergence of the notion “data” and its material and visual culture in nineteenth-century population statistics. Considering Prussian census-taking efforts, it argues that the more frequent use of the term data marked a new reflexivity towards cumulative scientific methods, yielding a fundamental change in the tools and workflows embedded in manual census tabulation. To produce state-of-the-art statistics, the Prussian census bureau re-



placed enumeration lists with loose paper slips, resulting in a regime of orderliness best performed by middle-class housewives in their own home parlors. The project *Citizen Science of the Mind* explores observation, note-taking, and data compilation on the minds of infants in the context of fin-de-siècle efforts to unlock humanity's evolutionary roots. Baby observa-

tion gained momentum following Darwin's publication on his own son's early development, and scholarly enthusiasm quickly spread to the nursery, where homebound mothers took to the task. On the basis of Milicent Shinn's correspondence, the project reconstructs a network of at-home observers spanning the North American continent that challenges the (female) amateur versus (male) expert divide and shows striking affinities to contemporary citizen science initiatives.



Christine von Oertzen

Eduard Niese, *Gute Stube*, Watercolor (1891). Courtesy of City Museum for the History of Hamburg, Germany.



#### SELECTED PUBLICATIONS

Oertzen, Christine von. “Whose world? Internationalism, nationalism and the struggle over the ‘Language Question’ in the International Federation of University Women, 1919–1932.” *Contemporary European History* 25 (2 2016): 275–290.

Oertzen, Christine von. “Die Historizität der Verdatung: Konzepte, Werkzeuge und Praktiken im 19. Jahrhundert.” *NTM* 25 (4 2017): 407–434.

Oertzen, Christine von. “Machineries of data power: manual versus mechanical census compilation in nineteenth-century Europe.” *Osiris* 32 (2017): 129–150.



Elena Serrano (Postdoctoral Fellow, MPIWG; as of September 2015 Research Scholar, Dept. I, MPIWG)

### Accounting for Life: Enlightened Medical Arithmetic in Madrid's Foundling House



Elena Serrano

In 1799, a female society replaced the male administration of the Madrid Foundling House. The *Junta de Damas de Honor y Mérito* (the Committee of Ladies of Honor and Merit) touted its own management of the Foundling House as a break from the previous old-fashioned, careless male way of running it. From introducing new hy-

gienic measures, to increasing the caring staff to regulating wet-nursing, the Junta meticulously re-ordered the institution's everyday life. The project analyses the paperwork that the Junta used for labeling, tracing, and counting children and for collating statistics on child mortality rates. It compares forms, accounting books, paper slips, parchments for identifying babies, and reports created between 1799 and 1820. The project explores how this gendered manner of using paper technologies—mediating the manipulation, arrangement, and classification of information—eventually shaped the ways of looking at and caring for foundlings.



Domenico di Michelino, *Maddona degli Innocenti*. Tempera on canvas (ca. 1446). Istituto degli Innocenti, Florence. Photo: Ottaviano Caruso.



#### PUBLICATION

Serrano, E. "Spreading the revolution: Guyton's fumigating machine in Spain; politics, technology, and material culture (1796–1808)." In: *Compound histories: materials, governance, and production, 1760–1840*, eds. Lissa L. Roberts and Simon Werrett. 106–130. Brill 2018. Online 2017.

#### Short-Term Visiting Scholars

*Christina Benninghaus* (Universität Gießen, Germany)

*Carla Bittel* (Loyola Marymount University, USA)

*Dan Bouk* (Colgate University, USA)

*Matthew Eddy* (University of Durham, UK)

*Derya Gürses Tarbuck* (Bahcesehir University, Turkey)

*Sally Gregory Kohlstedt* (University of Minnesota, Minneapolis, USA)

*Beth Linker* (University of Pennsylvania, USA)

*Anna Maerker* (Kings College, London, UK)

*Erika Milam* (Princeton University, USA).

## Project

## Science in Circulation: The Exchange of Knowledge, 9th–17th Centuries

ORGANIZERS *Robert Casties* (MPIWG),  
*Rivka Feldhay* (Tel Aviv University, Israel),  
*Elaine Leong* (MPIWG/MPG Minerva Program/  
 University College London, UK),  
*Jamil Ragep* (McGill University, Canada),  
*Sally P. Ragep* (McGill University, Canada),  
*Alisha Rankin* (Tufts University, USA),  
*Pamela Smith* (Columbia University, USA)

COOPERATION PARTNERS McGill University  
 (Canada), Tel Aviv University (Israel),  
 Staatsbibliothek zu Berlin (Germany), member  
 institutions of the Islamic Scientific Manuscripts  
 Initiative (ISMI) Board and ISMI sponsors  
 (listed below)

Commodities, ideas, facts, instruments, texts, techniques, and people all travel—but selectively. Knowledge, both implicit and explicit, does not spread simply because it is true or useful; nor do the paths it takes cover the entire globe. The “Science in Circulation” project focuses on which knowledge circulates, and where, how, and by whom. Although the questions posed by the project potentially apply to many epochs and cultures, the project concentrates on the period from the fifteenth to the eighteenth centuries and the geographical areas of the Mediterranean basin, the Atlantic, and Asia, because in this context the opening up of new trade routes and markets, advances in navigation, military and colonial initiatives, and religious migrations all conspired to set an unprecedented number of things, people, and thoughts in motion. The Working Groups devoted to this research project combine the perspectives of the history of science and technology with those of social and economic history and the geography of knowledge.

Three Working Groups and a Digital Humanities project (ISMI) in Department II address this topic: “Before Copernicus” (organized by Rivka Feldhay, Tel Aviv University, Israel, and Jamil Ragep, McGill University, Canada), “Testing Drugs and Trying Cures in the Early Modern World” (organized by Elaine Leong, MPIWG/MPG Minerva Program/University College London, UK), and “Itineraries of Materials, Recipes, Techniques, and Knowledge in the Early Modern World” (organized by Pamela H. Smith, Columbia University, USA). See also the related MPIWG projects “Global Perspectives of Knowledge” (Department I) and “Histories of Planning” (Department III). → pp. 24ff., pp. 229ff.



Jan van Kessel and Erasmus Quellinus,  
*Asien* (ca. 1664/66), detail. Alte Pinakothek,  
 Munich, Germany.

## Working Groups

### Itineraries of Materials, Recipes, Techniques, and Knowledge

MEETINGS March 13–14 and July 9–11, 2014; working group in residence: July 13–24, 2015

ORGANIZER *Pamela Smith* (Columbia University, USA)



The world map from Leinhardt Holle's edition of Nicolaus Germanus's emendations to Jacobus Angelus's 1406 Latin translation of Maximus Planudes's late thirteenth-century rediscovered Greek manuscripts of Ptolemy's second century *Geography* (1482).

Much recent work in the history of science has focused on the circulation of knowledge within Europe, across the Atlantic World, and between the two poles of East Asia and Western Europe. This scholarship has resulted in much new information about the circulation, exchange, and transformation of knowledge, as well as new conceptual and methodological perspectives on the circulation of knowledge, and, especially, on the issues of the local and the global in the formation of scientific knowledge. The movement of knowledge across Eurasia (and especially across Central Asia) during the same period has been much less well-researched, despite recent scholarship on the silk routes.

This working group examined the movement and circulation of materials, people, and practices in the “late medieval” and “early modern period”—from around 750 to 1800—to study the movement of knowledge (broadly conceived) across Eurasia. The group explored the methodological and evidentiary challenges of following non-textual materials and processes, and considered such questions as: What are the particular problems of studying knowledge and science *in motion*? Can we trace the passage of matter and materials into the realm of ideas and scientific theories? How do materials, recipes, and techniques function as “knowledge”? How does the epistemic role of such things change *en route*? How and when do such things become stabilized as epistemic objects?

Two workshops with over 24 participants were held in 2014, followed by a two-week Working Group meeting in July 2015. The resulting volume, entitled *Entangled Itineraries of Materials, Practices, and Knowledge: Eurasian Nodes of Convergence and Transformation from Bronze to Tea* is currently in press at the University of Pittsburgh Press. It contains eleven essays that investigate the movement of materials, people, and practices—things that do not necessarily take a written form—in order to examine processes of knowledge-making across large spans of time and distance.

#### Table of Contents

Pamela H. Smith, *Introduction: Nodes of Convergence, Material Complexes, and Entangled Itineraries across Eurasia*

Part I: Movements, Entanglements, and Transformations across Eurasia

Tansen Sen, *Movements, Itineraries, and Cross-Regional Integration: South Asia-China Connections over the Longue Durée*

Ronit Yoeli-Tlalim, *The Silk Roads as a Model for Exploring Eurasian Transmissions of Medical Knowledge: Views from the Tibetan Medical Manuscripts of Dunhuang*

Part II: Mechanics of Knowledge-Making

Dagmar Schäfer, *What is a Thing? Things (wu) and Their Transformations (zaowu) in the Late Ming Dynasty: Song Yingxing's and Huang Cheng's Approach to Mobilizing Craft Knowledge*

Feza Günergrun, *Alchemy and Dervishes: The Emergence of a Field of Knowledge in Bursa, Turkey, 1500–1700*

Francesca Bray and Georg Freise, *Translating the Art of Tea: Naturalizing Chinese Savoir-Faire in British Assam*

Part III: Itineraries and Transformations: Wide Span Explorations

Angela Ki Che Leung and Chen Ming, *The Itinerary of Hing/Awei/Asafetida across Eurasia, 400–1800*

Pamela H. Smith, Joslyn DeVinney, Sasha Graft, and Xiaomeng Liu, *Smoke and Silkworms: The Itineraries of Material Complexes across Eurasia*

Tara Alberts, *Curative Commodities between Europe and Southeast Asia 1500–1700*

Part IV: Itineraries and Knowledge Formation: Small Span Circuits

Dorothy Ko, *Itineraries of Inkstones in Early Modern China*

Che-Chia Chang, *A Wooden Skeleton Emerges from the Knowledge Hub of Edo Japan*

### Islamic Scientific Manuscripts Initiative (ISMI)

WORKSHOP MEETING 29 February–1 March, 2016

ORGANIZERS Lorraine Daston (MPIWG), Jamil Ragep (McGill University, Canada), Sally P. Ragep (McGill University, Canada), Robert Casties (MPIWG)

COOPERATION PARTNERS Institute of Islamic Studies (IIS) at McGill University (Canada), Staatsbibliothek zu Berlin (Germany)

Other sponsors include the American Council on Learned Societies (2006–2007); the McGill Arts Undergraduate Research Internship Awards (2011, 2012); Canada Foundation for Innovation (2008–2013); Canada Research Chair in the History of Science in Islamic Societies (2007–2021); Gouvernement du Québec (2008–2013); Canada Social Sciences and Humanities Research Council, Partnership Development Grant (2015–2019).

Member Institutions of the ISMI Board: Institute for the Study of Muslim Civilizations, Aga Khan University (UK), Archimedes Project, Harvard University (USA), Filologia Semítica, Universitat de Barcelona (Spain), Encyclopaedia Islamica Foundation (Iran), Institute for the History of Arabic Science, Aleppo University (Syria), Institute for the History of Science and Technology (Russia), Institute of Ismaili Studies (UK), Warburg Institute (UK), Written Heritage Research Center (Iran)

Depictions of solar and lunar eclipses in an undated copy of a 1205/1206 CE work by Sharaf al-Din Maḥmūd ibn Muḥammad ibn 'Umar al-Jaghminī al-Khwārizmī, entitled *al-Mulakhkhaṣ fī al-hay'a al-baṣīṭa* (Epitome of Simplified Theoretical Astronomy). Staatsbibliothek Berlin, Wetzstein II 1135, f. 24a.



The mission of the Islamic Scientific Manuscripts Initiative (ISMI) is to make accessible information on all Islamic manuscripts in the exact sciences (astronomy, mathematics, optics, mathematical geography, music, mechanics, and related disciplines), whether in Arabic, Persian, Turkish, or other languages. ISMI represents a collaborative effort between the Institute of Islamic Studies (IIS) at McGill University in Montreal, Canada and the Max Planck Institute for the History of Science (MPIWG) in Berlin, Germany of more than ten years' duration". At the IIS, ISMI researchers and their colleagues at the related Post-classical Islamic Philosophy Database Initiative (PIPDI) have collected over 600,000 images from some 4,000 codices that have been the subject of in-depth examination. The MPIWG has been developing an innovative data model and an object-relational database (OpenMind) in which the data collected is stored and retrieved for analysis.

At present, the database contains entries for 2,400 "persons" (authors, annotators, copyists, correctors, dedicatees, illuminators, illustrators, inspectors, owners, patrons, students, readers, teachers, translators), who span the entire Islamic world from Islamic Spain to India and the borders of China, beginning in the eighth century and continuing until the nineteenth. The initiative continues to electronically link these individuals with texts, manuscript witnesses, locations of teaching and study, and so forth. Currently there are over 4,600 text entries and 15,000 manuscript witness entries in the database.

In February 2016, the MPIWG workshop "Working with ISMI: Scholars Take Stock of a New Tool" presented the database and the query and visualization tools under development to international scholars from relevant fields to discuss the additional possibilities this kind of database offers and receive suggestions for new or enhanced features.

### **Participants**

*Asad Ahmed* (University of California, Berkeley, USA)

*Robert Casties* (MPIWG)

*Andrew Hankinson* (University of Oxford, UK)

*Judith Pfeiffer* (University of Oxford, UK)

*Kim Plofker* (Union College, Schenectady, USA)

*Peter Pormann* (University of Manchester, UK)

*Jamil Ragep* (McGill University, Canada)

*Sally P. Ragep* (McGill University, Canada)

*Martin Raspe* (MPI Biblioteca Hertziana, Italy)

*Mònica Rius* (University of Barcelona, Spain)

*Raphaela Veit* (Universität Köln, Germany)

*Dirk Wintergrün* (MPIWG)

As a next step, the project plans to have a public launch, scheduled for fall 2018, of entries for the first 350 authors in the database, spanning the period 650–1050 CE. This will include information on the author, the scientific works, and manuscript witnesses of those works.



Later in 2018, another launch is planned, highlighting the capacity of the database to show chains of transmission and networks of dissemination. This pilot project involves two works by the science textbook writer al-Jaghmīnī (fl. 1200 CE): *al-Mulakhkhaṣ fī ‘ilm al-hay’*a on astronomy, and *al-Qānūnča* on medicine. Both had extensive commentary traditions and gave rise to numerous derivative works and translations that can be made particularly vivid using the visualization tools developed by the IT team at the MPIWG. These tools showcase the group’s ability to map the intellectual, institutional, religious, and social contexts of Islamic scientific traditions.



#### SELECTED PUBLICATIONS

Ragep, F. Jamil and Taro Mimura, eds. *On Astronomia: an Arabic critical edition and English translation of Epistle 3. Epistles of The Brethren of Purity*. Oxford: Oxford University Press, 2015.

Ragep, Sally. *Jaghmīnī’s Mulakhkhaṣ: an Islamic introduction to Ptolemaic astronomy*. Sources and studies in the history of mathematics and physical sciences. Cham: Springer, 2016.

Ragep, F. Jamil. “*Ibn al-Shāṭir and Copernicus: the Uppsala notes revisited.*” *Journal for the History of Astronomy* 47 (4 2016): 395–415.

#### Completed Project

##### Testing Drugs and Trying Cures in the Early Modern World

see MPG Minerva Research Group

→ pp. 181ff.

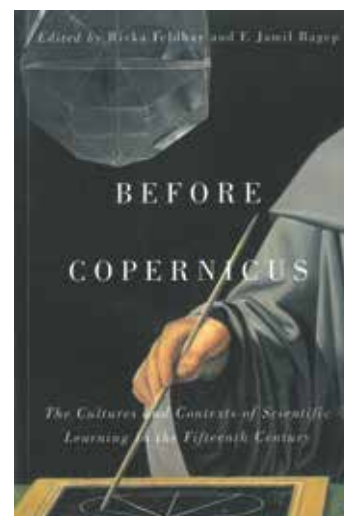
#### Completed Project

##### Before Copernicus: The Cultures and Contexts of Scientific Learning in the Fifteenth Century

DURATION 2008–2017

ORGANIZERS *Rivka Feldhay* (Tel Aviv University), *Jamil Ragep* (McGill University, Canada)

This collection of essays explores the multicultural, multireligious, and multilingual contexts of learning in the Mediterranean region on the eve of the Copernican revolution. Although Copernicus’s work and its influence have been the subject of a number of excellent studies, there has been surprisingly little attention paid to Copernicus’s sources and the diverse cultures and contexts of learning in which he lived and was educated. The main topics of the Working Group volume are (a) the European cultural background, (b) the fifteenth-century astronomical background, (c) epistemological and conceptual foundations, (d) intercultural transmission, and (e) Copernicus’s immediate predecessors. The volume was published by McGill-Queen’s University Press in 2017.







PUBLICATION

Feldhay, Rivka and F. Jamil Ragep. *Before Copernicus: the cultures and contexts of scientific learning in the fifteenth century*. McGill-Queen's Studies in the history of ideas series 71. Montreal: McGill-Queen's University Press, 2017.

**Table of Contents**

Jamil Ragep and Rivka Feldhay, *Introduction*

Part One: The Fifteenth-Century European Social and Political Contexts

Christopher S. Celenza, *What Did It Mean to Live in the Long Fifteenth Century?*

Nancy Bisaha, *European Cross-Cultural Contexts before Copernicus*

Part Two: The Fifteenth-Century European Intellectual and Scientific Contexts

Edith Dudley Sylla, *The Status of Astronomy as a Science in Fifteenth-Century Cracow: Ibn al-Haytham, Peurbach, and Copernicus*

Michael H. Shank, *Regiomontanus and Astronomical Controversy in the Background of Copernicus*

Raz Chen-Morris and Rivka Feldhay, *Framing the Appearances in the Fifteenth Century: Alberti, Cusa, Regiomontanus, and Copernicus*

Part Three: The Multicultural Astronomical Background to the Copernican Revolution

Sally P. Ragep, *Fifteenth-Century Astronomy in the Islamic World*

Jamil Ragep, *From Tūn to Torun: The Twists and Turns of the Tūsi-Couple*

Robert Morrison, *Jews as Scientific Intermediaries in the European Renaissance*

**Workshops and Conferences**

**Colonial Sciences and Indigenous Knowledge Systems in South Asia**

June 10–11, 2016

ORGANIZER *Minakshi Menon* (MPIWG/Humboldt-Universität zu Berlin and Center for the History of Knowledge, Berlin, Germany), co-sponsored by Dept. III.

What are the indigenous knowledge systems in South Asia that map onto the English word “science”? What do we mean when we speak of “colonial science” in South Asia?

The workshop addressed these questions by examining Sanskrit, vernacular, and Indo-Muslim knowledge systems such as ayurveda, unani, and jyotishastra, tracing the changes produced in them once they were appropriated by Western categories of knowledge. The main goals of the workshop were to identify pre-colonial forms of thought considered systematic knowledge/science; to trace their careers in the colonial world; and to chart the new scientific knowledge forms and the practices associated with them that colonialism engendered.

John Flaxman's (1755–1826) memorial to Sir William Jones in the chapel of University College, Oxford. Jones is seated on a chair codifying a digest of Hindu and Islamic law, with his indigenous informants huddled at his feet in postures of quiet contemplation.



## Participants

*D. Senthil Babu* (French Institute of Pondicherry, France)

*Sonja Brentjes* (MPIWG)

*Anthony Cerulli* (University of Wisconsin, USA)

*Pratik Chakrabarti* (The University of Manchester, UK)

*Clare Griffin* (MPIWG)

*Diana Lange* (Humboldt-Universität zu Berlin, Germany)

*Projit Bihari Mukharji* (University of Pennsylvania, USA)

*Cristina Pecchia* (Austrian Academy of Sciences)

*Kim Plofker* (University of Utrecht, Netherlands)

*Dagmar Schäfer* (MPIWG)

*Matthias Schemmel* (MPIWG)

*Michael Stanley-Baker* (MPIWG)

## Individual Projects

*Anna Echterhölter* (Postdoctoral Fellow, MPIWG/Humboldt-Universität zu Berlin, Germany; as of April 2018 Professor for History of Science, Universität Wien, Austria)

### Paper Weights: August Boeckh's Metrology and the Transformation of the Economic Archive

When Julius Oppert sent the first letter from his excavation in Babylon in 1853 there was much at stake for classical philologist August Boeckh. His system of “comparative



metrology” rested on the equivalence of the Egyptian and the Babylonian cubit. But fortunately the new archaeological findings sustained his monumental theoretical architecture: all ancient systems of measurement are interlinked. They constitute an intangible order governing the private economy of the household just as chronology shapes the public sphere. This is but one instance from a long and largely unwritten history of social metrology. Several disciplines in

nineteenth-century Germany comprise social as well as scientific concerns—such as Germanic law, the auxiliary sciences of history, theories on the origin of money, or the financialization of colonies. Measurement emerges from these accounts as a practice that produces equivalents that may, at second sight, be revealed as asymmetric.



Anna Echterhölter

Metrology as balancing act (detail). From Jacob Leupold, *Theatrum Staticum Universale das ist Schauplatz der gewichts-Kunst und Waagen* (1726). Reprint Leipzig (1926), vol. 1, p. 254.



SELECTED PUBLICATIONS

Echterhölter, Anna. “Jack Goody: die Liste als administrative Praktik.” In *Die Liste: Ordnungen von Dingen und Menschen in Ägypten*, eds. Susanne Deicher and Erik Maroko. 243–261. Berlin: Kulturverlag Kadmos, 2015.

Echterhölter, Anna. “Data, diplomacy, and liberalism: August Ferdinand Lueder’s critique of German descriptive statistics (c. 1810).” *Bulletin of the German Historical Institute* 59 (2016): 83–102.

Echterhölter, Anna. “Injury and measurement: Jacob Grimm on blood money and concrete quantification.” *Social Analysis* 61 (4 2017): 31–48.

*Minakshi Menon* (Postdoctoral Fellow, MPWIG/ as of September 2017: Postdoctoral Fellow, Berlin Center for the History of Knowledge/Humboldt-Universität zu Berlin, Germany)

**Sanskrit Names on Paper: Knowing Plants in East India Company Bengal, ca. 1790**



Minakshi Menon



*Plumeria rubra* of Linnaeus, i. e. *Frangipani*, by Lady Anna Maria Jones, annotated in her hand with Sanskrit, Bengali and Malay names (1791). Image: Courtesy the Royal Asiatic Society, UK.

Two British orientalists in colonial Bengal, William Jones (1746–1794) and Henry Thomas Colebrooke (1765–1837), produced English translations of a famous Sanskrit verse lexicon, the *Amara Kośa*, which they mined for Sanskrit plant names. Jones used his translation of the *Amara* to create plant descriptions bringing together Sanskrit names and Linnaean classification. In so doing he drew on John Locke’s Rule of Propriety, which specified names of “common use” as the aid to better communication about the properties of objects. Colebrooke worked hard to stabilize Sanskrit plant names by linking them to their equivalents in the Indian vernaculars. Both men used forms of visualizing plants

names – lists and tables – which would have been impossible without access to rectangular sheets of European paper. The project explored how Jones and Colebrooke re-visualized and re-structured the information in the *Amara*, producing new knowledge practices for identifying Indian plants.



SELECTED PUBLICATIONS

Menon, Minakshi. “Medicine, money and the making of the East India Company State: William Roxburgh in Madras, c. 1790.” In *Histories of medicine and healing in the Indian Ocean World. Vol. 1: The medieval and early modern period*, eds. Anna Winterbottom and Facil Tesfaye. 151–178. New York, NY: Palgrave MacMillan, 2015.

Menon, Minakshi. “Grains of paradise and reading against the grain: telling stories about science in the Global South. Essay Review of: Crawford, Matthew: *The Andean wonder drug*. Pittsburgh, PA: University of Pittsburgh Press 2016; and Osseo Asare, Abena Dove: *Bitter Roots*. Chicago: The University of Chicago Press 2014.” *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 66 (2017): 83–86.

Mårten Söderblom Saarela (Postdoctoral Fellow, MPIWG, as of January 2019: Assistant Research Fellow, Institute of Modern History at Academia Sinica, Taiwan)

### Manchu and the Study of Language in China

This project focuses on the Manchu language, particularly its script’s influence on language studies in Qing China, covering the period 1607–1911: how Manchu was developed as a written language by the early Qing rulers and subsequently taught, used, and theorized by individuals both inside and outside the empire. Visible in administrative, pedagogical, and scholarly texts is the relationship between Manchu and Chinese. The project is especially interested in the heritage left by Manchu language



studies in China as the language declined as a tool of spoken communication. The generally assumed but poorly understood decline of Manchu coincided with the emergence of a normative form of Chinese out of an earlier imperial multilingualism. Four papers are forthcoming in 2018, among them the article, “Shooting Characters’: A Phonological Game and Its Uses in Late Imperial China,” in *Journal of the American Oriental Society* 138.2.



Mårten Söderblom Saarela

Beijing children pretending to be scholars (19th century). From Andrew Lo et al., eds., *Daying Tushu Guan tecang Zhongguo Qingdai waixiao hua jinghua* (Chinese Export Paintings of the Qing Period in the British Library) Guangzhou (2011), vol. 8, p. 66.

Dror Weil (Postdoctoral Fellow, MPIWG/Berlin Center for the History of Knowledge)

### The Circulation of Arabo-Persian Medical Knowledge in China, Thirteenth to Eighteenth Centuries

Arabo-Persian-inspired physiological and pharmacological theories and concepts were read and transformed into praxis in China between the thirteenth and nineteenth centuries, before and after the arrival of European missionaries in China. By focusing on a Chinese pharmaceutical manual from the fifteenth century and works on natural philosophy from the seventeenth and early eighteenth centuries, this project explores the role of translation, widely defined, in transcending the linguistic, cultural, and theoretical boundaries inherent to the movement of medical knowledge



Dror Weil

from the Islamic world to China, and the types of negotiation of meaning it entailed. A book chapter from an earlier work, entitled “The Fourteenth-Century Transformation in China’s Reception of Arabo-Persian Astronomy,” is forthcoming in 2018 in Patrick Manning and Abigail Owen (eds.) *Knowledge in Translation: Global Patterns of Scientific Exchange, 1000–1800 CE* (Pittsburgh: University of Pittsburgh Press), 345–370.

#### Short-term Visiting Scholars

*Daniel Boyarin* (University of California, Berkeley, USA)

*Eugenia Lao* (University of Maryland, USA)

*Ruth Morgan* (Monash University, Australia)

*Katharine Park* (Harvard University, USA)

*Ahmed Ragab* (Harvard University, USA)

*Gabriela Soto Laveaga* (Harvard University, USA)

## Pre- and Postdocs

During the reporting period 2015–2017, Department II hosted 56 pre- and postdoctoral fellows from 13 countries for periods ranging from one month to three years, with both MPIWG and external funding. The research of longer-term, MPIWG-financed postdocs is described above under the relevant project; predoctoral fellows funded with Fellowships of Department II who completed their dissertations are listed below, including the title of their dissertations and information on positions taken upon leaving the MPI. For ready reference, a list of additional visiting pre- and postdoctoral fellows resident in Department II for shorter periods and their funding

institutions is also provided here. Some 95 publications, incorporated in Dept. II’s bibliography on the green pages at the end of this section, have resulted from their stay.

The 2017/18 cohort of postdocs:  
Maria Avxentevskaya, Märten Söderblom  
Saarela, Hansun Hsiung, and  
Ion Mihailescu, with Christine von Oertzen  
and Sebastian Felten.





### Completed Dissertations

*Noam Andrews* (Harvard University, USA), “Irregular Bodies: Geometry and Material Culture in Early Modern Germany,” completed 2016; Assistant Professor/Faculty Fellow, Gallatin School of Individualized Study, New York University, USA.

*José Beltran* (European University Institute, Florence, Italy), “Scribal Scholars: The Manuscript Economy of Overseas Natural History in France, 1660–1760,” completed 2017; Postdoctoral Fellow and Lecturer, École normale supérieure de Paris, département d’histoire, France.

*Dorit Brixius* (European University Institute, Florence, Italy), “French Empire on the Ground: Plants, Peoples, and Knowledge in the Service of Eighteenth-Century Isle de France,” completed 2017; Postdoctoral Fellow, German Historical Institute Paris, France.

*Nele Diekmann* (Freie Universität Berlin, Germany), “Talbot’s Tools: Scientific Notebooks as a Laboratory of Victorian Scholarship,” completion 2015; Editor, de Gruyter Academic Publishers, Berlin, Germany.

*Evan Hepler-Smith* (Princeton University, USA), “Nominally Rational: Systematic Nomenclature and the Structure of Organic Chemistry, 1889–1940,” completion 2016; Postdoctoral Fellow, Harvard University Center for the Environment.

*Sonam Kachru* (University of Chicago, USA), “Minds and Worlds: A Philosophical Commentary on the Twenty Verses of Vasubandhu,” completed in 2015; Assistant Professor, Department of Religious Studies, University of Virginia, USA.

*Whitney Laemmli* (University of Pennsylvania, USA), “The Choreography of Everyday Life: Rudolf Laban and the Making of Modern Movement,” completed 2016; Postdoctoral Fellow, Society of Fellows in the Humanities, Columbia University, as of 2018: Assistant Professor of the history of technology, Department of History, Carnegie Mellon University, USA.

*Daniel Messner* (Universität Wien, Austria), “Die Erfindung der Biometrie: Identifizierungstechniken und ihre Anwendungen, 1870–1914,” completed 2015; Communication and Public Outreach Officer, Universität Hamburg, Germany.

*Anja Sattelmacher* (Humboldt-Universität zu Berlin, Germany), “Anschauen, Anfassen, Auffassen: Eine Wissensgeschichte mathematischer Modelle,” completed 2017; Postdoctoral Fellow, Berlin Center for the History of Knowledge, Germany.

*Tillmann Taape* (University of Cambridge, UK), “Hieronymus Brunschwig and the Making of Vernacular Medical Knowledge in Early German Print,” completed 2017; Postdoctoral Scholar, The Making and Knowing Project, Columbia University, USA.

*Elisabeth Wallmann* (University of Warwick, UK), “Enlightening Insects: Insects and the Formation of the French Enlightenment,” completion 2016; Early Career Fellow at the Institute of Advanced Study, University of Warwick, UK.



**Visiting Pre- and Postdocs (and their Funding Institutions)**

*Susanna Berger* (Princeton University, USA/Princeton Society of Fellows in the Liberal Arts, USA)  
*Melissa Charenko* (University of Wisconsin, Madison, USA/MPIWG)  
*Ashley Clark* (University of Chicago, USA/MPIWG)  
*Camille Creighton* (University of Amsterdam, the Netherlands/Vossius Center for the History of Humanities and Sciences, the Netherlands)  
*Ryan Dahn* (University of Chicago, USA/MPIWG)  
*Vincent Deluze* (University of Geneva, Switzerland/Fonds National Suisse pour la Recherche Scientifique)  
*Abram Kaplan* (Columbia University, USA/Society of Fellows, Harvard University, USA)  
*Christian Flow* (Princeton University, USA/MPIWG)  
*Kate Grauvogel* (University of Indiana, Bloomington, USA/MPIWG)  
*Ivo Gurschler* (University of Vienna/ Junior Fellow Abroad, International Research Institute for Cultural Studies, Vienna)  
*Emma Hagström-Molin* (University of Uppsala, Sweden/Swedish Research Council)  
*James Hall* (University of Cambridge, UK/MPIWG)  
*Lily Huang* (University of Chicago, USA/MPIWG)  
*Adam Fulton Johnson* (University of Michigan Ann Arbor, USA/MPIWG)  
*Sophie Ledebur* (MPIWG)  
*Ian Lawson* (University of Sydney, Australia/MPIWG)  
*Daniel Liu* (University of Illinois, USA/Andrew Mellon Postdoctoral Fellowship in the Biohumanities)  
*Anna-Maria Meister* (Princeton University, USA/MPIWG)  
*Thilo Neidhöfer* (Universität Linz, Austria/International Research Center for Cultural Studies in Vienna)  
*Felix Ohnmacht* (The Graduate Institute, Université de Genève, Switzerland/Swiss National Science Foundation)  
*Penaloza Brooks* (Universität Wien, Austria/Austrian Academy of Sciences DOC Program)  
*Abram Kaplan* (Columbia University, USA/DAAD)  
*Felix Rietmann* (Princeton University, USA/MPIWG)  
*Susanne Schmidt* (University of Cambridge, UK/Studienstiftung des deutschen Volkes and the HPS Department and the Arts and Humanities Research Council),  
*Floris Solleveld* (Radboud University, the Netherlands/MPIWG)  
*Richard Spiegel* (Princeton University, USA/Princeton History Department and the Social Sciences and Humanities Research Council of Canada)  
*Alma Steingart* (Harvard University, USA/Society of Fellows, Harvard University, USA)  
*Carolyn Taratko* (Vanderbilt University, USA/ IIE Fulbright Research Award)  
*Barbara Tramelli* (MPIWG)  
*Jessica Varner* (Massachusetts Institute of Technology, USA/MIT)  
*Abril de Vasquez* (Universitat Autònoma de Barcelona, Spain/Mexican National Council of Science and Technology)  
*Oriana Walker* (MPIWG)  
*Gloria Yu* (University of California, Berkeley, USA/UC Berkeley Graduate Division and the Department of History).

MPG Minerva Research Group

## Reading and Writing Nature in Early Modern Europe



DURATION 2012–2018

RESEARCH GROUP LEADER *Elaine Leong* (MPIWG/MPG Minerva Program; as of January 2019: Wellcome University Award Lecturer, University College London, UK)

Portrait of two of the engravers of Leonhard Fuchs's *De historia stirpium commentarii insignes...* (1542). The men are identified as Heinrich Füllmaurer and Albertus Neher. Courtesy of Wellcome Collection, London, UK.

This research group explores the myriad of different ways in which early modern Europeans read the “book of nature.” Focusing on health-related knowledge and activities, the group has two main research goals. First, it seeks to understand the codification of vernacular and learned natural knowledge through the examination of reading and writing practices as epistemic processes. Within this first strand, members of the group interrogated “paper technologies” such as notebooks, letters, and hair curling paper in the working group “Working with Paper.” A second working group, “Translating Medicine in the Premodern World,” focuses on the intersections between practices of medicine and translation. This group aims to probe a broad range of “translation practices” from linguistic translation to reading to visualization. The digital humanities project “Vernacular Medical Books in Early Modern England” offers opportunities to investigate the relationship between medical knowledge and book production, particularly in the area of translation.

By analyzing drugs and cures, the second research strand investigates how men and women have sought to read and understand their own bodies and the natural and material world around them. Projects within this strand include the working group “Testing Drugs and Trying Cures,” the collaborative research blog “The Recipes Project,” and the citizen transcription project “Early Modern Recipes Online Collective.”

## Working Groups

### Translating Medicine in the Premodern World

Workshops: June 23–24 and July 7–8, 2017; working group in residence: August 12–18, 2018

ORGANIZERS *Tara Alberts* (University of York, UK), *Sietske Fransen* (University of Cambridge, UK), *Elaine Leong* (MPIWG/MPG Minerva Program/University College London, UK)



A drawing of a cyclamen in a seventeenth-century Japanese herbal with names of the plant in Old Dutch, Chinese, Japanese, and Latin. Wellcome Library, Japanese Collection 58, illustration 28. Courtesy of Wellcome Collection, London, UK.

Understandings of the human body, and of diseases and their cure, are shaped and informed by a range of religious, cultural, environmental, and intellectual factors. Medical theories, practices, and materials, therefore, rarely move across linguistic, cultural, or other boundaries unchanged. Communicating the concepts underpinning a medical theory in a new linguistic and cultural space means not only translating these ideas into a new language, but also explaining them so that they make sense within existing local systems of medical belief. Materials—including drugs, amulets, and surgical tools—can also change as they cross cultural boundaries: varied and changing beliefs about their meaning, proper use, and effectiveness cause them to be reimagined and reused in a range of new situations. As a result, complex systems of translation developed to enable the flow of knowledge about the human body across the global world. This working group asks: What kinds of knowledge easily crossed linguistic and geographical borders? What were the points of resistance and tension? How did epistemic, social, political, and economic structures impact upon “translation”? How did our historical actors “translate” embodied knowledge and hands-on practices? What roles did visual images and material objects play in the

transfer and appropriation of health-related knowledge? This project opened with two exploratory workshops in 2017; a further week-long authors’ workshop is scheduled August 2018 with the aim of submitting a manuscript for publication in 2019.

#### Participants and projects

*Tara Alberts* (University of York, UK), *Translating Techniques of Alchemy and Surgery between Europe and Southeast Asia*

*Montserrat Cabré* (Universidad de Cantabria, Spain), *Medieval Catalan Translations on Women’s Health*

*Sietske Fransen* (Cambridge University, UK), *Thinking in Tables: Translating Medical Knowledge in Seventeenth-Century Europe*

*Pablo F. Gómez* (University of Wisconsin-Madison, USA), *Translating Health Practices in the Early Modern Caribbean*

*Hansun Hsiung* (MPIWG), *The Breast of Rihei’s Mother: Patients, Portraits, and the Translation of Medical Virtues in Japan, ca. 1800*

*Elaine Leong* (MPIWG/MPG Minerva Program/University College London, UK), *Translating, Printing, and Reading John French’s The Art of Distillation*

Projit Bihari Mukharji (University of Pennsylvania, USA), *Feringhee Seductress: Translating Love Magic in the Ibero-Mughal World*  
 Alisha Rankin (Tufts University, USA), *Monardes on the Move: New World Drugs and the Language of Experience in European Vernacular Translations*  
 Ahmed Ragab (Harvard University, USA), *Translation as Diffusion: Rethinking the Making of Medieval Islamic Medicine*  
 Daniel Trambaiolo (University of Hong Kong), *Afterword*  
 Ronit Yoeli-Tlalim (Goldsmiths, University of London, UK), *Lost, and Found in Translation: Narrating the Origins of Medicine*  
 Dror Weil (MPIWG), *The Body Translated: Representations of Arabo-Persian Physiology in Late Imperial China*

### Working with Paper: Gendered Practices in the History of Knowledge

with Department II

ORGANIZERS *Carla Bittel* (Loyola Marymount University, USA), *Elaine Leong* (MPIWG/MPG Minerva Program/University College London, UK), *Christine von Oertzen* (MPIWG)

The research aims, activities, and outputs of this working group are described under “Gender Studies of Science.”

→ pp. 169ff.

### Completed Project

#### Testing Drugs and Trying Cures in Medieval and Early Modern Europe

DURATION 2014–2017

ORGANIZERS *Elaine Leong* (MPIWG/MPG Minerva Program/University College London, UK), *Alisha Rankin* (Tufts University, USA)

This working group investigated the traditions of testing drugs (as substances) and trying cures (on patients) in medieval and early modern Europe. Published as a special issue of the *Bulletin of the History of Medicine* in 2017, the collection of twelve essays demonstrate that the practice of conducting thoughtful—and sometimes contrived—tests on drugs has a rich and varied tradition dating back to antiquity, which expanded in the Middle Ages and early modern period. The activities surveyed by the group took a wide variety of forms, from theoretical trials on paper in learned tomes, to structured repeated experiments set in the newly founded academies, to tests conducted in domestic spaces. The historical actors not only tested for efficacy but also in order to uncover the composition and effects of particular ingredients. Although drug-testing practices expanded in scale, actors, and sites, there was significant continuity from the Middle Ages to the eighteenth century. When taken together, the essays paint a complex picture of the varied ways in which testing drugs and trying cures feature in histories of science and medicine in the early modern world and



argue that the history of drug testing needs to be a more central story to overall histories of scientific experiment.



PUBLICATION

Leong, Elaine and Alisha Rankin, eds. *Testing drugs and trying cures*. Bulletin of the History of Medicine: Special issue; 91/2. Baltimore: Johns Hopkins University Press, 2017.

---

**Table of Contents**

Elaine Leong, Alisha Rankin, *Testing Drugs and Trying Cures: Experiment and Medicine in Medieval and Early Modern Europe*

Michael McVaugh, *Determining a Drug's Properties: Medieval Experimental Protocols*

Erik A. Heinrichs, *The Live Chicken Treatment for Buboes: Trying a Plague Cure in Medieval and Early Modern Europe*

Valentina Pugliano, *Pharmacy, Testing, and the Language of Truth in Renaissance Italy*

Alisha Rankin, *On Anecdote and Antidotes: Poison Trials in Sixteenth-Century Europe*

Michael Bycroft, *Iatrochemistry and the Evaluation of Mineral Waters in France, 600–1750*

Evan R. Ragland, *Experimental Clinical Medicine and Drug Action in Mid-Seventeenth-Century Leiden*

Justin Rivest, *Testing Drugs and Attesting Cures: Pharmaceutical Monopolies and Military Contracts in Eighteenth-Century France*

Francesco Paolo De Ceglia, *Playing God: Testing, Modeling, and Imitating Blood Miracles in Eighteenth-Century Europe*

Jeremy A. Greene, *Therapeutic Proofs and Medical Truths: The Enduring Legacy of Early Modern Drug Trials*

---

**Co-sponsored workshops**

In 2016, the MPG Minerva Research Group co-sponsored the “New Directions in the Cultural History of Medicine” workshop with Claudia Stein (University of Warwick, UK). The workshop will lead to the publication of *A Cultural History of Medicine: The Renaissance* (contracted with Bloomsbury Publishing, forthcoming, 2018). The volume is edited by Elaine Leong and Claudia Stein. Contributors to the volume include: Sandra Cavallo (Royal Holloway, University of London, UK); Rebecca Earle (University of Warwick, UK); Karin Ekholm (St. Johns College, USA); Angus Gowland (University College London, UK); Natalie Kauokji (University of Cambridge, UK); Sachiko Kusukawa (University of Cambridge, UK); Alisha Rankin (Tufts University, USA), and Olivia Weisser (University of Massachusetts, Boston, USA).

In 2017, as part of the activities of the “Translating Medicine in the Early Modern World” working group, a workshop on the same theme was co-organized with Elma



Brenner (Wellcome Library) and Sandra Cavallo (Royal Holloway, University of London). The workshop was held at the Wellcome Library, London. In 2018, with Angela Creager (Princeton University), Mathias Grote (Humboldt-University Berlin), and Kerstin von der Krone (German Historical Institute, Washington DC), the group will co-host a conference titled “Learning by the Book: Manuals and Handbooks in the History of Knowledge” which will take place at Princeton University. The workshop will examine how handbooks, protocols, manuals, catalogues, and related instructional or reference media have contributed to the standardization, codification, transmission, and revision of knowledge in diverse fields.

### Digital Humanities Projects

#### Vernacular Medical Books in Early Modern England

ORGANIZERS *Mary Fissell* (John Hopkins University, USA), *Elaine Leong* (MPIWG/MPG Minerva Program/University College London, UK)

RESEARCH IT ORGANIZERS *Robert Casties* (MPIWG), *Florian Kräutli* (MPIWG)  
<https://reem.mpiwg-berlin.mpg.de/>

This project documents and makes searchable (by title, author, subject, and other categories) all pre-1700 medical books published in English. The database contains entries for almost 3,000 titles, 1,500 persons (authors, publishers, and booksellers) and 500 sites (printing houses and bookshops). First conceived as a research project to analyze medical print in early modern England, *Vernacular Medical Books* has blossomed into a project that is both pedagogical and research-driven. Working with a close-knit group of professors at a diverse array of colleges and universities, the group is designing the database to introduce students to early modern medicine and to techniques of digital history, such as text mining and network analysis. At the same time, the database is a rich resource for researching a wide range of topics in early modern health and healing. As the project matures, additional content (links to the Early Modern Map of London, short articles on particular books, historical actors, and places) will be crowdsourced via student assignments.

The project team hosted an informal working meeting in 2017 to foster conversations with researchers and teachers who might use the database in their projects and classrooms. A follow-up meeting is planned for September 2018, funded by John Hopkins University.

The doctor's dispensary and the apothecary's shop in the 17th century. Pictures facing the title page of *The Expert Doctor's Dispensary* by Nicholas Culpepper (1616–1654). Likely translated from *Formulae remediorum* by Pierre Morel and Johannes Jacob Brunn. Courtesy of Wellcome Collection, London, UK.





## Early Modern Recipes Online Collective

ORGANIZERS *Rebecca Laroche* (University of Colorado at Colorado Springs, USA), *Elaine Leong* (MPIWG/MPG Minerva Program/University College London, UK), *Jennifer Munroe* (University of North Carolina at Charlotte, USA), *Hillary Nunn* (University of Akron, USA), *Lisa Smith* (University of Sussex, UK), *Amy Tigner* (University of Texas, Arlington, USA), *Heather Wolfe* (Folger Shakespeare Library, USA)

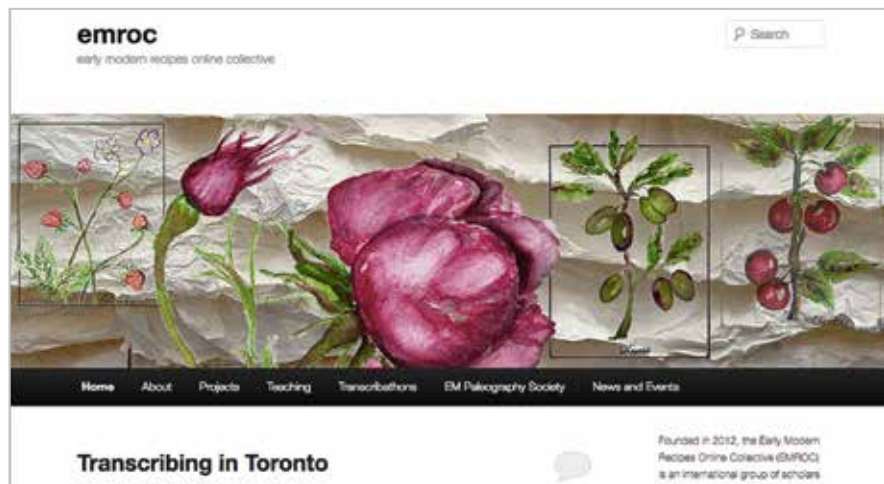
COOPERATION PARTNER Folger Shakespeare Library, USA

<https://emroc.hypotheses.org/> and

<https://emmo.folger.edu/>

This project is a research-led pedagogical experiment. It brings together students from campuses in the United Kingdom, United States, and Germany to create a dataset of recipes through crowd-sourced transcriptions. Using the Dromio transcription platform developed by the Folger Shakespeare Library, project members produce triple-keyed transcriptions encoded by basic XML tagging adhering to the standards of the Text Encoding Initiative (TEI). In 2015, 2016, and 2017, EMROC organized three 12-hour international transcribathons, involving over 300 international contributors to transcribe a number of texts including the recipe books of Rebeckah Winche (d. 1713) and Grace Castleton (1635–1667). Since 2012, the project has involved over 1,000 contributors and produced complete transcriptions of more than 20 recipe manuscripts (around 3,000 pages). In 2017, funded by the Institute of Museum and Library Services and the Pine Tree Foundation, the Folger Shakespeare Library staff has begun to vet and publish the resulting transcriptions on the Early Modern Manuscripts Online platform.

Screenshot of the EMROC project website at <https://emroc.hypotheses.org>.



## Research Blog

### The Recipes Project

EDITORS *Jessica Clark* (Brock University, Canada, since 2018), *Elaine Leong* (MPIWG/MPG Minerva Program/University College London, UK, since 2012), *Amanda Herbert* (Folger Shakespeare Library, USA, since 2014), *Lisa Smith* (University of Essex, UK, since 2012), and *Laurence Totelin* (Cardiff University, UK, since 2015).

SOCIAL MEDIA MANAGER *Laura Mitchell* (University of Toronto, Canada, since 2012).

<https://recipes.hypotheses.org/>

*The Recipes Project* is an international collaborative project aiming to gather and showcase interdisciplinary research on recipes across broad temporal, geographical, and epistemic spans. The project provides a platform for researchers to share their newest archival discoveries of recipes with a broad range of readers who work both inside and outside of academia. Envisioned as a long-term digital research network, the blog fosters cross-discipline conversations amongst researchers at all stages of their careers. The project also runs thematic series, offers a resources area with a collective Zotero bibliography, and, every September, highlights the wonderful ways in which colleagues use recipe texts in their teaching activities. Since its foundation in 2012, the blog has published over 700 posts by more than 100 scholars and draws some 25,000 unique readers per month. The project was runner-up for the British Society for the History of Science's Digital Engagement Prize in 2015. In 2017, funded by the University of Essex, the project ran a month-long cross-media virtual conversation on the question "What is a Recipe?"

### Individual projects

*Clare Griffin* (Postdoctoral Fellow, MPIWG; as of August 2017: Assistant Professor, Nazarbayev University, Kazakhstan)

### Dangerous Drugs: Global Medicines in Early Modern Russia

*Dangerous Drugs* traces the impact of early modern globalization on the dividing line between good and bad consumable medicines in Russia from 1534—the earliest translation of a Western European herbal into Slavonic—to 1750, when an empire-wide decree on medical drugs was promulgated. During this period, medical practitioners in Russia had access to local plants; Afro-Eurasian herbal medicines such as rhubarb from China; animal parts; corpse medicines such as mumia, a powder made from preserved human bodies; chemical medicines; and American drugs, commodified in post-1492 Eurasia by the Spanish and Portuguese empires. Russian Orthodox concerns over pollution led to restrictions on the animal- and corpse-based medicines, restrictions that were codified in the early seventeenth century; conversely, that categoric restriction led to an openness regarding the geography of herbal medicines, and to heavy exploitation of the global medical drugs markets, notably in order to

Early modern Russian manuscript herbal (detail). Library of the Academy of Sciences, St. Petersburg, Russia. Photo: Clare Griffin.

import an increasing number of American plant drugs. *Dangerous Drugs*, by focusing on the consumption and regulation of medical drugs, rather than the now-familiar histories centered on the loci of production, places Russia at the center of the early modern global world, consuming medical commodities from the ends of the earth, but according to local priorities and concerns.



SELECTED PUBLICATIONS

Griffin, Clare. "In search of an audience: popular pharmacies and the limits of literate medicine in late seventeenth- and early eighteenth-century Russia." *Bulletin of the History of Medicine* 89 (4 2015): 705–732.

Griffin, Clare. "Bureaucracy and knowledge creation: the apothecary chancery." In *Information and Empire: mechanisms of communication in Russia, 1600–1850*, eds. Simon Franklin and Katherine Bowers. 255–285. Cambridge: Open Book Publishers, 2017.

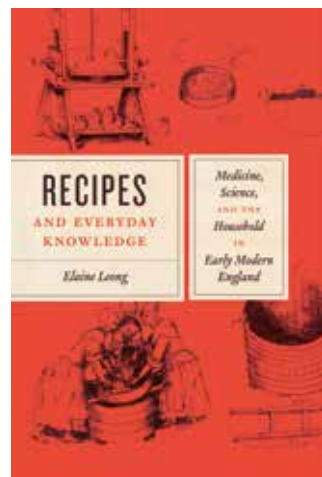
Elaine Leong (Research Group Leader MPIWG/MPG Minerva Program; as of January 2019, Wellcome University Award Lecturer, University College London, UK)

**Recipes and Everyday Knowledge: Medicine, Science, and the Household in Early Modern England**



Elaine Leong

Early modern English men and women were fascinated by recipes. Across the country, people of all ranks enthusiastically collected, exchanged, and experimented with medical and cookery instructions. They sent recipes in letters, borrowed handwritten books of family recipes, and consulted popular printed medical and culinary books.



*Recipes and Everyday Knowledge* is the first major study of knowledge production and transfer in early modern households. It places the production and circulation of recipes at the heart of "household science"—quotidian investigations of the natural world—and situates these practices in larger and current conversations in gender and cultural history, the history of the book and archives, and the history of science, medicine, and technology. Household recipe knowledge was made through continual, repeated, and collective trying, making, reading, and writing. And recipe trials were one of the main ways householders gained deeper understandings of sickness, health and the human body, and the natu-

ral and material worlds. Recipes were also social knowledge. Recipes and recipe books were gifted between friends, viewed as family treasures, and passed down from generation to generation. By recovering the knowledge activities of householders—masters, servants, husbands, and wives—this project recasts current narratives of early modern science through elucidating the very spaces and contexts in which famous experimental philosophers worked and, crucially, by extending the parameters of natural inquiry. The resulting monograph, entitled *Recipes and Everyday Knowledge: Medicine, Science, and the Household in Early Modern England* will be published with the University of Chicago Press in October 2018.



## SELECTED PUBLICATIONS

Leong, Elaine. “Herbals she peruseth’: reading medicine in early modern England.” In *History of medicine. Vol. 2: Early modern medicine*, eds. Roger Cooter and Claudia Stein. 292–316. London: Routledge, 2016.

Leong, Elaine. “Brewing ale and boiling water in 1651.” In *The structures of practical knowledge*, ed. Matteo Valleriani. 55–75. Cham: Springer, 2017.

Leong, Elaine and Alisha Rankin. “Testing drugs and trying cures: experiment and medicine in medieval and early modern Europe.” *Bulletin of the History of Medicine* 92 (2 2017): 157–182.

Jaya Remond (Postdoctoral Fellow, MPIWG/The Getty Foundation, Los Angeles, USA) Funded by the Gerda Henkel Foundation.

### Imperial Nature: Botanical Illustration between Northern Europe and the New World (1550–1750)



This research project studies the production of botanical illustrations depicting “exotic” plants in early modern Northern Europe (1550–1750), with a focus on France, the Low Countries, and their relationship to the Caribbean. It analyzes the evolutions in the pictorial descriptions of New World flora and questions the artistic, scientific, and commercial stakes of such representations. Indeed, depicting plants in word and image as well as inventorizing species unknown (for the most part) until then in the West was a task that necessarily entailed the control and conquest of natural resources. Through the examination of paintings, drawings, and engravings of plants, scientific imagery is investigated as a site of political authority and visual innova-



Jaya Remond

Charles Plumier (1646–1704), *Balisier*. Pencil and watercolor, Musée National d’Histoire Naturelle, Paris, Ms 6. Photo: Jaya Remond.

tion, and the role of images in the indexation and circulation of knowledge is explored. The project shows how the flora of the Americas, as a new object of scrutiny, encouraged new modes of representation, which reflected specific viewing practices informed by first-hand observation of nature: as a result, botanical illustrations offered a stage for the development of innovative visual strategies, including cropped, zoomed-in details of plants.



PUBLICATION

Remond, Jaya. "Bodies of knowledge: movement, variety and imagination in a German Renaissance art primer." In *Movement - Bewegung: über die dynamischen Potenziale der Kunst*, eds. Andreas Beyer and Guillaume Cassegrain. 45–60. Berlin: Deutscher Kunstverlag, 2015.

---

**Short-term visiting scholars**

*Vera Keller* (University of Oregon, USA)

*Alisha Rankin* (Tufts University, USA)

*Tillmann Taape* (University of Cambridge, UK)

*Simon Werrett* (University College London, UK),

*Heather Wolfe* (Folger Shakespeare Library, USA)

*Elizabeth Yale* (University of Iowa, USA).

## Department II

## Publications 2015–2017

Aronova, Elena. “Environmental monitoring in the making: from surveying nature’s resources to monitoring nature’s change.” *Historical Social Research* 40 (2 2015): 222–245.

Aronova, Elena. “Citizen seismology, Stalinist science, and Vladimir Mannar’s Cold Wars.” *Science, Technology, and Human Values* 42 (2 2017): 226–256.

Aronova, Elena. “Geophysical datascares of the Cold War: politics and practices of the world data centers in the 1950s and 1960s.” *Osiris* 32 (2017): 307–327.

Aronova, Elena. “Russian and the making of world languages during the Cold War.” *Isis* 108 (3 2017): 643–650.

Aronova, Elena, Christine von Oertzen, and David Sepkoski. “Introduction: Historicizing big data.” *Osiris* 32 (2017): 1–17.

- 1 Aronova, Elena, Christine von Oertzen, and David Sepkoski, eds. *Data histories*. *Osiris*: special issue; 32. Chicago: The University of Chicago Press, 2017.
  - 2 Aronova, Elena and Simone Turchetti. “Introduction: Science studies in East and West — incommensurable paradigms?” *In Science studies during the Cold War and beyond: paradigms defected*, eds. Elena Aronova and Simone Turchetti. 1–20. New York: Palgrave MacMillan, 2016.
- Aronova, Elena and Simone Turchetti, eds. *Science studies during the Cold War and beyond: paradigms defected*. Palgrave studies in the history of science and technology. New York: Palgrave MacMillan, 2016.
- Aubin, David. “Jeanne Dumée as astronomer and woman in seventeenth-century France: the myth and her lost voice.” *Journal for the History of Astronomy* 47 (3 2016): 231–255.
- Aubin, David. “The moon for a twopence: street telescopes in nineteenth-century Paris and the epistemology of popular stargazing.” *Early Popular Visual Culture* 15 (2 2017): 125–151.





Aubin, David. “On the epistemic and social foundations of mathematics as tool and instrument in observatories, 1793–1846.” In *Mathematics as a tool: tracing new roles of mathematics in the sciences*, eds. Johannes Lenhard, Martin Carrier, Johannes Lenhard, and Martin Carrier. 177–196. Cham: Springer, 2017.

Avxentevskaya, Maria. “The spiritual optics of narrative: John Wilkins’s popularization of Copernicanism.” *Journal of Literature and Science* 8 (2 2015): 1–16.

Avxentevskaya, Maria. “From inventio to invention: John Wilkins’s Mathematical magick.” In *English literature and the disciplines of knowledge, early modern to eighteenth century: a trade for light*, eds. Jorge Bastos da Silva and Miguel Ramalheite Gomes. 117–145. Leiden: Brill Rodopi, 2017.

Bangham, Jenny see also Reardon, Ankeny and Bangham

Bangham, Jenny. “‘What is race?’ UNESCO, mass communication and human genetics in the early 1950s.” *History of the Human Sciences* 28 (5 2015): 80–107.

Bangham, Jenny. “Blood, paper, and total human genetic diversity.” *Limn* 6 (2016): <http://limn.it/blood-paper-and-total-human-genetic-diversity>

Bangham, Jenny and Judith Kaplan, eds. *Invisibility and labour in the human sciences*. Max-Planck-Institut für Wissenschaftsgeschichte: Preprint 484. Berlin: Max-Planck-Institut für Wissenschaftsgeschichte, 2016.

- 3 Bargheer, Stefan. “Conserving the future: UNESCO biosphere reserves as laboratories for sustainable development.” In *Endangerment, biodiversity and culture*, eds. Fernando Vidal and Nelia Dias. 115–133. New York: Routledge, 2015.

Bayoumi, Soha. “Health and social justice in Egypt: towards a health equity perspective.” In *World social science report 2016: challenging inequalities; pathways to a just world*, 140–143. Paris: UNESCO Publishing, 2016.

Beck, Naomi see also Witt and Beck

Beck, Naomi. “The garden of orderly polity: F. A. Hayek and T. H. Huxley’s views on social evolution.” *Journal of Bioeconomics* 17 (1 2015): 83–96.

Beck, Naomi. "The spontaneous market order and evolution." *Studies in History and Philosophy of Biological and Biomedical Sciences* 58 (2016): 49–55.

Benson, Etienne. "Endangered birds and epistemic concerns: the California condor." In *Endangerment, biodiversity and culture*, eds. Fernando Vidal and Nélia Dias. 175–194. London: Routledge, 2015.

Benson, Etienne. "Territorial claims: experts, antelopes, and the biology of land use in Uganda, 1955–1975." *Comparative Studies of South Asia, Africa and the Middle East* 35 (1 2015): 137–155.

Benson, Etienne. "Umwelt zwischen System und Natur: Alan Sonfists 'Army ants: patterns and structures' (1972) und die Grenzen des System-Denkens in der Environmental Art." In *Ökologie und die Künste*, eds. Daniela Hahn and Erika Fischer-Lichte. 51–70. Paderborn: Fink, 2015.

Benson, Etienne. "Naming the ethological subject." *Science in Context* 29 (1 2016): 107–128.

Benson, Etienne. "Trackable life: data, sequence, and organism in movement ecology." *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 57 (2016): 137–147.

Benson, Etienne. "A centrifuge of calculation: managing data and enthusiasm in early twentieth-century bird banding." *Osiris* 32 (2017): 286–306.

Bouk, Dan. *How our days became numbered: risk and the rise of the statistical individual*. Chicago: The University of Chicago Press, 2015.

Bouk, Dan. "The history and political economy of personal data over the last two centuries in three acts." *Osiris* 32 (1 2017): 85–106.

Boumediene, Samir. "L'acclimatation portuaire des savoirs sur le lointain: les drogues exotiques à Séville, Cadix et Livourne (XVIe–XVIIe siècles)." In *Les savoirs-mondes: mobilités et circulation des savoirs depuis le Moyen Âge*, eds. Pilar González Bernaldo and Liliane Hilaire-Peréz. 133–145. Rennes: Presses Universitaires de Rennes, 2015.

Boumediene, Samir. *La colonisation du savoir: une histoire des plantes médicinales du "Nouveau Monde" (1492–1750)*. Vaulx-en-Velin: Les éditions des mondes à faire, 2016.

Bourguet, Marie-Noelle. *Le monde dans un carnet: Alexander von Humboldt en Italie (1805)*. Les marches du temps Paris. Édition du Félin, 2017.

Boyarin, Daniel. "The concept of translation in American religious studies." *Critical Inquiry* 44 (1 2017): 17–39.

Brusius, Mirjam. *Fotografie und museales Wissen: William Henry Fox Talbot, das Altertum und die Absenz der Fotografie*. Studies in theory and history of photography 6. Berlin: De Gruyter, 2015.

Brusius, Mirjam. "Royal photographs in Qajar Iran: writing the history of photography between Persian miniature painting and Western technology." In *Photography, history, difference*, ed. Tanya Sheehan. 57–83. Hanover, New Hampshire: Dartmouth College Press, 2015.

Brusius, Mirjam. "The field in the museum: puzzling out Babylon in Berlin." *Osiris* 32 (1 2017): 264–285.

Burak, Guy. "Reliable books: Islamic law, canonization, and manuscripts in the Ottoman Empire (sixteenth to eighteenth centuries)." In *Canonical texts and scholarly practices: a global comparative approach*, eds. Anthony Grafton and Glenn W. Most. 14–33. Cambridge: Cambridge University Press, 2016.

Camprubí, Lino. "Resource geopolitics: Cold War technologies, global fertilizer, and the fate of Western Sahara." *Technology and Culture* 56 (3 2015): 676–703.

Camprubí, Lino. "La naturaleza no existe: conservacionismos y relaciones internacionales en Doñana." *Arbor* 192 (781 2016): 1–16.

- 1 Camprubí, Lino. *Los ingenieros de Franco: ciencia, catolicismo y Guerra Fría en el Estao franquista*. Barcelona: Crítica, 2017.

Camprubí, Lino. "The sonic construction of the ocean as the Navy's operating environment." In *Navigating noise*, eds. Nathanja van Dijk, Kerstin Ergenzinger, Christian Kassung, and Sebastian Schwesinger. 219–245. Köln: Walther König, 2017.

Camprubí, Lino and Timothy Johnson. "Deserts: the geopolitics of geology." *Technosphere Magazine: Phosphorus* (5 2016): [http://technosphere-magazine.hkw.de/#/author/265baf10-9d0c-11e6-9242-373a2023b30d?\\_k=3prmf](http://technosphere-magazine.hkw.de/#/author/265baf10-9d0c-11e6-9242-373a2023b30d?_k=3prmf)

Camprubí, Lino and Sam Robinson. "A gateway to ocean circulation: surveillance and sovereignty at Gibraltar." *Historical Studies in the Natural Sciences* 46 (4 2016): 429–459.

Carson, John. "Intelligence, history of the concept." In *International encyclopedia of the social and behavioral sciences*. Vol. 12, ed. James D. Wright. 309–312. Oxford: Elsevier, 2015.

Carson, John. "Equality, inequality, and difference: genius as problem and possibility in American political/scientific discourse." In *Genealogies of genius*, eds. Joyce E. Chaplin and Darrin M. McMahon. 43–62. New York: Palgrave MacMillan, 2016.



Casties, Robert and Dirk Wintergrün. “Bilder als Quelle in TextGrid.” In *TextGrid: von der Community — für die Community; eine virtuelle Forschungsumgebung für die Geisteswissenschaften*, eds. Heike Neuroth, Andrea Rapp, and Sibylle Söring. 153–163. Glückstadt: Hülsbusch, 2015.

Chang, Kevin. “Zur Gründung der Orientalistik in China.” *Geschichte der Germanistik: Historische Zeitschrift für die Philologien* 49/50 (2016): 5–22.

Cohen-Cole, Jamie. “Kreativität: wie man im Kalten Krieg die moderne Gesellschaft von ihren Gebrechen heilen wollte.” In *Designing thinking: angewandte Imagination und Kreativität um 1960*, ed. Claudia Mareis. 39–73. Paderborn: Fink Verlag, 2016.

Creager, Angela N. H. “Radiation, cancer, and mutation in the atomic age.” *Historical Studies in the Natural Sciences* 45 (1 2015): 14–48.

Creager, Angela N. H. “EAT. DIE.” *The domestication of environmental carcinogens in the 1980s*. *Salvia småskrifter* 16. Uppsala: Uppsala Universitet, 2016.

- 2 Creager, Angela N. H. “Paradigms and exemplars meet biomedicine.” In *Kuhn’s ‘Structure of scientific revolutions’ at fifty: reflections on a science classic*, eds. Robert J. Richards and Lorraine Daston. 150–166. Chicago: The University of Chicago Press, 2016.

Creager, Angela N. H. “Radioisotopes as political instruments from Truman to Eisenhower.” In *Nuclear energy and the legacy of Harry S. Truman*, ed. J. Samuel Walker. 108–145. Kirksville, Mo.: Truman State University Press, 2016.

Daston, Lorraine see also Klein, Lemov, Gordin and Daston

Daston, Lorraine see also Richards and Daston

Daston, Lorraine. “At the center and the periphery: Joseph Pitton de Tournefort botanizes in Crete.” In *Relocating the history of science: essays in honor of Kostas Gavroglu*, eds. Theodore Arabatzis, Jürgen Renn, and Ana Simões. 85–98. Dordrecht: Springer, 2015.

Daston, Lorraine. *Before the two cultures: big science and big humanities in the nineteenth century; The Martin Buber Memorial Lectures*. Proceedings of the Israel Academy of Sciences and Humanities 9/1. Jerusalem: Israel Academy of Sciences and Humanities, 2015.

Daston, Lorraine. "Epistemic images." In *Vision and its instruments: art, science, and technology in early modern Europe*, ed. Alina Payne. 13–35. University Park, Pennsylvania: Penn State University Press, 2015.

Daston, Lorraine. "Philosophies de la nature et philosophie naturelle (1500–1750)." In *Histoire des sciences et des savoirs. Vol. 1: De la Renaissance aux Lumières*, eds. Dominique Pestre and Stéphane Van Damme. 177–203. Paris: Seuil, 2015.

Daston, Lorraine. "Simon and the sirens: a commentary." *Isis* 106 (3 2015): 669–676.

Daston, Lorraine. "Super-Vision: weather watching and table reading in the early modern Royal Society and Académie Royale des Sciences." *Huntington Library Quarterly* 78 (2 2015): 187–215.

Daston, Lorraine. "Über Johannes Kepler." In *Der Orden pour le mérite für Wissenschaft und Künste: Reden und Gedenkworte. Vol. 42*, 15–32. Göttingen: Wallstein Verlag, 2015.

Daston, Lorraine. "Authenticity, autopsy, and Theodor Mommsen's Corpus Inscriptionum Latinarum." In *For the sake of learning: essays in honor of Anthony Grafton. Vol. 2*, eds. Ann Blair and Anja-Silvia Goeing. 955–973. Leiden: Brill, 2016.

Daston, Lorraine. "Can liberal education save the sciences?" *The Point* 11 (2016): <https://thepointmag.com/2016/examined-life/can-liberal-education-save-the-sciences>

Daston, Lorraine. "Cloud physiognomy." *Representations* 135 (1 2016): 45–71.

Daston, Lorraine. "Die moralisierten Objektivitäten der Wissenschaft." In *Moral, Wissenschaft und Wahrheit*, eds. Julian Nida-Rümelin and Jan-Christoph Heilinger. 79–110. Berlin: De Gruyter, 2016.

Daston, Lorraine. "Die Wahrheit im Blatt." In *Glanzlichter der Wissenschaft 2016: ein Almanach*, 35–40. Heidelberg: Universitätsverlag Winter, 2016.

Daston, Lorraine. "Die Zukunft der GDNÄ — die GDNÄ der Zukunft." In *Menschen und Ideen: die Gesellschaft Deutscher Naturforscher und Ärzte 1822–2016*, eds. Ansgar Schanbacher and Eva-Maria Neher. 11–13. Göttingen: Wallstein, 2016.

Daston, Lorraine. "History of science without *Structure*". In *Kuhn's "Structure of scientific revolutions" at fifty: reflections on a science classic*, eds. Robert J. Richards and Lorraine Daston. 115–132. Chicago: The University of Chicago Press, 2016.



1

Daston, Lorraine. “Science as a weapon of cultural competition [Interview].” In *1001 distortions: how (not) to narrate history of science, medicine, and technology in non-western cultures*, eds. Sonja Brentjes, Taner Edis, and Lutz Richter-Bernburg. 19–23. Würzburg: Ergon, 2016.

Daston, Lorraine. “When science went modern.” *The Hedgehog Review* 18 (3 2016): [http://www.iasc-culture.org/THR/THR\\_article\\_2016\\_Fall\\_Daston.php](http://www.iasc-culture.org/THR/THR_article_2016_Fall_Daston.php)

Daston, Lorraine. “The history of science and the history of knowledge.” *KNOW: A Journal on the Formation of Knowledge* 1 (1 2017): 131–154.

Daston, Lorraine. “The immortal archive: nineteenth-century science imagines the future.” In *Science in the archives: pasts, presents, futures*, ed. Lorraine Daston. 159–182. Chicago: The University of Chicago Press, 2017.

1 Daston, Lorraine, ed. *Science in the archives: pasts, presents, futures*. Chicago: The University of Chicago Press, 2017.

Daston, Lorraine. “Third nature.” In *Science in the archives: pasts, presents, futures*, ed. Lorraine Daston. 1–14. Chicago: The University of Chicago Press, 2017.

Daston, Lorraine. “The time of the archive.” In *Science in the archives: pasts, presents, futures*, ed. Lorraine Daston. 329–332. Chicago: The University of Chicago Press, 2017.

Daston, Lorraine. “What is an insurable risk?: Swiss re and atomic reactor insurance.” In *Managing risk in reinsurance: from city fires to global warming*, eds. Niels Viggo Haueter and Geoffrey Jones. 230–247. Oxford: Oxford University Press, 2017.

Daston, Lorraine and Glenn W. Most. “History of science and history of philologies.” *Isis* 106 (2 2015): 378–390.

Dias, Nélia see also Vidal and Dias, eds. *Endangerment, biodiversity and culture*. Routledge, 2015.

Dias, Nélia. “From French Indochina to Paris and back again: the circulation of objects, people, and information, 1900–1932.” *Museum and Society* 13 (1 2015): 7–21.



Dias, Nelia and Fernando Vidal. "Introduction: the endangerment sensibility." In *Endangerment, biodiversity and culture*, eds. Fernando Vidal and Nelia Dias. 1–38. New York: Routledge, 2015.

Dutreuil, Sébastien. "James Lovelock, Gaïa et la pollution: un scientifique entrepreneur à l'origine d'une nouvelle science et d'une philosophie politique de la nature." *Zilsel* 2 (2 2017): 19–61.

Echterhölter, Anna. "Data, diplomacy, and liberalism: August Ferdinand Lueder's critique of German descriptive statistics (c. 1810)." *Bulletin of the German Historical Institute* 59 (2016): 83–102.

Echterhölter, Anna. "Injury and measurement: Jacob Grimm on blood money and concrete quantification." *Social Analysis* 61 (4 2017): 31–48.

Echterhölter, Anna. "Jack Goody: die Liste als administrative Praktik." In *Die Liste: Ordnungen von Dingen und Menschen in Ägypten*, eds. Susanne Deicher and Erik Maroko. 243–261. Berlin: Kulturverlag Kadmos, 2015.

Eddy, Matthew D. "The politics of cognition: liberalism and the evolutionary origins of Victorian education." *British Journal for the History of Science* 50 (4 2017): 677–699.

Engelstein, Stefani. "Love or knowledge: sexual epistemology in Fichte and Kleist." *The Germanic Review: Literature, Culture, Theory* 92 (4 2017): 368–387.

Engelstein, Stefani. *Sibling action: the genealogical structure of modernity*. New York: Columbia University Press, 2017.

Feldhay, Rivka and F. Jamil Ragep. *Before Copernicus: the cultures and contexts of scientific learning in the fifteenth century*. McGill-Queen's studies in the history of ideas series 71. Montreal: McGill-Queen's University Press, 2017.

Felten, Sebastian. "Ein verhinderter Kapitalist? Wirtschaft und Buchführung des rheinhessischen Bauernkaufmanns Chrisostomus Kirschbaum (1783–1846)." *Der Wormsgau* 32 (2016): 113–126.

Fransen, Sietske. "Anglo-Dutch translations of medical and scientific texts." *Literature Compass* 14 (4 2017): <https://doi.org/10.1111/lic3.12385>

Fransen, Sietske. "Latin in a time of change: the choice of language as a signifier of new science?" *Isis* 108 (3 2017): 629–635.

Fransen, Sietske, Niall Hodson, and Karl Enenkel, eds. *Translating early modern science*. Intersections 51. Leiden: Brill, 2017.

Friedrich, Markus. "Genealogy as archive-driven research enterprise in early modern Europe." *Osiris* 32 (1 2017): 65–84.

Friedrich, Markus, Philipp Müller, and Michael Riordan, eds. *Practices of historical research in archives and libraries from the eighteenth to the nineteenth century*. History of the Humanities: special issue ; 2/1. Chicago: The University of Chicago Press, 2017.

Frumer, Yulia. "Before words: reading Western astronomical texts in early 19th century Japan." *Annals of Science* 73 (2 2016): 170–194.

Gaboury, Jacob. "Sounding silence." *Continent* 5 (3 2016): <http://continentcontinent.cc/index.php/continent/article/view/261>

Gaboury, Jacob. "Other places of invention: computer graphics at the University of Utah." In *Communities of computing: computer science and society in the ACM*, ed. Thomas J. Misa. 259–285. New York: ACM Books, 2017.

Germanese, Donatella. "'We will make Europe there': Italian intellectuals in search of Europe and America in Hitler's Germany." *Modern Intellectual History* 14 (2 2017): 451–476.

Grafton, Anthony. "Good company: Spinoza the traditionalist and some unexpected friends." In *What reason promises: essays on reason, nature and history*, eds. Wendy Doniger and Peter Galison. 178–185. Berlin: De Gruyter, 2016.

Grafton, Anthony. "'Pandects of the Jews': a French, Swiss and Italian prelude to John Selden." In *Jewish books and their readers: aspects of the intellectual life of Christians and Jews in early modern Europe*, eds. Scott Mandelbrote and Joanna Weinberg. 169–188. Leiden: Brill, 2016.

Grafton, Anthony. "Spinoza's hermeneutics: some heretical thoughts." In *Scriptural authority and biblical criticism in the Dutch golden age: God's word questioned*, eds. Dirk van Miert, Henk Nellen, Piet Steenbakkers, and Jetze Touber. 177–196. Oxford: Oxford University Press, 2017.

Grafton, Anthony and Glenn W. Most, eds. *Canonical texts and scholarly practices: a global comparative approach*. Cambridge: Cambridge University Press, 2016.

Grafton, Anthony and Glenn W. Most. "How to do things with texts: an introduction." In *Canonical texts and scholarly practices: a global comparative approach*, eds. Anthony Grafton and Glenn W. Most. 1–13. Cambridge: Cambridge University Press, 2016.

Griffin, Clare. "In search of an audience: popular pharmacies and the limits of literate medicine in late seventeenth- and early eighteenth-century Russia." *Bulletin of the History of Medicine* 89 (4 2015): 705–732.

Griffin, Clare. “‘Skazaniia o dare Shakha Abbasa’ and ‘Semen Ivanovich Shakhovskoi.’” In *Christian-Muslim relations: a bibliographical history. Vol. 8: Northern and Eastern Europe (1600–1700)*, eds. David Thomas and John Chesworth. 838–845. 8. Leiden: Brill, 2016.

Griffin, Clare. “Bureaucracy and knowledge creation: the apothecary chancery.” In *Information and Empire: mechanisms of communication in Russia, 1600–1850*, eds. Simon Franklin and Katherine Bowers. 255–285. Cambridge: Open Book Publishers, 2017.

Griffin, Clare. “Russia and the medical drug trade in the seventeenth century.” *Social History of Medicine* 31 (1 2018): 2–23. Published online 2017.

Härdle, Wolfgang Karl and Annette Vogt. “Ladislaus von Bortkiewicz — statistician, economist and a European intellectual.” *International Statistical Review* 83 (1 2015): 17–35.

Hagström Molin, Emma. “Skattjakten: Beda Dudíks sökande efter Mährens historia i Stockholm och Rom 1851–1853.” *Biblis* 77 (2017): 2–11.

Hsia, Florence. “Astronomy after the Deluge.” In *Science in the archives: pasts, presents, futures*, ed. Lorraine Daston. 17–52. Chicago: The University of Chicago Press, 2017.

Hsiung, Hansun. “The ‘Circle of knowledge’: radical commensurability and the deaf textbook.” In *The global histories of books: methods and practices*, eds. Elleke Boehmer, Rouven Kunstmann, Priyasha Mukhopadhyay, and Asha Rogers. 161–187. Cham: Palgrave Macmillan, 2017.

Hsiung, Hansun, Stephanie Ann Frampton, Evan Hepler-Smith, and Craig Robertson. “Virtual roundtable on ‘Compression.’” *Public Books Online* 13 (2017): <http://www.publicbooks.org/virtual-roundtable-compression>

Kachru, Sonam. “Things you wouldn’t think to look for in one place: a note on an all-too-brief example on life and matter in Abhidharmakośabhāṣyam A.D. 3.14c.” *Journal of the American Oriental Society* 137 (4 2017): 669–678.

Kaplan, Judith see also Bangham and Kaplan, eds. *Invisibility and labour in the human sciences*. Max-Planck-Institut für Wissenschaftsgeschichte, 2016.

Kaplan, Judith. “Avestan studies in Imperial Germany: sciences of text and sound.” *History of the Human Sciences* 28 (1 2015): 25–43.

Kaplan, Judith. “Archiving descriptive language data.” *Limn* 6 (2016): <https://limn.it/articles/archiving-descriptive-language-data>



1

Kaplan, Judith. “Linguistic turns. Essay review of: Michael Gordin: *Scientific Babel: the language of science from the fall of Latin to the rise of English*. London: Profile Books 2015.” *Studies in History and Philosophy of Science. Part A* 60 (2016): 88–91.

Kaplan, Judith. “Self-inscription and (in)visibility: the Oneida language and Folklore project.” In *Invisibility and labour in the human sciences*, eds. Jenny Bangham and Judith Kaplan. 93–98. Berlin: Max-Planck-Institut für Wissenschaftsgeschichte, 2016.

Kaplan, Judith. “From lexicostatistics to lexomics: basic vocabulary and the study of language prehistory.” *Osiris* 32 (1 2017): 202–223.

- 1 Klamm, Stefanie. *Bilder des Vergangenen: Visualisierung in der Archäologie im 19. Jahrhundert — Fotografie, Zeichnung und Abguss*. Humboldt-Schriften zur Kunst- und Bildgeschichte 20. Berlin: Gebr. Mann, 2017.

Klein, Judy L., Rebecca Lemov, Michael D. Gordin, Lorraine Daston, Paul Erickson, and Thomas Sturm. *Quand la raison faillit perdre l'esprit: la rationalité mise à l'épreuve de la Guerre froide*. Translated by Jean-François Caro. [Bruxelles]: Zones sensibles, 2015.

Krajewski, Markus. “Tell meta from data: tracing the origins of big data, bibliometrics, and the OPAC.” *Osiris* 32 (1 2017): 224–240.

Krause, Katja. “Albert the Great on animal and human origin in his early works.” *Lo Sguardo* 18 (2 2015): 205–232.

Krause, Katja. “Transforming Aristotelian philosophy: Alexander of Aphrodisias in Aquina’s early anthropology and eschatology.” *Przegląd Tomistyczny* 21 (2015): 175–217.

Krause, Katja and Henryk Anzulewicz. “Appropriating traditions of totality: reality as a whole in Albert the Great.” In *Regards sur les traditions philosophiques (XIIe–XVIe siècles)*, eds. Dragos Calma and Zénon Kaluza. 99–125. Leuven: Leuven University Press, 2017.

Kreuder-Sonnen, Katharina. "Grenzen ziehen und überschreiten: Ärzte und das Jüdische im Königreich Polen während der Choleraepidemie 1892/93." *Zeitschrift für Ostmitteleuropa-Forschung* 64 (3 2015): 330–355.

Kreuder-Sonnen, Katharina. "Internationale Standards und lokale Heterogenität: das Scheitern der internationalen Normierung der Syphilisdiagnostik in den 1920er Jahren." In *Wissen transnational: Funktionen — Praktiken — Repräsentationen*, eds. Justyna Aniceta Turkowska, Peter Haslinger, and Alexandra Schweiger. 117–138. Marburg: Verlag Herder-Institut, 2016.

Küçük, Harun. "New medicine and the Hikmet-i Tabî'iyye problematic in eighteenth-century Istanbul." In *Texts in transit in the medieval Mediterranean*, eds. Y. Tzvi Langermann and Robert G. Morrison. 222–242. University Park, Penn.: The Pennsylvania State University Press, 2016.

Küçük, Harun. "Science in Ottoman Turkish." In *Encyclopaedia of the history of science, technology, and medicine in non-western cultures. Vol. 5*, ed. Helaine Selin. 3901–3903. Dordrecht: Springer, 2016.

Kumar, Prakash, Timothy Lorek, Tore C. Olsson, Nicole Sackley, Sigrid Schmalzer, and Laveaga Gabriela Soto. "Roundtable: New narratives of the green revolution." *Agricultural History* 91 (3 2017): 397–422.

Laemmler, Whitney E. "Paper dancers: art as information in twentieth-century America." *Information and Culture* 52 (1 2017): 1–30.

Lee, Jung. "Between universalism and regionalism: universal systematics from imperial Japan." *The British Journal for the History of Science* 48 (4 2015): 661–684.

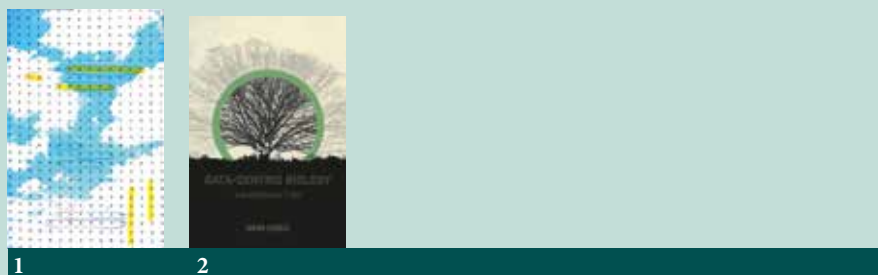
Lee, Jung. "[기획논문] 식민지 과학 협력을 위한 중립성의 정치: 일제강점기 조선의 향토적 식물 연구 (Politics of neutrality for colonial collaboration in science: political regionalization of botanical research in colonial Korea)." *Han'guk Kwahaksa Hakhoe-ji: Journal of the Korean History of Science Society* 37 (1 2015): 265–298.

Lee, Jung. "Mutual transformation of colonial and imperial botanizing? The intimate yet remote collaboration in colonial Korea." *Science in Context* 29 (2 2016): 179–211.

Lehmann, Philipp N. see also Camprubí and Lehmann

Lehmann, Philipp N. "Whither climatology? Brückner's climate oscillations, data debates, and dynamic climatology." *History of Meteorology* 7 (2015): 49–70.

Lehmann, Philipp N. "Infinite power to change the world: hydroelectricity and engineered climate change in the Atlantropa project." *American Historical Review* 121 (1 2016): 70–100.



Lehmann, Philipp N. “Losing the field: Franz Thorbecke and (post-)colonial climatology in Germany.” *History of Meteorology* 8 (2017): 145–158.

Lehmann, Philipp N. “Utopia.” In *Fueling culture: 101 words for energy and environment*, eds. Imre Szeman, Jennifer Wenzel, and Patricia Yaeger. 365–368. New York: Fordham University Press, 2017.

Lemov, Rebecca see also Klein and Lemov

Lemov, Rebecca. “Anthropological data in danger, c. 1941–1965.” In *Endangerment, biodiversity and culture*, eds. Fernando Vidal and Nelia Dias. 87–111. New York: Routledge, 2015.

- 1 Lemov, Rebecca. *Database of dreams: the lost quest to catalog humanity*. New Haven, CT: Yale University Press, 2015.

Lemov, Rebecca. “On not being there: the data-driven body at work and at play.” *The Hedgehog Review* 17 (2 2015): 44–55.

Lemov, Rebecca. “What escapes the total archive.” *Limn* 6 (2016): <https://limn.it/articles/what-escapes-the-total-archive>

Lemov, Rebecca. “Anthropology’s most documented man, ca. 1947: a prefiguration of big data from the big social science era.” *Osiris* 32 (2017): 21–42.

Lemov, Rebecca. “Archives-of-self: the vicissitudes of time and self in a technologically determinist future.” In *Science in the archives: pasts, presents, futures*, ed. Lorraine Daston. 247–270. Chicago: The University of Chicago Press, 2017.

Leonelli, Sabina. “Valuing data in postgenomic biology: how data donation and curation practices challenge the scientific publication system.” In *Postgenomics: perspectives on biology after the genome*, eds. Sarah S. Richardson and Hallam Stevens. 126–149. Durham: Duke University Press, 2015.

- 2 Leonelli, Sabina. *Data-centric biology: a philosophical study*. Chicago: The University of Chicago Press, 2016.





1

Leonelli, Sabina. “Epistemische Diversität im Zeitalter von Big Data: wie Dateninfrastrukturen der biomedizinischen Forschung dienen.” In *Diversität: Geschichte und Aktualität eines Konzepts*, eds. André Blum, Nina Zschocke, Hans-Jörg Rheinberger, and Vincent Barras. 85–105. Würzburg: Königshausen & Neumann, 2016.

Leonelli, Sabina. “What counts as scientific data? A relational framework.” *Philosophy of Science* 82 (5 2016): 810–821.

Leonelli, Sabina, Daniel Spichtinger, and Barbara Prainsack. “Sticks and carrots: encouraging open science at its source.” *Geo: Geography and Environment* 2 (1 2015): 12–16.

Leong, Elaine. “‘Herbals she peruseth’: reading medicine in early modern England.” In *History of medicine. Vol. 2: Early modern medicine*, eds. Roger Cooter and Claudia Stein. 292–316. London: Routledge, 2016.

Leong, Elaine. “Brewing ale and boiling water in 1651.” In *The structures of practical knowledge*, ed. Matteo Valleriani. 55–75. Cham: Springer, 2017.

Leong, Elaine and Alisha Rankin, eds. *Testing drugs and trying cures*. Bulletin of the History of Medicine: special issue; 91/2. Baltimore: Johns Hopkins University Press, 2017.

- 1 Leong, Elaine and Alisha Rankin. “Testing drugs and trying cures: experiment and medicine in medieval and early modern Europe.” *Bulletin of the History of Medicine* 92 (2 2017): 157–182.

Lindee, Susan see also Radin and Lindee

Lindee, Susan. “Human genetics after the bomb: archives, clinics, proving grounds and board rooms.” *Studies in History and Philosophy of Biological and Biomedical Sciences* 55 (2016): 45–53.

Lindee, Susan. “Survivors and scientists: Hiroshima, Fukushima, and the Radiation Effects Research Foundation, 1975–2014.” *Social Studies of Science* 46 (2 2016): 184–209.

Märker, Anna. "Within one's grasp: anatomical displays from cabinet of curiosities to shop window." *Historical Social Research* 40 (1 2015): 284–300.

Mayer, Andreas. "Histoire de 'L'interprétation du rêve.'" In *Dictionnaire Sigmund Freud: l'homme et l'œuvre*, ed. Sarah Contou Terquem. 882–886. Paris: Ed. Laffont, 2015.

Mayer, Andreas. "La Traumdeutung: histoire d'un livre fondateur." In *Sigmund Freud*, eds. Roger Perron and Sylvain Missonnier. 91–95. Paris: Editions de L'Herne, 2015.

Mayer, Andreas. "Rêves." In *L'interprétation: un dictionnaire philosophique*, eds. Christian Berner and Denis Thouard. 397–400. Paris: Vrin, 2015.

Mayer, Andreas. "Thinking in cases, picturing types: on the afterlife of Galton's composite photographs in psychoanalysis." *Annual of Psychoanalysis* 38 (2015): 71–86.

Mayer, Andreas. *Sigmund Freud zur Einführung*. Hamburg: Junius Verlag, 2016.

McCray, W. Patrick. "The biggest data of all: making and sharing a digital universe." *Osiris* 32 (1 2017): 243–263.

McNamee, Megan. "Picturing as practice: placing a square above a square in the central Middle Ages." In *Canonical texts and scholarly practices: a global comparative approach*, eds. Anthony Grafton and Glenn W. Most. 200–223. Cambridge: Cambridge University Press, 2016.

Meister, Anna-Maria T. "Formatting the modern dream." *Harvard Design Magazine* 43 (2016): 122–124.

Menon, Minakshi. "Medicine, money and the making of the East India Company State: William Roxburgh in Madras, c. 1790." In *Histories of medicine and healing in the Indian Ocean World. Vol. 1: The medieval and early modern period*, eds. Anna Winterbottom and Facil Tesfaye. 151–178. New York, NY: Palgrave MacMillan, 2015.

Menon, Minakshi. "Grains of paradise and reading against the grain: telling stories about science in the Global South." Essay review of: Crawford, Matthew: *The Andean wonder drug*. Pittsburgh, PA: University of Pittsburgh Press 2016; and Osseo Asare, Abena Dove: *Bitter roots*. Chicago: The University of Chicago Press 2014." *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 66 (2017): 83–86.

Milam, Erika L. "The ascent of man and the politics of humanity's evolutionary future." *Endeavour* 40 (4 2016): 225–237.

Milam, Erika L. "Science of the sexy beast: biological masculinities and the Playboy lifestyle." In *Groovy science: knowledge, innovation, and American counterculture*, eds. David Kaiser and Patrick McCray. 270–302. Chicago: The University of Chicago Press, 2016.

Milam, Erika L. and Deborah Weinstein, eds. *Science in the public eye*. Endeavour: special issue; 40/4. Oxford: Elsevier, 2016.

Milam, Erika L. and Deborah Weinstein. "Introduction." *Endeavour* 40 (4 2016): 223–224.

Mitman, Gregg and Kelley Wilder, eds. *Documenting the world: film, photography, and the scientific record*. Chicago: The University of Chicago Press, 2016.

Morgan, Mary S. and M. Norton Wise, eds. *Narrative in science*. Studies in History and Philosophy of Science Part A: special issue 62. Amsterdam: Elsevier, 2017.

Morgan, Mary S. and M. Norton Wise. "Narrative science and narrative knowing: introduction to special issue on narrative science." *Studies in History and Philosophy of Science Part A* 62 (2017): 1–5.

Most, Glenn W. see also Daston and Most

Most, Glenn W. see also Grafton and Most, eds. *Canonical texts and scholarly practices*. Cambridge University Press, 2016.

Most, Glenn W. "Allegoresis and etymology." In *Canonical texts and scholarly practices: a global comparative approach*, eds. Anthony Grafton and Glenn W. Most. 52–74. Cambridge: Cambridge University Press, 2016.

Most, Glenn W. "What is a critical edition?" In *Ars edendi lecture series. Vol. 4*, eds. Barbara Crostini, Gunilla Iversen, and Brian M. Jensen. 162–180. Stockholm: Stockholm University Press, 2016.

Müller-Wille, Staffan. "How the great chain of being fell apart: diversity in natural history, 1758–1859." *Thema: la Revue des Musées de la Civilisation* 2 (2015): 85–95.

Müller-Wille, Staffan. "Reproducing species." In *The secrets of generation: reproduction in the long eighteenth century*, eds. Raymond Stephanson and Darren N. Wagner. 37–58. Toronto: University of Toronto Press, 2015.

Müller-Wille, Staffan. "Brüche in der Stufenleiter der Natur: Diversität in der Naturgeschichte 1758–1859." In *Diversität: Geschichte und Aktualität eines Konzepts*, eds. André Blum, Nina Zschocke, Hans-Jörg Rheinberger, and Vincent Barras. 41–59. Würzburg: Königshausen & Neumann, 2016.

Müller-Wille, Staffan. “Names and numbers: ‘Data’ in classical natural history, 1758–1859.” *Osiris* (32 2017): 109–128.

Müller-Wille, Staffan. “Verfahrensweisen der Naturgeschichte nach Linné.” In *Akteure, Tiere, Dinge: Verfahrensweisen der Naturgeschichte in der Frühen Neuzeit*, eds. Silke Fröschler and Anne Mariss. 109–124. Köln: Böhlau, 2017.

Murphy, Hannah. “Common places and private spaces: libraries, record-keeping and orders of information in sixteenth-century medicine.” *Past and Present* 230 (Suppl. 11 2016): 253–268.

Nasim, Omar W. “Astrofotografie und John Herschels ‘Skelette’.” In *Zeigen und / oder Beweisen? Die Fotografie als Kulturtechnik und Medium des Wissens*, ed. Herta Wolf. 157–177. Berlin: De Gruyter, 2016.

Nemec, Birgit. “Anatomical modernity in Red Vienna: Julius Tandler’s textbook for systematic anatomy and the politics of visual milieus.” *Sudhoffs Archiv* 99 (1 2015): 44–72.

Nemec, Birgit. “Julius Tandler: Anatom, Politiker, Eugeniker.” In *Universität — Politik — Gesellschaft*, eds. Mitchell G. Ash and Joseph Ehmer. 257–263. Göttingen: V&R unipress, 2015.

Németh, András. “Layers of restorations: Vat. Gr. 73 transformed in the tenth, fourteenth, and nineteenth centuries.” In *Miscellanea Bibliothecae Apostolicae Vaticanae*, 281–330. 21. Città del Vaticano: Biblioteca Apostolica Vaticana, 2015.

Németh, András. “Excerpts versus fragments: deconstructions and reconstitutions of the Excerpta Constantiniana.” In *Canonical texts and scholarly practices: a global comparative approach*, eds. Anthony Grafton and Glenn W. Most. 253–274. Cambridge: Cambridge University Press, 2016.

Oertzen, Christine von see also Aronova, Oertzen and Sepkoski, eds. *Data histories*. The University of Chicago Press, 2017.

Oertzen, Christine von see also Aronova, Oertzen, and Sepkoski, “Introduction: Historicizing big data.” *Osiris* 32 (2017): 1–17.

Oertzen, Christine von. “Akademische Fluchthilfe aus Deutschland: neue Perspektiven.” *VHD Journal* 5 (2016): 35–39.

Oertzen, Christine von. “Netzwerke der Verständigung: Erfolg und Grenzen transnationaler Verflechtungen von Akademikerinnen im frühen 20. Jahrhundert.” In *Netzwerke im Schnittpunkt von Organisation, Wissen und Geschlecht*, eds. Uta C. Schmidt and Beate Kortendiek. 91–103. Essen: Netzwerk Frauen- und Geschlechterforschung NRW, 2016.

Oertzen, Christine von. "Universitärer Nationalismus versus akademische Verständigung: zur Wirkungsmacht weiblicher Netzwerke, 1918–1933." *Jahrbuch für Universitätsgeschichte* 18 (2015 publ. 2016): 81–100.

Oertzen, Christine von. "Whose world? Internationalism, nationalism and the struggle over the 'Language Question' in the International Federation of University Women, 1919–1932." *Contemporary European History* 25 (2 2016): 275–290.

Oertzen, Christine von. "Die Historizität der Verdatung: Konzepte, Werkzeuge und Praktiken im 19. Jahrhundert." *NTM* 25 (4 2017): 407–434.

Oertzen, Christine von. "Machineries of data power: manual versus mechanical census compilation in nineteenth-century Europe." *Osiris* 32 (2017): 129–150.

Ortega, Francisco see Vidal and Ortega

Park, Katharine. "Relics of a fertile heart: the 'autopsy' of Clare of Montefalco." In *History of medicine. Vol. 1: Ancient and medieval medicine*, eds. Roger Cooter and Claudia Stein. 264–279. London: Routledge, 2015.

Park, Katharine. "Was there a Renaissance body?" In *History of medicine. Vol. 2: Early modern medicine*, eds. Roger Cooter and Claudia Stein. 35–47. London: Routledge, 2015.

Paul, Herman. "Introduction: Repertoires and performances of academic identity." *Low Countries Historical Review* 131 (4 2016): 3–7.

Paul, Herman. "The virtues of a good historian in early imperial Germany: Georg Waitz's contested example." *Modern Intellectual History* (2017): 1–29.

Penaloza Patzak, Brooke. "Anthropologist Leo Frachtenberg and the politics of biting your tongue in World War I America." In *Quiet invaders revisited: biographies of twentieth century immigrants to the United States*, ed. Günter Bischof. 65–78. Innsbruck: StudienVerlag, 2017.

Radin, Joanna. "Planning for the past: cryopreservation at the farm, zoo, and museum." In *Endangerment, biodiversity and culture*, eds. Fernando Vidal and Nélia Dias. 218–240. London: Routledge, 2015.

Radin, Joanna. "'Digital natives': how medical and indigenous histories matter for big data." *Osiris* 32 (1 2017): 43–64.

Radin, Joanna. *Life on ice: a history of new uses for cold blood*. Chicago: The University of Chicago Press, 2017.

Radin, Joanna and Susan Lindee. “Patrons of the human experience: a history of the Wenner-Gren Foundation for Anthropological Research, 1941–2016.” *Current Anthropology* 57 (S14 2016): S218–S301.

Ragep, F. Jamil see also Feldhay and Ragep. *Before Copernicus*. McGill-Queen’s University Press, 2017.

Ragep, F. Jamil. “Ibn al-Shāṭir and Copernicus: the Uppsala notes revisited.” *Journal for the History of Astronomy* 47 (4 2016): 395–415.

Ragep, F. Jamil and Taro Mimura, eds. *On Astronomia: an Arabic critical edition and English translation of Epistle 3*. Epistles of The Brethren of Purity. Oxford: Oxford University Press, 2015.

Ragep, Sally P. *Jaghmīnī’s Mulakhkhaṣ: an Islamic introduction to Ptolemaic astronomy*. Sources and studies in the history of mathematics and physical sciences. Cham: Springer, 2016.

Ragep, Sally P. “Fifteenth-century astronomy in the Islamic world.” In *Before Copernicus: the cultures and contexts of scientific learning in the fifteenth century*, eds. Rivka Feldhay and F. Jamil Ragep. 143–160. Montreal: McGill-Queen’s University Press, 2017.

Rankin, Alisha see also Leong and Rankin, eds. *Testing drugs and trying cures*. Johns Hopkins University Press, 2017.

Rankin, Alisha see also Leong and Rankin. “Testing drugs and trying cures.” *Bulletin of the History of Medicine* 92 (2017).

Rankin, Alisha. “Natural philosophy.” In *Oxford handbook of the protestant reformations*, ed. Ulinka Rublack. 1–14. Oxford: Oxford University Press, 2015.

Rankin, Alisha. “On anecdote and antidotes: poison trials in sixteenth-century Europe.” *Bulletin of the History of Medicine* 92 (2 2017): 274–302.

Rankin, Alisha and Justin Rivest. “Medicine, monopoly, and the pre-modern state: early clinical trials.” *New England Journal of Medicine* 375 (2 2016): 106–109.

Reardon, Jenny, Rachel A. Ankeny, Jenny Bangham, Katherine W. Darling, Stephen Hilgartner, Kathryn Maxson, Jones Beth, and Hallam Stevens Shapiro. “Bermuda 2.0: reflections from Santa Cruz.” *GigaScience* 5 (1 2016): <https://doi.org/10.1093/gigascience/giw003>

Remond, Jaya. “Bodies of knowledge: movement, variety and imagination in a German Renaissance art primer.” In *Movement — Bewegung: über die dynamischen Potenziale der Kunst*, eds. Andreas Beyer and Guillaume Cassegrain. 45–60. Berlin: Deutscher Kunstverlag, 2015.



Remond, Jaya. "Distributing Dürer in the Netherlands: gifts, prints and the mediation of fame in the early sixteenth century." In *The agency of things in medieval and early modern art: materials, power and manipulation*, eds. Grażyna Jurkowlaniec, Ika Matyjaszkiewicz, and Zuzanna Sarnecka. 117–126. New York: Routledge, 2018. Published online 2017.

Richards, Robert J. and Lorraine Daston. *Kuhn's "Structure of scientific revolutions" at fifty: reflections on a science classic*. Chicago: The University of Chicago Press, 2016.

Richardson, Sarah and Hallam Stevens, eds. *Postgenomics: perspectives on biology after the genome*. Durham: Duke University Press, 2015.

Roberts, Lissa Louise and Simon Werrett, eds. *Compound histories: materials, governance, and production, 1760–1840*. Cultural dynamics of science 2. Leiden: Brill, 2018.

Rosenberg, Daniel. "An archive of words." In *Science in the archives: pasts, presents, futures*, ed. Lorraine Daston. 271–310. Chicago: The University of Chicago Press, 2017.

Sandmo, Erling. *Tid for historie: en bok om historiske spørsmål*. Oslo: Universitetsforlaget, 2015.

Schmidt, Susanne. "The feminist origins of the midlife crisis." *The Historical Journal* 61 (2017): <https://doi.org/10.1017/S0018246X17000309>

Sepkoski, David see also Aronova, Oertzen and Sepkoski, eds. *Data histories*. The University of Chicago Press, 2017.

Sepkoski, David see also Aronova, Oertzen, and Sepkoski, "Introduction: Historicizing big data." *Osiris* 32 (2017): 1–17.

Sepkoski, David. "Extinction, diversity, and endangerment." In *Endangerment, biodiversity and culture*, eds. Fernando Vidal and Nelía Dias. 62–86. New York: Routledge, 2015.

Sepkoski, David. "'Replaying life's tape': simulations, metaphors, and historicity in Stephen Jay Gould's view of life." *Studies in History and Philosophy of Science. Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 58 (2016): 73–81.

Sepkoski, David. "The 'Species concept' and the beginnings of paleobiology." In *Species and speciation in the fossil record*, eds. Warren D. Allmon and Margaret M. Yacobucci. 9–27. Chicago: The University of Chicago Press, 2016.

Sepkoski, David. "The database before the computer?" *Osiris* 32 (2017): 175–201.

Sepkoski, David. "The Earth as archive: contingency, narrative, and the history of life." In *Science in the archives: pasts, presents, futures*, ed. Lorraine Daston. 53–83. Chicago: The University of Chicago Press, 2017.

Sepkoski, David. "Extinction and biodiversity: a historical perspective." In *The Routledge handbook of philosophy of biodiversity*, eds. Justin Garston, Anya Plutynski, and Sahotra Sarkar. 26–39. London: Routledge, 2017.

Sepkoski, David and Marco Tamborini, eds. *Darwin and the reception of evolutionary theory in paleontology: a transnational perspective*. Studies in History and Philosophy of Biological and Biomedical Sciences: special issue; 66. Amsterdam: Elsevier, 2017.

Sepkoski, David and Marco Tamborini. "Introduction: Towards a global history of paleontology: the paleontological reception of Darwin's thought." *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 66 (2017): 1–2.

Shuttleworth, Sally. "Life in the zooniverse: working with citizen science." *Journal of Literature and Science* 10 (1 2017): 46–51.

Shuttleworth, Sally and Berris Charnley, eds. *Science periodicals in the nineteenth and twenty-first centuries*. Notes and Records of the Royal Society: special issue; 70/4. London: Royal Society, 2016.

Smith, Pamela H. "Itineraries of materials and knowledge in the early modern world." In *The global lives of things*, eds. Ann Gerritsen and Giorgio Riello. 31–61. Routledge, 2015.

Solleveld, Floris Otto. "How to make a revolution: revolutionary rhetoric in the European humanities around 1800." *History of Humanities* 1 (2 2016): 277–301.

Somsen, Geert. "Science, fascism, and foreign policy: the exhibition 'Scienza Universale' at the 1942 Rome world's fair." *Isis* 108 (4 2017): 769–791.

Stamhuis, Ida H. and Annette Vogt. "Discipline building in Germany: women and genetics at the Berlin Institute for Heredity Research." *British Journal for the History of Science* 50 (2 2017): 267–295.

Stark, Laura. "Work, welfare, and the values of voluntarism: rethinking Anscombe's 'action under a description' in postwar markets for human subjects." *American Journal of Cultural Sociology* 5 (1/2 2017): 181–224.

Stark, Laura and Nancy Campbell. "Making up 'vulnerable' people: human subjects and the subjective experience of medical experiment." *Social History of Medicine* 28 (4 2015): 825–848.

Stevens, Hallam see also Richardson and Stevens

Stevens, Hallam. "Networks: representations and tools in postgenomics." In *Post-genomics: perspectives on biology after the genome*, eds. Sarah S. Richardson and Hallam Stevens. 103–125. Durham: Duke University Press, 2015.

Stevens, Hallam. "A feeling for the algorithm: working knowledge and big data in biology." *Osiris* 32 (1 2017): 151–174.

Tamborini, Marco see also Sepkoski and Tamborini, eds. *Darwin and the reception of evolutionary theory in paleontology: a transnational perspective*. Studies in History and Philosophy of Biological and Biomedical Sciences: special issue; 66. Amsterdam: Elsevier, 2017.

Tamborini, Marco. "Paleontology and Darwin's theory of evolution: the subversive role of statistics at the end of the 19th century." *Journal of the History of Biology* 48 (4 2015): 575–612.

Vidal, Fernando see also Dias and Vidal. "Introduction: the endangerment sensibility." In *Endangerment, biodiversity and culture*, eds. Fernando Vidal and Nelia Dias. 1–38. New York: Routledge, 2015.

Vidal, Fernando. "Brains, bodies, selves, and science: anthropologies of identity and the resurrection of the body." In *History of medicine. Vol. 4: Medicine in postmodernity*, eds. Roger Cooter and Claudia Stein. 301–342. London: Routledge, 2015.

Vidal, Fernando. "Desire, indefinite lifespan and transgenerational brains in literature and film." *Theory and Psychology* 26 (5 2016): 665–680.

Vidal, Fernando. "Frankenstein's brain: 'The Final Touch.'" *SubStance* 45 (2 2016): 88–117.

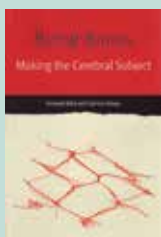
Vidal, Fernando. "Modernizing the miraculous body in Prospero Lambertini's 'De servorum die.'" In *Benedict XIV and the enlightenment: art, science, and spirituality*, eds. Rebecca Messbarger, Christopher M. S. Johns, and Philip Gavitt. 151–174. Toronto: University of Toronto Press, 2016.

Vidal, Fernando and Nelia Dias, eds. *Endangerment, biodiversity and culture*. Routledge environmental humanities. New York: Routledge, 2015.

- 1 Vidal, Fernando and Francisco Ortega. *Being brains: making the cerebral subject*. Forms of living. New York: Fordham University Press, 2017.

Vogt, Annette see also Härdle and Vogt

Vogt, Annette. "Anneliese Maier (1905–1971) zwischen der Bibliotheca Hertziana und dem Campo Santo Teutonico." In *Orte der Zuflucht und personeller Netzwerke*:



1

der *Campo Santo Teutonico und der Vatikan 1933–1955*, eds. Michael Matheus and Stefan Heid. 94–122. Freiburg: Herder Verlag, 2015.

Vogt, Annette. “Die Vertreibung jüdischer Mathematiker ab Frühjahr 1933 und ihre Wege ins Exil.” In *Von Maimonides bis Einstein — Jüdische Gelehrte und Wissenschaftler in Europa*, eds. Ingrid Kästner and Jürgen Kiefer. 363–386. Aachen: Shaker Verlag, 2015.

Vogt, Annette. “In Memoriam: Éva Vámos (22 May 1950–25 July 2015).” *Acta Baltica Historiae et Philosophiae Scientiarum* 3 (2 2015): 122–124.

Vogt, Annette. “Leonid W. Kantorowitsch und seine Vorschläge zur Reform der sowjetischen Ökonomie.” In *Reformen und Reformer im Kommunismus: für Theodor Bergmann, eine Würdigung*, eds. Wladislaw Hedeler and Mario Keßler. 197–221. Hamburg: VSA Verlag, 2015.

Vogt, Annette. “Statistik versus Stochastik: zur Begriffsgeschichte der beiden Termini.” In *Namenspatrone und Taufpaten: wie mathematische Begriffe zu ihrem Namen kamen; XIII. Österreichisches Symposium zur Geschichte der Mathematik*, ed. Christa Binder. 181–189. Wien: Österreichische Gesellschaft für Wissenschaftsgeschichte, 2016.

Vogt, Annette. Das Problem sind die Daten — Zur Rolle der Statistik in der Geschichte der linearen Programmierung. In *Festschrift — Proceedings of the Scriba Memorial Meeting History of Mathematics*, ed. Gudrun Wolfschmidt. 452–454. Hamburg: tredition, 2017.

Vogt, Annette. “Die ‘Gesellschaft der Freunde des neuen Russland’ (1923–1933) und ihre Beziehungen zu sowjetischen Institutionen.” In *Deutsch-Russische Zusammenarbeit wissenschaftlicher und kultureller Institutionen vom 18. und 20. Jahrhundert*, eds. Ingrid Kästner and Michael Schippan. 191–212. Aachen: Shaker Verlag, 2017.

Vogt, Annette. “Science in education: the role history of science, technology, and medicine (STM) and gender studies could play.” In *Interdisciplinary and general education in the 21st century*, eds. Maria Burguete and Jean-Patrick Connerade. 25–39. 2017: Science Matters Press, 2017.

Werrett, Simon see Roberts and Werrett

White, Paul Stuart. "Darwin's home of science and the nature of domesticity." In *Domesticity and the making of modern science*, eds. Donald L. Opitz, Staffan Bergwik, and Brigitte Van Tiggelen. 61–83. Houndmills: Palgrave Macmillan, 2016.

White, Paul Stuart. "Reading the blush." *Configurations* 24 (3 2016): 281–301.

Wilder, Kelley see Mitman and Wilder, eds. *Documenting the world*. The University of Chicago Press, 2016.

Wise, M. Norton see also Morgan and Wise, eds. *Narrative in science*. Studies in History and Philosophy of Science Part A 62. Amsterdam: Elsevier, 2017.

Wise, M. Norton. "Epilogue: 'Man, that woman can talk!'" In *What reason promises: essays on reason, nature, and history*, eds. Wendy Doninger, Peter Galison, and Susan Neiman. 247–251. Berlin: De Gruyter, 2016.

Wise, M. Norton. "Goethe was right: 'The history of science is science itself'" In *Shifting paradigms: Thomas S. Kuhn and the history of science*, eds. Alexander Blum, Kostas Gavroglu, Christian Joas, and Jürgen Renn. 347–359. Berlin Edition Open Access, 2016: <http://edition-open-access.de/proceedings/8/28/index.html>

Wise, M. Norton. "A smoker's paradigm." In *Kuhn's 'Structure of scientific revolutions' at fifty: reflections on a science classic*, eds. Robert J. Richards and Lorraine Daston. 31–41. Chicago: The University of Chicago Press, 2016.

Wise, M. Norton. "'Wasser auf dem dürren Hügel': mit Dampfkraft und Ingenieurkunst zum blühenden Landschaftsgarten." In *Parkomanie: die Gartenlandschaften des Fürsten Pückler in Muskau, Babelsberg und Branitz*, 200–205. München: Prestel, 2016.

Wise, M. Norton. "On the narrative form of simulations." *Studies in History and Philosophy of Science Part A; Special Issue* 62 (2017): 74–85.

Witt, Ulrich and Naomi Beck. "Austrian economics and the evolutionary paradigm." In *The Oxford handbook of Austrian economics*, eds. Peter J. Boettke and Christopher J. Coyne. 576–593. Oxford: Oxford University Press, 2015.

Department III

# Artifacts, Action, Knowledge

DIRECTOR Dagmar Schäfer





Members of Department III, May 11, 2017  
©setform.de.

## 2015–2017

### RESEARCH STAFF

*Dagmar Schäfer, Shih-Pei Chen, Emily Brock, Wilko Graf von Hardenberg, Tamar Novick, Lisa Onaga*

### POSTDOCTORAL FELLOWS

*Stewart Allen, Sarah Blacker, Edna Bonhomme, Marius Buning, Qun Che, Kaijun Chen, Alina-Sandra Cucu, Yuzhen Guan, Masato Hasegawa, Jennifer Hsieh, Shehab Ismail, Robert Kett, Alexis Lycas, Michelle McCoy, Ian Matthew Miller, Mårten Söderblom Saarela, Ylva Söderfeldt, Michael Stanley-Baker, Carolin Roeder, Yubin Shen, Honghong Tinn, Yijun Wang, Isaiah Lorado Wilner, Zhao Lu*

### VISITING PREDOCTORAL FELLOWS

*Kevin Donovan, Sijia Cheng, Nungyao Lin, Katarina Nordstroem, Kerstin Pannhorst, Kelsey Seymour, Yangzi Wu, Yang Qiao*

### VISITING POSTDOCTORAL FELLOWS

*Anna Andreeva, Marjolijn Bol, Daniel Burton-Rose, Yan Gao, Yuzhen Guan, Xing Huang, Jung Lee, Annapurna Mamidipudi, Anindita Nag, Lik Hang Tsui, Sonja Walch, Bin Xu, Lobsang Yongdan*

### AFFILIATED RESEARCHERS

*Lanling Bai, Claudia Stein, Friedrich Steinle, Heiner Schwenke*

### VISITING SCHOLARS

*Kathlene Baldanza, David A. Bello, He Bian, David Bloor, William Boltz, Rita Brara, Emily Brownell, Paul David Buell, Aurelia Campbell, Cao Ling, BuYun Chen, Jinhua Chen, Xi Chen, Desmond Cheung, Surekha Davies, Christian de Pee, Emmanuel Delille, Joseph Dennis, John P. DiMoia, Vera Dorofeeva-Lichtmann, Yongtao Du, Fa-ti Fan, Francesca Fiaschetti, Daiwie Fu, Courtney Fullilove, Albert Galvany, Anne Gerritsen, Asaf Goldschmidt, Xueling Guan, Bertrand Guillaume, Fuxiang Guo, Barbara Hahn, Jonathan Harwood, Stéphanie Homola, Fei Huang, Hallie Hyde, Brian P. Jones, Hadi Joráti, Lara René Kusnetzky, Fuqiang Li, Yan Li, Jongtae Lim, Wenhua Luo, Annapurna Mamidipudi, Anna Mazanik, Aaron Moore, Michelle Murphy, Anindita Nag, Carla Nappi, Lisa Onaga, Pablo Ariel Pellegrini, Kavita Philip, Jennifer Reardon, Giorgio Riello, Lissa Louise Roberts, Bruce Rusk, Eric Schatzberg, Martina Schlünder, Gregory Adam Scott, Ori Sela, Kerry Smith, Lingping Song, Catherine Stuer, Marie Thébaud-Sorger, Roy Tzohar, Sarah Van Beurden, Helen R. Verran, Xueling Wang, Guangyao Wang, Hongsu Wang, Tristan Weddigen, Abigail Woods, Huiyi Wu, Yulei Yang, Karin Zachmann, Shuxian Zhang, Yingpin Zhang, Siyuan Zhao*

### DH-TEAM

*Calvin Yeh, Sean Wang, Pascal Belouin*

### SUPPORT TEAM

*Gina Grzimek, Nuria Monn †, Karin Weninger, Chaonan Zhang, Danyang Zhang*

鉛之與丹，異類殊色，而可以為丹者，得其數也。故繁稱文辭，無益於說，審其所由而已矣。

“Although different in kind and color, lead, when participating in vermillion making (cinnabar), can function as vermillion. One has to grasp its ‘inner workings’ (shu 數). Therefore, that which can be said is not effectuated by intricate formula and elegant phrases. Simply test the causes and that is that.”

*Huainanzi* Writings of the Masters, South of Huainan, 2nd century



Fusion of two images: dyers scraping stenciled fabrics, Figure 235 Hommel & Mercer, *China at Work* 1937, and Indian indigo-dye worker, photo A. Mamidipudi, 2017.

## Research Agenda

Inspired by the *Huainanzi*'s explanation of vermillion production, Department III seeks to understand how people historically approached things and their “inner workings” in action and thought. In this core text of Han-Chinese statecraft, a major reference point for cosmological speculations, things testify to the materiality of existence that cuts across every domain of life and is nigh on impossible to escape. The things of the *Huainanzi* are everywhere. We interrogate this ubiquity by investigating how the materiality of existence impacts knowing or reflects what one knows. Our focus of analysis is on processes: how one understands inner workings when making things work or imagining such ways of working. In other words, our aim is to develop a historical epistemology of action. Our research agenda has three entry points: **artifacts** (things), **action** (making), and **knowledge** (work).

### Artifacts (things)

What “knowledge” inhabits the *Huainanzi*’s myriad things, such as plants, ghosts, or stones? Without inquiring into life and artifacts and their boundaries and intersections we cannot fully understand what it means to know. Historians mainly engage with things that populate the human world via their material remains. As historians of science, we study the artifacts of human action and thought as sources, mediators, and products of scientific and technological change and question their boundaries in terms of materialism, material culture studies, materiality, and the ontological turn. Our research considers that all knowledge and knowing processes relate to materiality or have a material component far beyond the artifacts that remain. Hence, it is important to ask how people make things work.

### Action (making)

How does one “know” as a process? Historically ephemeral, action leaves behind a residue of its most important reference points, imaginable as the pillars circumscribing the void of a room. The pillars are manifest in histories of codification: how textual, material, and visual means represent and explain “knowing” in different cultures and historical situations. The ceiling is formed by a scaffold of beams, interlocked by causality, correlation, or methodological assumptions of a category of knowledge, its consistency and expressions. Our focus is on the otherwise non-descript space: how people deal with the void and how they grasp it through approximation, inference, or estimation, or respond to its uncertainty, or even not-knowing. We analyze judgments and modes of decision-making by looking at how relations were drawn through management, organizational forms, or systemic choices. Thus, we unfold all that constitutes the room.

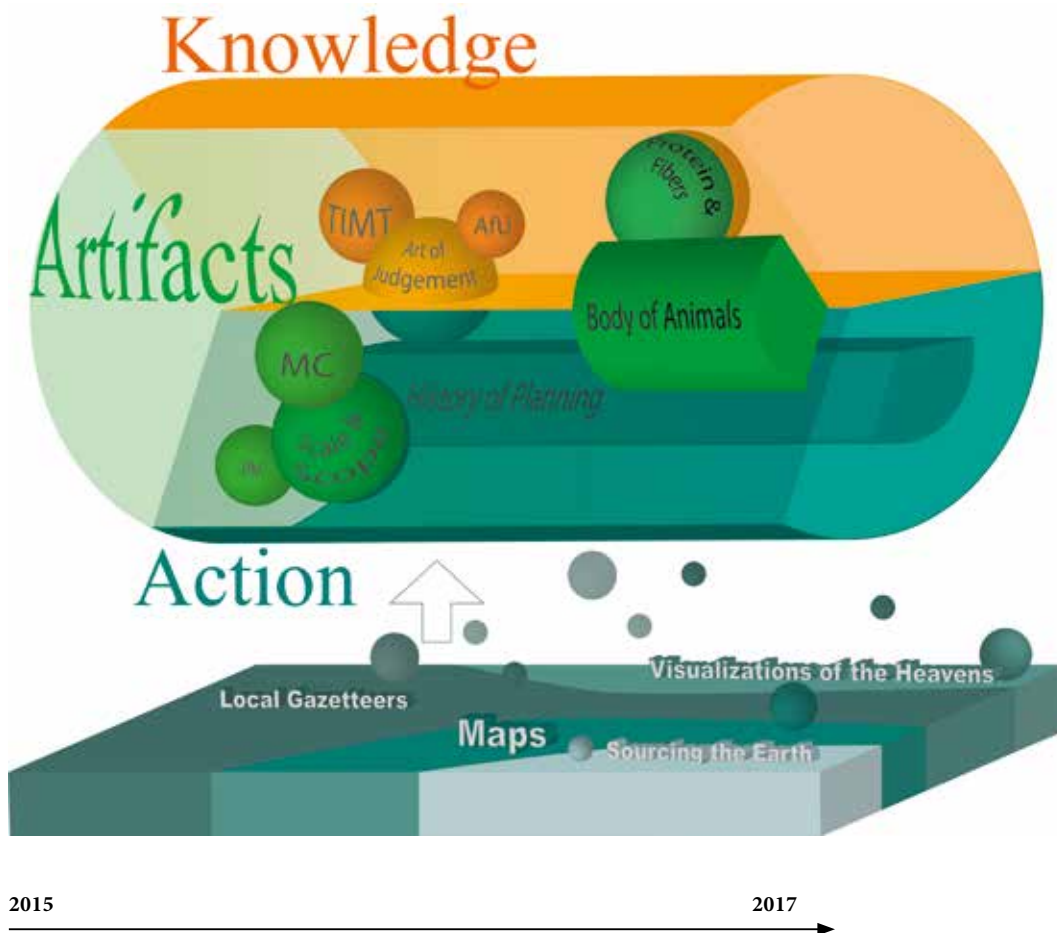
### Knowledge (work)

What kind of work is it to make “knowledge”? Knowledge-making is work for brain and brawn. By emphasizing the physical side, our aim is to push the historical analysis of what and how people knew beyond the written traces of practices and the material remnants of products. We look into the varying conceptual roles of “action” as “knowing” and ask for the use histories of terms such as: техника, సుళుమలు, మొలకువలు, تحقيق, تجريبه, מְלִמְנָה, מְלִמְנָה, מְלִמְנָה, 便, 術, 統. What are the methodological capacities of such concepts and their roles in the politics of knowledge, past and present?

The department, established in 2013, currently pursues two research themes: *Histories of Planning* (since 2013) and *The Body of Animals* (since 2016). The former operates with action as an entry point. The latter sets out from artifacts. These conceptual approaches are complemented by a critical engagement with source-based research.

## Structure of the Department

Three senior research fellows support the organization of events and visiting scholars within each cluster, while developing their own collaborative working group and pursuing their individual projects. Our growing number of postdoctoral fellows are encouraged to organize a workshop or lecture series. A considerable number of reading (both primary and secondary source based) and writing groups have developed.



- BoA** Body of Animals
  - S&S** Scale & Scope
  - MC** Moving Crops
  - PM** Palace Machine
  - HoP** History of Planning
  - AoJ** Art of Judgement
  - TIMT** Thinking in Many Tongues
  - AfU** Accounting for Uncertainty
  - P&F** Proteins and Fibers
- Diagram design: Wiebke Weitzmann.

## Overview of the Reporting Period

Substantial differences mark historical, historiographic, and current methodological interpretations of action as “knowledge.” To return to the opening quote, Liu An 劉安 (d. 122), the author of the *Huainanzi*, identified truth and persuasion in the action of skilled work (*lianggong* 良工) and the workings of things. In contrast, R. H. Hommel and Henry Chapman Mercer photographed craftsmen and their tools in their 1937 study of *China at Work* as artifacts of “a past, projected into a modern world.” Hommel also relegated the *Huainanzi* to being a source for “empirical knowledge (...) of pre-Christian time, with a practical application.” Somewhere between these two instances, practices and processes had lost their conceptual cause and cognitive edge: understanding action-as-knowledge turned into knowledge-produced/used-in-action.

The juxtaposition of historical and methodological interpretations of action has informed the department’s research since its establishment in two ways: (1) analyzing regionally variant historical epistemologies of “making things work”; and (2) asking how methods of the sciences and humanities have reflected upon such variances. Developing these two agendas side-by-side in and across various research programs has proven most effective as it allows a serious engagement with all knowledge cultures and all facets of scientific and technological change, including those that lie beyond the remit of current sciences.

The overview uses three different perspectives. The first is a chronological outline of the department since 2015; the second, an interactional view, demonstrates how the departmental agenda links the work done in themes, clusters, and collaborative and individual projects. The third and final perspective explains how our source-centric analyses correlates to the conceptual approaches and enhances our view of the sources that make up the history of science.

### 1. Chronological Outline

In broad brushstrokes, between 2015 and 2017 the research program *Scale and Scope* scrutinized local and global trajectories of planning, movement, and materiality since the nineteenth century. The focus in the Research Cluster *The Art of Judgement* has been recalibrated from questions about the ways in which changes are apprehended and evaluated in and around science and technology to the historical validity of scientific standards and baselines and the management and perception of environments and natural resources. Once *Histories of Planning* was up and running, the department intensified explorations into its second theme: *The Body of Animals*. These explorations resulted in a structural set-up that addresses the historical thresholds of animality, knowledge, and materiality, and engages with the methods and geographies defining how people have known about and through animals.



### 2015: Analyses of Practices and Skills

The year 2015 was marked by the intensive study of activities surrounding [practical skills](#). We inquired how practices were developed, memorized, and assessed from three vantage points: (1) social and political structures, (2) space, and (3) the production technique itself. The conference *Learning How*, (organizers Nina Lerman and Stewart Allen) brought into conversation scholars working on learning as an institutionalized and ad-hoc experience in varied political systems, periods, and regions. *The Palace Machine* (May 28–29, 2015, Martina Siebert, Kaijun Chen and the Palace Museum, Beijing) looked at practices in the singular space of the Qing court between 1660 and 1850. Finally, a collaborative workshop with the University of Salzburg, Austria focused on a singular practice across time—that of alcohol distillation.

**Key Reference** Schäfer, Dagmar. “Patterns of design in Qing-China and Britain during the seventeenth and eighteenth centuries.” In *Goods from the East, 1600–1800: trading Eurasia*, eds. Maxine Berg, Felicia Gottmann, Hanna Hodacs, and Chris Nierstrasz, pp. 107–118. Houndmills, Basingstoke: Palgrave Macmillan, 2015.

All three initiatives shed light on organizational rationalities and how they created and maintained historical epistemologies of action in which actors attempted to find reliability and truth. *Learning How* revealed, for instance, reflections on hunting and accounting practices in the training of whalers in nineteenth-century Britain (Maria Ximena Senatore), as well as the authoritative function of health workers in the Yanomani community who “walked the path of health (*salud yoka huu kuaai*)” (Johanna Goncalves Martin). Research on the Palace Machine illustrated the effect of representational duties on craft practices and the influence of imperial views of governing such trades. Scholars in the conference *Recovery of Traditional Technologies: A Comparative Study of Past and Present Fermentation and Associated Distillation Technologies in Eurasia and Their Roots* (May 11–13, 2015) analyzed techniques and implements used for alcohol distillation. A marked similarity in material rationalities across cultures was revealed, as well as signs of the transmission of certain practices between East Asia and Latin America since the sixteenth century.





**Key Reference** Schäfer, Dagmar. "Introduction." In *Recovery of traditional technologies: a comparative study of past and present fermentation and associated distillation technologies in Eurasia and their roots*, ed. Angela Schottenhammer. 133–141. Crossroads 14. Großheirath: Ostasien Verlag, 2016.

Each of these projects highlighted the need for trans-disciplinary exchange and methodology. Publication strategies were adapted accordingly. A [special journal issue](#) brought together varied methods from different disciplines, illustrating their usefulness for the tracing of a food and preservation technology that leaves no historical residue. This included how the biological perspective can reveal the gist of historical Mongolian techniques of fermenting mare's milk; recent archaeological finds on different distillation technologies in China, Central Asia, and Mexico; or what the anthropological approach reveals of Mongolian drinking implements. *Palace Machine and Learning How* decided to spread research results across various disciplines. Research was published in diverse journals, edited volumes, or monographs and thus carried results into fields as varied as the history of technology (e.g. Joshua Grace's forthcoming monograph *African Motors: 1860–1940s*), Qing history, and the sociology of knowledge.

### 2016 and 2017: Questioning Normative Frameworks and Making Conceptual Tools

**Key Reference** Schäfer, Dagmar. "Thinking in many tongues: language(s) and late Imperial China's science." *Isis* 108 (3 2017): 621–628.

A broad range of activities marked 2016 and 2017. Organized by Wilko Graf von Hardenberg, the research program *The Art of Judgement* directed attention to the normative frameworks that actors develop to rationalize action related to the environments in which such action occurs. Research tackled, for instance, the rationale(s) that lie behind the perceived need to take measurements to identify an abstract mean level of the sea. We also critically engaged with the concept of scientific rationality (or any rationality for that matter) and its normatively written history. The working group *Thinking in Many Tongues*, co-organized by Glenn W. Most, Mårten Söderblom Saarela, and Dagmar Schäfer, enquired into the historical "normal" in language use and explored how reconsidering history as a multilingual space alters views on the circulation of scientific knowledge and on change in different world regions. *Accounting for Uncertainty*, a collaboration with the Käte Hamburger Kolleg's International Consortium for Research "Fate, Freedom and Prognostication" (University of Erlangen), looked at probabilistic or predictive methods in East Asia. Researchers in this group found examples of the conceptual history of uncertainty and its relation to prediction, probability, and truth, for instance when attempts were made to prevent locust plagues in Qing China or infanticide (*mabiki* 間引き) in medieval Japan.

In the research program *Scale and Scope*, various working groups critically engaged with the growing scales and diminishing scopes of plans and planning and how these affected knowledge dynamics. *Moving Crops and the Scales of History* questioned and experimented with time-scales, periodization, and temporalities in global accounts of resource development in agriculture between the seventeenth and twentieth centuries. Conventional associations of size with scale played an important role in the research of the *Planning and Counterplanning* group, which concentrated on the nineteenth and twentieth centuries.

The conceptual tools and approaches developed in this program unveiled the variances of historical epistemologies as much as they aspired to offer alternatives. Comparing tea plantations in India, coffee in Ethiopia, or tobacco in post-Independence Carolina, *Moving Crops* established "cropsapes" as a useful concept to untangle ide-

ologies and practices of size that have come to dominate in particular global history accounts. As *Planning and Counterplanning* pinpointed the lasting effects of nineteenth-century projects of “modernization” and “development” on knowledge and knowhow up to the contemporary period, the group developed an initial working glossary into a book manuscript. *Keywords: An Alphabetical History of Planning from the 19th Century to the Present* offers a critical reshaping of the myriad ways plans and planning practices have pervaded the last century and a half. Many entries also take up as their “keyword” a particular, historically specific detail or object rather than a common conceptual term.

The political implications of knowledge categories revealed in *Moving Crops and Planning and Counterplanning* resonated with the concerns of the *Ownership of Knowledge* conference jointly organized by Mario Bigoli, Marius Buning, and Dagmar Schäfer in November 2016. Scholars critically engaged with the current view of legal approaches as hegemonic. The conference has led to two important consecutive conclusions: first, the methods of the history of technology show how the law has historically been used to revise what the sciences consider(ed) to be a product of nature. Such legal influences are as problematic as they are intriguing. A special issue on this topic is in preparation. Second, scholars identified a substantial lack in current historical trajectories of how an object, product, or process turns from a “know-able” to an “own-able” entity. This included reflection on how scholarly research, whether historical, anthropological, or sociological, transforms things, ideas, and processes from know-able to own-able entities and on the fact that this scholarship itself produces social order. The issue of how research makes explicit the politics of knowledge, and how ownership practices and ideals are considered by scholars in courtrooms, workshops, policy spaces, and research practices advanced in a second workshop in summer 2018.



**Key Reference** Schäfer, Dagmar. “The historical roots of modern bridges: China’s engineers as global actors.” In *Technology and globalisation: networks of experts in world history*, eds. David Pretel and Lino Camprubí. 27–39. Cham: Palgrave Macmillan, 2018.

## 2. Interactional View of the Department: Materiality and the “Inner Workings”

As each research cluster, working group, and individual developed its agenda, it was involved in and generative of overarching conversations about the major concerns of Department III. From research topics to methodological approaches, and from source selections to collaborative efforts, the contemplation of matter, material properties, and complexes—in short, analyzing materiality—has inflected all aspects of work among the department’s researchers during this reporting period.

Materiality, as the lens through which the inner working of things is considered, is directly reflected, for instance, in a number of individual projects such as in stone

masonry and heritage protection in Scotland (Stewart Allen), porcelain manufacture in Jingdezhen and Meissen (Kaijun Chen), tin and pewter in Qing China (Yijun Wang), or the sewage systems and architecture of Cairo's urbanizing space (Shehab Ismail). In addition, the weekly departmental colloquium is an indispensable forum for methodologically innovative debates.

### Department Colloquia

Visiting scholars, post-docs, and working groups meet weekly to jointly discuss research-in-progress. On-going project work is presented to foster linkages and conversations across different working groups. In 2016, for instance, various members of the working group Thinking in Many Tongues took up the theme of materiality in an examination of language change and meaning:

#### Thematic cluster: Materiality, Language, Translation

*Ori Sela* (Tel Aviv University) "The Textual Nature of Nature: Astronomical Debates in Eighteenth Century China." September 27, 2016

*Glenn W. Most* (Scuola Normale Superiore di Pisa) "Editing the Presocratics: For Example, Anaximander." October 4, 2016

*Hadi Joráti* (Ohio State University) "The Textual Nature of Nature: Astronomical Debates in 18th Century China" October 11, 2016

Methodological concerns on the artifact as a source of information were important, for instance, in the doctoral project of Zhou Gu, who researched (within the training program *Get-it-published*) the production and trade of red beads along the Maritime Silk Road. His interests coincided with the methodological focus of the master series *Methods Intensive*, in which Jianjun Mei (April 2015) introduced four case studies from the history of metallurgy in China, and with the work of Kathleen Morrison (October 2015), who critically scrutinized paleobiology and its role in the history of science. In a collaboration with the Academia Sinica, Taiwan, and Bettina Wählig at the University of Braunschweig, scholars probed the material linkages of trade and scientific efforts—from butterflies to pharmaceuticals—between Taiwan and Germany since the seventeenth century (Material Cultures of Knowledge Berlin January 26–27, 2016; Taipei February 13–14, 2016).

In 2016, the research theme *The Body of Animals* dovetailed with events on the deep and global history of animals and conversations among residential scholars on animals as "things with life." Several scholars discussed historical approaches to health and healing and the use of animal parts, including animal waste (Tamar Novick, Sijia Cheng, BuYun Chen). Tamar Novick and Wilko Graf von Hardenberg cooperatively organized a working conversation with King's College London graduate students on standards and animal bodies. In 2017, *The Body of Animals* also explored temporalities and mobilities of animals across Eurasia in a jointly organized convention at the Hebrew University of Jerusalem, Israel (HUJI).

### Methods Intensive Master Class Series



... is an intensive research & training seminar that mobilizes the methodological diversity and expanding repertoire of historical studies on science, technology, and medicine and provides a forum to discuss, learn, and research cross-disciplinarily. The seminar, held by methodologically innovative leading scholars, is also an important venue to explore the state of the field and its future and has informed the new format of the Institute's Colloquium.

*Jianjun Mei* (Needham Research Institute, UK) "Metals: Archaeology and the History of Technology" April 14–15, 2015  
*Kathleen Morrison* (University of Chicago, USA) "Anthropogenic Landscapes" October 26–27, 2015  
*Joanna Guldi* (Southern Methodist University, USA) "Empires, Texts and DH" November 14–18, 2016  
*Janet Browne* (Harvard University, USA) "Biographies and the History of Science" October 19–20, 2017  
*Irina Chowdoury* (CASI, Penn State, USA) "Oral History and the History of Scientific Practice: A Difficult Dialogue" October 19–22, 2018



Departmental research on matter and material properties has reverberated in other units of the Institute. The 2015 Institute's Colloquium, dedicated to "materiality," initiated a conversation with various MPIWG researchers. The topic also connected the department to research pursued at the Berlin Center for the History of Knowledge on "Field Work and Practices." Scholars of the department reached out into broader debates on materiality in the form of roundtables, individual papers, and seminars in universities, museums, and conferences across the globe. Results influenced the work of the

art group [METIS](#) and their project *World Factory: The Game* staged at the Young Vic, London, UK and in Berlin.

**Key Reference** Svendsen, Zoë and Simon Daw. *World factory: the game*. London: Nick Hern Books, 2017.

### 3. Source-Centric Analysis

Returning to the room metaphor (the pillars and the void), as the geographical and material remit of the discipline expands, the structure and materiality of the pillars as well as their position and role in the statics of the room require our attention. Our

#### Get-it-published

Giving junior scholars the space, time, and peer community to get that first article published.

#### 2015

*Kevin Donovan* “The Politics of Infrastructural Regionalism in East Africa” September–November 2015

*Zhou Gu* “Indo-Pacific Beads” August 2014–January 2015

*Chu Longfei* “Understanding the Heaven through Numbers: Xue Fengzuo’s Calendric Learning” July–December 2015

*Maika Nakao* “Radiation, Science, and Spiritualism in early 20th c. Japan” July–December 2015

*Joppe van Driel* “Circulating Filth: Economic Chemistry and Recycling 1700–1830” October–December 2015

#### 2016

*Yijun Wang* “Tin Mining and Pewter Crafting in China and Southeast Asian 1700–1840” April–May 2017

*Lobsang Yongdan* “The Pythagorean Theorem and the History of Mathematics in Tibet” September–December 2017

#### 2017

*Cheng Sijia* “Nutritional Filth: Agricultural Uses of Animal Waste in Late Imperial China” September 2017–February 2018

*Qiao Yang* “Scientific Exchange in Mongol Eurasia: Astronomers and Physicians in the Mongol Empire” July 2017–June 2018

Infrastructural Research Initiatives, Sources in Sciences’ Histories (IRISSH) are designed to address the most basic assumptions about matter and meaning: how object and subject, text and artifact, practice and theory are related and reflected in the sources that we use. Against this background, the department has continued its investment into the Digital Humanities (DH), developing three digital and one analog-digital initiatives: *Local Gazetteers* (since 2014), *Drugs Database* (2015–17), *Visualization of the Heavens* (since 2017) and *Maps* (since 2017). Each source-centric project in Dept. III has generated a multitude of new questions and motivated historians to rethink their approaches in ways that have also contributed to the various working groups on histories of planning, judgement and scale, language, and the body of animals.

**Key Reference** Chen, Shih-Pei, Zoe Hong, Dagmar Schäfer, Martina Siebert, and José Urzúa. “Compiling a database on historical China from local records: the Local Gazetteers Project at MPIWG.” In *Digital Humanities 2016: conference abstracts ; Kraków 11–16 July 2016*, eds. Maciej Eder and Jan Rybicki. 452–455. Kraków: Jagiellonian University, 2016.

The seed initiative *Local Gazetteers* (LG) linked in its initial research agenda to *The Art of Judgement*, exploring the way in which a source informs judgement, plans and conceived actions, and activities. **Chinese local gazetteers**, a genre of local directories that recount issues such as taxes, buildings, landscapes, regional customs, and social structures, are a central source for local history and local materiality. LG asked about the varied local materialities that defined the Sinophone sphere and at the same time inquired into the reciprocal effect: how did the literary recognition of materials in a genre such as the Local Gazetteers shape the locality’s identity and correspondingly also the techniques, practices, and thinking that took shape?

As it has become possible to work across a large corpus, new research questions have substantially challenged the view of Ming and Qing China’s knowledge economies,





Popular cosmographic map of the Qing Empire (presumably early 20th century BCE). *Da Qing Tianxia zhonghua ge sheng fu zhou xian ting dili quantu* 大清天下中華各省府州縣廳地理全圖 “Complete Terrestrial Organisation Map of the Great Qing’s Under-Heaven and the Central Florescence (=China) with all the provinces, prefectures, districts, counties and sub-prefectures”. MPIWG collection.

universal standards, and regionally variant views that fed into *The Art of Judgement* research cluster. Qun Che explored practices of water conservancy in relation to the emergence and treatment of diseases at the middle Yangtze delta. Ian Matthew Miller analyzed forest policies, developed at one specific locality, and their universalization across the early Ming territory. As Joseph Dennis revealed the substantial variation in the size and scope of local libraries during the Ming and Qing periods, he could also throw new light on how, within and outside of imperial practices of education, localities thus developed particular interests in fields such as astronomy or botany.

The examination of school book collections across time and space represents one of many projects that profited from discussions of data expansion and historical dynamics pursued in *Scale and Scope*. Within the context of the practical implications of Big Data research Cao Ling, using local gazetteers, examined the introduction and spread of maize during the fifteenth and sixteenth century and its environmental impacts, such as deforestation and soil exhaustion—connecting at the same time to *Moving Crops*. Several researchers (David Bello and Desmond Cheung) developed new approaches to locusts, and their impact on agriculture, while exploring the insects’ role in the *Body of Animals* theme.



The compositions of sources in both the *Drugs Database and Visualizations of the Heavens* challenge historiographic approaches to regional and temporal views on knowledge representation and enactment. A major novelty of the *Drugs Database* has been to bring together historically separated corpora to understand the development of materia medica knowledge in texts. It could be shown how practices grew disparate over time for intellectual and political reasons, but also how, on a similar basis, similar judgements were made about the efficacy of herbs, a concoction, or an illness. *Visualizations of the Heavens* challenges us to consider when and how things find and obtain a voice as materials, forms, colors, and surfaces—and to ask how such voices materialized and became manifested across Europe, Asia, and North Africa. Conversations coincided with research on the colonial and postcolonial trajectories that affected the composition of these sources and our current access to them as well. Digital and analog cannot be separated; therefore, since 2017, *Visualizations of the Heavens* has assembled visual and material artifacts—sculptures, murals, pots—with astrological and astronomical content, iconographic, scriptural, and diagrammatic information on the planets, stars, and the earth. Also in 2017, the Institute's source and rara collection was expanded to include both analog and digital maps and map-making tools (Vera Dorofeeva-Lichtmann, Yulei Yang, Cathleen Päthe, Esther Chen).

All digital research initiatives have shown that it is crucial we go beyond histories of exchange and circulation to understand how matter and meanings emerged, were maintained, or disappeared. The most important result to date, however, may be that material culture and practices are becoming generative participants in a historical epistemology of action.

## Research Theme

## Histories of Planning

*Histories of Planning* heeds processes of knowledge production and use, rather than their end product or effects. In the first intensive working phase, conversations developed around two major issues, until each formed a new research cluster:

- **The Art of Judgement:** What are the formal and informal norms that shape a working process and work-in-progress and how do time, power, and availability of materials affect what turns into the visible pillars and invisible spaces of knowing?
- **Scale and Scope:** How do varying scales of space, time, and agency of an operation (imagined or real) impact the creation of knowledge, artifacts, practices, and ideas about them and their use?

Judgement is a question of morals, ability, or power. It is also an integral part of producing knowledge by processes of making. We are interested in the dynamic nature of both assessments and decisions, the art of producing, validating, and redefining what counts as knowledge and how some knowledge comes to count more than others. In focus are the processes of mediation and conflict, both synchronic and diachronic, that impact knowledge in the making. We scrutinize the subjective and objective ways in which knowledge and expertise are affirmed or rejected, how choices are validated by groups and individuals, and how planning—and more generally, how the attempt to make things work—is evaluated in terms of failure and success. Inquiries into the Art of Judgement examine the social, political, economic, and intellectual considerations that affect the timing and agents in knowledge processes.

“Scale” is an important apparatus of scientific inquiry. It is also inherent in many qualitative assumptions about the nature of scientific and technological change, including how science and technology impede or facilitate other developments that prompt historical analyses. Accounts of scientific change prominently figure dynamic interactions such as accelerating or delaying information flows, intensifying crop cultivation or the density of materials, shortening or expanding life cycles, diminishing sizes, or singularizing elements and events. “Scope” adds a spatial dimension and deals with cases when there are shifts in the plans to make things work, whether this involves a choice to operate on small or big data sets, to study large populations or individual genes, or to build one chair or several thousands per hour. Together, Scale and Scope clarify how things are done. By researching processes of doing, as the “why” and “how-to-do” are formalized into words or images, it becomes possible to express knowledge about the statics of specific things, their material qualities or costs, or how to work the materials that compose the parts.

Research Cluster

## The Art of Judgement



Europe. A Prophecy, Plate 1, Frontispiece. Print by William Blake, 1794. Source: Yale Center for British Art, Paul Mellon Collection, Public Domain.

ORGANIZER *Wilko Graf von Hardenberg* (MPIWG)

The Art of Judgement's research program focuses on how judgements, read as central and necessary elements of any knowledge process, are formed.

Over the last three years, the research program has gradually refined the analytical themes of its core agenda, focusing intensively on the connections between the history of judgements in science and technology and current concerns about global change. This recalibration stems from the perceived need to further develop the historiographical understanding of how changes have been apprehended, evaluated, and managed within an environment in constant transformation. In this context, it is crucial to pay attention to the artifacts of measurement, intended here in the sense of both the physical and theoretical instruments that are used to produce an image of the changing world as well as the possible distortions in perspective or meaning produced by those instruments. Some of the analytical themes tackled by the research agenda set by Wilko Graf von Hardenberg refer thus to the role of standards and baselines in assessing and framing changes, the social framework of value-laden decision-making processes regarding natural processes, also in correlation to conservation, and the historical dimension of the environmental context in which judgements have been produced.

Visiting Scholars associated with *The Art of Judgement* addressed research issues connected to the history of global change, sparking an extremely fruitful debate on how the group's new agenda could enter into a discussion with the overarching issue of the history of judgements. For instance, Pablo Ariel Pellegrini contributed to this with his work on the Pangea, elaborating on the question of when evidence is judged to be sufficient as scientific controversies occur. Surekha Davies addressed the ways in which judgements about identity have affected the European gaze on other peoples by looking at how artifacts in collections have modified ideas about cultural hierarchy.

---

## Visiting Scholars

**2015**

*David Bloor* (University of Edinburgh, UK) “Interpretations of the Cambridge Cockpit Experiments” March–May 2015; September 2015–May 2016

*Sarah Van Beurden* (University of Ohio, USA) “Planning a Colonial Cultural Economy: Arts and Crafts in the Belgian Congo (1930–1960)” August 2015–July 2016; September 2016–July 2017

**2016**

*John P. DiMoia* (National University of Singapore) “Comparison of Demographic Regimes” January–August 2016; August–December 2017

*Pablo Ariel Pellegrini* (La Universidad Nacional de Quilmes, Argentina), “When is Evidence Enough? The Pangea Controversy and the Drift of Evidence” April–June 2016

*Christian de Pee* (University of Michigan, USA) “The City as Nature: An Intellectual History of the City in Middle-Period China” September 2016–May 2017

**2017**

*Eric Schatzberg* (Georgia Tech, USA) “The Hermeneutics of Judgement and Critiques of Technology” January–July 2017

*Surekha Davies* (Western Connecticut State University, USA) “Collecting Artifacts in the Age of Empire” May–August 2017

*Stéphanie Homola* (EHES, France) “Hand Mnemonics and Counting Skills: Reducing Uncertainty through Fate Computation” May–June 2017; July–September 2017

---

Early debate about the thematic direction of activities resulted in a speakers’ series, held over a few months in 2016. The guest speakers addressed the various, occasionally unexpected ways that judgements have been understood, validated, and acted upon by historical actors at the crossroads of global change. Of particular relevance was the analysis of matters of objectivity, subjectivity, and reliability and of how these relate to the production of judgements in a variety of fields of inquiry. In February, Giacomo Parrinello (Sciences Po) discussed his project on the history of hydrography in the Po watershed in Italy, while in April, Steven Shapin (Harvard) talked about the issue of subjectivity and objectivity in wine-tasting. Finally, in June, Nancy Jacobs (Brown) presented her book *Birders of Africa: The Politics of a Network*.

The two major foci of 2017 were the role of empires in framing scientifically new environments and the intersection of simulation and estimation in science. Panels on *Empires of Knowledge* was organized in cooperation with Philipp Lehmann (Dept. II). Here scholars from diverse backgrounds discussed the role of empires, world politics, and the revolutionarily global dimensions of nineteenth-century science in determining how new conceptions of environments beyond the local scale—be they regional, continental, oceanic, or planetary—developed and interacted with diverse sets of cultural and social practices (American Society for Environmental History, Chicago, USA, March 29–April 4, 2017, European Society for Environmental History, Zagreb, Croatia, June 28–July 2, 2017, and European Congress on World and Global History, Budapest, Hungary, August 31–September 3, 2017).

**Key Reference** Hardenberg, Wilko Graf von, Matthew Kelly, Claudia Leal, and Emily Wakild, eds. *The nature state: rethinking the history of conservation*. Routledge environmental humanities. London: Routledge, 2017.

The second focal point, *Estimated Truths*, a workshop dedicated to the dynamic properties of water, developed, in part, as an outcome of Giacomo Parrinello's contribution to the speaker series. This workshop paid particular attention to the relationships between politics and science and the role of power structures in determining choices and decision-making processes. It explored the fluidity of data and judgements in the field of water science, in particular how water in its different states has been researched, and the role that approximations, models, and simulations have played in methods of scientific judgement, inquiry, and assessments of water. The ways in which the material properties of water and the larger bio-geophysical systems into which it is embedded shape the kinds of knowledge that are produced were discussed by exploring how scientists produce informed judgements about rates of flow, changes in level, processes of condensation and precipitation, and thickness and deformation of ice.

### Workshop

#### Estimated Truths: Water, Science, and the Politics of Approximation

August 16–17, 2017

CONVENORS *Wilko Graf von Hardenberg*, MPIWG, *Giacomo Parrinello*, Sciences Po, Paris, *Etienne Benson*, University of Pennsylvania, USA

#### PARTICIPANTS

*Azadeh Achbari* (Universiteit van Amsterdam, the Netherlands) “Local Waters, Global Ambitions: Dutch Participation in the Multinational Tide Experiment of 1835.”

*Debjani Bhattacharyya* (Drexel University, USA) “Soaking Ecologies: Swamps, Law, and the East India Company in Bengal.”

*Angelo Matteo Caglioti* (UC Berkeley, USA) “From Liberal to Fascist TechnoPolitics: The Hydro Politics of the Horn of Africa between Italian and British Imperialism (1919–1939).”

*Sarah Dry* (Science Museum Group, UK) “An Unruly Skill: Approximation, the Rainband, and the Politics of Weather Prediction in late Victorian Britain.”

*Maurits Ertzen* (TU Delft, the Netherlands) “Technology, Leaving all the Answers Blank, and Getting

100. Hydrological (Un)certainly in Dutch Colonial Irrigation.”

*Matthew Evenden* (University of British Columbia, Canada) “Measuring Pure Water for War: The Chlorination Debate in Vancouver during the Second World War.”

*Jessica Lehman* (University of Wisconsin–Madison, USA) “Observing the Ocean: Truth, Variability, and Potential in Anthropocene Seas.”

*Daniel Macfarlane* (Western Michigan University, USA) “‘As nearly as may be’: Controlling Water on the St. Lawrence River”

*Michael Reidy* (Montana State University, USA) “Glaciers, Modeling, and Spaces of Uncertainty”

*Christy Spackman* (Harvey Mudd College, USA) “Informed Taste: The Sensory Politics of Identifying Off Tastes and Odors in Municipal Water.”

The research cluster also cooperated in May 2017 with the Center for Ecological History, Renmin University, Beijing and the Rachel Carson Center for Environment and Society, Munich to organize an international conference, held in Beijing, on interactions between conflicting claims of knowledge about nature. This international conference examined what was seen and understood as measurable, speculative, safe, or unsafe and how scale (of landscapes, research projects, etc.) can affect knowledge production. It embraced a *longue durée* view of competing communities of knowledge over the past 10,000 years as well as views on how, in modern societies based on science and technology, scientific knowledge still competes with other bodies of knowledge with often profound consequences for the natural world. Finally, in June 2017, together with the Technical University, Berlin, the research cluster hosted a lecture by *Mats Fridlund* (Aalto), discussing the materiality of political struggle and resistance through the lens of their sociotechnical affordances, and another in October, by *Margaret Schotte* (York), on the role of tacit knowledge, experience, and training in the transmission of navigation theory in the eighteenth century.



The position of the glacier in 1990. Photographer Nathan Wong 2007, creative commons.

### International conference

#### Knowing Nature: The Changing Foundations of Environmental Knowledge

May 25–27, 2017

VENUE Center for Ecological History, Renmin University, Beijing

CO-ORGANIZING INSTITUTION Rachel Carson Center for Environment and Society, Ludwig-Maximilian-Universität, Munich

“Knowing Nature:” examined what has been seen and understood as measurable, speculative, safe, or unsafe and how scale (of landscapes, research projects etc.) can affect knowledge production. By doing this it moved beyond simple dichotomies (modernity vs. tradition, science vs. religion, folk wisdom vs. urban ignorance), to develop comparisons that cross national boundaries, and to bring neglected parts of the globe and time into view.

Two long-term collaborations on the history of geophysics and oceanography were initiated in 2017 that will bear fruit in the coming years: a digital humanities project, in cooperation with the library of the Deutsche GeoForschungs Zentrum (German Research Centre for Geosciences) in Potsdam and the Institute’s library, dedicated to producing a digital repository for the history of modern geodesy; and a sounding of possible joint work on the history of hydrography in an age of change with the Archivio Studi Adriatici of Consiglio Nazionale Delle Ricerche – Istituto di Scienze Marine (National Research Council Institute of Marine Sciences ISMAR-CNR) in Venice.

**Key Reference** Coulter, Kimberly and Wilko Graf von Hardenberg. “Cultivating the spirit of the commons in environmental history: digital communities and collections.” In *Methodological challenges in nature-culture and environmental history research*, eds. Jocelyn Thorpe, Stephanie Rutherford, and L. Anders Sandberg. 260–271. London: Routledge, 2017.



## Working Group

### Thinking in Many Tongues

*Glenn W. Most* (External Scientific Member), *Dagmar Schäfer*,  
*Mårten Söderblom Saarela*

Ennius mastered three languages; Isaac Newton knew three. Song astronomer Su Shi 蘇軾, moving from office to office, navigated through multiple Sinitic dialects. These knowledgeable men were “thinking in many tongues.”

This group focused on the impact of historical multilingualism on knowledge cultures. First conversations started in 2014 when visiting scholars helped expand and explore the concepts relevant for this project, such as a study of scriptural exegesis in

### Conversations on Multilingualism and Knowledge

#### **Moments of Translation** April 20–21, 2016

Discussion of key moments of translation as the transfer of a cultural tradition across languages (for example, the translation of the Jewish Bible into Greek; Indian Buddhism into Chinese).

#### **Koine** June 27–29, 2017 INVITED *Richard VanNess Simmons*

The idea of a koine, as developed in antiquity in reference to the situation in Greece, was tested against other historical situations of scientific exchange, including ancient Mesopotamia and late imperial China.

#### **Etymology** October 5–6, 2017 INVITED *Johannes Bronkhorst*

The practice of word history was analyzed, concluding that nothing like modern etymology existed anywhere before the nineteenth century.

#### **Lexicography** December 14–15, 2017 INVITED *Kees Veerstegh*

The emergence of ancient lexicography as glosses to canonical texts (Greek, Indian, Arabic traditions) as opposed to lists that might predate narrative texts (Mesopotamia) was investigated. In later periods, lexicographical traditions often originated as bilingual dictionaries often concerned with trade or administrative themes.

#### **Myths on Origin/Plurality of Languages** March 8–9, 2017

*Florentina Badalanova Geller; Shervin Farridnejad*

Concentrating on the myth of Babel, the meeting realized that the explanation of linguistic difference might have been specific to Mesopotamia, and not shared by the Sanskrit, Greek, and Classical Chinese cultures, for whom only one language mattered.

#### **Ethnographies of Languages** May 5–9, 2017

Language contact in the context of trade, conquest, and religious pilgrimage, as reflected in travel-ogues and word lists, was explored.

The conception of a Reader was presented twice in open fori, on September 4–5, 2017 (in Venice) and November 2–3, 2017 (in Tel Aviv), co-financed by University of Venice and Tel Aviv University.

Sanskrit (Roy Tzohar) or Late Imperial Chinese theories on the origin of language (Wolfgang Behr). Between 2016–2017, *Thinking in Many Tongues* formed a working group that brought together over a dozen historians and philologists with diverse linguistic expertise: Wolfgang Behr (Zürich), Sonja Brentjes (MPIWG), Michele Loporcaro (Zürich); Bill Mak (Kyoto); Glenn W. Most (Pisa/MPIWG); Hindy Najman (Oxford); Filippomaria Pontani (Venice); Mårten Söderblom Saarela (MPIWG); Dagmar Schäfer (MPIWG); Roy Tzohar (Tel Aviv); Markham Geller (FU Berlin). In conjunction with the theme several visiting scholars were invited. Source-based projects like water conservancy and planning in Imperial China (Qun Che) also contributed to inter-group research synergy.

Conducted in a reading seminar format, the members used joint readings and translation to explore how the text was affected by its origin in a plurilingual society and, conversely, the effect plurilingualism had on reading practices and on a “polyglot’s” understanding of a text (its concepts and ideals). Discussions ranged from ancient Mesopotamian dictionaries and bilingual phrase books used on the Silk Road to the myth of the Tower of Babel in Biblical sources and later tradition; from the display of language mastery through speculation on the origin of words in ancient India to an imagined, utopian language in ancient Greece. The concentration of expertise in various cultures and historical periods enabled the group to see patterns and surprising divergences that otherwise would have remained hidden from view. Invited speakers completed the group’s expertise on themes such as the role of translation in multilingual worlds (April 2016) or different cultural approaches to lexicography (December 2017).

In preparation is a collection of source texts on plurilingualism—given in translation and in the original language and script. The aim is to present course material for classes on plurilingualism as a historical and comparative phenomenon, something rarely taught but crucially important for understanding the emergence of knowledge traditions across Eurasia and beyond. Additional participants have teamed up to explore the historical relationship between scholars’ plurilingual abilities and the development of knowledge or scientific change to reflect on the issues discussed in the meetings.

### Untangling Threads: Translation and the History of Science

*Thinking in Many Tongues* has also led to multiple strands of consecutive research into the historical role of the scholarly practice of translation and transmission histories through which the department was able to reach into ongoing discourses. While a [culture of translation](#) has been traditionally perceived as bound between two languages and thus culturally homogeneous, the participants of the meetings highlighted variations, imitations, differences, and ruptures in translation practices that expanded reflections beyond the narrow terrain of translations of scientific, medical, or philosophical texts to the larger cultures in which and for which such translations were made.

Structurally, this approach originated in a series of conferences, some in conjunction with Department I. Two of the workshops and one conference

**Key Reference** Brentjes, Sonja, Taner Edis, and Lutz Richter-Bernburg, eds. *1001 distortions: how (not) to narrate history of science, medicine, and technology in non-western cultures*. Bibliotheca academica: Orientalistik 25. Würzburg: Ergon, 2016.

**Key Reference** Schäfer, Dagmar. “Translation history, knowledge and nation building in China.” In *The Routledge handbook of translation and culture*, eds. Sue-Ann Harding and Ovidi Carbonell Cortes. 134–153. London: Routledge, 2018.

were part of a research project headed by José-Luis Mancha (University of Seville) in cooperation with Sonja Brentjes (Dept. I) and took place in Berlin (2014, 2015) and Barcelona (2016). Translation will also be a major theme in the 2018 Masterclass organized by the postdoctoral fellows of the Berlin Center for the History of Knowledge.

A variety of relevant publications are in preparation: on the construction of tales of translation according to legal standards to enable **political and juridical “fact finding,”** the differences or similarities between Tangut, Chinese, and Uighur translation practices, translation as a cultural metaphor and political enterprise in different parts of the Indian subcontinent, the relation between reading, translation, and educational practices in Japan, attitudes of Syriac clerics towards the translation of secular texts, and the invention of translations in competitive environments, such as the multilingual and multi-faith Abbasid court of the early ninth century.

### Working Group

#### Accounting for Uncertainty: Prediction and Planning in Asian History

ORGANIZERS *Dagmar Schäfer, Michael Lackner* (Friedrich-Alexander Universität Erlangen-Nürnberg, Germany)

Planning and prediction about nature, matters of state, and life itself depend on making sense of the unknown. *Accounting for Uncertainty* addresses these material processes coupled to the visualization of scenarios used to plan for the future.

*Accounting for Uncertainty* was a cooperative project between Department III and the International Consortium for Research in the Humanities “Fate, Freedom, and Prognostication—Strategies for Coping with the Future in East Asia and Europe” at the Friedrich-Alexander University Erlangen-Nürnberg. The two institutions took turns hosting visiting scholars for two three-month periods: June through August 2016, and May through July 2017. This allowed scholars to explore the religious and intellectual elements of prognostication and its context in East Asian cultures and the scientific, technical, and material issues of planning and prediction within global trajectories and ideals of modernity.

### Visiting Scholars

#### June–August 2016

*Anna Andreeva* (Universität Heidelberg, Germany) “Childbirth in Medieval Japan”

*Daniel Burton-Rose* (Brown University, USA) “Spirit-Writing among the Civil Examination Elite: The Altar of Peng Dingqui, 1670s–1710s”

*Stéphanie Homola* (Collège de France, Paris /IKGF, Friedrich-Alexander Universität Erlangen-Nürnberg, Germany) “Hand Mnemonics and Counting Skills: Reducing Uncertainty through Fate Computation”

**May–July 2017**

*David Bello* (Washington and Lee University, USA) “The Ethological Theodicy of Locust Infestation in Early Modern China”

*Jinhua Chen* (University of British Columbia, Canada/MPIWG) “To Prognosticate the Unknown: Ruixiang-Related Ideas and Practices in Medieval China”

*Kerry Smith* (Brown University, USA/IKGF, Friedrich Alexander Universität Erlangen, Germany) “Seas of Fire: Earthquakes, Disasters, and Japan in the Twentieth Century”

Visiting scholars also helped connect working groups to each other or contributed to a comparative or cross-regional perspective. For example, whereas *Accounting for Uncertainty* initially concentrated on China and Japan, Rita Brara contributed a useful perspective on prediction as practice in Rajasthan, India.

*Rita Brara* (University of Delhi, India) “Prediction as Practice: Entanglements of Local Culture, Sci-Tech, and the State” September–December 2016

Following an open call, six scholars joined the project, dividing their period of research between Erlangen and Berlin to develop a sense for the lines that actors drew between planning and predicting and thus the borderlines and intersections drawn between knowing, guessing, and experimenting: what counted as evidence in such situations and how truth and reliability were achieved in processes of planning and predicting, such as childbirth, environmental dynamics, or earthquake prediction. The cooperation between cultural history and the history of science led participants to substantially rethink concepts and practices. Despite diverse strategies of publication, the group found it useful to produce a joint publication on the regional variances of “Uncertainty” debates. Currently, a preprint is in preparation.



You Tong 尤侗 (1618–1704) was a prominent Suzhou literatus who participated in the spirit-writing altar of Peng Dingqiu. This illustration from his autobiography depicts him receiving a visit from an emissary of the Jade Bureau, the name of the celestial bureaucracy of Wenchang with which Dingqiu facilitated communication. The site of the contact is the Cultural Star Pavilion 文星閣 in southeastern urban Suzhou. From *You Hui'an Taishi nianpu tu yong* 尤梅菴太史年譜圖詠 (Chronological Autobiography of the Local Notable You Hui'an, with Illustrations and Verses), 1: 17a. In *You Xitang quanji* 尤西堂全集 (Complete Works of You Tong), Shanghai: Wenrui lou, 1900. Courtesy of the East Asian Library and the Gest Collection, Princeton University Library.

## Research Cluster

## Scale and Scope

ORGANIZERS *Emily Brock* (2014–2016), *Dagmar Schäfer*

Synergy, extrapolation, and scalability exemplify the historical knowledge dynamics of planning that are explored in *Scale and Scope*.

The processes that constitute shifts in scale and scope play a substantial role in our understanding of scientific and technological change. These processes include small-scaling, abstraction, and modeling as much as expansions, accelerations, or intensifications. Here also conversations with and between visiting scholars at the Institute between 2013–2015 contributed to a cross-regional research agenda including South and East Asia, Africa, Europe, and Australia; examples include the “Arts and the Transnational Politics of Congolese Culture” (Sarah Van Beurden), and engineering across South-East and East Asia (Aaron Moore).

---

 Visiting Scholars
**2015**

*Bertrand Guillaume* (Université de technologie de Troyes, France) “Engineering the Earth: Large Scale Environmental Plans in France” September 2014–August 2016

*Xueling Guan* (Palace Museum, China) “Making the Emperor Work: Producing and Ensuring Health in the Qing Court” July–August 2015

*Wang Guangyao* (Palace Museum, China) “Shards and Money: Managing Quantities, Qualities, and Finances in Ming-Qing Imperial Porcelain Production” July–August 2015

**2016**

*Asaf Goldschmidt* (Tel Aviv University, Israel) “The Practice and Language of Science and Politics: Power and Knowledge Formation in Asian History (10th to 18th century)” June 2015–September 2016; August–September 2017

*Lissa Louise Roberts* (University of Twente, the Netherlands) “The History of Production in Eurasia” October–November 2016

*Marie Thébaud-Sorger* (Centre Alexandre Koyré, France) “Managing Heat, Gas, and Steam in Everyday Life: Urban Micro-Inventions in Enlightened Europe” August–November 2016

*John P. DiMoia* (National University of Singapore) “Demographic Regimes” August 2016–December 2017

*Annapurna Mamidipudi* (Maastricht University, the Netherlands) “Beyond IP, Property” October–November 2016

**2017**

*Aaron Moore* (Arizona State University, USA) “Engineering Growth: Infrastructure of Planning in Japanese Overseas Development” January–July 2017

*Jongtae Lim* (Seoul National University, South Korea), “Promoting Techniques in Confucian Statecraft: Pak Chega’s ‘Technology Policy’ in Late Eighteenth-century Korea” April–July 2017

*Fu Daiwie* (National Yang Ming University, Taiwan) “The Historical Construction of British Sociology: Scientific Knowledge in the First Two Decades, from 1970s–1990s” July–August, 2017

*Giorgio Riello* (University of Warwick, UK) “Cultures of Innovation in Global History” September 2017–August 2018

While research activities until 2014 mainly explored expansion and population growth, since 2015 work has increasingly engaged with the materiality of global exchange on the one hand, and the frequently disruptive and violent processes of erasure in colonial planning on the other. “Common sense” was investigated and how the intransigence of planning lasts long after the fact. As the two working group projects, *Post-Colonial Planning* and *Moving Crops*, drew to a close, they found that the expansion of complex ventures from the local to the regional, national, even global scale involves revisiting and revising the axioms for success.

### Working Group

#### Colonial and Postcolonial Planning and Counter-Planning

ORGANIZERS *Sarah Blacker* (2016–2018), *Dagmar Schäfer*

The long-lasting “common sense” produced by colonial planning and its not infrequent facilitation of violence and erasure is the object of analysis that constitutes scholarship about counter-planning.

From the middle of the twentieth century, a range of voices—including modernization and development theorists, transnational feminists, Global South activists, and other critical intellectual traditions—articulated critiques of “master planning.” This working group of initially six members, Sarah Blacker, Sarah Van Beurden, Emily Brownell, Anindita Nag, Kavita Philip, and Martina Schlünder offered a fresh perspective by considering the epistemic effects of such “master planning” practices and how they have been called into question, modified, subverted, altered, or reified by resistance, counter-conduct, and critique.

Between 2014 and 2017 the working group emerged as a major methodological hub in Department III for discussions on difference and otherness. From its inception, the group engaged in the subtle implications of knowledge terminologies and information management in planning and when implementing such plans. A [series of interviews](#) with historians of colonial encounters (Benjamin Zacharia, Itty Abraham, and Michelle Murphy) opened up debates on how such plans can be unraveled.

**Key Reference** [http://mediathekPublic/2016/Events/2015-2016\\_Planning-and-Counterplanning.html](http://mediathekPublic/2016/Events/2015-2016_Planning-and-Counterplanning.html)



In 2016 Dr. Helen Verran joined the working group. She gave a public lecture at the MPIWG on “Colonial Planning and the Unraveling of Plans,” discussing how planning by German colonizing companies was systematically countered by the German colonial judiciary and how planning by Papua New Guinea’s new Australian colonizers was effectively unraveled by some daisy plants of the species *Tanacetum cinerariifolium*. Both cases have interrogated the agency of actors and the forms such agencies can take. In two week-long workshops participants discussed how decolonization is not merely a historical process, but also an epistemological one. Any attempt to “decolonize” thus has to critically engage with concepts of knowing and doing and their assessment. Rather than simplifying or flattening accounts of decolonization, this research project has encouraged a broader understanding of decolonizing processes as taking place at a number of different levels simultaneously.



### Workshop

#### Decolonizing the Plan: Keywords for Rethinking the Histories of Planning I

June 12–16, 2017

#### PARTICIPANTS

*Itty Abraham* (National University Singapore) “The Violence of Postcolonial Spaces”

*Ben Joseph Allen* (Stanford University, USA) “COBOL 60”

*Sarah Van Beurden* (Ohio State University, USA) “Workshop”

*Lilly Irani* (University of California San Diego, USA) “Hackathon: Delhi, 2012”

*Robert Kett* (San Francisco Museum of Modern Art, USA) “Grid”

*Monika Kirloskar-Steinbach* (Universität Konstanz, Germany) “Constitution”

*Laura Mitchell* (University of California, Irvine, USA) “Taxonomy”

*Gregg Mitman* (University of Wisconsin-Madison, USA) “Parasite”

*Tamar Novick* (MPIWG) “Theft”

*Benjamin Peters* (University of Tulsa, USA) “Computing: A Keyword Study”

*Helen Verran* (Charles Darwin University, Australia) “A Postcolonial Museum”

*Benjamin Zachariah* (Universität Heidelberg, Germany) “Rural Reconstruction in India”

Some first conceptual ideas emerging from these interventions were evident in the Planning and Counter-Planning Keywords Manual Editors’ Meeting Workshop at the Max Planck Institute for the History of Science, December 14–16, 2017.

This meeting gave rise to the notion of translating the glossary into a book: *Keywords: An Alphabetical History of Planning from the 19th Century to the Present*. The concept and approach were presented in a public panel at the Newkirk Center for Science and Society, University of California, Irvine, USA (January 12, 2017) on “Colonial, Post-Colonial, Settler, and Fascist Citizens: How to Resist the Master-Plan” followed by a workshop in cooperation with the Workshop on Science, Technology, and Race (STAR), co-sponsored by the UC Irvine Humanities Commons, the Newkirk Center for Science and Society, the Department of History, and the UC Consortium for Black Studies in California, at UC Irvine. Invited authors met with the group in June 2017

to discuss the final format of short, empirically-grounded case studies that produce a complex, multi-layered picture of how plans in colonial, postcolonial, and settler colonial contexts shape how knowledge emerges and is assessed.

*Keywords* unfolds in various case studies the myriad ways in which plans and planning practices pervade the last century and a half, not only conceptually, but even more so in the materials and practices of planning and through rationalities of “doing.”

### Workshop

#### Decolonizing the Plan: Keywords for Rethinking the Histories of Planning II

June 26–30, 2017

##### PARTICIPANTS

*Emily Brownell* (University of Northern Colorado, USA) “Charcoal”  
*Raúl Necochea Lopez* (University of North Carolina, USA) “Surveyors”  
*Karen McAllister* (McGill University, Canada) “Weeds”  
*Lauren Minsky* (New York University, USA) “Forgetting”  
*Aaron Moore* (MPIWG) “Flows and Networks”  
*Leon Morenas* (University of Edinburgh, UK) “The Region”  
*Nada Moumtaz* (University of Toronto, Canada) “Property in Planning”  
*Tahini Nadim* (Museum für Naturkunde, Berlin) “Seeds”  
*Juno Salazar Parrenas* (Ohio State University, USA) “Experiment”  
*Martina Schlünder* (MPIWG) “Alarm Clock”  
*Ana Carolina Vimerio* (Univ. Federal de Minas Gerais, Brazil) “National Identity”  
*Alexandra Widmer* (York University, Canada) “Lazy”  
*Alden Young* (Drexel University, USA) “Sudan”



### Visiting Scholars

#### 2015

*Martina Schlünder* (University of Toronto, Canada), “1 + 1 = 3. Economies of Reproduction” January–February 2015  
*Kavita Philip* (University of California, Irvine, USA) “Post-Independence Indian Planning” April–September 2015; May–September 2016  
*Anindita Nag* (German Historical Institute, Washington DC, USA) “Haunted by Hunger: Famine, Science, and Cultures of Planning in India” July–September 2015

#### 2016

*Emily Brownell* (University of Northern Colorado, USA) “Colonial and Post-Colonial Planning and Counter-Planning: Urban, Environmental, and Transnational Themes” September 2016–January 2017  
*Sarah Blacker* (MPIWG) “Planning for Persistent Environmental Contamination: Public Health, Indigenous Traditional Knowledge, and Technoscience in Canada” September 2016–May 2018

*Sarah Van Beurden* (Ohio State University, USA) “Planning a Colonial Cultural Economy: Arts and Crafts in the Belgian Congo 1930–1960” September 2016–May 2017; June–July 2017

**2017**

*Helen Verran* (Charles Darwin University, Australia) “Epistemic Practices and State Planning in Settings of Western Colonialism” June 2016–June 2017

---

### Working Group

#### Moving Crops and the Scale of History

ORGANIZERS *Alina-Sandra Cucu* (2015–2018), *Dagmar Schäfer*

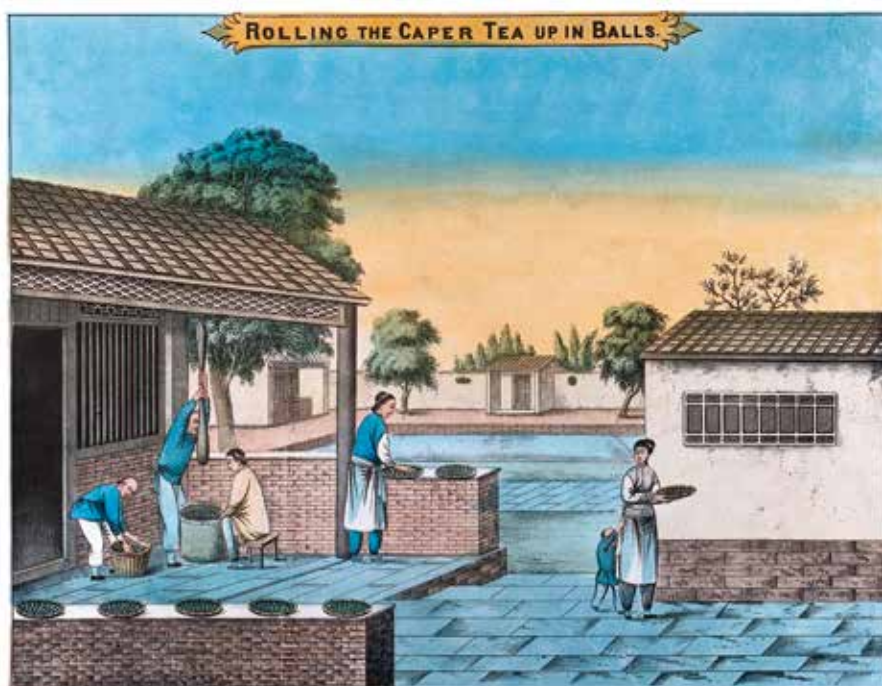
Crops are endowed with their own agency and capacities for resistance. This working group of four—Francesca Bray, Barbara Hahn, John-Bosco Lourdusamy, and Tiago Saraiva—uses this premise to examine how places produce crops and crops produce places.

*Cropscapes* is the conceptual entrée of this scholarly collective, playing with scales of historical writing and historical space, time, and agency and rethinking narratives of global circulations in global history, [agricultural history](#), and the histories of science and technology. Crops are plant species or varieties deliberately selected and located in selected sites by humans. Yet like all life-forms that humans seek to control, they have their own preferred patterns of spatial and temporal behavior and innate propensities to vary. Crops grow with time, but their domestication reshapes the “nature” and temporalities of a plant. Size is crucial in the historical account, say crop essentialists. The enlargement of historical scale reveals important size-scale effects, with crops originally cultivated and processed on a small scale converted into large-scale enterprises.

Over the last three years the group met once or twice per annum at the MPIWG for week-long meetings to plan and work on their book (tentatively titled *Moving Crops*) of six chapters (*Times, Places, Sizes, Actants, Compositions, and Reproduction*). In July 2016, an international workshop was held, in which invited participants reviewed the concept of “cropscapes” and presented their related research. The group members pre-circulated a project statement in order to get interdisciplinary feedback on their initial ideas, which were then presented to a group of historians of science, technology, agriculture, and economy, as well as historical anthropology. In due course, several visiting scholars stimulated further conversations on crops in relation to food and processing techniques.

Visiting scholars linked the group’s research to fields such as environmental studies and stimulated further conversation on the changing role of archaeology and material science studies on the analysis of agricultural change. During the December 2017 meeting, the authors connected to ongoing research on food technologies in Leiden

**Key Reference** Bray, Francesca and Georg Freise. “Tracking the translation of the savoir-faire of tea from China to British India.” In *Entangled itineraries of materials, practices, and knowledge: Eurasian nodes of convergence and transformation*, ed. Pamela H. Smith. Pittsburgh: University of Pittsburgh Press, in press.



A tea plantation in China: workers roll the caper tea into balls.  
Coloured lithograph. Courtesy : Wellcome Trust Collection UK

(Anne Gerritsen) and participated in an informal seminar with Department III members. A shared interest in crops and their circulation also emerged between group research here and source-based projects, such as research into the production and circulation of various strains of corn in Imperial China (Cao Ling) in the Local Gazetteers group.

---

### Visiting Scholars

#### 2016

*Courtney Fullilove* (Wesleyan University, USA) “Biodiversity Preservation in International Agricultural Research” September–December 2016

*Barbara Hahn* (Texas Tech University, USA) “Cloth Britannia: A History of Technology Treatment of the Industrial Revolution” September–October 2016

#### 2017

*Anne Gerritsen* (Universiteit Leiden, the Netherlands) “A Savory and Not Unpleasant Flavor: Food, Technology, and the Global Circulation of New Foodstuff between Asia and Europe” January–April 2017

*Yan Gao* (Ludwig Maximilian Universität München, Germany) “Jiangnan Plain as a Case of Sustainability (or Unsustainability) and Resilience Resource Management in Late Imperial China” January–February 2017

→ pp. 251ff.

### **Moving Crops & Local Gazetteers**

Cao Ling (Nanjing TU): *Natural Disasters in Ming-Qing Gazetteers*

The Columbian Exchange beginning around 1500 CE linked the old and new worlds and introduced American crops such as maize, sweet potatoes, and potatoes into Eurasia. While there has been extensive research about the exchange's impact on economy and society, little has been said about its environmental impacts in the old world. This project investigates one such environmental impact in China during the Ming and Qing Dynasties. Using local gazetteers, it examines the introduction and spread of maize during this period and its environmental impacts such as deforestation and soil exhaustion.

---

**Key Reference** Schäfer, Dagmar.  
“Mobilities studies, a transdisciplinary field.” *Transfers* 8 (1 2018): VII–X.

Currently in preparation is an essay on the group's approach to “mobility,” which is not quite the same in today's loaded academic discourses as “movement,” thereby also responding and reacting to the growing field of Mobility Studies and correlated research in the History of Technology. The group hosts a blog-like website on *Cropscapes*, which is conceived as functioning as an on-going dialogue between the core group members and collaborators on the topics of circulation, rootedness, and historical scale. Thus far, the website presents the project, outlines the working group's planned book, offers four cases of the group's central concept of “cropscales,” and lists associated activities. The persistent enthusiasm and commitment that *Moving Crops* generates among peers is notable. Both the book and the website are intended to function as intellectual hubs, or as a proper “collective” taking on crop history.

## Research Theme

## The Body of Animals

ORGANIZERS *Tamar Novick* (2016–), *Lisa Onaga* (2017–)

Animals have been central to humans in their attempts to understand the world and in revealing the secrets of nature. A central research question of the project is how and when animals become artifacts of knowledge, and what of that knowledge remains in the artifact.

Many of the actions in human notions of the world center on life and on the attempts to understand it. Focusing on animals, this research theme critically engages with how the artifacts of such life, namely bones, skin, flesh, and fluids—much like the pillars, roof, and void—have acted as informants of scientific and technological knowledge and practice. At the center of research stand the multiple contexts in which bodies of animals and animal parts have been used and managed, and how those contexts of use connect to different ways of knowing; how animals signify human socialities just as much as the natural world; and how humans of the past interacted with animal matter within their cosmologies. The various projects search for the meaning in pragmatic, everyday practices of using, reproducing, and caring for animals and their bodily parts, but also in practices of fearing, avoiding, and moving around them. Participants in *The Body of Animals* question whether knowing animals equates with the practices of “doing science,” and challenge the prominent frameworks of natural history and the laboratory as an endpoint. By engaging with and questioning the contours of the human and of nature, this theme also encourages research on what has historically been made to count as animal, and explores the methodological possibilities for studying animals in history.

---

### Visiting Scholars

#### 2015

*Francesca Fiaschetti* (Hebrew University of Jerusalem, Israel) “Diplomacy on the Move between Song and Yuan Traditions” July–November 2015

#### 2016

*Lisa Onaga* (Nanyang Technological University, Singapore) “Cocoon Cultures: Silk and Science in Japan (1840s–1940s)” January–August 2016

*Fuqiang Li* (Sichuan Technical University, China) “Western Scholars’ Study on Silk, Science, and Technology in China” March 2016–March 2017

*BuYun Chen* (Swarthmore College, USA) “Dyeing for Permanence: Communities of Practice and the Making of Bingata” September 2016–August 2018



**2017**

*Abigail Woods* (King's College London, UK) "One Medicine? Investigating Human and Animal Disease" January–March 2017

*Fa-ti Fan* (Binghamton University, USA) "The People's War Against Earthquakes" January–July 2017

*David A. Bello* (Washington and Lee University, USA) "The Ethological Theodicy of Locust Infestation in Early Modern China" May–July 2017

*Carla Nappi* (The University of British Columbia, Canada) "Prepositional Bodies" May–July 2017

---

Between 2015 and 2017 the group hosted several visiting scholars who participated in constitutive debates on *The Body of Animals*, addressing questions of animals, knowledge, and materiality. Abigail Woods (KCL), for example, focused on the history of the One Health approach, bringing to the fore inquiries about the human and non-human bodily components in the construction of medical knowledge. BuYun Chen (Swarthmore) looked at dyeing practices that relied on the manipulation and use of animal parts in the Ryūkyū Kingdom, and investigated the construction of knowledge and expertise around bingata textiles. In addition, special guests presented their work, such as Zeb Tortorici (NYU), who talked about bestiality accusations in colonial Latin America, opening up a larger discussion about the search for animals in the archives.

→ pp. 251ff.

**Animals & Local Gazetteers project**

*Desmond Cheung* (Portland State University) "Locust: Environmental Statecraft in Ming China."

This project looked at the locusts' lifecycle and behavior and how Ming statesmen and literati conceptualized them regionally. It analyzed administrative ideas of prevention and asked how scientific data contributed to the historical study of the Chinese understanding of nature and the environment during the seventeenth century.

The year 2017 began with a series of workshops.

"Movement, Temporality, and Exchange: Animals in Mongol Eurasia" focused on an under-studied region and people whose lives have been intimately connected with animals throughout different historical times. The workshop brought together scholars of Asia to rethink Mongol Eurasia in order to examine movements and exchanges through animals. This meeting stirred an animal-focused conversation and re-examined Mongol Eurasia explicitly with the non-human. During this one-day workshop, participants were invited to think through notions of temporality and seasonality as they related to animals and explored the ways in which animals were used and became part of understanding nature, the world, and human societies.

**Workshop****Movement, Temporality, and Exchange: Animals in Mongol Eurasia**

February 25, 2017

Hebrew University of Jerusalem (in conjunction with the ERC project Mobility Empire and Cross Cultural Contacts in Mongol Eurasia at the HUJI)

ORGANIZERS *Dagmar Schäfer* and *Tamar Novick* (MPIWG), *Michal Biran* (HUJI)*Reuven Amitai* (HUJI) “A Mamluk’s Best Friend: Some Remarks on the Mounts of the Military Elite of Egypt and Syria in the Late Middle-Ages”*Sare Aricanli* (Durham University, UK) “Organizational Context of the ‘Mongolian Doctors’ in Qing Imperial Medicine”*Na’ama Arom* (HUJI) “Unicorn in the Woods, Tigers at the Gates: Different Stages in the Contacts between the Il-Khanate and the Delhi Sultanate”*Brian Baumann* (UC Berkeley, USA) “Between Heaven and History: Zoomorphic Intercession in ‘The Secret History of the Mongols’”*William G. Clarence-Smith* (SOAS, Univ. of London, UK) “Mongols and Elephants”*Márton Vér* (University of Szeged, Hungary) and *Francesca Fiachetti* (Hebrew University of Jerusalem, Israel) “Animals in the Service of the Khan: The Postal System of the Mongol Empire and its Animals”*Masato Hasegawa* (MPIWG) “Animals and Transport in Koryŏ Korea”*Keith Knapp* (The Citadel, The Military College of South Carolina, USA) “The Use and Understanding of Domestic Animals in Early Medieval Northern China”*Shane McCausland* (SOAS, Univ. of London, UK) “Animals in Art at the Yuan Court”*Timothy May* (University of North Georgia, USA) “Lambs to the Slaughter: Conflict and Culture Over Animal Slaughter in Mongol Eurasia”*Yokkaichi Yasuhiro* (Waseda University, Japan) “Diffusion of Stone Lion, Shishi, and Koma-Inu in Eurasia and Maritime Asia”

“Present Absents: Animals in World History” developed a language and new conceptual approaches for discussing the role of animals in scientific and technological change and the understanding of man and nature in a deep historical perspective (ninth–sixteenth centuries). This began with the assumption that, while ignored thus far, animals exist and operate within those worlds and their canonical texts and surviving artifacts—that they are present absents.

**Workshop****Present Absents: Animals in World History**

March 27–28, 2017

Harvard University (in conjunction with the Science, Religion, and Culture program at Harvard Divinity School)

ORGANIZERS *Dagmar Schäfer* and *Tamar Novick* (MPIWG), and *Ahmed Ragab* (Harvard University)

Participants focus on the bodies of animals and the conceptual tools that emerged through the attempts to know and use animals. This attention to animals (as a

body of knowing and as bodies for use), their existence, movement, and actions, furthermore opens an avenue into exploring the diverse approaches to nature of this time, the factors (including the animals themselves) that actors consider to have impacted such approaches, and the ways in which such approaches connected in premodern worlds.

*Michal Biran* (Hebrew University of Jerusalem, Israel)

*Katja Krause* (Durham University, UK)

*Efraim Lev* (Haifa University, Israel)

*Carla Nappi* (The University of British Columbia, Canada)

*Ahmed Ragab* (Harvard University, USA)

*Seth Richardson* (University of Chicago, USA)

“Vetting Animals,” organized in conjunction with “The Art of Judgement” working group, tackled a specific conceptual question, that of standards of value and judgement of animals and their bodies. This one-day workshop examined both ends of the decision-making processes: the creation of judgement criteria and their application

to the natural world. By exploring the cultural and political dynamics of different sets of notions, criteria, and standards used to evaluate animals, the workshop participants sought to understand how judgements concerning animals are created and changed with respect to place and time. In addition to these workshops, a reading and works-in-progress group has consolidated around questions of animal agency, technology, and bodies.



**Workshop****Vetting Animals**

March 14, 2017

CONVENERS *Dagmar Schäfer, Tamar Novick, Wilko Graf von Hardenberg, Abigail Woods*

**Participants** (King's College London, UK)

*Felicity McWilliams* “‘They Are Slow, But They Are Very Sure’: The Value of Draught Horses to British Inter-War Faring”

*Elle Larsson* “From ‘Magnificent’ and ‘Very Fine’ to ‘Frightful’ and ‘Worthless’: Walter Rothschild’s Criteria for Judging the Value of Natural History Specimens”

*Alison Skipper* “‘A Capital Standard of Merit’: What Was a Healthy Show Dog in Edwardian England?”

*Esther Harper* “Racehorse Housing in 19th-Century England”

*Kathryn Schoefert* “Metempsychosis in the Indus and Other Anecdotes: Seeking out Normal Animal Brains around 1970”

*Alex Bower* “‘To Dose or Not to Dose? That is the Question’: Examining the Role of Animal Health Chests in Livestock Health Decision Making ca. 1930–1960”

Looking forward, *The Body of Animals* plans to advance research beyond the familiar geographic contexts and beyond textual evidence. These goals for the next phase of projects encompass an examination of the methodological possibilities of studying animals in their materiality, in the archive and beyond, and articulation of the variegated historical relationships between people and animals. Two working groups that are being constructed in 2018 both target these goals through distinct approaches. First, “**Proteins and Fibers: Scaffolding History with Molecular Signatures**” focuses on methods connected to the study of animal-based materials and looks at the potential in combining different scientific expertise with the study of animals in history. This working group investigates the development of scientific processes used to generate information known about animals and how animal materialities, in turn, inform scientific research. Second, “**Out of Place, Out of Time**” has a specific focus on disruptive animality, while paying attention to the inherent evasiveness of animals as historical research subjects. This working group will deal with questions of the disruption and destabilization of categories, and search for the ways in which animal bodies, materiality, and presence destabilized a sense of place and time and defied social, political, and cultural categories. These efforts to widen the research terrain spatially, temporally, and methodologically clear the ground for developing and working toward future goals connected to the history of animal materialities and actions.

**Key Reference** Onaga, Lisa, and Harry Yi-Jui Wu. Key Reference: “Articulating Genba: Particularities of Exposure and Its Study in Asia.” *Positions: Asia Critique* 26, no. 2 (May 1, 2018): 197–212. <https://doi.org/10.1215/10679847-4351530>.

**Key Reference** Novick, Tamar. “All about Stavit: the story of a bovine champion.” *Theory and Criticism* 51. Jerusalem: Van Leer Institute, in press.

## Infrastructural Research Initiatives, Sources in Sciences' Histories (IRISSH)

While historians still debate the challenges and opportunities of Big Data and source access, we recognize that the paradox of plenty has enabled the effective development and use of digital methods for a critical analysis of our sources' epistemological foundations/tenets and their composition.

Sources inform our research in multiple ways. Karin Chemla has noted (Chemla 2004:201) that just as that the formats of textual presentation and the material culture of knowledge changed broadly over time, so did the way authors designed texts and how to read them. Local Gazetteers (LG) began in 2014 as the kernel of Department III's Digital Humanities (DH) group, in the Methods and Tools research theme. It initially aimed to support research on the Chinese history of science and knowledge using gazetteers and digital methodologies. Today, LG has turned into a major cynosure for research on local materialities and the development of DH infrastructures.

Since 2015, Department III has introduced three new initiatives beyond *Local Gazetteers*, each probing another way in which digital humanities can help reveal the relation between the materiality of information exchange and epistemic premises. *Drugs Database*, for instance, facilitates research on the circulation of materia medica across sectarian and genre divisions in early imperial China, using nearly the entire extant Buddhist and Daoist canons and medical texts between 400 BCE and 589 CE. This means that three genres separated by historical dynamics can now be jointly researched. Started in Dept. I in 2015, and since 2017 in Dept. III, *Visualizations of the Heavens* has been assembling visual and material artifacts—sculptures, murals, pots—with astrological and astronomical content, as well as iconographic, scriptural, and diagrammatic information on the planets, stars, and Earth. Aware that any period bears the risk of falling prey to a materially induced fragmentation of information and data, analog sourcing was also considered. Since 2017, the Institute's source and rara collection has been expanded to a global perspective. Working with the Asian maps and map-making tools (*The MPIWG Chinese Map Collection: Typological Parallels and "Historical" Layers*, Cathleen Päthe, Esther Chen) *The Diagrammatics of the Past and in the Present* project has been able to add to the library's expertise.

Since the launch of research within the newly developed library infrastructure in 2016, the department's source-based initiatives have developed into an intellectual and methodological melting pot for historical research on the materiality of knowledge cultures—in terms of the conditions that inform knowledge cultures and the materialities generated by such knowledge, namely texts, artifacts, and landscapes. All projects have garnered enthusiastic international attention. Whereas the *Drugs Database* has partly transferred operations and will continue in cooperation with Nanyang Technical University (NTU), *Visualizations* is still in a phase of composition, collecting, and configuring sources. Facilities that will enable a sharing of sources and our research about them across institutional and geographic boundaries have culminated in the *Asia Network*.

### Investment into an International Research Platform: Asia Network

*Shih-Pei Chen, Sean Wang, Pascal Belouin, Hou Jeong “Brent” Ho*

Asia Network is a digital research infrastructure project that aims to link digital historical sources in Asian languages, both proprietary and open-access, with digital research tools in an authenticated and secured manner. This project grew out of the LG working group and is an ongoing collaboration with Leiden University and the Staatsbibliothek zu Berlin.

Based on the three principles of accessibility, interoperability, and sustainability, Asia Network is a pioneering approach for resource dissemination and emerging data analytics (such as text mining and other fair-use, consumptive research techniques) in the humanities. It is a language-agnostic software that facilitates linking of research tools to different textual collections (both licensed and open-access) via APIs (Application Programming Interfaces), and it revolutionizes how scholars work with textual sources.

This flexible, networked approach to e-infrastructure development avoids re-creating silos of resources in the digital realm and allows scholars to fully utilize the potential of material digitization and digital research tools.

Despite its name, Asia Network can handle resources in all languages and is fully compatible with libraries and service units within the Max Planck Society. For example, it can facilitate digital resource sharing and management with MPIWG’s own library and other central collections from the Max Planck Digital Library. Many projects and infrastructures have proposed similar ideas (including many EC-funded e-infrastructures), creating complex new initiatives. Ours, by comparison, is a modular solution that works by adapting and growing with research projects. Research and structural design remain intimately connected. This demonstrates the significant returns from Department III’s early investment into digital humanities research.

IRISSH

## Local Gazetteers

ORGANIZERS *Shih-Pei Chen, Qun Che, Dagmar Schäfer*

Gazetteers (*Difang zhi*) are a Chinese written genre that was used to record “local knowledge” from the twelfth century onward. Their structure and semantics reveal regional diversity as well as attempts at standardizing and unifying. The role of materials and material complexes in China’s culture was researched, as well as the way in which a literary genre has contributed to a locality’s material identity.



After preliminary development in 2014, Local Gazetteers (LG) commenced with the workshop “Chinese Local Gazetteers (*difangzhi* 地方志): Historical Method and Computerized Data Collection and Analysis” in April 2015. We invited eleven leading scholars who had been using computational technologies to collect and analyze local gazetteers to present their research. Joseph Dennis was able to reveal, based on both the manual collection of school sections of local gazetteers and the mining of newly available local gazetteer databases, that, in fact, local schools were important sites of intellectual development and exchange, and that schools collected books on a wide range of topics, including astronomy, medicine, law, and the military (Joe Dennis). Regional differences in the introduction and spread of maize during the Ming and Qing Dynasties were interpreted based on local gazetteers (Cao Ling). Major architectural projects of the Yongle emperor (r. 1402–1424), one of the most prolific builders in the history of China, were discussed: the Forbidden City in Beijing; the sacrificial halls at Yongle’s tomb, Changling, a few hours north of the capital; a Daoist temple complex on Mount Wudang in central China; and a Buddhist monastery at the Sino-Tibetan frontier (Aurelia Campbell). Researchers also studied the history of city planning (Bin Xu), mining, and Ming environmental change (Fei Huang). This interaction led to the subsequent development of the Local Gazetteers Research Tools (LoGaRT).

### **Workshop**

#### **Historical Method and Computerized Data Collection and Analysis**

April 27–28, 2015

*Lex Berman* (Harvard University, USA) “A Temporal Gazetteer for Chinese History”

*Peter Bol* (Harvard University, USA) “Local Gazetteers as Databases: Joining the Biographical and Geographical”

*Cao Ling* (Nanjing University of Information Science and Tech., China) “Study on Visualization Disclosure of Meteorological Disasters in Chinese Ancient Chorography”

*Subin Chang* (National Taiwan Normal University, Taiwan) “The Taxonomy and Fauna and Flora of Taiwan Local Gazetteers in Qing Dynasty”

*Hsi-yuan Chen* (Academia Sinica, Taiwan) “Retrieving History from a Tattered Map: A Case Study of the Use of Local Gazetteers”

*Joseph Dennis* (University of Wisconsin-Madison, USA) “Using Data from Chinese Local Gazetteers: Opportunities and Problems”

*Hou Jeong “Brent” Ho* (Universiteit Leiden, the Netherlands) “MARKUS: A Semi-Automatic Markup Platform for Classical Chinese”

*Adam Mitchell* (Harvard University, USA) “Encoding China’s Past: Computational Methods of Historical Analysis”

*Hsieh-Chang Tu* (National Taiwan University, Taiwan) “DocuSky: A System of Personal Text Databases”

*Micha Wu* (National Taiwan University, Taiwan) “Using Approaches in Digital Humanities for the Studies of Chinese Local Gazetteers”

*Siyuan Zhao* (Shanghai Jiao Tong University, China) “Compilation, Digitalization, and Research: Historical Local Archives in Shanghai Jiao Tong University”

---

## Visiting Scholars

**2016**

*Cao Ling* (Nanjing University of Information Science & Technology, China) “Natural Disasters in Ming-Qing Gazetteers” August–November 2016

*Aurelia Campbell* (Boston College, USA) “Architecture and Empire in the Reign of Yongle” August 2016–June 2017

*Joseph Dennis* (University of Wisconsin-Madison, USA) “School Library Book Collections in Ming, Qing, and Republican China” December 2016–January 2017; May–July 2017

**2017**

*Yan Gao* (University of Memphis, USA) “Human Conflicts, Local Resources, and the Adaptive Cycle” January–February 2017

*Lik Hang Tsui* (Harvard University, USA) “A Cyberinfrastructure for Historical China Studies” May–June 2017

*Ian Matthew Miller* (St. John’s University, USA) “Tax Data in Song, Yuan, and Ming Gazetteers” June–July 2017

---

Tools have to be research driven. We carefully selected outstanding scholars, who visited for three to four weeks during summer workshops and conducted intensive, dialectical collaboration between their research projects and our tools. In the workshops of 2016 (“Local Materiality in the History of Science, Technology, and Medicine”) and 2017 (“Terminology” and “Building Materials”) an initial tools and methodology demonstration was followed by participating scholars’ active engagement with LoGaRT for their research questions. Finally, participants presented their preliminary results to interested observers from within and outside the MPIWG. The feedback from all of the workshops was extremely positive, and research results are currently being published by individuals referencing our tools.

**Workshop****Local Materiality in the History of Science, Technology, and Medicine**

August 1–19, 2016

*Kathlene Baldanza* (Penn State, USA) “Miasmatic Disease in Late Imperial China”

*He Bian* (Princeton University, USA) “Materia Medica as Local Product in Ming-Qing Gazetteers”

*Aurelia Campbell* (Boston College, USA) “Tracing the Sources of Nan Wood for Imperial Construction in the Yongle Reign”

*Desmond Cheung* (Portland State University, USA) “Expelling Locusts”

*Fei Huang* (Universität Tübingen, Germany) “Contesting Landscape in Periphery”

*Ian Matthew Miller* (St. John’s University, USA) “History of Wood Rights and Forestry in South China in the Ming and Qing Periods”

*Gregory Adam Scott* (University of Edinburgh, UK) “Database of Chinese Buddhist Reconstruction, 1866–1966”

*Hongsu Wang* (Harvard University, USA) “Buddhist Data Index in Local Gazetteers”

*Huiyi Wu* (Cambridge University, UK) “From Travelogues and Local Gazetteers”

**Workshop**

**Building Materials**

February 27– March 3, 2017

*Aurelia Campbell* (Boston College, USA) “Imperial Construction in the Yongle Reign”

*Tracy Miller* (Vanderbilt University, USA) “Timber Use in Northern Architecture”

*Changxue Shu* (Katholieke Universiteit Leuven, Belgium) “Mineral Construction Materials in Chinese Local Gazetteers”

**Workshop**

**Terminology**

July 1–31, 2017

*Xi Chen* (Fudan University, China) “Spatial Analysis on China’s Ancient Private Libraries”

*Yongtao Du* (Oklahoma State University, USA) “Local Gazetteers in Republican China”

*Yan Li* (Tianjin University, China) “The Military Settlements along the Ming Dynasty Great Wall in Local Chronicles”

*Catherine Stuer* (Denison University, USA) “Guji as Artefact and Category in Chinese Local Gazetteers”

*Bin Xu* (Palace Museum, China) “Planning with Nature in Chinese Local Gazetteers”

*Yingpin Zhang* (Chinese Academy of Social Sciences) “Structural Analysis and Style Observation of Chinese Local Gazetteers”

**Joseph Dennis**

*School Library Book Collections in Ming, Qing, and Republican China*

The circulation of information is crucial to understanding intellectual life and knowledge production, and local libraries are key sites for such circulation. Using both manual collection and text mining from newly available local gazetteers databases, this project examines how school libraries enabled information circulation in Ming, Qing, and Republican China, especially in borderland regions that lacked private libraries and easy access to commercial books. In addition to traditional scholarly outputs, this project is also building a geo-tagged database of school libraries and their collections to make comparisons over time and space.

LoGaRT would not be possible without the close collaboration with, and ongoing support from, the Staatsbibliothek zu Berlin, with which we cooperate also for the long-term maintenance of our tools. Our positive collaboration has also led to another ongoing, large-scale infrastructural project called Asia Network, which aims to link both proprietary and open-access historical sources with existing research tools

in a secure, federated manner. LoGaRT's current release version links to 4,000 titles of proprietary, processed local gazetteers and provides features, such as full-text search, tagging, and geovisualization, that analyze across the entire collection of digital gazetteers. Development of new features is ongoing.

The geographical distribution of the 4,000 sets of Chinese Local Gazetteers linked behind LoGaRT. The availability of large quantities of digitized gazetteers and tools that analyze the entire collection leads to new insights for understanding this well-studied genre.



## Mapping Drugs across Epistemic and Geographic Domains in Early Medieval China

*Michael Stanley-Baker, Shih-Pei Chen*

Practices and concepts of healing and pharmacopedic knowledge are studied within and across literature divided by centuries of sectarian and genre divisions.

This initiative brings together a corpus of nearly the entire extant Buddhist, Daoist, and medical texts dating between 400 BCE and 589 CE. *Materia medica* are described in various literatures that in later periods were divided into sectarian and genre divisions. Together with collaborators from the National Taiwan University, Dharma Drum Institute for Liberal Arts, Taiwan, and Leiden University, Holland, the project developed a suite of analytical tools (1) to search for large sets of terms across these diverse canons; and (2) to visualize the search results and their distribution across time, intellectual and sectarian genres, and geographic space. These tools are part of DocuSky, a digital research platform for analyzing uploaded digital text corpora by

**Key Reference** Stanley-Baker, Michael and Brent Ho. "Mapping drugs across epistemic and geographic domains: a case study for early medieval China." In *6th International Conference of Digital Archives and Digital Humanities in Taipei*, 2015: <https://dr.ntu.edu.sg/handle/10220/44783>.

the National Taiwan University (NTU). The digital texts that were produced, with over 3,000 chapters of Buddhist, Daoist, and medical texts that are searchable and enriched with historical metadata, are now accessible in a DocuSky database. Among these, two hundred chapters (*juan* 卷) of texts are marked with materia medica terms, properties, and geographic locations.

### Infrastructures on the Move

Michael Stanley-Baker, the principle investigator for the project, has given international workshops on how to use DocuSky at Stanford University and at National Taiwan University (NTU), and will give four more such workshops in 2018: at Beijing Normal University, China; University of Michigan, Ann Arbor; Cornell University, Ithaca, (New York); and at the American Academy of Religion, Atlanta (Georgia). The development team from NTU has also given workshops and demonstrations in Taiwan and at Harvard University, and at the Association for Asian Studies 2017, Toronto, Canada. Stanley-Baker is currently working with library services at his home institution, Nanyang Technological University, Singapore, to publish the entire set of marked texts on their Dataverse digital repository with individually citable DOIs that are tracked in Web of Science.

The project has led to the development of new, user-friendly means to visualize the proximity of different texts based on whether they share common technical vocabulary. These are easily replicable to enable others to corroborate findings, and can be easily applied to new research. They provide an intuitive and straightforward complement to existing philological methods for assessing whether texts share a common intellectual heritage. For example, five fifth-century translations into Chinese of the Buddhist monastic codes exhibit considerable variation in drug vocabulary. This data raises entirely new research questions that could not have previously been asked. Through collaboration with Stanley-Baker and Chen, NTU has developed DocuSky into its own project, enabling scholars to independently upload and publish their own datasets. New analytical tools, applications, and improvement of the user interface continue to be developed through cooperative efforts.

Visualization of drug term vocabulary shared across fifth-century Chinese translations of Buddhist monastic codes.



## Diagrammatics of the Past and in the Present

*Qun Che, Nungyao Lin, Shih-pei Chen, Vera Dorofeeva-Lichtmann, Yulei Yang*

Maps are spatial and mental means of knowledge circulation, platforms on which actors negotiate the commensurable and what cannot be moved.

Over the last two decades, historians of science and global historians have been equally “mapping the large-scale networks in which practitioners of the sciences are involved,” as January Golinski has noted. Maps are thereby a surface on which research takes place and a continuous object of study themselves. Department III has engaged with both sides as well. The WebGIS Platform of Historical Maps of China, originally designed by Shanghai Jiao Tong University’s (SJTU) Department of History, is a WebGIS and historical scholarship database focusing on historical maps of China. At the heart of the second map initiative are methodological issues on geographical knowledge and cultural concepts of the Chinese Maps Collection at MPIWG.

Since 2015 a collaboration between MPIWG and SJTU has been developing an open-access platform to geo-reference scanned historical maps for analysis. In the first phase this project focused on military maps from premodern China. All maps were scanned at a high resolution (600dpi) and then geo-referenced. The WebGIS platform now contains 4,088 maps, taken from 《中国大陸五万分之一地圖集成》 (*Maps of China at a Scale of 1:50,000*). These maps were charted in the late nineteenth century for military purposes and they covered nineteen major provinces of the main territory of China—Fujian, Guangdong, Guangxi, Guizhou, Yunnan, Hainan, Hebei, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shanxi, Zhejiang, Anhui, Henan, Inner Mongolia, Shaanxi, and Sichuan—with geographic elements such as cities, villages, rivers, lakes, and mountains in great detail. A landing page was created for the WebGIS platform of Chinese historical maps.

In 2017 the Department invited Vera Dorofeeva-Lichtmann and Yulei Yang to undertake a detailed examination and catalog five rare Chinese maps from the late nineteenth to early twentieth centuries that the Institute’s library had acquired via Sotheby’s. They have different geographic and thematic coverage and reflect cross-cultural influences in cartographic techniques from this period in China. Coupled with the Library’s extensive collections on the history of cartography, the examination and research of these rare maps contributes to other research based on local sources, comparative research across regions and historical periods, and cartographic studies of global history and empires. Currently the project has identified methods for determining the filiation of maps that have a similar configuration, for which the two Chinese “cosmographic” maps at the MPIWG are test cases.



## Visualizations of the Heavens and Their Material Cultures in Eurasia and North Africa (4000 BCE–1700 CE)

*Sonja Brentjes, Dagmar Schäfer*

Approaches to the heavens, either as zones of organic and social life in constant flux or as an eternally stable object with unchangeable physical properties—translatable into mathematical models and hierarchical spatial structures, but only accessible to humans through visualization and narration—are collected and presented across media and regional divides to unveil the dynamics of visual, textual, and material representations, concepts, and practices.

*Visualizations of the Heavens and Their Material Cultures in Eurasia and North Africa (4000 BCE–1700 CE)* is a source-based project designed to enhance new approaches to the study of cross-cultural exchanges, appropriations, and adaptations of knowledge (verbal, visual, manual, organizational) that overcome traditional forms of national, imperial, and global histories. It focuses on knowledge of the heavens expressed through visual formats enshrined in a manifold of media and materials. Its main research questions concern the interdependence between materiality and visual formats, as well as narrative media and visualizations, and the mobility, stability, and flexibility of iconographic forms across time, space, and cultures in Eurasia and North Africa.

While visual formats as carriers of knowledge and components of knowledge practices have received substantial attention in early modern and modern societies in Europe and the emerging Western world, this is much less the case for societies and cultures in Eurasia and North Africa that do not belong to the major areas of research in history of science. The collection and analysis of digital images of instruments, tables, diagrams, paintings, sculptures, coins, textile designs, and further objects has already stoked questions about the established views of linguistic and visual connections between Indian, pre-Islamic Iranian, and Islamic celestial iconographies and their concepts. This project fills a major gap in studies of knowledge practices and cultural interconnectivity for the Ancient worlds up to societies in the early modern period.

Its methodological and conceptual approaches go beyond investigations within the history of science. They are anchored in transdisciplinary cooperation between historians of different cultural regions (Ancient Near East, Ancient Iran and Central Asia, Islamicate World, South Asia, East Asia) and research competences (linguists, historians of science, art historians, Sinologists, Indologists, sociologists).

In a first step, an open-ended annotated database was created, bringing together visual representations of the heavens as a divine, social, naturalistic, or conceptual whole and of individual celestial bodies, phenomena, imagined inhabitants, and their life cycles as told in various types of narratives. The representation of different aspects

of the heavens, from deities to demons and from stars to weather phenomena, offers a rich and broad array of possibilities for the comparative study of contacts, commonalities, overlaps, differences, and ruptures across different territories, time periods, social organizations, and linguistic communities. The materiality of such representations unveils **movements of concepts, values, and lifestyles across social strata within a given society** as well as the stability or fluidity of their subsets and thus provides access to sociocultural complexities of individual, communal, societal, and cross-cultural modes of organizing relations, knowledge practices, and human interactions with natural phenomena and the celestial realm on different sociocultural levels. The resulting database delivers the basis for comparative studies of visual, material, and narrative formats used in astronomy, astrology, meteorology, the formation of myths, political and religious rituals, healing and medical theories, and the organization of time.

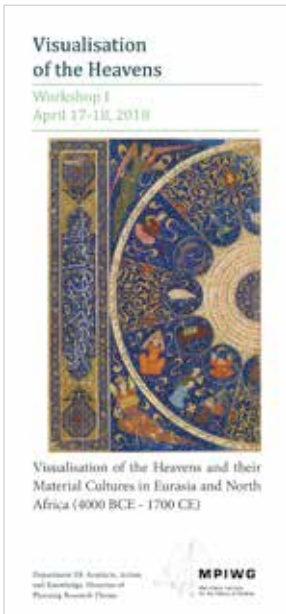
The first results of the database, which currently relies on about 1,500 objects, demonstrate that narrative media, materials, and visual formats are interdependent facets that shape processes of acquisition, reproduction, and dissemination of visually embodied knowledge and that the interpretation of specific but transcultural forms of heavenly iconography needs to build on the joint investigation of these facets to avoid superficiality or naive expectations of cross-cultural transferences of visual formats.

The construction of the database initiated a steep learning curve across traditional academic disciplinary boundaries, a necessary precondition for a successful investigation of processes of knowledge formation and exchange in Eurasia and North Africa over almost 6,000 years.

A series of open or under-researched topics show potential for future research: the relationship between astral tablets, divine semiotics, and the pictorial fixation of the Zodiac in ancient Mesopotamia; the political meaning of Mesopotamian astral imagery in Egyptian temples for Roman imperial rulers; the relevance of syncretic practices and royal symbolism for the creation, reformulation, and modification of astral pictorial languages in ancient and medieval Iran; the function and content of royal inscriptions with astral and calendrical content on Shiva, Vishnu, and Jain temples with representations of planetary deities and the Zodiac in

**Key Reference** Brentjes, Sonja. “Visualization and material cultures of the heavens in Eurasia and North Africa.” In *Studying the Near and Middle East at the Institute for Advanced Study*, Princeton, 1935–2018, ed. Sabine Schmidtke. 134–153. Piscataway, NJ: Gorgias Press, 2018.





### Workshop I

#### Visualisation of the Heavens

April 17–18, 2018

*John Steele* (Brown University, USA) “The Babylonian Zodiac in Image and Text: Choices, Significance, and Societal Meaning”

*Marvin Schreiber* (Humboldt-Universität zu Berlin, Germany) “Representations of Celestial Bodies in Mesopotamian Magic, Medicine, and Rituals”

*Alexandra von Lieven* (Freie Universität Berlin, Germany) “The Ancient Egyptian Classical Sky Picture”

*Ilaria Bultrighini* (University College London, UK) “Heavenly Time: The Visualization of the Planets and the Astrological Planetary Week in the Greco-Roman World and the Ancient Near East”

*Daniel Morgan* (CNRS, France) “On Iconographic and Diagrammatic Irregularities in the Representation of Constellations in Han (206 BCE–220 CE) Tomb Art”

*Antonio Panaino* (Università di Bologna, Italy) “The Structure of the Superimposed Heavens in the Mazdean System and its Rationale”

*Florentina Badalanova Geller* (Freie Universität Berlin, Germany) “Apocalyptic Imagery and the Visualization of the Heavens”

*Stefanie Rudolph* (Freie Universität Berlin, Germany) “In Search of a Syriac Sky”

*Satomi Hiyama* (Buddhist University, Kyoto, Japan) “Indian Astral Deities in the Mural Paintings of Dunhuang Cave 285”

Tamil Nadu; or the impact of celestial and chronological concepts and visual formats on Romanic and early Gothic religious architecture and its interior design as well as royal paraphernalia in several regions of Catholic Europe between the eleventh and the thirteenth centuries.

In November 2017, a joint panel plus a poster session formed by members of the Institute (Michelle McCoy, Sonja Brentjes), a colleague from Rikkyō University in Tokyo (Yoichi Isahaya), and a colleague from the Freie Universität Berlin (Adrian Pirtea) on themes anchored in or related to the project was organized at the conference *East–West Encounter in the Science of Heaven and Earth* held at Kyoto University (<http://wdc2.kugi.kyoto-u.ac.jp/ictsa2017/>). A fourth colleague from the Institute (Dror Weil, Dept. II) participated in a different panel at this conference. Three of the papers were delivered for publication. The fourth paper was published in 2018 in revised form in a volume on the research done by former and current members of the Institute for Advanced Studies in Princeton.

**Workshop II****Visualisation of the Heavens**

April 19–20, 2018

*Tamar Abuladze* (National Center of Manuscripts, Georgia, USA) “Astrological and Astronomical Manuscripts in Georgia”

*Nicolas Weill-Parot* (École Pratique des Hautes Études, France) “Producing Stars and Heavens? Astral Magic, Scientific Utopia, and the Process of Imitation of the Supralunary World (12th–15th Century)”

*Gábor Kósa* (Eötvös Loránd University, Hungary) “The Representation of Firmaments in the Chinese Manichaean ‘Cosmology Painting’”

*Shi Yunli* (Universität Tübingen, Germany) “Charting the Chinese Sky with European Observation: Jesuit Star Maps from the Late Ming Dynasty Revisited”

*Michelle McCoy* (MPIWG) “The Hellenistic Zodiac on the Eastern Silk Road: Sources and Semiotics”

*Gerd J. R. Mevissen* (Independent Scholar) “Can the Tropic of Cancer be Regarded as Indicative of the Occurrence of Representations of Astral Deities or Symbols on Certain Images in Indian Art?”

*T. V. Venkateshvaran* (Vigyan Prasar, India) “Calendar Aspects of Vijayanagara Epigraphy in Tamil: A Preliminary Survey”

*D. Senthil Babu* (French Institute of Pondicherry, India) “Sculpting the Heavens: Measuring as Work”

*Ronit Yoeli-Tlalim* (University of London, UK) “Notes on the Tibetan Seven Day Planet Week and its Possible Sources”

*Markham Geller* (Freie Universität Berlin, Germany) “Eclipse Myth: The Long Road from Sumerian to Aramaic”

*Marek Vinklát* (Univerzita Karlova, Czech Republic) “Triple Function of Mandaic Illustrations”

**Visiting Scholars****2016**

*Lobsang Yongdan* (Lhasa/Zürich) “Meeting Halfway: The Tibetan Encounter with European Science through the Qing Court” September 2016–December 2016

*Hadi Joráti* (Ohio State University, USA) “The Maragha Observatory Complex in Ilkhanid Iran” September 2016–February 2017

**2017**

*Yuzhen Guan* (University of Science and Technology of China) “The Selection and Calculation of Cycles: Eclipse Theories in Mesopotamia and Early China” January 2017–February 2017

## Individual Projects

Individual projects are presented in chronological order of the arrival of scholars in Dept. III.

### DIRECTOR

*Dagmar Schäfer* (Since April 2013)

#### **Wefts of Innovation in Premodern China (13th–17th Century)**

“Cloths are for all (衣被群生)” declared the Chinese statesman Ouyang Xiu 歐陽修 (1007–1071) once in a memorandum to the throne. Although Ouyang did not specify, he most likely wore cloth made of silk. Indeed, that generation of Chinese scholars could not have lived without it, at least not comfortably. Taking silk as an example, this project pursues, in three iterations, the question of how the existence of a certain materiality has historically imprinted on approaches to knowledge, affecting understandings of life and the world, and changing or impacting creativity, forms of analysis, and judgements. The focus of the first iteration is silk’s global role. Second, textile technology’s major role in technological innovation in the premodern era is revealed. Inquiring silk as both a material and activity, the project, pursued in cooperation with economic and global historian Giorgio Riello, has revealed the dynamics of technical and socioeconomic change in premodern China. The third iteration on the science of silk in Late Imperial China is planned for 2019.

### SENIOR RESEARCHERS

*Shih-pei Chen* (Since January 2014)

#### **Developing New Digital Methodologies for Source-Centric Analysis**

An unprecedented quantity of digitized primary sources has accumulated in the past two decades (and earlier). This huge amount of textual human heritage, comprising books, archives, letters, newspapers, and more, has been digitized and is continuing to be digitized as computer-recognizable—and thus searchable—texts. The existence of such searchable digital texts in vast quantities opens up new possibilities for using and working with these sources—by using computers as a medium between scholars and sources. Researchers of all disciplines have debated whether or not the digitization of sources and digital technologies can change our understanding of the past and advance our research to a spectrum that was not previously possible. Research strives to find an answer by gathering large quantities of primary sources and working with them using digital technologies. By working closely with historians of science, technology, and medicine in several digital research projects the aim is to develop new digital methodologies for working with primary sources (mainly textual sources) as well as frameworks that would allow scholars to utilize such methodologies.

*Emily Brock* (September 2014–August 2017)

### **Tropical Trees and American Jungle**

Globalized industrial tropical forest management in the twentieth century required translating local Filipino knowledge about wood and trees into a globalized language that was both scientific and commercial. American businesspeople, middle-class Filipinos, biologists, and military officers worked in concert with the goals of U.S. colonial governance to define the Philippines' forests in terms of American forestry and economics. Analysis of the naming, defining, managing, planning, standardizing, and marketing of tropical forest trees by forest managers and scientists has shown how local people came to understand the occupying government's ability to control and transform the archipelago's governance and its very environment. This research has revealed how locally determined rules for scientific forest management led to hybrid constructions of American ideas and Philippine realities about tropical timber.

*Wilko Graf von Hardenberg* (September 2015–August 2018)

### **Understanding the Anthropocene: The Level of the Sea**

The level of the sea is nowadays a trope of environmental discourse, used widely to symbolize current and future changes to the environment. These modifications are inherently global and are already having revolutionary impacts. This project has detailed the history of an understudied topic: how has the mean sea level, a geodetic reference point developed as part of the study of tides, over time become the powerful symbol of the Anthropocene that it is now? That the sea is rising due to human influence is fairly recent; the awareness of this fact even more so. Research addressed the origin of this concept within cultural, social, and scientific agendas that were radically different from current ones. Central was the question of standardization and of how "scientific objects" come into being. Analysis revealed how a reference point like the mean sea-level turned into an eminently social and historical construct, developed in the outlook for a better understanding of the space surrounding us through its transformation into discrete elements.

*Tamar Novick* (September 2015–August 2019)

### **Barren Structures: The Problem of Sterility in the Age of Plenty**

This project looks at the use of bodily wastes as a research material and resource. It has focused on the use of urine, which, in the early days of endocrinology, was found to be rich in sex hormones. In the context of the European settlement in Palestine/Israel during the twentieth century, human and animal reproduction was key. This project has explored the development of infertility research and treatments, and the role of urine in drawing connections between fertility and environment construction. It has paid particular attention to a circle of European physicians and hormone



researchers who settled in Palestine in the 1930s. As this community of fertility experts grew, and while global attention turned to population control after World War II, infertility research flourished in British Palestine and the State of Israel, and urine flowed among farms, clinics, labs, the parliament, homes for the elderly, and pharmaceutical companies.

*Lisa Onaga* (September 2017–August 2020)

#### **Cocoon Cultures: Silk and Science in Japan (1840s–1940s)**

A subtle sericultural and scientific choreography around the variation and development of an insect underpinned Japan's industrialization from the 1840s through the 1940s. By reconsidering sericultural practice as part of the insect's environment, this project unveiled how laws of heredity came into focus as a way for experts to direct the qualities of the silk cocoon. Japan's endeavors to produce and export mass quantities of raw silk generated new knowledge about the domesticated silkworm and its care. Biological knowledge, entangled with the export silk industry, fed a discourse of Japanese unity predicated upon the stewardship of silkworm diversity. New sericultural practices were developed as well as scientific investigations among individual scientists who reimagined ways to secure Japan's place in the world.

#### POSTDOCTORAL FELLOWS

*Stewart Allen* (September 2013–December 2015)

#### **Stonemasonry, Apprenticeship, and the Repair of the Built Environment in Scotland (19th Century)**

This project centered on an ethnography of a stonemasonry workshop attached to St Mary's Cathedral in Edinburgh, Scotland. St Mary's is a nineteenth-century, neo-gothic cathedral and one of the largest in Scotland. The workshop, which is coming at the end of a thirty-year program to repair a backlog of stone maintenance issues, trains apprentice masons in the repair and restoration of the cathedral. The sustainability of a large building, in this case a cathedral, or any large sociotechnical system, requires planning. It requires a schedule of repair and maintenance to keep the decay, the dissolution, and the breakdown at bay. This research has focused on the role that "planning" plays in knowledge production, modes of learning, the maintenance of the built environment, and the efficacy and organization of vocational training under the U.K. and Scottish government's modern apprenticeship scheme.



#### PUBLICATION

Allen, Stewart. *An ethnography of NGO practice in India: utopias of development*. *New ethnographies*. Manchester: Manchester University Press, 2018.

Honghong Tinn (July 2014–August 2015)

### Planning the Mathematization of an Economy: Leontief's Inter-Industry Input-Output Analysis and its Global Circulation

This theoretical, practical, and technological history of inter-industry input-output analysis has drawn on knowledge about state-level economic interventions and the quantification of economic activities since the mid-twentieth century. Input-output analysis became a stable and widely-accepted method to aid regional and national economists and bureaucrats in predicting the effects of one industry's change on other industries in the 1960s. It provided its users with a set of mathematized, quantitative, and seemingly “scientifically” based concepts of inter-industry relationships to use in their economic engineering. Critical examination of the knowledge and skills that made the input-output analysis work involved studying how economists viewed, managed, and experimented with economic data to develop and stabilize theories, practices, and technologies for implementing input-output analyses. The processes that underpinned the mathematization of an economy through input-output analysis reveal the underlying historical tensions and contingencies needed to visualize, represent, and make sense of economic activities around the world.



#### PUBLICATION

Tinn, Honghong. “Charting the cartography of a global community of EASTS scholars.” *East Asian Science, Technology and Society: An International Journal* 10 (4 2016): 341–342.

Kaijun Chen (September 2014–August 2016)

### Interaction and Divergence of Ceramic Technology

This project has analyzed the interaction and divergence of ceramic technology, design, and planning in the manufacture of porcelain in Jingdezhen and Meissen in the seventeenth century. By concentrating on the tools related to production, porcelain pieces, archival records, and textual oeuvres attributed to two ceramic specialists, Lang Tingji (1662–1715) and Johann Höroldt (1696–1775), it revealed how technological knowledge and artistic styles were indirectly transmitted or reinvented with the mediation of export wares, tools of design, and textual descriptions. Including artifacts, this project has challenged conventional narratives of influence and reception in Eurasian intercultural studies with a historiography of mediation and international emulation.



#### PUBLICATION

Chen, Kaijun. “Learning about precious goods: transmission of mercantile knowledge from the Southern Song to the early Ming periods.” *Bulletin of the Jao Tsung-I Academy of Sinology* (5 2017): 291–327.

*Alina-Sandra Cucu* (September 2014–August 2017)

**Hidden Reserves of Productivity in Socialist Planning: From Historical Consciousness to Science and Expertise**

Central planning in Romanian industrialism represents a historically specific form of “modern technopolitics” that transformed local and embodied knowledge into a professionalized field of expertise with universalist aspirations. Archival material from the Romanian government, industrial management schools, and various factories has provided a means to question the nature of socialist economies as modern objects of governance and governmentality. This project focused on the mid-1960s and followed in particular the emergence of expertise that systematically defined itself around ideas of the “productive hidden reserves,” which replaced early socialist reliance on workers’ voluntary self-transformation and practical knowledge with contemporary Western methods of industrial management, thereby rendering workers into objects of policy and scientific analysis.

*Robert Kett* (September 2015–August 2017)

**Expansive Science: Medium and Discipline in Southern Mexican Intellectual Practice, 1880–1920**

This project reconstructed antiquarian and natural historical practices among provincial intellectuals involved with national projects of progress and development in late nineteenth- and early twentieth-century southern Mexico. An analysis of drawings, lithography, and photography has shown how these reproductive media served as technologies for documenting southern Mexico’s nature and cultural past as well as charged sites that articulated how the national and global periphery related to Euro-American scientific discourses. Naturalist and antiquarian collections and publications in the southern Mexican states of Chiapas, Tabasco, and Yucatan circulated on the global periphery, and media of scholarly documentation connected provincial scientists to global scientific debates. These scientists’ transdisciplinary practices in fields such as botany, antiquarianism, linguistics, engineering, and statistics left them well positioned to participate in national debates concerning the development and exploitation of the region.



PUBLICATION

Kett, Robert J. “Monuments in print and photography: inscribing the ancient in nineteenth-century Mexico.” *The Getty Research Journal* 9 (2017): 201–210.

*Mårten Söderblom Saarela* (September 2015–August 2018), see Dept II.

*Ian Matthew Miller* (August 2016 and June–July 2017)

### **Wood Rights and Forestry in Ming and Qing China**

This project examined the role that imperial and regional institutions played in mediating social and environmental change in the forests of early modern China. Imperial institutions governed wood supply during the Ming and Qing era. Yet private networks of timber plantations and wood merchants contributed to the government bureaucracy's retreat from the forest. Soon the state focused its oversight on wood markets and left the difficult management of forests to individuals. Analysis has revealed that landowners defined forest ownership. Courts' reliance on private documentation allowed landowners to negotiate exclusive or common forms of ownership that best suited their purposes. Research in local gazetteers revealed how local expertise and knowledge informed central policies and spread across the empire. Examining the interplay between the large, impersonal, institutional demand for timber and the array of local governing institutions has ultimately shown that China's forests were transformed not by policy fiat but by the diffuse aggregation of individual decisions into greater norms, rules, and economic forces.

*Ylva Söderfeldt* (August 2016–August 2017)

### **Knowing and Being Known: Hay Fever and the Fieldwork of Medical Knowledge 1897–1968**

Hay fever/allergy emerged only very belatedly—and upon considerable intervention by patients—as a medical diagnosis. The scope of this research paid attention to the transformation of patients and physicians into “known” or “knowing” subjects, as hay fever and similar conditions, once thought of as modern neuroses typically affecting the urban bourgeoisie, led to the establishment of allergology as a biomedical specialty by the 1920s. People seeking relief from their suffering at the fashionable resort of Heligoland founded the Heufieberbund (“Hay Fever Federation”) in 1897. Typical practices generating and implementing medical knowledge—observing and recording symptoms, gathering and analyzing data, taking preventive measures, testing and undergoing treatment, educating physicians, advising patients—were not associated with patient and physician selves. This project was part of the *History of Knowledge* focus on Fieldworks of Knowledge.

Masato Hasegawa (September 2016–June 2019)

### Logistics and Reliability in the Ming-Chosŏn Borderland (16th/17th Century)

Drawing on court records, memorials, and treatises in Chinese, Korean, and Manchu, this project examined how reliability was discussed and attempted during wartime in the area astride the Yalu River, a region of central importance in East Asia. Focusing on the rhetoric of reliability, it has explored how officials in the Ming, Chosŏn, and Qing bureaucracies sought to mitigate uncertainty in assessing risks and costs in the border region. This approach differs from the existing scholarship on military logistics in Ming China and Chosŏn Korea, which has largely focused on the maintenance of frontier garrisons and the expansion of the courier system. This project traced the practices of organizing logistics and how officials evaluated and chose from the available transport methods such as boats, carts, pack animals, and human bearers. It has also shed light on the social construction of reliability beyond the laboratory and factory settings.



#### PUBLICATION

Hasegawa, Masato. “War, supply lines, and society in the Sino-Korean borderland of the late sixteenth century.” *Late Imperial China* 37 (1 2016): 109–152.

Qun Che (January 2017–June 2018)

### Water Conservancy Works as Indicators of Environmental Transformations in the Dongting Lake Region in the Ming-Qing Dynasty

The environmental transformation of the Jingjiang River and Dongting Lake has been addressed in previous large-scale studies. This project has looked at the temporal and spatial contexts beyond “the transformation” to explore local environments’ animals, plants, cultivars, and agriculture, as well as their profound effects on human well-being. By focusing upon how large-scale lake transformations influence local micro-environments and how local people build local infrastructures, this project uses local gazetteers and memorials to track water conservancy construction. The historical flood-water levels of the Jingjiang River and the water works of the Dongting Lake Region were analyzed across different sub-regions and time periods. Tagging tools in Local Gazetteers Research Tools facilitated the collection of water conservancy construction data necessary to trace the flooding and deposition process of the lake and sociotechnical change.

Yuzhen Guan (January–February 2017)

### **The Selection and Calculation of Cycles: Eclipse Theories in Mesopotamia and Early China**

This project aimed to investigate the theories of solar and lunar eclipses in early China and Mesopotamia. Solar and lunar eclipses were important astronomical phenomena in both civilizations. Prediction methods developed from being based on eclipse periods to the construction of systematic theories. Arguments that ancient Chinese astronomy comes from the West are made by comparing specific features between the two cultures. This project advanced research on eclipse theories in Mesopotamian and Chinese astronomy by focusing on the development of the theories and analyzing the differences between the prediction methods of solar and lunar eclipses in early China and in Mesopotamia. From the perspective of mathematical astronomy, it revealed differences in the two approaches and identified similarities in the eclipse theories of both regions.



#### PUBLICATION

Guan, Yuzhen. “Calendrical systems in early Imperial China: Reform, evaluation and tradition,” in *Circulation of Astronomical Knowledge in the Ancient World*, ed. J. M. Steele. 451–477. Leiden: Cambridge University Press, 2016

Michael Stanley-Baker (February–August 2017)

### **Charting Interior and Exterior Worlds: Towards a Social Geography of Han-Tang Healthcare**

Many histories of Chinese medicine assert that the compilation of the classical corpus (ca. 100 BCE–200 CE) resulted in the formation of a rational, correlative system of thought that constituted a radical departure from religious practice. Yet the first formal, central medical institutions and the first state bibliographies to separate medical from religious texts did not appear until 220–589 CE. This project has identified an array of actors and communities who actively competed on medico-religious grounds during this time, concentrating on specific well-documented or significant moments. Different formative forces emerged—personal illness, salvific aspirations, sectarian competition, the state, and epidemic and political upheaval—to which actors responded with plans and strategies. Knowledge, in this analysis, was treated as a processual engagement with and means of navigating the world, one that actively structures relations to objects, communities, and events.



#### PUBLICATION

Stanley-Baker, Michael and Brent Ho. “Mapping drugs across epistemic and geographic domains: a case study for early medieval China.” In 6th International Conference of Digital Archives and Digital Humanities in Taipei, 2015.



Yijun Wang (April 2017)

### From Tin to Pewter: Craft and Statecraft in Qing China (1700–1844)

This project examined the trajectory of tin as an ore from mines in southwestern China and Southeast Asia to its fabrication as everyday tableware and the key ingredient in the alloy of pewter from 1700 to 1844. In the Qing Dynasty, pewter craftsmen experimented with styles and techniques of various cultural origins. Research into the social networks, ecology, global trade, and cultural exchange of tin elucidated connections among Chinese miners, the nascent Bangka (present-day Indonesia) mining industry, the Dutch East India Company, the British East India Company, and the Qing state. The development of statecraft and tin production as a craft were intricately related. The Qing state's attention to tin, a monetary metal, required a system to distribute the knowledge of merchants, artisans, miners, and carriers. Through the perspective of technology and "craft," analysis of low-level bureaucrats and their assistants has shown how the system generated knowledge about fundraising, cost estimation, and planning. This administrative work paved the way for further evidential philosophy and writings on tin that contributed to statecraft in the nineteenth century.

Isaiah Lorado Wilner (July 2017–July 2018)

### Narratives of Transformation: The Globalization of Indigenous Knowledge

This project linked cultural and intellectual history, indigenous studies, narrative studies, and the history of science to investigate the influence of non-state people on the state within the focus on *Fieldworks of Knowledge* pursued by the Berlin Center for the History of Knowledge. It focused on narratives of transformation: stories of self-alteration, reciprocity, and borderless travel developed as a survival strategy by colonized people facing the vectors of epidemic pathogens and state erasure, which resulted in the critique of race. Working with the indigenous people of British Columbia and with archives and objects from New York to Berlin, this project reconnected knowledge to its origins and traced its global propagation. Globalization is thus revealed as a narrative process of transmission and reception that joins and transforms intellectual ecosystems.



#### PUBLICATION

Wilner, Isaiah Lorado. "Transformation masks: recollecting the indigenous origins of global consciousness." In *Indigenous visions: rediscovering the world of Franz Boas*, eds. Ned Blackhawk and Isaiah Lord Blackhawk. 3–41. Newhaven: Yale University Press, 2018.

Edna Bonhomme (August 2017–July 2019)

### Mapping Epidemics in North African Port Cities, 1750–1950

Epidemics, whether real or imagined, elicit a host of responses generating fear, anxiety, and policy. They move across borders and space, maiming as they flourish. This research explores the ways that the port cities of Alexandria, Tripoli, and Tunis managed various epidemics during the expansion of capitalism, nationalism, and colonialism. Drawing on colonial and local chronologies, commercial records, maps, and statistical sources, this research traces how modern states, merchants, and international organizations systematically tracked goods and people in Mediterranean port cities for the sake of regulating diseases and people. The political economy that informed public health and scientific practices in the ports was constituted by multifarious and syncretic medical epistemologies, mostly grounded in traditional and allopatric medicine. This project considers how indigenous and foreign actors in North Africa used infectious encounters to define contagion, reify borders, and globalize medicine in port cities.



#### PUBLICATION

Bonhomme, Edna. “Plague in eighteenth-century Cairo: in search of burial and memorial sites.” In *Plague and contagion in the Islamic Mediterranean*, ed. Nükhet Varlik. 199–220. Newark: Rutgers University, 2017.

Marius Buning (August 2017–October 2017)

### Politics of Print in the Early Dutch Republic (1581–1621)

This project examined the history of copyright in the early Dutch Republic (ca. 1581–1621). It related the genesis of intellectual property rights to wider issues concerning state formation and innovation. The primary source material for the study consisted of printing privileges. The Dutch Republic was one of the major print production centers in early modern Europe during the turbulent period 1581–1621, when the Dutch broke away from the Habsburg Spanish Empire to form their own de facto state. Ownership notions changed in the light of continuous revolution and the making of a colonial empire. A digital archive containing the privileges issued in the Dutch Republic during the first decades of its existence allowed for cross-cultural comparisons as well as for novel ways of understanding how knowledge was shared among authors, publishers, artists, the general public, and the State in early modern Europe.



#### PUBLICATION

Buning, Marius. “Promoting technical knowledge: printing privileges and technical literature in the early Dutch Republic.” In *Le livre et les techniques avant le XXe siècle: à l'échelle du monde*, eds. Liliane Hilaire-Pérez, Koen Vermeir, Valérie Nègre, and Delphine Spicq. 453–462. Paris: CNRS Éditions, 2017.

*Shehab Ismail* (September 2017–August 2020)

### **Engineering, Contagion, and Capital in Cairo, 1882–1922**

During British imperial rule in Egypt, Cairo transformed into an object of governance within large-scale “global” technological and social interventions. This project has explored Cairo’s consequent development into a booming metropolis, analyzing how new subjectivities formed among the colonized as they encountered colonial technologies of water provisioning and sanitation. Research into the urban infrastructural organization of colonial Egyptian cities has shown how the imperial regime mobilized its scientific and technological expertise following cholera epidemics and a housing crisis. New contestations over knowledge formed around the materiality of piping infrastructure that carried the flows of clean and foul waters and, at the same time, delivered power. The project interrogated the logics, epistemologies, and reflexivity among public hygienists, engineers, designers, and managers of urban infrastructures.



#### PUBLICATION

Ismail, Shehab Fakhry. “Engineering heterotopia.” *International Journal of Middle East Studies* 47 (3 2015): 566–569.

#### DISSERTATION

Engineering metropolis: Contagion, capital, and the making of British colonial Cairo, 1882–1922

*Alexis Lycas* (September 2017–August 2020)

### **Chinese Local Geography before Local Gazetteers**

This project has analyzed the formative stages of geographical knowledge in dynastic China between the Eastern Han (25–220 CE) and Tang (618–907 CE) eras. Its focus has been the representation and understanding of local diversity in the plethora of geographical writings composed before the ninth century. Many are preserved only in the empire-wide geographies and encyclopedias of the Song (962–1279 CE) and have hitherto been studied mainly with regard to teleological issues of linear transmission. By cross-referencing these Han-Tang fragments with the MPIWG databases and re-arranging them topically and geographically, their mode and context of production has come to the fore. These texts bear witness to the heterogeneity of geo-historical information before the surge of local gazetteers. Furthermore, by exposing how the local informs the imperial center, local writings reveal the regional diversity of a space that historiography mostly addresses for its attempts towards unified rule.



#### PUBLICATION

Lycas, Alexis. “La mort par noyade dans la littérature géographique du haut moyen âge chinois.” *Études chinoises* 36 (1 2017): 51–78.

Carolin Roeder (September 2017–August 2020)

### Experts of Verticality: Climbing in the 20th Century

This project explored the creation of a transnational community of climbers and their contributions to studying and apprehending verticality as a practical and bodily experience. The concept of verticality developed in eighteenth and nineteenth century spatial science, side by side with practical experience. From the oceans to the mountains, imperial exploration and natural sciences made vertical space legible and part of an effort to conquer and comprehend nature. In this context, climbers turned mountains, artificial rock walls, or frozen waterfalls into spaces of physical experiences, competition, and technological playgrounds. Conquering and experiencing vertical space was a product of social interactions and institution building, standardization processes, and technological change. The project unveils the history of a practice and its role in the material and political frameworks of twentieth-century transnationalism.



#### PUBLICATION

Roeder, Carolin and Gregory Afinogenov. “Cold War creatures: Soviet science and the problem of the abominable snowman.” In *Ice and snow in the Cold War: histories of extreme climatic environment*, eds. Julia Herzberg, Christian Kehrt, and Franziska Torma, 236–252. New York: Berghahn, 2018.

Yubin Shen (September 2017–August 2019)

### Insect Enemies: Applied Entomology, Pest Control, and the Anthropocene in China, 1915–1960

In twentieth-century China, during a period of national struggle for survival against Japanese enemies, governments campaigned against insect pests to develop applied entomology. This project explored how global circulations of entomological knowledge and chemical insecticides altered relations among the Chinese people, the environment, and insects. Research addressed the conception of insects as pests and how entomological knowledge and practices in Chinese natural history, materia medica, and agricultural studies were transformed and related to a new, globally situated modern scientific discipline. Commercial insecticide development, scientific agriculture, and Mao’s public health campaigns are brought into the Anthropocene debate currently being pursued in global environmental humanities.



#### PUBLICATION

Shen, Yubin. “Too young to date! The origins of *zaolian* (early love) as a social problem in 20th-century China,” in *History of Science* 53 (1 2015): 86–101.

*Zhao Lu* (September 2017–August 2018)

### Psychology in China's Early 20th Century

Psychology emerged in the nineteenth century in China within the institutional and individual uncertainties of late Qing and early Republican times. At the turn of the twentieth century, as the academic and public interest in psychology grew, Chinese institutions, government, local groups, and individuals faced conflicting models of what “the study of the principles of the mind” (*xinli xue* 心理學) entailed, the value it posed for their particular agendas, and how to deal with discrepant assessments. This project has shed light on the development and localization of a discipline against uncertain times. When universities eventually included psychology, they were unable to monopolize its definition—as Anglican missionaries, Daoist practitioners such as the Society of Spiritual Philosophy (*Jingshen zhexue she* 精神哲學社), and the British-inspired Shanghai Spiritualist Society (*Shanghai lingxue hui* 上海靈學會) all deemed themselves part of studying the mind.



#### PUBLICATION

Cook, Constance A. and Zhao Lu. *Stalk divination: a newly discovered alternative to the I Ching*. Oxford: Oxford University Press, 2017.

*Jennifer Hsieh* (November 2017–February 2018)

### Colonial Ears: Noise, Acoustics, and Hearing Bodies in Colonial Taiwan

Noise in Taiwan was defined as a problem through a set of technological devices, including the audiometer, which informed the way colonial administrators introduced noise abatement as part of the civilizing project in Taiwan. Noise monitoring was included within the discourses of public health and administrative governance, wherein technology became an epistemic tool for practical knowledge about noise. This project analyzes noise abatement and acoustical sciences within the context of East Asian modernities and draws attention to multiple intervening processes of translation from the West—first to imperial Japan and then on to colonial Taiwan. Drawing upon colonial reports on noise monitoring from the Office of the Governor-General and social commentary on street noise by Japanese settlers, this project provides an account of the constitutive relationship between urban environmental noise and technologically-mediated perceptions of noise.

Michelle McCoy (December 2017–August 2018)

**Visual and Material Cultures of Astrology and Astronomy in China and Inner Asia, ca. 10th to 14th centuries**

Medieval Eurasia witnessed the widespread circulation of knowledge and beliefs about the visible heavens, the character and consequences of which are in many ways just beginning to be understood. This is particularly true for Sinitic and Inner Asian cultures, where local processes of reception were heavily mediated by older, indigenous systems for knowing the heavens and predicting or controlling the future. This project has examined how the heavens were described, modeled, and invoked with a focus on the Tanguts, Tibeto-Burman founders of the Xixia state (1038–1227), who left behind a dense record of astral worship and unique or otherwise lost documents of trans-Eurasian knowledge circulation. At issue in particular is how such processes came to transform the nature of representation itself.



PUBLICATION

McCoy, Michelle. “Catalogue” in *Cave temples of Dunhuang: Buddhist art on China’s silk road*, eds. Neville Agnew et al. Los Angeles: Getty, 2016.

Sarah Blacker (May 2015–August 2018)

**Planning for Persistent Environmental Contamination: Public Health, Indigenous Traditional Knowledge, and Technoscience in Canada**

The Canadian oil industry operates predominantly on First Nations treaty lands using in situ methods of bitumen extraction, resulting in environmental contamination on an immense scale. Through an inquiry connecting landscape, human health, geology, and oil extraction in Canada, this project has examined the historical and present-day dynamics among actors that challenged stable norms and paradigms of scientific knowledge production. This case has exemplified linkages between industrial development and the health of citizens affected by environmental contamination, by recognizing how industrial planning, environmental planning, and planning for Indigenous health become entangled together. The project has drawn attention to the mobilization of public health campaigns that lay down the epistemological groundwork for persistent environmental contamination. This research concludes that the onus of prevention, placed upon the behaviors of those at risk, has alleviated government responsibility, thus, in turn, permitting development to proceed.



PUBLICATION

Szeman, Imr, Sarah Blacker, and Justin Sully, eds. *A companion to critical and cultural theory*. Hoboken, NJ: Wiley Blackwell, 2017.



## PREDOCTORAL FELLOWS

*Kevin Donovan* (September–November 2015)

### **Enacting East Africa**

Ambiguities and tensions emerged as sovereign East African states integrated economically and politically with their neighbors during the long twentieth century. In archival and ethnographic research, efforts at supranational market formation and political federation became apparent that did not proceed to fruition. Contradictions became immanent as colonial authorities and postcolonial states sought autonomy without autarky. Regionalization is a risky project of reformulating social space, linking economic infrastructures, aligning institutional plans, and articulating cultural norms and temporalities. This project has clarified how symbolic and material contests have defined three generations of regional planning in East Africa: British colonialism, the decades following decolonization, and the ongoing efforts of the East African Community. The infrastructural efforts of regional planners and the frictions involved were manifested with more popular modes of understanding, practices of exchange, and structures of feeling.

*Yangzi Wu* (November 2016–May 2017)

### **Origin and Development of Quantum Cryptography**

Building upon the history of quantum physics after World War II, this project researched more detailed knowledge about quantum cryptography as first proposed by Columbia University physicist Stephen Wiesner. Research, including interviews, has advanced insights into Wiesner and his thinking about the concept of quantum money and quantum conjugate coding. Wiesner had designed quantum money, or unforgeable bank notes, to illustrate how to store or transmit two messages in a way that contrasted with traditional cryptography methods. Quantum cryptography thus involved encoding two messages in two “conjugate observables,” such as linear and circular polarization of light, so that either, but not both, may be received and decoded. This project particularly examined the significance of Wiesner’s thought on the work of Charles H. Bennett of the IBM Thomas J. Watson Research Center, and Gilles Brassard, of the University of Montreal, who proposed a method for secure communication based on Wiesner’s work.

*Katarina Nordstroem* (February–March 2017)

### **To Reconcile the Irreconcilable: Spatial Tools for Negotiating Environmental Conflicts in Swedish Land-Use Planning**

Swedish land-use plans were created with the stated goal of eliminating future conflicts between industry and environmental interests. The national land-use plan was

implemented in several different prevailing laws, among them the Environmental Protection Act of 1969. Examination of the planning process and of political debates between 1966 and 1972 shows the use of spatiality as a tool to answer the critique that the rising environmental movement had leveled against industry and technology. The project discussed the hands-on methods and theories that guided the land-use plan and reflected the strong position of spatiality as a technocratic knowledge field during the 1960s and 1970s. It also considered the tension between different spatial knowledge systems and ideals such as “spatial equality” and different spatial scales, as represented by the global-scale “shrinking earth” scenario of crowding and resource shortages confronted by massive regional-scale problems of depopulation due to unemployment.

*Qiao Yang* (July 2017–June 2018)

#### **Astronomers and Physicians in the Mongol Empire (1279–1368)**

Under Mongol rule, trans-Eurasian trade, military and diplomatic activities, and the migration of professionals created unprecedented opportunities for the exchange of knowledge and ideas among different regions, cultures, and civilizations. This research was part of a PhD project on the Mongol Empire (1206–1368) and its approaches to heavenly and human bodies. Medical and astral expertise often went hand in glove in this region. Comparative in approach, the analysis concerned the astronomers’ and physicians’ professional learning and practice, their social function and social networks, and their role in the process of transmission of scientific knowledge. In contrast to the Ilkhanates, Yuan rulers seem to have been interested in preserving a multiplicity of astral traditions. Also of interest in this research were the practices of patronage and gift-giving, as well as the role of the cross-border movement of astronomical texts and instruments.

*Sijia Cheng* (September 2017–February 2018)

#### **Nutritional Filth: Agricultural Uses of Animal Waste in Late Imperial China**

Since fecal matter played a pivotal role in the maintenance of soil fertility, fish farming, and silkworm rearing, Chinese agriculturists viewed excrement as valuable “gold” rather than useless and repulsive filth. This project scrutinized the cultural and social valorizations of animal waste from four angles: (1) the methods and technologies for collecting and producing animal manure; (2) animal waste within agricultural practices; (3) materiality of animal waste; (4) intellectual and political discourses on waste during the Ming and Qing Dynasties. By interrogating the social and cultural matrix that endows animal waste with various functions and explicit meanings, this project provides a fresh look at the relationships between humans and animals, knowledge and practice, as well as technology and the environment in late imperial China.

*Kerstin Pannhorst* (September 2017–August 2019)

### **Fleas and Butterflies from Taiwan in 20th-Century Global Trade**

This project has focused on practices and concepts surrounding the collecting and trading of insects in early twentieth-century Taiwan. By exploring the origins and entanglement of the mass-fabrication of research specimens, decorative art, and knowledge, this research has identified two main figures, Hans Sauter (1871–1943) from Germany and Yasushi Nawa (1857–1926) from Japan, in the entrepreneurial collection, study, and trade of insects from Taiwan, which was then a Japanese colony. The animals served as a resource for taxonomical and biogeographical descriptions, for research into insects relevant to the large-scale agricultural production being established in colonial Taiwan, and for the mass production of decorative objects such as paper fans made using butterfly specimens. Although driven by very different motivations, these actors and their respective employees met in the field, where they not only competed for specimens, but also exchanged ideas and collecting practices.

*Kelsey Seymour* (September 2017–February 2018)

### **Chanting and Expertise of Memory in Tang Dynastic (618–907) China**

In monastic ordination examinations, which were modeled on the secular civil examinations, would-be monks and nuns chanted and memorized prescribed amounts of text in order to gain admittance to the clergy. This project has investigated the changing role of chanting texts as a method to plan, prove, and evaluate Buddhist knowledge during the Tang Dynasty. It looked at learning strategies and techniques employed by medieval Buddhist communities, oral reading practices, examination frameworks, and methods of verification and judgement. Unlike more subjective elaborations of scriptural content, chanting performances relied on fixed amounts of text that an examiner could follow to judge their accuracy. Rather than just serving as a component of rituals or as a recondite practice believed to incite miracles, this project unfolds how education about chanting was also practically applied to substantiate truth in and with sound.

## Department III

## Publications 2015–2017

Andreeva, Anna. “Explaining conception to women? Buddhist embryological knowledge in the Sanshō ruijūshō (Encyclopedia of Childbirth, ca. 1318).” *Asian Medicine* 12 (1/2 2017): 170–202.

Blacker, S. *see Szeman and Blacker*

Bol, Marjolijn. “Technique and the art of immortality, 1800–1900.” *History of Humanities* 2 (1 2017): 179–199.

Bonhomme, Edna. “Plague in eighteenth-century Cairo: in search of burial and memorial sites.” In *Plague and contagion in the Islamic Mediterranean*, ed. Nükhet Varlik. 199–220. Newark: Rutgers University, 2017.

Brara, Rita. “Animal rights vs. bullfights: the horns of an Indian dilemma.” *Environment & Society Portal. Arcadia* 5 (Spring 2016): <http://www.environmentandsociety.org/arcadia/animal-rights-vs-bullfights-horns-indian-dilemma>.

- 1 Bray, Francesca, Peter A. Coclanis, Edda L. Fields-Black, and Dagmar Schäfer, eds. *Rice: global networks and new histories*. New York, NY: Cambridge University Press, 2015.

Brentjes, S. *1001 distortions*. Würzburg: Ergon Verlag, 2016 *see Department I*

- 2 Brock, Emily K. *Money trees: the Douglas fir and American forestry, 1900–1944*. Corvallis, OR: Oregon State University Press, 2015.

Brock, Emily K. “Repairing the damage: reforestation and the origins of the modern industrial tree farm.” In *Viewing the future in the past: historical ecology applications to environmental issues*, eds. H. Thomas Foster II, Lisa M. Paciulli, and David J. Goldstein. 119–132. Columbia, SC: The University of South Carolina Press, 2016.

Brock, Emily K. “The desert and the dendrograph: place, community, and ecological instrumentation.” In *Reasoning in measurement*, eds. Nicola Mössner and Alfred Nordmann. 170–185. London: Routledge, 2017.

Brown, Warren C. and Christian de Pee. “Medieval media revolutions: an exchange.” *The Medieval Globe* 3 (1 2017): art. 8.

Brownell, Emily. "Growing hungry: the politics of food distribution and the shifting boundaries between urban and rural in Dar es Salaam." *Global Environment* 9 (1 2016): 58–81.

Buell, Paul David and Montserrat de Pablo. "Distilling of the Volga Kalmucks and Mongols: two accounts from the eighteenth century by Peter Pallas, with some modern comparisons." *Crossroads* 13 (2016): 115–132.

Buning, Marius. "Discovering inventions: a short history of inventor's privileges." In *Janello Torriani: a Renaissance genius, Exhibition catalogue, Cremona – Museum of the Violin*, ed. C. Zanetti. 59–61. Cremona: Comune di Cremona, 2016.

Buning, Marius. "Promoting technical knowledge: printing privileges and technical literature in the Early Dutch Republic." In *Le livre et les techniques avant le XXe siècle: à l'échelle du monde*, eds. Liliane Hilaire-Pérez, Koen Vermeir, Valérie Nègre, and Delphine Spicq. 453–462. Paris: CNRS Éditions, 2017.

Chen, Kaijun. "Childs Frick's appreciation of Chinese Blue-and-White Porcelains." *Arts of Asia* 45 (1 2015): 42–50.

Chen, Kaijun. "Learning about precious goods: transmission of mercantile knowledge from the southern Song to the early Ming periods." *Bulletin of the Jao Tsung-I Academy of Sinology* (5 2017): 291–327.

Chen, Shih-Pei. "Remapping Locust Temples of Historical China and the use of GIS (重制陳正祥之蝗神廟分佈圖與淺談 GIS 的使用)." *Review of Religion and Chinese Society* 3 (2 2016): 149–163.

Chen, Shih-Pei, Zoe Hong, Dagmar Schäfer, Martina Siebert, and José Urzúa. "Compiling a database on historical China from local records: the Local Gazetteers Project at MPIWG." In *Digital Humanities 2016: conference abstracts ; Kraków 11–16 July 2016*, eds. Maciej Eder and Jan Rybicki. 452–455. Kraków: Jagiellonian University, 2016.

Chu, Longfei. "From the Jesuits' treatises to the imperial compendium: the appropriation of the Tychonic system in seventeenth and eighteenth-century China." *Revue d'histoire des sciences* 70 (1 2017): 15–46.

Coulter, Kimberly and Wilko Graf von Hardenberg. "Cultivating the spirit of the commons in environmental history: digital communities and collections." In *Methodological challenges in nature-culture and environmental history research*, eds. Jocelyn Thorpe, Stephanie Rutherford, and L. Anders Sandberg. 260–271. London: Routledge, 2017.

Davies, Surekha. *Renaissance ethnography and the invention of the human: new worlds, maps and monsters*. Cambridge, UK: Cambridge University Press, 2016.



de Pee, C. *see also Lam, Lin and de Pee*

- 3 de Pee, Christian. “Nature’s capital: the city as garden in “The splendid scenery of the capital (Ducheng jisheng, 1235)”” In *Senses of the city: perceptions of Hangzhou and southern Song China, 1127–1279*, eds. Joseph Lam, Shuen-fu Lin, Christian de Pee, and Martin Powers. 179–204. Hong Kong: Chinese University Press, 2017.

de Pee, Christian. “Notebooks (biji) and shifting boundaries of knowledge in eleventh-century China.” *The Medieval Globe* 3 (1 2017): art. 7.

- 4 Delille, Emmanuel, ed. *Ellenberger, Henri: Ethno-psychiatrie: édition critique*. Sociétés, espaces, temps. Lyon: ENS Éditions, 2017.

Dennis, Joseph. “Chinese school libraries book collections database project.” In *Chinese local chronicles culture going global international symposium on local chronicles culture / 走向世界的中国方志文化国际学术研讨会论文汇编*, 25–57. Beijing: The Office of Chinese Local Chronicles Guidance Group, 2017.

DiMoia, John P. “The Japanese medical Empire and its iterations. Essay review of: Kim, Hoi-eun: *Doctors of Empire: medical and cultural encounters between Imperial Germany and Meiji Japan*. Toronto: University of Toronto Press 2014.” *Cross-Currents: East Asian History and Culture Review* 15 (2015): 133–147.

Dumont, Aurore and Alexis Lycas. “Le monde perdu de la taïga: Malu, ah Malu, une nouvelle de Wure’ertu.” *Impressions d’Extrême-Orient* 7 (2017): 1–9.

Fan, Fa-ti. “The people’s war against earthquakes: cultures of mass science in Mao’s China.” In *Cultures without culturalism: the making of scientific knowledge*, eds. Karine Chemla and Evelyn Fox Keller. 296–323. Durham: Duke University Press, 2017.

- 5 Fullilove, Courtney. *The profit of the Earth: the global seeds of American agriculture*. Chicago: The University of Chicago Press, 2017.

Groß, Dominik and Ylva Söderfeldt, eds. “Disability Studies” meets “History of Science”: körperliche Differenz und soziokulturelle Konstruktion von Behinderung aus





1

*der Perspektive der Medizin-, Technik- und Wissenschaftsgeschichte. Studien des Aachener Kompetenzzentrums für Wissenschaftsgeschichte 17. Kassel: Kassel University Press, 2017.*

Guan, Xueling. “Qingguan zhong de yao yong juhua 清宫中的药用菊花 [The use of chrysanthemum as medicine in the courts of Qing Dynasty].” *Forbidden City* (9 2016): 50–55.

Guan, Xueling. “Qionggong yaojiu zhishi 清宫药酒摭拾 [A study on the medicinal wine in the courts of Qing Dynasty].” *Forbidden City* (2 2016): 86–97.

Guo, Fuxiang. “Qianlong gongting Manasi biyu yanjiu 乾隆宫廷玛纳斯碧玉研究 [A study on the Manasi biyu of the Qianlong Court].” *Palace Museum Journal* (2 2015): 6–31.

Hahn, Barbara. “Must we embody context?” *Technology and Culture* 58 (2 2017): 556–569.

Hardenberg, W. G. v. *see also Coulter and Hardenberg*

Hardenberg, W. G. v. *see also Kelly, Leal, Wakild and Hardenberg*

- 1 Hardenberg, Wilko Graf von. “Another way to preserve: hunting bans, biosecurity and the brown bear in Italy, 1930–60.” In *The nature state: rethinking the history of conservation*, eds. Wilko Graf von Hardenberg, Matthew Kelly, Claudia Leal, and Emily Wakild. 55–75. London: Routledge, 2017.

Hardenberg, Wilko Graf von. “L'altra faccia della montagna: tutela della natura, turismo e modernizzazione.” *Zapruder* 43 (2017): 56–69.

Hardenberg, Wilko Graf von, Matthew Kelly, Claudia Leal, and Emily Wakild, eds. *The nature state: rethinking the history of conservation*. Routledge environmental humanities. London: Routledge, 2017.

Harwood, Jonathan. “Global visions versus local complexity: experts wrestle with the problem of development.” In *Rice: global networks and new histories*, eds.

Francesca Bray, Peter Coclanis, Edda Fields-Black, and Dagmar Schäfer. 41–55.  
New York: Cambridge University Press, 2015.

Hasegawa, Masato. “War, Supply Lines, and Society in the Sino-Korean Borderland of the Late Sixteenth Century.” *Late Imperial China* 37 (1 2016): 109–152.

Hörnig, Johannes Thomas and Ylva Söderfeldt. *Von Wechselbälgen und verkörperter Differenz: zwei Beiträge zu den Disability Studies*. Stuttgart: Verlag der Evangelischen Gesellschaft, 2017.

Kelly, Matthew, Claudia Leal, Emily Wakild, and Wilko Graf von Hardenberg. “Introduction.” In *The nature state: rethinking the history of conservation*, eds. Wilko Graf von Hardenberg, Matthew Kelly, Claudia Leal, and Emily Wakild. 1–15.  
London: Routledge, 2017.

Kett, Robert J. “Monumentality as method: archaeology and land art in the Cold War.” *Representations* 130 (1 2015): 119–151.

Kett, Robert J. “Monuments in print and photography: inscribing the ancient in nineteenth-century Mexico.” *The Getty Research Journal* 9 (2017): 201–210.

Ko, Dorothy. *The social life of inkstones: artisans and scholars in early Qing China*. Seattle: University of Washington Press, 2017.

Lam, Joseph S. C., Shuen-fu Lin, Christian de Pee, and Martin Powers, eds. *Senses of the city: perceptions of Hangzhou and southern Song China, 1127–1279*. Hong Kong: The Chinese University Press, 2017.

Lee, Victoria. “Mold cultures: traditional industry and microbial studies in early twentieth-century Japan.” In *New perspectives on the history of life sciences and agriculture*, eds. Denise Phillips and Sharon Kingsland. 231–252. Cham: Springer, 2015.

Lee, Victoria. “Unraveling the search for microbial control in twentieth-century pandemics.” *Studies in History and Philosophy of Science. Part C, Studies in History and Philosophy of Biological and Biomedical Sciences* 53 (2015): 122–125.

Luo, Wenhua. “Cong Xizang Gonggaqude si bihua kan Qinze huapai de te dian 从西藏贡嘎曲德寺壁画看钦则画派的特点 [Studying the characteristics of the Qinde School from the frescoes of the Temple of Gonggaqude in Tibet].” *Palace Museum Journal* (5 2015): 110–130.

Lycas, A. *see also Dumont and Lycas*

Lycas, Alexis. “La mort par noyade dans la littérature géographique du haut Moyen Âge chinois.” *Études Chinoises* 36 (1 2017): 51–78.

Most, G. W. "Allegoresis and etymology." 2016 *see Publications list by Glenn W. Most*

Miller, Ian Matthew. "Forestry and the politics of sustainability in early China." *Environmental History* 22 (4 2017): 594 - 617.

Paethe, Cathleen and Dagmar Schäfer. "Books for sustenance and life: bibliophile practices and skills in the late Ming and Qi Chenghan's Library Dansheng tang." In *Transforming book culture in China, 1600–2016*, eds. Daria Berg and Giorgio Strafella. 19–48. Wiesbaden: Harrassowitz, 2016.

Schäfer, D. *see also Bray, Coclanis, Fields-Black and Schäfer*

Schäfer, D. *see also Chen, Hong and Schäfer*

Schäfer, D. *see also Paethe and Schäfer*

Schäfer, D. *see also Song and Schäfer*

Schäfer, Dagmar. "Patterns of design in Qing-China and Britain during the seventeenth and eighteenth Centuries." In *Goods from the East, 1600–1800: trading Eurasia*, eds. Maxine Berg, Felicia Gottmann, Hanna Hodacs, and Chris Nierstrasz. 107–118. Houndmills, Basingstoke: Palgrave Macmillan, 2015.

- 1 Schäfer, Dagmar. 工开万物：17世纪中国的知识与技术 [*The crafting of the 10000 things: knowledge and technology in seventeenth-century China*]. Translated by Xiujie Wu and Lanling Bai. Nanjing: Jiangsu ren min chu ban she, 2015.

Schäfer, Dagmar. "Culture et technique." In *Histoire des techniques: mondes, sociétés, cultures (XVIe-XVIIIe siècle)*, eds. Guillaume Carnino, Liliane Hilaire-Pérez, and Aleksandra Kobiljski. 369–395. Paris: PUF, 2016.

Schäfer, Dagmar. "Introduction." In *Recovery of traditional technologies: a comparative study of past and present fermentation and associated distillation technologies in Eurasia and their roots*, ed. Angela Schottenhammer. 133–141. Crossroads 14. Großheirath: Ostasien Verlag, 2016.

Schäfer, Dagmar. "Techniques et territoires en Asie orientale." In *Histoire des techniques: mondes, sociétés, cultures (XVIe-XVIIIe siècle)*, eds. Guillaume Carnino, Liliane Hilaire-Pérez, and Aleksandra Kobiljski. 25–52. Paris: PUF, 2016.

Schäfer, Dagmar. "China und Japan." In *Handbuch Wissenschaftsgeschichte*, eds. Marianne Sommer, Staffan Müller-Wille, and Carsten Reinhardt. 166–177. Stuttgart: Metzler, 2017.

Schäfer, Dagmar. "Knowledge by design - architecture and Jade models during the Qianlong 乾隆 reign (1735–1796)." In *The structures of practical knowledge*, ed. Matteo Valleriani. 271–286. Cham: Springer, 2017.



Schäfer, Dagmar. “Science in the pre-modern East.” In *The Oxford illustrated history of science*, ed. Iwan Rhys Morus. 108–142. Oxford: Oxford University Press, 2017.

Schäfer, Dagmar. “Thinking in many tongues: language(s) and late imperial China’s science.” *Isis* 108 (3 2017): 621–628.

Schäfer, Dagmar and Markus Popplow. “Technology and innovation within expanding webs of exchange.” In *The Cambridge world history. Vol. 5. Expanding webs of exchange and conflict, 500 E (CE)–1500 E (CE)*, eds. Benjamin Z. Kedar and Merry E. Wiesner-Hanks. 309–338. Cambridge: Cambridge University Press, 2015.

Schlünder, Martina. “Pastorale: sheep traffic in modern trauma surgery.” In *Humans, animals and biopolitics: the more-than-human condition*, eds. Kristin Asdal, Tone Druglitrø, and Steve Hinchliffe. 85–100. London: Routledge, 2017.

- 2 Schwenke, Heiner. *Die Verwechslung der Welten: Auferstehung, Reich Gottes und Jenseitserfahrungen*. Transzendente Erfahrungen: Phänomene und Deutungen 1. Freiburg: Verlag Karl Alber, 2017.

Shen, Yubin. “The origins of Yunnan Anti-Malarial Commission, 1935–1939.” In *Dao fa zi ran: Zhongguo huan jing shi yan jiu de shi jiao he lu jing*, ed. Qiong Zhou. 286–299. Beijing: Zhongguo she hui ke xue chu ban she, 2017.

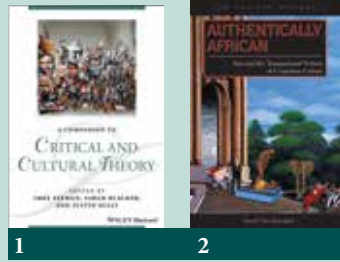
Söderblom Saarela, Märten. “Alphabets avant la lettre: phonographic experiments in late imperial China.” *Twentieth-Century China* 41 (3 2016): 234–257.

Söderblom Saarela, Märten. “Mandarin over Manchu: court-sponsored Qing lexicography and its subversion in Korea and Japan.” *Harvard Journal of Asiatic Studies* 77 (2 2017): 363–406.

Söderfeldt, Y. *see Groß and Söderfeldt*

Söderfeldt, Y. *see Hörnig and Söderfeldt*

Song, Jia-Ou and Dagmar Schäfer. “Interpreting the collection and display of contemporary science in Chinese museums as a reflection of science in society.” In *Challenging collections: approaches to the heritage of recent science and technology*,



eds. Alison Boyle and Johannes-Geert Hagmann. 88–102. Washington, (DC): Smithsonian Institution Scholarly Press, 2017.

Song, Shenmi. “The twelve signs of the zodiac during the Tang and Song dynasties: a set of signs which lost their meanings within Chinese horoscopic astrology.” In *The circulation of astronomical knowledge in the ancient world*, ed. John M. Steele. 478–526. Leiden: Brill, 2016.

Stanley-Baker, Michael. “‘Indian Massage’ from Sun Simiao’s ‘Prescriptions worth a thousand in gold.’” In *Buddhism and medicine: an anthology of premodern sources*, ed. C. Pierce Salguero. 533–537. New York: Columbia University Press, 2017.

Stanley-Baker, Michael and Brent Ho. “Mapping drugs across epistemic and geographic domains: a case study for early medieval China.” In *6th International Conference of Digital Archives and Digital Humanities in Taipei*, 2015: <https://dr.ntu.edu.sg/handle/10220/44783>.

Stanley-Baker, Michael and Dolly Yang. “Dung, hair and mungbeans: household remedies in the Longmen recipes.” *Buddhism and medicine: an anthology of premodern sources* (2017): 454–477.

Svendsen, Zoë and Simon Daw. *World factory: the game*. London: Nick Hern Books, 2017.

1 Szeman, Imr, Sarah Blacker, and Justin Sully, eds. *A companion to critical and cultural theory*. Hoboken, NJ: Wiley Blackwell, 2017.

Thébaud-Sorger, Marie. “Capturing the invisible: heat, steam and gases in France and Great Britain, 1750–1800.” In *Compound histories: materials, governance, and production, 1760-1840*, eds. Lissa L. Roberts and Simon Werrett. 85–105. Leiden: Brill, 2017.

Tinn, Honghong. “Charting the cartography of a global community of EASTS scholars.” *East Asian Science, Technology and Society: An International Journal* 10 (4 2016): 341–342.

Van Beurden, Sarah. “The art of (re)possession: heritage and the cultural politics of Congo’s decolonization.” *Journal of African History* (2015): 143–164.

- 2 Van Beurden, Sarah. *Authentically African: arts and the transnational politics of Congolese culture*. New African histories. Athens, Ohio: Ohio University Press, 2015.

Van Beurden, Sarah. “Restitution or cooperation? Competing visions of post-colonial cultural development in Africa.” *Global Cooperation Research Papers* 12 (2015): 1–25.

Yongdan, Lobsang. “A scholarly imprint: how Tibetan astronomers brought Jesuit astronomy to Tibet.” *East Asian Science, Technology, and Medicine* 45 (2017): 91–117.

Zhang, Shuxian. “Quanli yu yishu – kaocha Cixi jushi kongjian de neiyang zhuangxiu 权力与艺术—考察慈禧居室空间的内檐装修 [Throne and art: a survey on interior design in Cixi’s bedroom].” *Journal of Gugong Studies* (1 2017): 328–351.



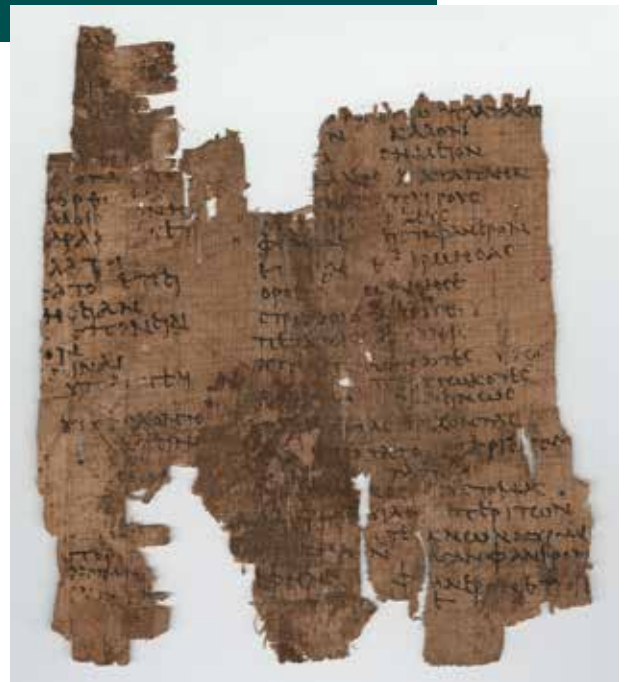


## External Scientific Member

# Glenn W. Most

During the period 2015–2017, my research continued to oscillate between two poles, one directed more towards the specific discipline of Classical Greek and Latin philology, the other more towards systematic comparison among various philologies, both of these poles being conceived within the perspective of the history of science.

On the one hand, I continued to apply the methods of Classical Greek and Latin philology to problems directly involving ancient Greek culture and to reflect upon the history, nature, and limits of those methods. In particular, I published a large-scale edition of the fragments and testimonia of the earliest Greek philosophers (the so-called “Presocratics”) together with André Laks, as well as a number of smaller studies on detailed issues arising from the study of these thinkers. The texts involved are of inestimable importance for studying the early development of European philosophy, cosmology, medicine, mathematics, musical theory, and other fields, as well as for investigating the inter-relations between early Greek science and comparable phenomena in other contemporary and earlier cultures such as Mesopotamia and Egypt. I also convened a workshop, publishing the results together with Leyla Özbek, on a notorious problem of ancient Greek tragedy, the scene of the suicide of Ajax in Sophocles’s homonymous tragedy—with the (apparently successful) intention of testing the extent to which the explicit discussion of the premises and methods shared by contemporary Classical philologists could help bring to a greater convergence a scholarly discussion that had hitherto been characterized by controversy and misunderstanding. So, too, I published a number of studies of various aspects of the Western Classical tradition, considering some of the ways in which texts and images produced in ancient Greece continued to influence European culture for millennia, often precisely through distortions and mistakes.



“Philological scholarship can be used for purposes other than those intended by the philologists. This papyrus from 3rd century CE Egypt containing a commentary on Homer’s Iliad was reused in antiquity as toilet paper.”

Image: Imaging Papyri Project, Oxford and the Egypt Exploration Society.

On the other hand, I continued to apply what I have learned from the practice of philology in my own discipline to the cross-cultural comparison of philological procedures in a variety of canonical textual traditions (Greek, Latin, Hebrew, Arabic, Mesopotamian, Sanskrit, Chinese, etc.). An essay written by Lorraine Daston and myself and published in *Isis* in 2015 programmatically explored the relations between the study of the history of science and the study of the history of the philologies. The creation of canons of written texts—religious, literary, philosophical, scientific—is a feature of numerous literate cultures from ancient times to the present. Such canons may crystallize cultural identities, confessional orthodoxies, school curricula, standards of taste and refinement, and/or the qualifications of ruling elites. They also give rise to learned textual practices, some of them quite technical, to stabilize, reproduce, store, access, format, correct, and interpret the canon. In ancient Chinese and ancient Greek, in medieval Arabic and medieval Latin, in Sanskrit and in Persian, in the modern European vernaculars since the Renaissance (to name only a few), highly trained scholars have developed, cultivated, and transmitted the textual practices of their respective canons. Building on recent work on the origins and cultural significance of canons, and following the example of historians of science and scholarship who have examined scientific practices such as collecting, measuring, and note-taking, I have developed a number of projects, some of them centered at the MPIWG, which investigate the distinctive practices that make texts objects of systematic inquiry.

External Scientific Member: Glenn W. Most

## Publications 2015–2017

Daston, Lorraine and Glenn W. Most. “History of science and history of philologies.” *Isis* 106 (2 2015): 378–390.

Comentale, Nicola and Glenn W. Most. “Hermipp. Μοῖραι fr. 48-<sup>\*</sup>47 K-A: interpretazione e inversione.” *Rheinisches Museum für Philologie* 159 (2016): 1–12.

- 1 Grafton, Anthony and Glenn W. Most, eds. *Canonical texts and scholarly practices: a global comparative approach*. Cambridge: Cambridge University Press, 2016.

Grafton, Anthony and Glenn W. Most. “How to do things with texts: an introduction.” In *Canonical texts and scholarly practices: a global comparative approach*, eds. Anthony Grafton and Glenn W. Most. 1–13. Cambridge: Cambridge University Press, 2016.

Laks, André, Glenn W. Most, Gérard Journée, Leopoldo Iribarren, and David LévyStone, eds. *Early Greek philosophy*. 9 Vol. Loeb classical library 524–532. Cambridge, Mass.: Harvard University Press, 2015.

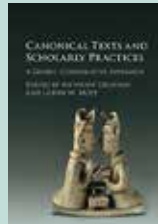
Laks, André and Glenn W. Most, eds. *Les débuts de la philosophie: des premiers penseurs grecs à Socrate*. Paris: Fayard, 2016.

Most, Glenn W. “Crisis and criticism.” *Deutsche Vierteljahrsschrift für Literaturwissenschaft und Geistesgeschichte* 89 (4 2015): 602–607.

Most, Glenn W. “Die Erbschaft der Griechen.” *Zeitschrift für Ideengeschichte* 10 (1 2015): 55–66.

Most, Glenn W. “Some ancient posthumous lovers.” In *Love after death: concepts of posthumous love in medieval and early modern Europe*, eds. Bernhard Jussen and Ramie Targoff. 17–25. Berlin: De Gruyter, 2015.

Most, Glenn W. and Leyla Ozbek, eds. *Staging Ajax's suicide: atti del convegno internazionale, Pisa, Scuola Normale Superiore, 07-09 Novembre 2013*. Pisa: Edizioni della Normale, 2015.



1

Most, Glenn W. "Allegoresis and etymology." In *Canonical texts and scholarly practices: a global comparative approach*, eds. Anthony Grafton and Glenn W. Most. 52–74. Cambridge: Cambridge University Press, 2016.

Most, Glenn W. "Eraclito tra volpi e ricci." In *Riccio o volpe? Uno e molteplice nel pensiero degli antichi e dei moderni*, ed. Vanna Maraglino. 87–105. Bari: Cacucci Editore, 2016.

Most, Glenn W. "Heraclitus Fragment B123 DK." In *What reason promises: essays on reason, nature, and history*, eds. Wendy Doninger, Peter Galison, and Susan Neiman. 117–123. Berlin: De Gruyter, 2016.

Most, Glenn W. "Historicization reconsidered." In *Historisierung: Begriff – Geschichte – Praxisfelder*, eds. Moritz Baumstark and Robert Forkel. 36–41. Stuttgart: Metzler, 2016.

Most, Glenn W. "The rise and fall of Quellenforschung." In *For the sake of learning: essays in honor of Anthony Grafton*. Vol. 2, eds. Ann Blair and Anja-Silvia Goeing. 933–954. Leiden: Brill, 2016.

Most, Glenn W. "What is a critical edition?" In *Ars edendi lecture series*. Vol. 4, eds. Barbara Crostini, Gunilla Iversen, and Brian M. Jensen. 162–180. Stockholm: Stockholm University Press, 2016.

Most, Glenn W. "Afterword: Classicism, modernism, postclassicism." In *Classicisms*, eds. Larry F. Norman and Anne Leonard. 127–135. Chicago: The University of Chicago Press, 2017.

Most, Glenn W. "Postface: The mazes of mythography." In *Apollodoriana: ancient myths, new crossroads; studies in honor of Francesc J. Cuartero*, ed. Jordi Pàmias. 227–234. Berlin: De Gruyter, 2017.

Most, Glenn W. "Sad stories of the death of Kings." In *The scaffolding of sovereignty: global and aesthetic perspectives on the history of a concept*, eds. Zvi Ben-Dor Benite, Stefanos Geroulanos, and Nicole Jerr. 57–79. New York: Columbia University Press, 2017.

# Gerd Graßhoff

## Computational History of Science

The new discipline “Computational History of Science” applies algorithmic methods in order to solve structurally novel and challenging questions in the history of science. These methods enable the execution, documentation, and communication of sophisticated investigations, the construction of extensive data archives, and the execution of methodologically complex operations in a scholarly, concise, and transparent way. Computational History of Science develops new genres of computable documents as hybrid forms of scientific publications. *Jupyter* notebooks, as executable documents, are now experiencing a meteoric rise in science. In the humanities, they will play a prominent role as a new, hybrid form of fast, reliable publications. Phylogenetic interdependencies, the transfer of manuscripts, the diffusion of ideas and technological innovation processes, as well as the development of science are examined with these state-of-the-art techniques of natural language processing. Up-to-date approaches of machine learning make it possible to refine the analysis of figures and forms and to carry out high-level classification tasks. Large sets of historical documents can be analyzed in a comprehensive way. Digital notebooks organize the tools available to the researcher and all operate in a virtual *research cloud*.

The advantage of a computational history of science especially pays off in circumstances well suited for computational means that approach new kinds of hitherto unanswerable questions. Four dimensions are particularly crucial for the fruitful development of an innovative computational history of science:

- Research Environment: The Max Planck Fellowship is enhancing the development of a digital research cloud through the activation of the Berlin network of institutional partners in the Digital Humanities. This will catalyze community resources.



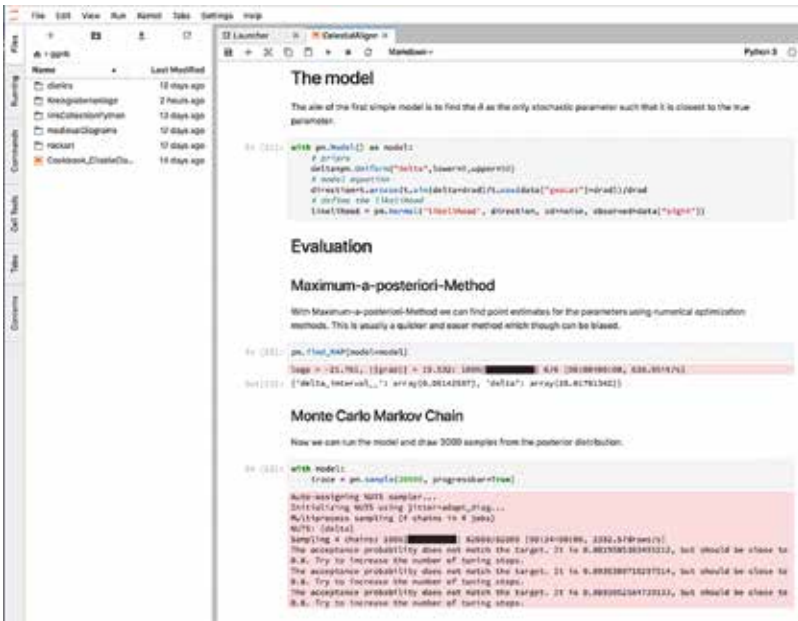
Ptolemaeus, Claudius: *Cosmographia* Weltkarten, facsimile from the Kodex Lat. V F. 32. Würzburg, Popp, 1977.



- Data: Large sets of curated data from a representative set of generally available data form the foundation of comparative studies. On the basis of that data, hypotheses about the development of knowledge can be developed, analyzed, and justified.
- Tools: Modern data analytics from computational text and language analysis, image processing, deep learning models of classification, and computational models of causal reasoning allow new levels of historical research to be examined.
- Publications: Extended forms of data publication will link traditional open access publication with computational notebooks that will transparently foster the collaborative exchange of knowledge. Joint investigations in the area of the computational history of science will quickly establish a new field of research.

In the context of the Max Planck Fellowship, a collaborative digital research platform is being developed that allows timely and intense scientific cooperation, the exchange of digital notebooks, and new access to joint programming libraries and repositories of digital sources. The exchange and common use of tools in the digital humanities

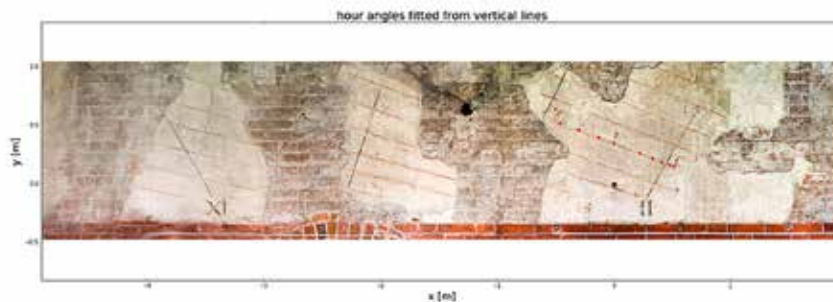
are easily accessible through the research cloud. Digital publications significantly extend both the scope for research in the field of the history of science and the impact of research results. The spectrum of case studies will be rapidly expanded to many fields of research in the history of science to demonstrate the enormous potential of the new approach. The project began with a detailed study in two fields, leading to the publication of the new results that were thus established.



### Copernican Heliograph

Exactly 500 years ago, Nicolaus Copernicus drew a lattice of lines on a panel above the doorway to his rooms at Olsztyn Castle, then in the Bishopric of Warmia. Although its design has long been regarded as some kind of reflecting vertical sundial, the exact astronomical designation of the lines and related measuring techniques remained unknown. Surprisingly, Copernicus did not refer to his new observational methods in his principal work, *De Revolutionibus*. A data analysis of a 3D model of the panel has, at last, solved the mystery: Copernicus created a new type of measuring device—a heliograph with a non-local reference meridian—to precisely measure ecliptic longitudes of the Sun around the time of the equinoxes. The data, 3D model,

and modeling results of our analysis are open access and available in the form of digital (*Jupyter*) notebooks.



Because of the design of the lines and the now fragmentary inscriptions that accompany them, we can confirm the received view that this panel uses the principles of a reflecting and inclining vertical sundial: the red horizontal lines, which slope slightly downwards to the right, are called day lines. On a sundial these lines would represent the daily movement of the reflected spot of light on the wall from west to east (from left to right on our orthophoto). The black vertical lines, which slope upwards to the right, show the hours of the day according to the position of the spot of light on the panel.

The horizontal, slightly downward-inclining day lines for the ecliptic longitudes of the Sun were constructed for every five degrees. During the day, the projected spot of light of the Sun runs parallel to these lines, from left to right. Four marked vertically oriented lines are visible, which we interpret as hour lines: on the far left, the eleventh hour line labeled “XI”; next what we call the “noon line”—its label is lost; then, the fragment of the unmarked first hour line; and finally the hour line marked “II” on the far right.

To set up the computational model we followed the received view that the panel lines were constructed according to the principles of a reflecting vertical sundial with a horizontally oriented mirror that reflects the incident sunlight onto a vertical wall. During the day the projected spot of light moves in the opposite direction of the diurnal motion of the Sun across the wall from west to east. At the equinoxes, on a wall aligned exactly in an east–west direction, the spot of light would move during the day along a straight horizontal line from west to east. The height of this horizontal day line depends solely on the mirror’s distance from the wall and the geographical latitude of the instrument. If the wall turns away from its north direction (as at Olsztyn Castle), the equinoctial lines will be straight but tilted.

In September 2016 Gerd Graßhoff and Joanna Pruszyńska took a series of photographs of the panel. Using structure-from-motion techniques, a 3D model was calculated from the photos. The 3D model was calibrated using Miałdun’s GIS data and serves as a reference template for calibrating the photos. All the detail photos were registered with the 3D model and allow for a precise computational mapping of their pixels to the panel’s metric reference frame. This provides a high-resolution measurement of the geometry of the heliograph that surpasses previous results.

On this basis, we studied an astronomical model of the panel's geometry by simulating the lines, which enabled us to determine the position of the mirror that Copernicus had placed in front of the wall. We also tested possible interpretations of their astronomical meaning, especially those of the hour lines. The panel was modeled using a 3D reconstruction of the wall employing current data analysis tools. The *Jupyter* notebooks of data analysis can be accessed interactively through the server environment.

When calculating local hours on a reflected sundial, the noon line is always vertical. On the heliograph, however, all the lines are clearly tilted and shifted to the east. Either these lines were not intended to display the hours of any time system at all or Copernicus plotted the hour lines for a different reference time. We make no assumptions about the Roman numberings of the hour lines on the lower part of the panel in our reconstruction, which searches for a sequence of hour angles that matches the lines. In particular, we make no assumptions about a specific reference meridian. If the lines on the panel are indeed hour lines, their time difference would amount to exactly one hour between consecutive lines for all the days of the year. Each passage of the moving spot of reflected light would pass a line exactly every hour. This holds independently of the specific reference meridian and would be a characteristic criterion of an hour system used by Copernicus. It can easily be tested; indeed, all the lines on the panel are separated by 15° equatorial time and fit exactly one specific meridian difference. A published notebook analyzes the effect of different reference meridians on the orientation of the hour lines for the fitted set of parameters.

This proves that, with the heliograph, Copernicus had set up a new kind of measuring device for studying the variation of the length of the tropical year. The power of modern 3D photo techniques and evaluation methods has proven the innovative character of computational approaches.

### **Ptolemy's Geography**

In a joint project with Professor Alfred Stückelberger, a new, bilingual edition of the *Geography* of Claudius Ptolemy was published and is the basis of current database revisions of the edition. It is a revised edition of the Greek text that—for the first time—considers the manuscript found in Topkapi Museum in Istanbul in 1930. The publication of the 2006 edition of the *Geography* was the basis of new investigations on Ptolemy's sources and working methods, carried out at the University of Bern and continued at the center of excellence TOPOI and the Max Planck Institute for History of Science. It has led to a better understanding of the origins of the geographical coordinates contained in Ptolemy's work and of the textual transmission of the *Geography*.

Ptolemy's *Geography* (second century CE) contains a catalog in which localities are listed with their geographical coordinates, as well as concrete instructions that allow anyone to draw maps of the known world.

The research project investigates the genesis and transmission of Ptolemy's geographical catalog of places, in particular by considering its structure and the relations between the text of the *Geography* and its cartographical realization. Understanding Ptolemy's working methods not only sheds light on the scientific practices in Antiquity; it also enables the establishment of new philological criteria to assess whether a coordinate in a manuscript is likely to be the original or has been corrupted during the transmission of the text. Three aspects will hence be analyzed together: the origins of the catalog, the history of its transmission, and the reconstruction of Ptolemy's maps.

During the Max Planck Fellowship, tools were developed in the frame of computational humanities that made it possible to take advantage of those particularities of Ptolemy's *Geography* that hinder more traditional approaches: the large amount of numerical data, the complex structure of the catalog, the deep relations between the coordinates, and their graphical application. Thanks to computable documents such as *Jupyter* notebooks, it is possible to perform a great variety of analyses, to widen the scope of the philological investigation, and to communicate the results in form of digital documents. The case studies that are examined relate to Ptolemy's description of the Iberian Peninsula. This research project aims, among other things, at the realization of an enhanced, digital, interactive edition of Ptolemy's map of the Iberian Peninsula and its catalog of localities. The project confirmed the previous results concerning the nature of the underlying data, especially the fact that Ptolemy used geometrical processes, progressively built his map, and established his list of localities afterwards.

Although much information on the history of Ptolemy's text can be gleaned from philological and codicological studies, it is harder to detect deliberate changes to the coordinates using traditional philological investigations. Understanding Ptolemy's working method can help shed light on the transmission of Ptolemy's coordinates and reveal the answers to certain questions that would otherwise remain unsolved. Further information on the topic can be found in: Graßhoff, Gerd, Elisabeth Rinner, Mathieu Ossendrijver, Olivier Defaux, Marvin Schreiber, and Emilie Villey. "Longitude." *eTopoi: Journal for Ancient Studies* 6 (2016): 634–677.

The research unit is headed by Gerd Graßhoff; Olivier Defaux works on the reconstruction methodology of phylogenetic networks applied to the transmission processes of Ptolemy's *Geography*. Working part time, Malte Vogl programs the Python libraries and application notebooks in iPython, from data analytics to text analysis and image processing. The Research Group is funded jointly by a special grant of the Max Planck Society and by Department I (led by Jürgen Renn).

→ pp. 19ff.

A close cooperation involving technology, methodology, tool development, and case studies has been established with the research activities of Department I. The aim is the optimal sharing of research tools and infrastructure, including such areas as the development of *Jupyter* notebooks and the use of critical community libraries. Python developer and scientist Malte Vogl, who is funded equally by both research units (jointly with Dirk Wintergrün), is pushing forward the design of a research

cloud. Vogl works on data analysis and the development of computational packages for the Max Planck Fellowship. While one of his main areas of work in Department I is the development of critical components such as user administration, file sharing, and virtual machines for a research platform, he also develops techniques of digital humanities.

The overlap of technological procedures and tools allows intense and fruitful cooperation in the development of computational methods, to which all departments and the research community have open access. The fruit of this collaboration was a joint contribution to the application for the successful establishment of a Berlin Center for Machine Learning (headed by Professor Klaus Müller of Technische Universität Berlin), which began its research in autumn 2018.

Max Planck Fellow: Gerd Graßhoff

## Publications 2015–2017

Graßhoff, Gerd. “Living according to the seasons: the power of *parapegmata*.”

In *Knowledge, text and practice in ancient technical writing*, eds. Marco Formisano and Philip van der Eijk. 200–216. Cambridge: Cambridge University Press, 2017.

Graßhoff, Gerd. “Panbabylonismus als Mythos der Kulturentwicklung.” In *Antike als Transformation: Konzepte zur Beschreibung kulturellen Wandels*, eds. Johannes

Helmrath, Eva Marlene Hausteiner, and Ulf Jensen. 39–46. Berlin: De Gruyter, 2017.

Graßhoff, Gerd, Hans-Christoph Liess, Bruce S. Eastwood, and Domenico Schneider.

“*Medieval diagrams*”. Berlin: Edition Topoi, 2016: <http://repository.edition-topoi.org/collection/MAPD>

Graßhoff, Gerd, Florian Mittenhuber, and Elisabeth Rinner. “Of paths and places:

the origin of Ptolemy’s *Geography*.” *Archive for History of Exact Sciences* 71 (6 2017): 81–101.

Graßhoff, Gerd and Mathieu Ossendrijver. “Ein antikes Großforschungsprojekt.”

*Spektrum der Wissenschaft: Spezial Archäologie, Geschichte, Kultur* (4 2017): 58–65.

Graßhoff, Gerd, Elisabeth Rinner, Mathieu Ossendrijver, Olivier Defaux, Marvin

Schreiber, and Emilie Villey. “Longitude.” *eTopoi: Journal for Ancient Studies* 6 (2016): 634–677.

Graßhoff, Gerd, Elisabeth Rinner, Karlheinz Schaldach, Bernhard Fritsch, and Liba

Taub. “*Ancient Sundials*”. Berlin: Edition Topoi, 2016: <http://repository.edition-topoi.org/collection/BDSP>

Graßhoff, Gerd, Markus Wäfler, Thomas Hofmeier, and Gordon Fischer. “*Rock*

*paintings in Indonesia*”. Berlin: Edition Topoi, 2016: <http://repository.edition-topoi.org/collection/PIND>

Graßhoff, Gerd and Erich Wenger. “The coordinate system of astronomical observa-

tions in the Babylonian diaries.” In *Studies on the ancient exact sciences in honour of Lis Brack-Bernsen*, eds. John Steele and Mathieu Ossendrijver. 83–103. Berlin: Edition Topoi, 2017.

Meyer, Michael and Gerd Graßhoff. “Ein Dreiklang aus Raum, Wissen und Zeit.”

*Spektrum der Wissenschaft: Spezial Archäologie, Geschichte, Kultur* (4 2017): 6–7.





Emeritus Scientific Member

# Hans-Jörg Rheinberger

Hans-Jörg Rheinberger has been Director emeritus at the Institute since February 2014. In the years from 2015 to 2017, he worked on a number of projects deriving from his long-standing interest in the relations between the sciences, the arts, and literature from the early modern times to the present. Two case studies have recently resulted from this interest. The first study deals, from a historical as well as a literary perspective, with still lifes in the Flemish and Dutch Baroque. It combines an essay on European flower gardens in the seventeenth century with literary descriptions of a number of still life paintings from the same period (*Kunststücke*, Alpheus, 2015).

The second case study deals with an unusual encounter, that between the philosopher of science Gaston Bachelard and the copper engraver and Bauhaus student Albert Flocon in *après guerre* Paris. The artist and the epistemologist interacted for about a decade, publishing a number of bibliophilic books together, to which Flocon contributed the copper engravings and Bachelard wrote the accompanying texts. It is an illuminating case where art and epistemology come to interact in a very particular fashion. Reflections on the hand occupy a central place in both registers. The case study was published with Diaphanes (*Der Kupferstecher und der Philosoph*, 2016). A French version has been published with Editions Hermann (2017), and an English version is currently in press (SUNY).

A third study with a focus on the history of the life sciences has its roots in a project that connects back to the time when Rheinberger was Director of Department III. It takes an epistemic object—the gene—as its focus, and follows the vagaries of its development over the course of the long twentieth century. Not only genetics, but also the life sciences as a whole and society in its manifold connections with human, animal, and plant reproduction have been fascinated, intrigued, and haunted by this molecular object. The book was written together with Staffan Müller-Wille from the University of Exeter and was published by Chicago University Press (*The Gene: From Genetics to Postgenomics*, 2017).



David de Coninck (1636–1687), Still Life with Flowers, Fruits and Ape (ca. 1685). Kunsthau Zürich.

During the time period from 2015 to 2017, Rheinberger held a number of Visiting Fellowships that greatly helped in completing these projects. He spent the Spring Semester 2015 at the International Research Center for Cultural Studies (IFK) in Vienna, the Spring Quarter 2016 at the German Department of Northwestern University in Evanston, Illinois (USA), and the Spring Period of 2017 at the Swedish Collegium for Advanced Studies in Uppsala. A number of new projects have been connected to and inspired by these stays, among them a book with conversations on the laboratory, the atelier, and the archive as spaces of knowledge; a study on Ernst Cassirer and historical epistemology; and a book-length inquiry into the phenomenology of experimentation. Rheinberger is currently continuing his work on these projects.

Albert Flocon, *Le Rideau*. From: Albert Flocon and Gaston Bachelard, *Chateaux en Espagne*. Cercle Grolier, Paris 1957.



**Emeritus Scientific Member: Hans-Jörg Rheinberger**

## Publications 2015–2017

Ash, Mitchell G., Martin Carrier, Olaf Dössel, Ute Frevert, Siegfried Großmann, Martin Grötschel, Reinhold Kliegl, Alexander Peukert, Hans-Jörg Rheinberger, Eberhard Schmidt-Aßmann, Uwe Schimank, Volker Stollorz, Niels Taubert, and Peter Weingart, eds. *Empfehlungen zur Zukunft des wissenschaftlichen Publikationssystems*. Berlin: Berlin-Brandenburgische Akademie der Wissenschaften, 2015: [http://edoc.bbaw.de/volltexte/2015/2641/pdf/2015\\_Empfehlungen\\_Publikationssystem\\_gesamt.pdf](http://edoc.bbaw.de/volltexte/2015/2641/pdf/2015_Empfehlungen_Publikationssystem_gesamt.pdf)

Rheinberger, Hans-Jörg. “Curating the European University.” In *Relocating the history of science: essays in honor of Kostas Gavroglu*, eds. Theodore Arabatzis, Jürgen Renn, and Ana Simões. 357–365. Dordrecht: Springer, 2015.

- 1 Rheinberger, Hans-Jörg. *Die Farben des Tastens*. Einsichten im Dialog 3. Frankfurt am Main: Edition Faust, 2015.

Rheinberger, Hans-Jörg. “Difference machines: time in experimental systems.” *Configurations* 23 (2 2015): 165–176.

Rheinberger, Hans-Jörg. “Eine praktische Form, auf die Welt zuzugreifen [Interview].” *Age of artists* (2015): 1–16: <http://www.ageofartists.de/eine-praktische-form-auf-die-welt-zuzugreifen-interview-mit-hans-joerg-rheinberger/>

Rheinberger, Hans-Jörg. “Labor.” In *Künstlerische Forschung: ein Handbuch*, eds. Jens Badura, Selma Dubach, and Anke Haarmann. 311–314. Zürich: Diaphanes, 2015.

- 2 Rheinberger, Hans-Jörg. *Epistemologia historyczna*. Translated by Jan Surman. Warszawa: Oficyna Naukowa, 2015.

Rheinberger, Hans-Jörg. “‘Er selbst wollte nicht rhetorisch nach aussen treten...’: Gespräch.” In *Ferdinand Nigg (1865-1949): gestickte Moderne*, ed. Christiane Meyer-Stoll. 218–231. Vaduz: Kunstmuseum Liechtenstein, 2015.

Rheinberger, Hans-Jörg. “Experimentalsysteme und epistemische Dinge.” In *Jahrbuch Technikphilosophie 2015: Ding und System*, eds. Gerhard Gamm, Petra Gehring, Christoph Hubig, and Andreas Kaminski. 71–79. Zürich: Diaphanes, 2015.



Rheinberger, Hans-Jörg. “Experimentelle Serialität in Wissenschaft und Kunst.” In *Serialität: Wissenschaften, Künste, Medien*, eds. Olaf Knellessen, Giaco Schiesser, and Daniel Strassberg. 68–77. Wien: Turia + Kant, 2015.

Rheinberger, Hans-Jörg. “Heidegger and Cassirer on science after the Cassirer and Heidegger of Davos.” *History of European Ideas* 41 (4 2015): 440–446.

Rheinberger, Hans-Jörg. “Jean Brachet (1909–1988).” *eLS* (2015): 1–2:  
<https://onlinelibrary.wiley.com/doi/pdf/10.1002/9780470015902.a0025069>

3 Rheinberger, Hans-Jörg. *Kunststücke*. Berlin: Alpheus Verlag, 2015.

4 Rheinberger, Hans-Jörg. *Natur und Kultur im Spiegel des Wissens: Marsilius-Vorlesung am 6. Februar 2014*. Schriften des Marsilius-Kollegs 12. Heidelberg: Universitätsverlag Winter, 2015.

Rheinberger, Hans-Jörg. “Preparations, models, and simulations.” *History and Philosophy of the Life Sciences* 36 (3 2015): 321–334.

Rheinberger, Hans-Jörg. “Re-discovering Mendel: the case of Carl Correns.” *Science & Education* 24 (1 2015): 51–60.

Rheinberger, Hans-Jörg. “‘Trennung als historisches Faktum akzeptieren’: Hans-Jörg Rheinberger über Philosophie, Wissenschaft, das Experiment und Jacques Derrida.” In *Wissen ohne Relevanz (Telepolis): Philosophen über Leben und Technik*, ed. Reinhard Jellen. 40–46. Hannover: Heise Medien, 2015.

Rheinberger, Hans-Jörg. “Über den Eigensinn epistemischer Dinge.” In *Vom Eigensinn der Dinge: für eine neue Perspektive auf die Welt des Materiellen*, ed. Hans Peter Hahn. 147–162. Berlin: Neofelis Verlag, 2015.

Rheinberger, Hans-Jörg. “Über die Möglichkeit einer allgemeinen Wissenschaftsphilosophie heute.” In *Critical science studies after Ludwik Fleck*, ed. Dimitri Ginev. 101–113. Sofia: University Press St. Kliment Ohridski, 2015.

Rheinberger, Hans-Jörg and Peter Schöttler. “Empirie vor Theorie: Leopold von Ranke und Hermann von Helmholtz.” In *Berlins wilde Energien: Porträts aus der*

*Geschichte der Leibnizschen Wissenschaftsakademie*, eds. Stephan Leibfried, Christoph Marksches, Ernst Osterkamp, and Günter Stock. 190–211. Berlin: De Gruyter, 2015.

Blum, André, Nina Zschocke, Hans-Jörg Rheinberger, and Vincent Barras, eds. *Diversität: Geschichte und Aktualität eines Konzepts*. Würzburg: Königshausen & Neumann, 2016.

Rammert, Werner and Hans-Jörg Rheinberger. “Geleitwort.” In *Stabile Interdisziplinarität: eine Biografie der Elektronenmikroskopie aus historisch-soziologischer Perspektive*, ed. Eric Lettkemann. 7–13. Baden-Baden: Nomos, 2016.

Rheinberger, Hans-Jörg. “Afterword: Instruments as media, media as instruments.” *Studies in History and Philosophy of Science, Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 57 (2016): 161–162.

Rheinberger, Hans-Jörg. *A brief history of protein biosynthesis and ribosome research*. Lindau Nobel Laureate meetings: topic clusters. Lindau: Lindau Nobel Laureate Meetings, 2016: <http://www.mediatheque.lindau-nobel.org/topic-clusters/a-brief-history-of-protein-biosynthesis-and-ribosome-research>

Rheinberger, Hans-Jörg. “Claude Bernard.” In *Kindler Kompakt: Klassiker der Naturwissenschaften*, ed. Michael Hagner. 131–133. Stuttgart: Metzler, 2016.

Rheinberger, Hans-Jörg. “Culture and nature in the prism of knowledge.” *History of Humanities* 1 (1 2016): 155–181.

Rheinberger, Hans-Jörg. “Das Problem von Design in der Forschung.” In *Eigenlogik des Designs*, eds. Gerhard M. Buurman and Marc Rölli. 133–138. Zürich: Niggli, 2016.

- 5 Rheinberger, Hans-Jörg. *Der Kupferstecher und der Philosoph*. Zürich: Diaphanes, 2016.

Rheinberger, Hans-Jörg. “Einige Bemerkungen zu Moden in der Wissenschaft.” In *Mode und Moden*, eds. Heini Bader, Olaf Knellisen, Tamara Lewin, Angelika Oberhauser, and Husam Suliman. 79–91. Zürich: Seismo, 2016.

Rheinberger, Hans-Jörg. “Einige epistemologische Überlegungen zur Vererbung im 20. Jahrhundert.” In *Formendes Leben – Formen des Lebens: Philosophie – Wissenschaft – Gesellschaft; Festschrift für Reinhard Mocek zum 80. Geburtstag*, eds. Wolfgang Krohn, Uta Eichler, and Ruth Peuckert. 43–64. Halle/Saale: Hallescher Verlag, 2016.

Rheinberger, Hans-Jörg. “Episteme zwischen Wissenschaft und Kunst.” In *Episteme des Theaters: aktuelle Kontexte von Wissenschaft, Kunst und Öffentlichkeit*,



eds. Milena Cairo, Moritz Hannemann, Ulrike Haß, and Judith Schäfer. 17–27. Bielefeld: Transcript Verlag, 2016.

Rheinberger, Hans-Jörg. “Gaston Bachelard and the hands of Albert Flocon†.” *Revista de Humanidades de Valparaíso* 4/2 (8 2016): 205–221.

Rheinberger, Hans-Jörg. “George Kubler and the question of time and temporality.” In *Vision in motion: streams of sensation and configurations of time*, ed. Michael F. Zimmermann. 549–556. Zürich: Diaphanes, 2016.

Rheinberger, Hans-Jörg. “Gregor Johann Mendel.” In *Kindler Kompakt: Klassiker der Naturwissenschaften*, ed. Michael Hagner. 134–136. Stuttgart: Metzler, 2016.

Rheinberger, Hans-Jörg. “Heidegger und Cassirer über die Wissenschaften nach der Begegnung in Davos.” *Deutsche Zeitschrift für Philosophie* 64 (4 2016): 655–666.

Rheinberger, Hans-Jörg. “Historisierung der Epistemologie: historische Epistemologie und die Epistemologisierung der Wissenschaftsgeschichte.” In *Historisierung: Begriff – Geschichte – Praxisfelder*, eds. Moritz Baumstark and Robert Forkel. 72–82. Stuttgart: Metzler, 2016.

Rheinberger, Hans-Jörg. “How new things come into being [Interview].” In *New big science in focus: perspectives on ESS and MAX IV*, eds. Josephine V. Rekers and Kerstin Sandell. 105–117. Lund: Lund University, 2016.

Rheinberger, Hans-Jörg. “Hybride: Dialog zwischen Andreas Greiner und Hans-Jörg Rheinberger.” In *Anatomy of a fairy tale: Andreas Greiner*, ed. Stefan Vicedom. 124–149. Wien: Verlag für moderne Kunst, 2016.

Rheinberger, Hans-Jörg. “On the language of the history of science.” In *Sprache – Kultur – Kommunikation: ein internationales Handbuch zu Linguistik als Kulturwissenschaft*, eds. Ludwig Jäger, Werner Holly, Samuel Krapp, Samuel Weber, and Simone Heekeren. 341–347. Berlin: De Gruyter, 2016.

Rheinberger, Hans-Jörg. “On the possible transformation and vanishment of epistemic objects.” *Teorie Vedy / Theory of Science* 38 (3 2016): 269–278.

Rheinberger, Hans-Jörg. “Patterns of the international and the national, the global and the local in the history of molecular biology.” In *The local configuration of new research fields: on regional and national diversity*, eds. Martina Merz and Philippe Sormani. 193–204. Cham: Springer, 2016.

Rheinberger, Hans-Jörg. “Préface.” In *Genèse d’une découverte: la division des infusoires (1765-1766)*, ed. Marc J. Ratcliff. 7–8. Paris: Muséum National d’Histoire Naturelle, 2016.



1

Rheinberger, Hans-Jörg. "Recessional poem: 'Josefa de Ayala / Josepha von Óbidos (1630-1684); Stilleben, ca. 1660-1670'." In *What reason promises: essays on reason, nature, and history*, eds. Wendy Doninger, Peter Galison, and Susan Neiman. 253. Berlin: De Gruyter, 2016.

Rheinberger, Hans-Jörg. "Science and experiment." In *Scientific knowledge and the transgression of boundaries*, eds. Bettina-Johanna Krings, Hannot Rodríguez, and Anna Schleisiek. 23–33. Wiesbaden: Springer, 2016.

Rheinberger, Hans-Jörg. "Synthetische Biologie aus Labor und Atelier." In *Evolution in Menschenhand: synthetische Biologie aus Labor und Atelier*, eds. Sonja Kießling and Heike Catherina Mertens. 145–151. Freiburg im Breisgau: Herder, 2016.

Rheinberger, Hans-Jörg. "Über die Möglichkeit einer allgemeinen Wissenschaftsphilosophie heute." In *Fleck and the hermeneutics of science*, eds. Erich Otto Graf, Martin Schmid, and Johannes Fehr. 95–100. Zürich: Collegium Helveticum, 2016.

Rheinberger, Hans-Jörg. "Universität und Forschung." In *Was wäre Bildung? Festschrift für Klaus Näscher*, eds. Roman Banzer and Hansjörg Quaderer. 237–250. Vaduz: Universität Liechtenstein, 2016.

- 1 Rheinberger, Hans-Jörg and Staffan Müller-Wille. "Heredity before genetics." In *Heredity explored: between public domain and experimental science, 1850-1930*, eds. Staffan Müller-Wille and Christina Brandt. 143–166. Cambridge, Mass.: The MIT Press, 2016.

Rheinberger, Hans-Jörg and Jan St. Werner. "'Wissenschaftliche Ergebnisse kann man eben nicht wie eine Pizza bestellen': im Gespräch mit Hans-Jörg Rheinberger und Jan St. Werner." In *Die Gegenwart der Zukunft*, eds. Susanne Witzgall and Kerstin Stakemeier. 117–125. Zürich: Diaphanes, 2016.

Heintel, Peter, Hans-Jörg Rheinberger, Felix Tretter, and Wolfgang Zinggl. *Wissenschaft:Kunst – Sind Künstler Forscher und Forscher Künstler? Quer denken* 11. Klagenfurt am Wörthersee: Wieser Verlag, 2017.

Rheinberger, Hans-Jörg. "Cultures of experimentation." In *Cultures without culturalism: the making of scientific knowledge*, eds. Karine Chemla and Evelyn Fox Keller. 278–295. Durham: Duke University Press, 2017.

Rheinberger, Hans-Jörg. "Das Experiment als Ideal." *Kreative Lernwelten – New Work Order* (2017): 27. <http://www.mynewsdesk.com/de/iba-germany/documents/new-work-order-kreative-lernwelten-60679>

Rheinberger, Hans-Jörg. "Erkenntnisse in Wissenschaft und Kunst: sind Künstler nicht auch Forscher und Forscher Künstler?" In *Wissenschaft:Kunst – Sind Künstler Forscher und Forscher Künstler?*, eds. Peter Heintel, Hans-Jörg Rheinberger, Felix Tretter, and Wolfgang Zinggl. 111–128. Klagenfurt am Wörthersee: Wieser Verlag, 2017.

Rheinberger, Hans-Jörg. "Historische Epistemologie." In *Handbuch Wissenschaftsgeschichte*, eds. Marianne Sommer, Staffan Müller-Wille, and Carsten Reinhardt. 32–45. Stuttgart: Metzler, 2017.

Rheinberger, Hans-Jörg. "In constant flux: thoughts about the epistemic." In *Raw flows: fluid mattering in arts and research*, ed. Roman Kirschner. 16–29. Berlin: De Gruyter, 2017.

Rheinberger, Hans-Jörg. *Le graveur et le philosophe: Albert Flocon rencontre Gaston Bachelard*. Paris: Hermann Éditeurs, 2017.

Rheinberger, Hans-Jörg. "Nautilus – Spiraltendenzen in Kultur und Natur." In *Nautilus: Schnecken, Muscheln und andere Mollusken in der Fotografie*, eds. Stefanie Odenthal and Christiane Stahl. 9–15. Petersberg: Michael Imhof Verlag, 2017.

Rheinberger, Hans-Jörg. "On epistemic objects and around." In *WdW Review – arts, culture, and journalism in revolt, vol. 1 (2013-2016)*, eds. Defne Ayas and Adam Kleinman. 376–381. Rotterdam: Witte de With, 2017.

Rheinberger, Hans-Jörg. "Siegfried Zielinski im Gespräch mit Hans-Jörg Rheinberger." In *Zur Genealogie des MedienDenkens*, eds. Daniel Irrgang and Florian Hadler. 192–227. Berlin: Kulturverlag Kadmos, 2017.

Rheinberger, Hans-Jörg. "Sur la terminologie qui a accompagné l'essor du modèle de l'opéron." In *L'invention de la régulation génétique: les Nobels 1965 (Jacob, Lwoff, Monod) et le modèle de l'opéron dans l'histoire de la biologie*, eds. Laurent Loison and Michel Morange. 149–166. Paris: Éditions Rue d'Ulm, 2017.

Rheinberger, Hans-Jörg. *Systèmes expérimentaux et choses épistémiques*. Paris: Classiques Garnier, 2017.

Rheinberger, Hans-Jörg. “Über die Sprache der Wissenschaftsgeschichte.” In *Das interpretative Universum: Dimitri Ginev zum 60. Geburtstag gewidmet*, eds. Paula Angelova, Jassen Andreev, and Emil Lensky. 283–292. Würzburg: Königshausen & Neumann, 2017.

Rheinberger, Hans-Jörg and Elfie Miklautz. “Zufall oder nicht? Auf der Suche nach dem Unvorhersehbaren [Interview].” In *Neugier: mehr zeigen*, eds. Elfie Miklautz and Wilhelm Berger. 43–61. Paderborn: Fink, 2017.

Rheinberger, Hans-Jörg and Staffan Müller-Wille. *The gene: from genetics to post-genomics*. Chicago: The University of Chicago Press, 2017.

Rheinberger, Hans Jörg. “Intervention.” In *Interferences and events: on epistemic shifts in physics through computer simulations*, eds. Anne Dippel and Martin Warnke. 151–154. Lüneburg: meson press, 2017.

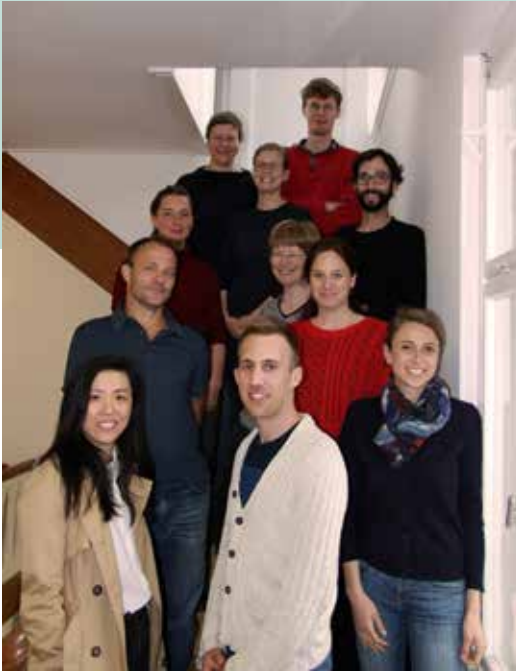


Max Planck Research Group

# Epistemes of Modern Acoustics

RESEARCH GROUP LEADER *Viktoria Tkaczyk* (2015–2020)





The Max Planck Research Group  
“Epistemes of Modern Acoustics”  
in the Villa.

Counterclockwise from front left:  
Xiaochang Li, Joeri Bruyninckx,  
Fanny Gribenski, Viktoria Tkaczyk,  
Kate Sturge, João Romão, Leendert  
van den Miesen, Birgitta von  
Mallinckrodt, Julia Steinmetz,  
Hannah Eßler, Martin Scherzinger.  
Photo: Hartmut Kern.

#### GROUP MEMBERS

*Viktoria Tkaczyk* (Research Group Leader)

March 1, 2015–February 29, 2020: *Thinking with Sound, 1860–1930*

*Rebecca Wolf* (Postdoctoral Fellow)

March 1, 2015–April 30, 2016: *The Elements of Sound: Experiments in Musical Instruments, 1830–1950*

*Joeri Bruyninckx* (Research Scholar)

June 1, 2015–May 31, 2018: *Listening and the Shaping of Work Performance in the Twentieth Century*

*Xiaochang Li* (Postdoctoral Fellow)

September 1, 2017–August 31, 2019: *Signal, Symbol, Measure, Model*

*Anna Kvíčalová* (Predoctoral Fellow, funded by VolkswagenStiftung)

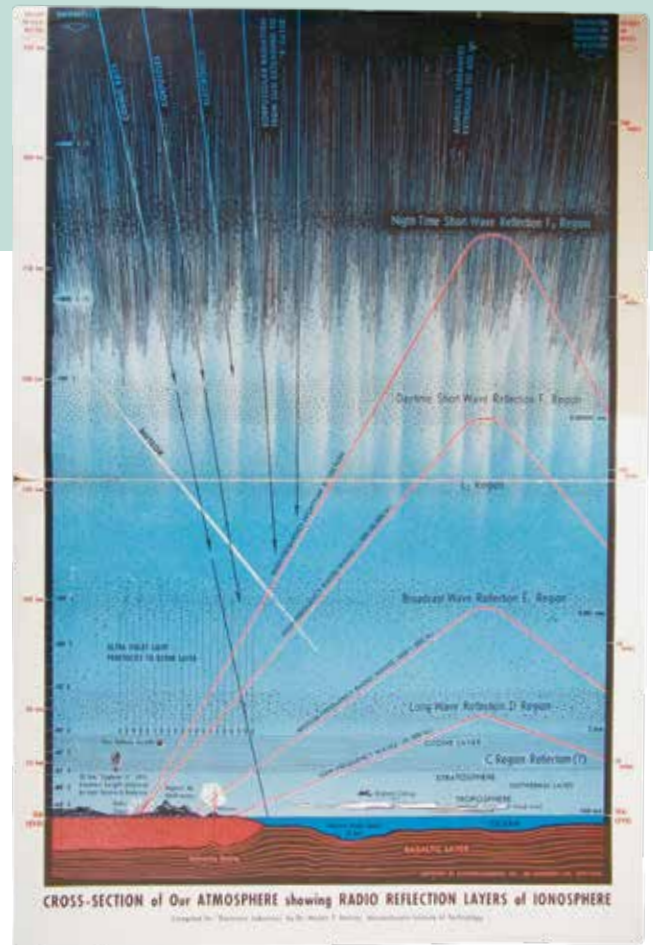
January 1, 2013–December 31, 2016: *Disciplining the Sense of Hearing: Auditory Practices in Mid-Sixteenth-Century Geneva*

## Introduction

The discipline of acoustics is generally assumed to have resulted from the success of the modern exact sciences, but this research group sets it in a considerably broader cultural and historical context. The projects affiliated with the group consider sound in its dual function as a *research object* and an *epistemic tool*. They chart the making of the discipline of acoustics throughout the modern period and explore the historical conditions that allowed acoustic knowledge to be turned into scientific knowledge and back into the practices of musicians, architects, engineers, or everyday listeners. Second, they unpick sonic strategies of knowledge production in various different scientific and humanistic disciplines, strategies—sometimes manifest, but often implicit—that have previously been largely overlooked by historians of science. What historical knowledge could be acquired only through particular listening techniques? Why, how, and when were musical instruments, audio technologies, or new sound apparatuses deployed as alternative means of research?

The “Epistemes of Modern Acoustics” group answers these questions mainly through the prism of historical case studies. Individual projects range from the emergence of particular acoustic concepts (such as “auditory memory” or “background noise”), to acoustic norms (such as “performance pitch” or “noise level”), to the invention of acoustic materials and technologies (such as sound photography or speech recognition systems), to the genealogy of acoustic subdisciplines as varied as electroacoustics, audiology, and bioacoustics.

Three overarching themes afford group members broad frameworks connecting their projects to developments that surface on much larger temporal, geographical, and conceptual scales. These themes pick up long-standing questions and current debates in the history of science, which gain a novel perspective through the focus on sound and, relatedly, human hearing. With the theme *Testing Hearing*, the group opened up a new view on the nature of testing, as an underestimated scientific technique with



Harlan T. Stetson, Cross-Section of Our Atmosphere Showing Radio Reflection Layers of Ionosphere, in “Radio-Wave Propagation,” *Electronic Industries* (December 1942), p. 85.

immense epistemic value and sociopolitical impact. The various projects subsumed under *Betwixt and Between: Sound in the Humanities and Sciences* prompt a reevaluation of the historically variable tensions, boundaries, and rapprochements between the humanities and the sciences in the modern period. Scholars working on *Sound Objects in Transition* offer new insights into the global, long-term, and large-scale formation of scientific research objects.

The fruits of detailed archival research and the conceptual work of the research group come together in the database “Sound & Science: Digital Histories,” in which scholars share difficult-to-access sources in the history of acoustics. Rich cross-referencing reveals the unexpected and striking historical relationships among the sources contributed.

Established in March 2015, the research group comprises the group leader, two postdoctoral fellows, five affiliated PhD students, and two to three visiting scholars at a time. In 2016, group leader Viktoria Tkaczyk was offered a W3 professorship at the Humboldt-Universität zu Berlin, to be held from 2018 with a reduced teaching load, which allows her to continue the research group as initially planned until 2020. Also in 2016, the group bade farewell to postdoctoral fellow Rebecca Wolf, now leader of the Leibniz Research Group “Materiality of Musical Instruments” at the Deutsches Museum in Munich and a continuing collaboration partner of the group. Both of the current postdoctoral fellows have successfully applied for Assistant Professorships (tenure track): when they complete their work in the group, Joeri Bruyninckx will move to Maastricht University, Xiaochang Li to Stanford University.

## Research Theme 1

## Testing Hearing

ORGANIZERS: *Viktoria Tkaczyk* (MPIWG), *Alexandra Hui* (Mississippi State University), *Mara Mills* (New York University)

Contributors to this Research Theme aim to launch a discussion about the nature of testing as a principal technique of knowledge production, instrument design, and social control in the modern period. Among historians of science, tests have attracted far less attention than experiments. For one thing, testing is often presumed to be identical to experimentation. In other accounts, tests are merely the stable parts of open-ended experiments—parts that serve to calibrate technical objects or standardize laboratory practices. As such, testing plays the “boring” part in the story. The theme’s collaborators provide a more thorough examination of the parallels and distinctions between techniques of testing and experimenting in the history of science, industry, and music. They emphasize the large sociopolitical impact of *hearing tests/testing with hearing* by pointing to the wide-ranging applicability of tests, which allows tests to be taken from the industrial laboratory to the classroom to the concert hall to the radio, from an aquarium to a nuclear submarine. Tests are mobile, but they are not immutable. Tests are materialized networks: they are the manifestation of practices, ideas, values, norms, and institutions.

The two cultural practices of *hearing* and *testing* emerged in a long and intertwined relationship—a relationship that deserves closer examination. Since the early nineteenth century, auditory test tools (whether organ pipes or electronic tone generators) and the results of hearing tests have flowed back into instrument calibration, human training, and the creation of new sounds. Whether employed to detect auditory impairment or tone differentiation skill, hearing tests underwent especially intensive development in experimental physiology. They received a further boost around 1900 as a result of injury compensation laws and state and professional demands for aptitude testing in schools, conservatories, the military, and other fields. Tests of seemingly small measure—auditory acuity, hearing range—when applied at large scale ultimately redefined the modern concept of hearing as such.

During the twentieth and twenty-first centuries, hearing gained a new epistemic function as it switched its role from test object to test instrument. The Research Theme thus charts testing *with* hearing: building materials are evaluated based on models of human hearing; noise meters for managing public space incorporate standards that are based on loudness thresholds. Acoustic equipment is now constantly tested via calibration: in the laboratory, in the field, and on the performance stage. The components of this equipment, if mass-produced, undergo quality testing at each



Two heads are better than one for Bell Telephone Laboratories. Experiment with “Oscar II” and human ears, conducted in November 1961. Courtesy of AT&T Archives and History Center.

stage of the manufacturing process. Data from hearing tests are fed back not only to manage bodies, but also to design objects, as is most obviously the case in the fields of music and the electroacoustic industry. There, hearing and listening preferences are used strategically in the creation of new buildings and environments, new sounds and devices, or the redrafting of public policy.

### Conference

#### Testing Hearing: Science, Art, Industry

MPIWG, December 4–5, 2015

ORGANIZERS: *Viktoria Tkaczyk* (MPIWG), *Mara Mills* (New York University),  
*Alexandra Hui* (Mississippi State University)

### Authors' Workshop

#### Testing Hearing: Science, Art, Industry

MPIWG, October 21–22, 2016

ORGANIZERS: *Viktoria Tkaczyk* (MPIWG), *Mara Mills* (New York University),  
*Alexandra Hui* (Mississippi State University)

In December 2015, the international conference “Testing Hearing: Science, Art, Industry” was held at the MPIWG, and a circle of conference participants continued working on the theme during longer research stays and a workshop with the research group in September 2016. The resulting collection, edited by Mara Mills, Alexandra Hui, and Viktoria Tkaczyk, was submitted for review in December 2017.

---

### Table of Contents

Alexandra Hui, Mara Mills, and Viktoria Tkaczyk, *Introduction*

Emily I. Dolan, *Hearing Perfection*

Alexander Rehding, *Opelt's Siren and the Technologies of Musical Hearing*

Jonathan Sterne, *The Software Passes the Test When the User Fails It: Constructing Digital Models of Analog Signal Processors*

Viktoria Tkaczyk, *The Testing of a Hundred Listeners: Otto Abraham's Studies on "Absolute Tone Consciousness"*

Mara Mills, *Testing Hearing with Speech*

Sebastian Klotz, *Murray Island versus Aberdeenshire: Contextualizing the Cross-cultural Hearing Tests of the Cambridge Anthropological Expedition to Torres Straits, 1898–1899*

Jennifer Hsieh, *To Hear As I Do: The Concessions of Hearing in Taiwan's Noise Management System*

Stefan Krebs, *Testing Spatial Hearing and the Development of Kunstkopf Technology, 1957–1981*

Roland Wittje, *Absorption, Transmission, Reflection: Testing Materials in the Laboratory*

Joeri Bruyninckx, *Of Silent Sirens and Pied Pipers: Auditory Thresholds and High-Frequency Technologies of Animal Control*

Lino Camprubí and Alexandra Hui, *Testing the Underwater Ear: Hearing, Standardizing, and Classifying Marine Sounds from World War I to the Cold War*

Benjamin Steege, *This Is Not a Test: Listening with Günther Anders in the Nuclear Age*

Hans-Jörg Rheinberger, *Afterword*

Trevor Pinch, *Afterword*

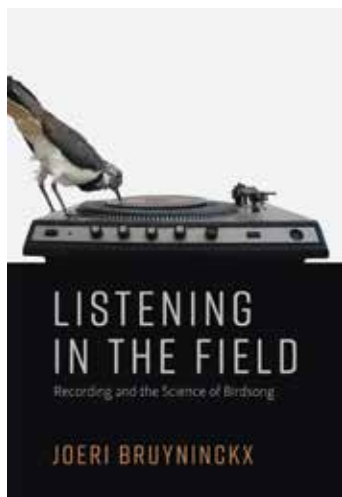
*Testing Hearing* benefited from dialogue with the DFG-funded research network “Auditory Knowledge in Transition: An Epistemic History of Listening in Modernity.” Several scholars associated with the Research Group—Viktoria Tkaczyk, Hansjakob Ziemer, Nicola Gess, Alexandra Hui, Julia Kursell, and Rebecca Wolf—were founding members of the network, which explored the epistemic status of hearing and listening throughout modernity, starting from the sixteenth century. In five workshops held between 2013 and 2016, members investigated features of hearing and listening that pertain to processes of knowledge production or communication. Fifteen case studies explored auditory knowledge in spaces such as the scientific laboratory, parliament, city, concert hall, classroom, lecture hall, and factory. The project concluded in 2017 with the publication of *Wissensgeschichte des Hörens in der Moderne*.



## Selected projects associated with *Testing Hearing*

Joeri Bruyninckx (Research Scholar, MPIWG)

### Sound Science: Recording and Listening in the Biology of Bird Song



This project investigated how scientists have sought to render the sounds of the natural world into a legitimate source of scientific knowledge. From the late nineteenth century, ornithologists and field biologists attempted to study birds’ acoustic behavior both in the field and in the laboratory, for purposes of field recognition as well as the study of taxonomic difference, learning processes, or population dynamics. In doing so, they drew on a range of media for transcribing and recording sounds, from musical notations and gramophones to spectrograms. How did sound recording become a scientific technique? How did ornithologists employ their ears in making sense



Joeri Bruyninckx



of what they studied, and how did such practices of mediated and unmediated listening generate new acoustical and behavioral knowledge? Finally, how did these kinds of listening come to be legitimized as authoritative scientific practices? Published in 2018 by the MIT Press, the study traces a history of scientific listening between 1880 and 1980, across fieldsites and locales including the Cornell Laboratory of Ornithology, the British Broadcasting Corporation, and the Cambridge University department of zoology. It shows how scientific records, testing practices, and bioacoustical knowledge ultimately came into existence through ornithologists’ multifarious collaborations with amateur birdwatchers, hobbyist sound hunters, recording engineers, public broadcasters, and musicians.

Alexandra Hui (Mississippi State University)



Alexandra Hui

**Sonifying Space: A History of the Science of Background Music**

This monograph project is a history of the co-construction of the environment and how one listens to it. *Sonifying Space* takes as its departure point the often-maligned music of waiting spaces, which has become more ubiquitous than ever: background music (environmental music or muzak). In the twentieth century, new technology contributed to new understandings and manipulations of the soundscape. The project explores the development of new listening practices and products by experimental and industrial psychologists, sound engineers, dystopian authors, avant-garde artists, and environmental composers, and aims to offer new insights into the dynamics of the dissemination of scientific knowledge about listening. At the core of the co-development of modern, technology-dependent background music and the active cultivation of new forms of listening was a feedback loop of testing increasingly functional applications of music—from experiments to surveys to recommendation algorithms—and an ambivalent acceptance of such applications by listeners. With each test of the efficacy of music (on happiness, focus, consumption, etc.), the subject gained awareness of the test, in turn altering the relationship between individuals’ and communities’ understanding of their sonic environment and their experience of it.

The Mood Change Chart (ca. 1920) was used by Edison Phonograph Co. psychologists to determine which recordings had consistent mood effects. Over 10,000 completed charts were collected and analyzed. William Maxwell Files, Box 18. U.S. Dept. of the Interior, National Park Service, Thomas Edison National Historical Park.

**MOOD CHANGE CHART**  
 An Analysis of Your Mental Reactions to Music, as Re-Created by the New Edition, "The Phonograph with a Soul."

Date of Test \_\_\_\_\_

1. Place (Mark X in space)  
 Morning  Afternoon   
 Evening

2. Time (Mark X in space)  
 Morning  Afternoon   
 Evening

3. Weather (Mark X in space)  
 Dull  Cold   
 Bright  Warm

4. What kind of music did you feel like hearing? (Mark X in space)  
 Tender  Vivacious  Joyous   
 Solemn  Majestic  Weird   
 Martial  Soothing  Gay   
 Simple  Dreamy  Sad

5. What was your mood immediately preceding test? (Mark X in space)  
 Serious or  Worried or   
 Gay  Careless   
 Depressed or  Nervous or   
 Exhilarated  Contented   
 Fatigued or  Sad or   
 Unfatigued  Joyful   
 Discouraged   
 or Optimistic

6. As a result of the test, what were your most noticeable mood changes? (Mark X in space, marked to continue, serious to composed, etc.)  
 MOOD CHANGE Re-Creation Caution: BEER CHANGE

7. Please comment on manner in which mood changes occurred:

Please fill in, sign and hand in  
 Edison dealer, \_\_\_\_\_ Signed \_\_\_\_\_  
 MUSIC RESEARCH DEPARTMENT  
 EDISON LABORATORIES  
 ORANGE, N. J. Address \_\_\_\_\_

SEE INSTRUCTIONS ON REVERSE SIDE

Mara Mills (New York University)

### The History of Audiometry and the Construction of the Normal Auditory Threshold



This project took “testing” to be a key technique for understanding and managing hearing in the modern period. It specifically addressed the history of electronic audiometry and its significance for the medicalization of deafness and the definition of “noise” in the telephone system, framing electronic audiometry within the longer history of hearing measurement. Through a comparison between the audiogram and prior hearing charts, the following topics were explored: the different ways in which the sense of hearing has been defined, dissected, and visualized; the range of cultural possibilities that have existed for “normal” hearing; the means by which nineteenth-century categories such as “just noticeable differences” and “areas of sensation” were transformed by telephone engineers

into transmission units and channel capacities; and the incorporation of hearing statistics into instrument calibration, architecture, and apparatus design.



Mara Mills

“The Ear Is Our Customer.” Bell Telephone Laboratories print advertisement, July 1949. Courtesy of AT&T Archives and History Center.

Joeri Bruyninckx and Alexandra Hui (MPIWG and Mississippi State University)

### Productive Sounds in Everyday Spaces: Sounds at Work in Science, Art, and Industry, 1945 to Present

One of the many consequences of the proliferation of hearing tests and the psychophysical study of the human ear in the late nineteenth and early twentieth centuries was that managers and employees alike became increasingly concerned with workers’ rhythms, postures, and movements; their internal states; and their capacities for focus, attention, and information processing. The mutual reconfiguration of work, worker, and work environment coincided with the rise of new professional fields of investigation, from interwar *Psychotechnik* to office automation, and was reflected in new kinds of artistic experiment. Drawing insights from applied psychology, ergonomics and human factors, architecture, and design, their techniques aimed to rearrange modern life in the



Sounds were carefully managed in the postwar office. Robert Propst and Michael Wodka, *The Action Office Acoustic Handbook* (Ann Arbor: Herman Miller Research Corporation, 1975), p. 20. Courtesy of Herman Miller Corporation.

office, factory, laboratory, and studio, and by extension also the home or the classroom. This project examines the changing phenomenal and collective experience of “work” (not necessarily limited to “labor”) in the twentieth century, focusing on one important modality of such experience—sound. It asks how corporations, scientists, and artists turned acoustic or musical sound and listening into a subject of knowledge generation and intervention in the workplace, and how their investigations have, in turn, been characterized as work. How was sound used to articulate new theories of behavior, express new technological utopias, aestheticize corporate identities, manage affective and psychological states, or redefine productivity across different economic and industrial regimes?

**Projects and short-term visiting scholars associated with *Testing Hearing***

*Lino Camprubí* (MPIWG), The Sonic Construction of the Ocean as a Human Environment

*Jennifer Hsieh* (Stanford University, USA), Colonial Ears: Noise, Acoustics, and Hearing Bodies in Colonial Taiwan

*Myles Jackson* (New York University, USA), German Radio and the Development of Electric Music in the 1920s and 1930s

*Alexander Rehding* (Harvard University, USA), Toward a Digital Music Theory: Opelt’s Siren and the Technologies of Musical Hearing

*João Romão* (Predoctoral Fellow, funded by the Fundação para a Ciência e Tecnologia, Portugal, 2017–2020), After Mapping the Avant-Garde: Music, Experimentalism, Technology, Science

*Benjamin A. Steege* (Columbia University, USA), Music and the Limits of Psychology, 1910–1960

*Jonathan Sterne* (McGill University, Canada) and *Mara Mills* (New York University, USA), Tuning Time: Sequences from the History of Time Stretching and Pitch Shifting

*Roland Wittje* (Indian Institute of Technology Madras, India), Electroacoustics in the Laboratory, Late Nineteenth to Early Twentieth Century





Folders in the Lautarchiv, Berlin. Photo: Britta Lange and Eric Llaveria Caselles.

nineteenth century on. Selected papers from the conference are forthcoming as a special issue of *Technology and Culture*, edited by Viktoria Tkaczyk and Carolyn Birdsall. The papers, each dealing with a specific archival case, together trace the ways in which sound archives were conceived according to temporal projections. In some cases, sound data were intended for immediate reuse; in others, recordings were stockpiled for imagined future research. Not uncommonly, sound holdings gave rise to research that was anachronistic—subject to the particular institution’s own archival time. What is more, the creation and management of recorded sound collections was a costly, labori-

ous, and, above all, time-consuming process. Not only did it take time to listen to recordings, but substantial processing time was required for the tasks of copying and editing, duplication and marking up, indexing and cataloging. Another temporal consideration was the limited shelf life of recording media: from the outset, historical actors were aware of the fragility of wax cylinder carriers (later of magnetic tapes) and the damage caused by playback, as well as the difficulties of long-term preservation arising from physical degradation, generation loss, and, increasingly, format obsolescence. Picking up on the complexities of these time-related concerns, the articles demonstrate how sound archives—as research technologies—fostered the formation of a multitude of new research fields both within and between the sciences and the humanities, whether experimental phonetics, tone psychology, psychophysics and language pedagogy, radio studies, audio forensics and computational linguistics, linguistic anthropology, or bioacoustics.

---

**Special issue of *Technology and Culture* (forthcoming 2019)**

**Table of Contents**

Carolyn Birdsall and Viktoria Tkaczyk, *Introduction*

Patrick Feaster, *Enigmatic Proofs: The Archiving of Édouard-Léon Scott de Martinville’s Phonautograms*

Julia Kursell, *Listening to More Than Sounds: Carl Stumpf and the Experimental Recordings of the Berliner Phonogramm-Archiv*

Viktoria Tkaczyk, *Archival Traces of Applied Research: Language Planning and Psychotechnics in Interwar Germany*

Carolyn Birdsall, *Radio Documents: Broadcasting, Sound Archiving, and the Rise of Radio Studies in Interwar Germany*

Xiaochang Li and Mara Mills, *Vocal Features: From Voice Identification to Speech Recognition by Machine*

Judith Kaplan and Rebecca Lemov, *Archiving Endangerment, Endangered Archives: Journeys through the Sound Archives of Americanist Anthropology and Linguistics, 1911–2016*

Joeri Bruyninckx, *For Science, Broadcasting, and Conservation: Wildlife Recording, the BBC, and the Consolidation of a British Library of Wildlife Sounds*

---



Following on from this, two new projects within the Research Theme have begun. First, Viktoria Tkaczyk, Julia Kursell (University of Amsterdam), and Hansjakob Ziemer are pursuing related interests through the Working Group “Sounds of Language, Languages of Sound,” which focuses more explicitly on the relationships between research on sound in the humanities and in the sciences. The broad domain of acoustics that emerged in academic life throughout the modern era is usually categorized as part of the natural sciences. Yet, as this project aims to show, acoustic subdisciplines or other fields of research on sound are rarely interested in the formal, “hard” description of sound alone; “soft” practices, epistemic forms, and experiential knowledge generally play their part as well.

The second related project is “Historicizing the Applied Humanities,” currently being developed by Viktoria Tkaczyk and Anke te Heesen (Humboldt-Universität zu Berlin, enabled by the Berlin Center for the History of Knowledge). This starts from the observation that the term “applied humanities” first appeared in the 1950s, when cybernetics and then the postwar reform of school and university education prompted the development of new, interdisciplinary programs with novel funding models. But the question of the humanities’ applicability appeared on the disciplinary horizon long before certain subject fields exchanged the primacy of logic and history (disciplines ending with “-ology” and “history”) for phenomenological contemplation or practice (disciplines ending with “studies,” or in French “études”). Almost all humanities disciplines emerged in the course of the “long modern” period (from ca. 1500) out of fields of practical knowledge; examples are history, law, art history, musicology, linguistics, and literary studies (the latter three dealing specifically with sonic phenomena). Far from losing sight of their fields of application, such disciplines have constantly updated them by means of connoisseurship, judgement, and knowledge of the canon. “Historicizing the Applied Humanities” addresses the techniques in the humanities that led to the emergence and reorientation of new disciplines in the long modern period.

## Selected projects associated with *Betwixt and Between*

Viktoria Tkaczyk (Research Group Leader, 2015–2020)

### Thinking with Sound, 1860–1930

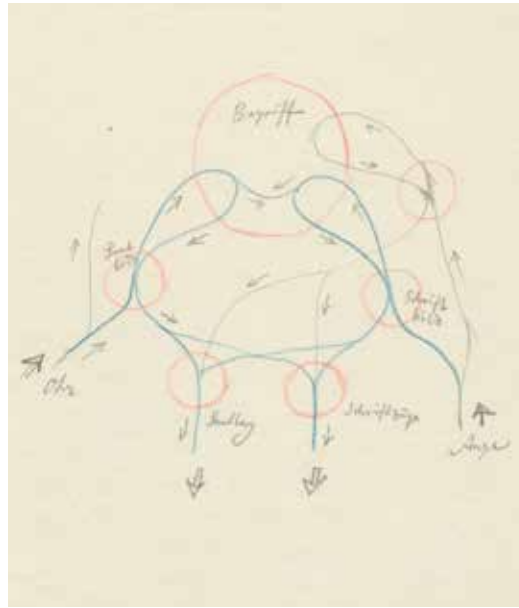
This book project starts from debates about auditory perception that were initiated by 1860s neuroanatomists’ identification of the auditory cortex in the human brain and by subsequent experiments on auditory cognition in the field of experimental psychophysiology. It traces how these new insights were taken up by disciplines ranging from psychoanalysis, linguistics, and philosophy to pedagogy, experimental aesthetics, and physics (with relational concepts such as the “auditory unconscious,” “auditory memory,” “auditory image,” “absolute pitch,” “inner voice,” “supersonic speed”), and how they left the academic realm to be applied in the arts, industry, and warfare. In turn, knowledge in auditory cognition around 1900 was facilitated by new audio



Viktoria Tkaczyk



This unpublished sketch by Ernst Mach (1896) reveals his engagement with psychologist Adolf Kussmaul's 1877 model of interaction between various language faculties in the human brain. Mach illustrates the dynamic association of visual and aural perception, the genesis of sound images and written images, and the influence of those images on perception. Ernst Mach Nachlass, NL 174/484. Photo: Deutsches Museum, Munich, Archives.



technologies that provided alternate modes of simulating, reproducing, collecting, preserving, disseminating, and—most importantly for this project's argument—studying and comparing sound data. Focusing on these historical conjunctions, the work is primarily microhistorical (with case studies from Germany and France), but it also offers a historically grounded encounter with current trends in auditory neuroscience, or more generally the “sonic turn” in research.

Xiaochang Li (Postdoctoral Fellow, MPIWG)

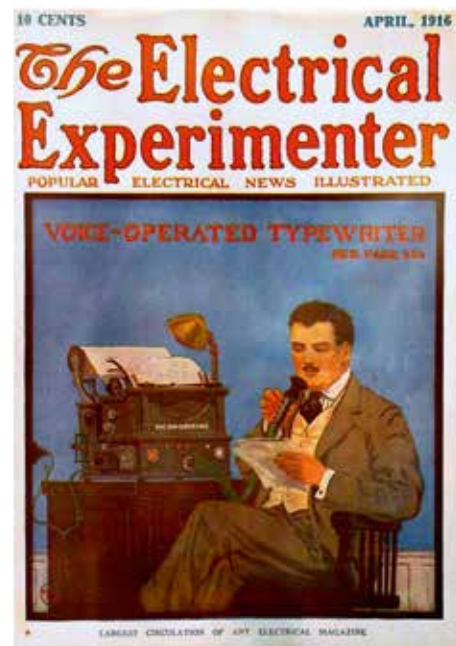
### Signal, Symbol, Measure, Model



Xiaochang Li

Beginning in 1972, a team of researchers at IBM began to reorient speech recognition from the study of language and perception towards a startling new mandate: “There’s no data like more data.” Systematically prying speech recognition away from the simulation of symbolic reason and linguistic processes, the IBM Continuous Speech Recognition group refashioned it as a problem of purely statistical data processing. In doing so, they spurred the development and diffusion of data-driven algorithmic techniques that are today standard throughout speech and natural language processing, and increasingly pervasive in knowledge practices across the humanities and the sciences alike. This project examines how speech recognition, as a problem of reconciling acoustic measurement with linguistic meaning, helped bring language under the purview of data processing as something that could not only be formatted and stored digitally, but also analyzed and even interpreted algorithmically. It traces the pivotal role of such efforts to computationally map sound to language in shaping the conceptual, industrial, and technical foundations that gave rise to the proliferation of “big

The Phonoscribe “voice-operated typewriter.” Cover of *The Electrical Experimenter*, April 1916.



data” analytics, machine learning, and sibling algorithmic practices across diverse domains of knowledge production and into the sphere of everyday life.

*Hansjakob Ziemer (MPIWG)*

### **Observing Concert Hall Listeners: Outline of a History of Journalistic Typologies of Listening, 1870–1940**

Since the establishment of the modern symphony concert around 1800, the musical experience has been mediated through journalistic observation. Over the nineteenth and twentieth centuries, journalists were in a unique position to report on listening, bringing together observations that reflected on the music itself, the listening space, and the concert hall visitors. Their reports were attempts to think about the listeners’ approach to music, including physical gestures, modes of self-representation, collective mood, and so on. As they wrote, journalists constructed listener types through which they hoped to better understand social practices. This project studies such observation techniques and their uses as cognitive tools to create and establish social knowledge about order and hierarchy in society. It asks how journalistic discourse on listening and the listener, established in the late nineteenth and early twentieth century, underpinned the emergence of the new academic disciplines of music education and music sociology in the mid-twentieth century.



Hansjakob Ziemer

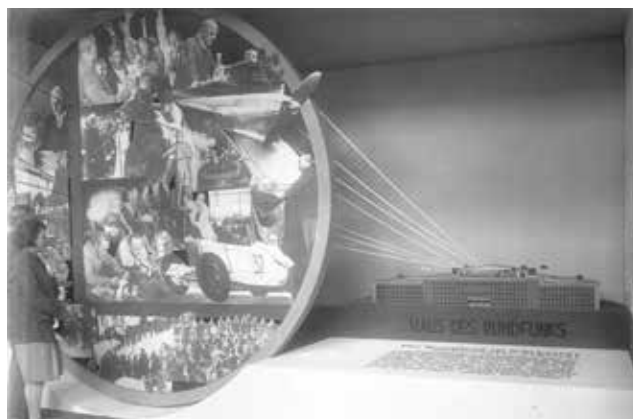
*Carolyn Birdsall (University of Amsterdam)*

### **Researching Radio: Sound Archives and Discipline Formation, 1930–1945**

This project investigates the relationship between radio, sound archiving, and the rise of radio studies (*Rundfunkwissenschaft*). Largely unknown today, Germany’s first radio studies institute was based at the University of Freiburg between 1939 to 1944, led by the linguist Friedrichkarl Roedemeyer (1894–1947). The institute gained substantial support, but was officially disbanded after 1945, with postwar radio researchers and archivists keen to downplay its existence and their own involvement in Nazi-era broadcasting, archiving, and knowledge production. The project shows that the radio



Carolyn Birdsall



Berlin’s Funk-Stunde station presents its latest technical and aesthetic innovations at the International Radio Exhibition, August 1931. Bundesarchiv, Bild 102-12189 / CC-BY-SA 3.0.

institute was informed by an earlier model for a Sound Department (*Lautabteilung*) developed by Wilhelm Doegen in 1920s Berlin. This precedent draws attention to an influential concept of “science via radio” starting in the early 1920s, based on experimental practice and science communication strategies in broadcasting, along with an emergent concept of broadcast content as commodity objects and “sound documents.” Following the National Socialist takeover in 1933, an ideological investment in radio gave further impetus to its status as a politically significant cultural form worthy of costly archival storage, reproduction, and redistribution. The project critically investigates the legacy of Roedemeyer’s “science of radio” and its multidisciplinary research agenda centered on studio experiments, recording media, and sound archival practice.

*Karin Bijsterveld* (Maastricht University)

### **Hidden Ears: Wiretapping, Eavesdropping, and Analyzing Sonic Information, 1960s–the Present**



Karin Bijsterveld

In state security and forensic contexts, auditory surveillance through wiretapping and sound recording is as old as the technologies that have enabled it since the 1890s. Historical and critical studies of systematic eavesdropping have commonly focused on the act of taping, the decoding of encrypted messages, and the sociopolitical contexts of those activities. This project, however, centers on the history of scientific and humanities-based research into the recordings’ sonic features—the characteristics of voices, speech, and non-speech sounds—for speaker identification. It studies two settings: the Ministerium für Staatssicherheit (Stasi) in the German Democratic Republic and its research program on sound; and the field of audio forensics in the United States. Which characteristics of sound did the German and American experts consider relevant? What analytic techniques did they use? How did forensics and state security programs inform each other? And how did these practices affect the use of sonic skills in the sciences and humanities more widely? Methodologically, the project draws on the analysis of archival documents and sonic elicitation interviews. Theoretically, it aims to link STS theories on “sonic skills” with work on “acousmatic sound.” And socially, it aims to put recent debates about auditory surveillance into historical context.

The Stasi’s key instrument for audio surveillance and sound analysis was the magnetic tape recorder.



**Projects and short-term visiting scholars associated with *Betwixt and Between***

*Veit Erlmann* (University of Texas at Austin, USA), Sound and the Legal Imagination

*Anke te Heesen* (Humboldt-Universität zu Berlin), The Earwitness Thomas Kuhn:

Interview and Historiography

*James Kennaway* (University of Durham, UK), A Historical and Critical Neuroscience of Music

*Julia Kursell* (University of Amsterdam, The Netherlands), Listening to More Than Sounds: Experimental Recordings at the Berliner Phonogramm-Archiv

*Anna Kvičalová* (MPIWG), Disciplining the Sense of Hearing: Auditory Practices in Mid-Sixteenth-Century Geneva

*Karsten Lichau* (Centre Marc Bloch, Berlin), Synchronizing Sounded Communities: Acoustical Practices in the Minute's Silence and Early Radio Theory

*Steven Lydon* (Harvard University, USA), Nietzsche's Tuning Fork

*Reinhart Meyer-Kalkus* (Universität Potsdam), Authors' Voices on Records and Radio, 1889–1932

*Lotte Schüßler* (Predoctoral Fellow, funded by the Studienstiftung des Deutschen Volkes, 2016–2020), Theater Exhibitions, Exhibition Media, and the Humanities around 1900

*Tanvi Solanki* (Cornell University, USA), Reading in Tones: The Emergence of Cultural Acoustics, ca. 1750–1800

*Leendert van der Miesen* (Predoctoral Fellow, DFG Collaborative Research Center "Epistemes in Motion," 2016–2020), Harmonies at Work: Musical Instruments and the Transfer of Knowledge in Early Acoustics

*Magdalena Zorn* (Ludwig-Maximilians-Universität, Munich), The Implicit Listener

Research Theme 3

## Sound Objects in Transition



Buccin in B-flat. The buccin was a visually distinctive trombone popular in French military bands during the early nineteenth century. Inv. no. 10184. Photo: Deutsches Museum, Munich, Archives.

ORGANIZERS: *Viktoria Tkaczyk* (MPIWG), *Rebecca Wolf* (Deutsches Museum, Munich), and *Leendert van der Miesen* (CRC “Epistemes in Motion”)

Sound objects—bells, stringed instruments, vacuum tubes, concert halls, singing flames, echoes, or inner voices—have a long history that is deeply entangled with the cultural and sociopolitical shaping of the objects, the knowledge of professional and lay users, and scientific expertise. The Research Theme brings such enmeshments to light by means of workshops, a Working Group, and individual scholars’ case studies.

In contrast to most recent historical scholarship, which favors microhistory, the Working Group “Sound Objects in Transition: Knowledge, Science, Heritage” (initiated by Viktoria Tkaczyk, Rebecca Wolf, and Leendert van der Miesen) pursues a broader exploration of sound objects in the history of knowledge, science, and heritage. The investigation of the “lives” of sound objects follows a three-part approach:

*Lifeworlds.* The spatial and cultural lifeworlds of objects mold their use, and the Working Group explores the ways in which sound objects have been embedded in codified actions in science, everyday life, technology, and the arts. We trace the social networks of instrument builders, musicians, engineers, collectors, and museum curators. How do sound objects communicate tacit knowledge? When have they marked the transition from practical action to scientific research? How do they circulate between disciplines or escape from scientific contexts to become everyday, museum, or art objects?

*Lifeforms.* Focusing on the coming into being of sound objects, we ask who gave them their shape, their material, their value, and their specific sound. Alongside materially tangible objects (natural objects, artifacts, objets trouvés), the Working Group also considers imaginary objects (inner sounds, epistemic sounds), passed on in written or pictorial form.

*Lifespans.* By telling the “lives of sound objects” back to front, the Working Group considers what those objects lost on their journeys to the present: how they were transformed, redefined, mislaid, and rediscovered. Why did some of these objects gain a high profile while others did not, or had to wait for their time to come? Taking a *longue durée* perspective, Working Group members employ and reevaluate a plethora of methods, from digital discourse analysis to the physical and virtual reconstruction of historical instruments and experiments.

## Workshops

### Sound Objects in Transition: Knowledge, Science, Heritage

MPIWG, September 15–16, 2016

ORGANIZERS: *Viktoria Tkaczyk* (MPIWG), *Rebecca Wolf* (MPIWG / Deutsches Museum, Munich)

### Sound Modernities? Histories of Architecture, Design, and Space

MPIWG, June 15, 2016

ORGANIZERS: *Sabine von Fischer* (EPF Lausanne), *Olga Touloumi* (Bard College), *Viktoria Tkaczyk* (MPIWG)

In June 2016, guest scholars Sabine von Fischer and Olga Touloumi coorganized the workshop “Sound Modernities? Histories of Architecture, Design, and Space” at the MPIWG. During the twentieth century, modern architectural acoustics, in tandem with sound technologies such as the radio and telecommunication networks, gave rise to notions of endless and unproblematic connectivity. Telecommunication networks connected the urban fabric by circulating information, and seemed capable of collapsing geographical, political, and social differences. These new infrastructures and technologies challenged previous theorizations of the public sphere and promised new models of participatory democracy and media transparency. In this context, architects and designers made sound a central field of inquiry: an “object” to build with and a concept to think with. They recognized that sound actively shaped modern built environments. Approaching architecture as a medium that not only absorbs and reflects other social and political forces, but also produces them, “Sound Modernities” launched a critical discussion on the aural history of space and the spatial history of aurality.

Equipment room in Franz Max Osswald’s laboratory for applied acoustics in Zurich, 1930. The intersection of architecture, physics, photography, and music is explored through an apparatus for ultrasound photography. ETH-Bibliothek Zürich, Bildarchiv, Ans\_10391-008. Photographer unknown.





## Selected projects associated with *Sound Objects*

*Rebecca Wolf* (Postdoctoral Fellow, MPIWG)



Rebecca Wolf

The many materials used in this bandonion (A. Arnold, Germany, ca. 1840) include various wallboards, celluloid, German silver, ebony, cardboard, synthetic leather, leather, mother of pearl, aluminum, and steel. Inv. no. 1984-15. Photo: Deutsches Museum, Munich, Archives.

### **The Elements of Sound: Experiments in Musical Instruments, 1830–1950**

This project focused on the period between 1830 and 1950, when instruments were being made with a wide variety of materials and the insights of the burgeoning science of experimental acoustics led to novel experiments and innovations. Investigating the basic materials of musical instruments can bring to light previously hidden connections with neighboring disciplines such as the history of acoustics and materials science. Against this background, fascinating research questions arise: How did



the craft of instrument building affect the demands that instruments placed on musicians and the expansion of instrumental capabilities? To what extent can instruments be understood as practical experiments in knowledge production in the field of acoustics? What is the relationship between the materials of instrument construction and the

ways that the resulting tone is heard and interpreted? For example, what was the rationale for introducing surrogate materials—such as early plastics—that were otherwise widely found in the objects of everyday life? These questions were explored using the experimental results and written records of instrument makers, official reports on exhibitions, patent specifications, and music reviews.

*Fanny Gribenski* (University of California, Los Angeles)



Fanny Gribenski

### **Tuning the World: Aesthetics, Acoustics, Industry, and Global Politics (1834–1939)**

Now commonly adopted as the point of reference for musicians in the Western world, A 440hz only became the standard pitch during an international conference held in 1939. The adoption of this norm was the result of decades of international negotiations involving a surprising mix of actors. If performers first raised the cry for musical standardization, composers were quick to follow in order to assert their authority in the field of aesthetics. At the same time, instrument builders' participation in the negotiations revealed the stakes that standardization held for the sale of their products internationally, while physicists were determined to rationally determine the most accurate pitch for performance. Finally, representatives of different state ministries were eager to impose their nations' norms as a sign of their superiority. Which actors and countries were empowered in the negotiations? What were the procedures that led to the adoption of A 440 as a standard? By answering such

questions, the project demonstrates the aesthetic, political, scientific, and industrial contingencies underlying the construction of one of the most “natural” objects of contemporary musical performance, itself the result of a cacophony of competing views and interests, and maps the forces aiming literally to tune the world.



Twenty-four tuning forks from around Europe, used by the French Pitch Commission of 1858. Musée de la musique, Paris. Photo: Emmanuel Mervé.

*Martin Brody* (Wellesley College, USA)

### **Liberal Sound: Milton Babbitt and the RCA Synthesizer**

“Liberal Sound” considers the impact of a man and a machine on Cold War musical modernism. The machine is the Mark II, RCA’s second programmable sound synthesizer—the first such device repurposed to support the esoteric work of “advanced” composers. The person is the composer Milton Babbitt, who regarded the Mark II as catalyst for developing a specialized community of elite, creative musicians and psychoacoustic researchers. The project explores various translations and transformations: from machine language to musical notation, from World War II military devices to Cold War sound synthesizers, and from the poetics of 1920s Viennese modernism to the ethos of Cold War American liberalism. The Mark II was created in RCA’s Sarnoff Laboratories in the mid-1950s and moved to Columbia University’s Columbia-Princeton Electronic Music Center in 1957 with funding from the Rockefeller Foundation. For Babbitt, the advent of a hybrid instrument comprising analog synthesis modules and digital programming instructions signaled a “revolution in musical sound.” In promoting this revolution, Babbitt recast Schoenberg’s rationale for emancipating dissonance, rejecting the Viennese composer’s ideas about evolutionary musical development in favor of an epistemology based on logical positivism,



Martin Brody



Milton Babbitt and the RCA Synthesizer, Columbia-Princeton Electronic Music Center, ca. 1958. Courtesy of The Computer Music Center, Columbia University.

musical pluralism, and incommensurable structures. Electroacoustic synthesis not only instigated a postwar research and development program in music, but also affirmed the liberal-cosmopolitan ethics characteristic of American cultural cold warriors of Babbitt's generation.

**Projects and short-term visiting scholars associated with *Sound Objects***

*Nikita Braguinski* (MPIWG), The History of Algorithmic Sound Production

*Brigid Cohen* (New York University, USA), Sonic Intermedia of Cold War Experimentalism

*Sabine von Fischer* (École Polytechnique fédérale de Lausanne, Switzerland),

A Visual Imprint of Moving Air

*Alexandra Hui* (Mississippi State University, USA), Listening to Nature: Standardized Soundscapes and Imagined Ecologies, 1900–2000

*Anna Laqua* (Predoctoral Fellow, DFG Collaborative Research Center “Epistemes in Motion,” 2015–2020), Ciphers, Sounds, and Ear Trumpets: Acoustics and Espionage in England, 1655–1685

*Thomas Levin* (Princeton University, USA), Personal Audio Postcards 1905–1907:

Rediscovering a Forgotten Chapter of the Media Archaeology of Voice Mail

*Jens Gerrit Papenburg* (Humboldt-Universität zu Berlin), Volume and Vibration:

A Media and Knowledge History of Public Address Systems in Germany circa 1930

*Alfredo Thiermann* (MPIWG), Radio-Activities: The Architecture of Broadcasting in Cold War Berlin

*Viktoria Tkaczyk* (MPIWG), Theater, Opera and Concert Culture, and the Architects of Sound (1750–1900)

# Sound & Science: Digital Histories

The screenshot shows a search results page for the term 'stumpf'. The search bar at the top indicates 'Search for: stumpf' and 'Displaying 1 - 10 of 76'. The results are categorized by object type, subfields, topics, and location. The left sidebar lists filters: OBJECT TYPE (text: 41, audio: 30, location: 2, person: 2, contributor\_essay: 1), SUBFIELDS (psychoacoustics: 5, physical acoustics: 3, musical acoustics: 2, (comparative) musicology: 1, speech communication: 1), TOPICS (speech/voice: 20, hearing (psychology): 4, recording: 3, melody: 1, musical intervals: 1), and LOCATION (berlin: 55). The main content area displays three results:

- PERSON:** Carl Stumpf. Description: Stumpf studied at the University of Würzburg—first aesthetics and law, and later philosophy with Franz Brentano. Because Brentano had not completed the qualifications allowing him to supervise dissertations, Stumpf wrote his doctoral thesis on Plato (1868) and his habilitation thesis on mathematical axioms (1871) at the University of Göttingen, supervised by Hermann Lotze. Both philosophers had a strong influence on Stumpf's thinking and further writings.
- TEXT:** Stumpf Papers: [Stumpf, Carl], [Untitled folder]. [Envelope] 5. Diagramme zu den Resonanzversuchen (Vokale). Description: Stumpf, C. Stumpf Papers: [Stumpf, Carl], [Untitled folder], [Envelope] 5. Diagramme zu den Resonanzversuchen (Vokale).
- LOCATION:** Lautarchiv. Description: What is today known as the Lautarchiv ("sound archive"), based at the Humboldt University, Berlin, contains the remaining traces of almost a century's endeavors in sound archiving: 7,500 shellac recordings and smaller collections of wax cylinders, tapes, and aluminum discs that document a wide variety of languages and dialects, along with "voice portraits" of famous public figures of the German Reich and Weimar Republic.
- AUDIO:** Experimental Record: Carl Stumpf, Versuchswalze. Description: Stumpf, C. Versuchswalze.

Joeri Bruyninckx, Xiaochang Li,  
Fanny Gribenski, Viktoria Tkaczyk, Robert Casties, Florian Kräutli

"Sound & Science: Digital Histories."  
[https://acoustics.mpiwg-berlin.mpg.de/  
browse-objects?fulltext=stumpf](https://acoustics.mpiwg-berlin.mpg.de/browse-objects?fulltext=stumpf).

"Sound & Science: Digital Histories" is an ongoing and multifaceted digitization project devoted to the history of acoustics. Growing out of work by members of the research group "Epistemes of Modern Acoustics," the project combines a multimedia archive of primary source material with data visualization and analysis tools, commentaries, and original essays by scholars, archivists, and curators in the area of acoustic history. The database provides valuable access to a diverse range of sources in the history of acoustics, many of them previously unavailable in digital format. They include documents, images, sounds, film, and historical reenactments, reflecting the variety of people, places, instruments, and technologies that have shaped acoustic history.

By bringing together archives from various places and periods, the database offers users a means to recover the historical multiplicity of scientific, artistic, religious, and political practices entwined with the study of sound. In addition, data visualization tools give access to large-scale and *longue durée* views on the history of sound and science, allowing users to explore and assemble material in novel ways. Such instruments are also projected to turn the database into a research tool in its own right, aiding scholars in the identification of new connections and sites of inquiry.

The collection is continually extended through the efforts of the “Epistemes of Modern Acoustics” members, guest scholars, and collaborators, thus serving as a record of the group’s collective project. To source, digitize, and contextualize rare material, we work with international partners including the Deutsches Museum (Rebecca Wolf), the Science Museum in London (Aleksander Kolkowski), New York University (Mara Mills), the University of Cambridge (David Trippett), Maastricht University (Karin Bijsterveld), and the University of Amsterdam (Carolyn Birdsall, Julia Kursell).

Collaborators also assist in linking and contextualizing historical sources through specially curated exhibits and a series of accessible multimedia essays. Written by outstanding experts in musicology, sound studies, and the history of science, technology, engineering, and architecture, the essays frame the objects in light of the disciplines’ latest insights. In turn, database objects can be directly linked to users’ own digital and print publications using QR codes and shortened URLs. Already, the database serves as a multimedia counterpart to the research group’s own publication projects, such as a forthcoming special issue in the journal *Technology and Culture*, where it will provide access to the original sources discussed in the papers.



Visit “Sound & Science: Digital Histories” at  
<https://acoustics.mpiwg-berlin.mpg.de/>

## Colloquium Series

### Colloquium Series 2015



#### **Science Goes to War: World War I and the Industrialization of Acoustics**

March 17, 2015, *Roland Wittje* (University of Regensburg)

#### **Physics and Musical Instrument Manufacture in England and the German Territories during the Early Nineteenth Century**

April 21, 2015, *Myles Jackson* (New York University)

#### **A Visual Imprint of Moving Air: Architectural Sound Photography, 1912–1935**

May 19, 2015, *Sabine von Fischer* (ETH Zurich)

#### **Persuasion in the Air: Pig-Squeal Radio, Marketing Muzak, and the Behaviorist Turn**

June 16, 2015, *Alexandra Hui* (Mississippi State University)

#### **Nietzsche’s Tuning Fork and the Birth of Acoustics**

September 8, 2015, *Steven Lydon* (Harvard University)

**Communication Engineering: Efficiency and Deficiency**October 6, 2015, *Mara Mills* (New York University)**Material Makes Music: Experiments in Instrument Building**November 24, 2015, *Rebecca Wolf* (MPIWG)**Colloquium Series 2016****Touch and Tone in Piano Playing, ca. 1900**January 19, 2016, *Julia Kursell* (University of Amsterdam)**Mozart as a Reader: Problems in the Historiography of Musical Enlightenment**March 15, 2016, *Laurenz Lütteken* (University of Zurich)**Scientific Scores and Musical Ears: Sound Diagrams in Field Recording**April 12, 2016, *Joeri Bruyninckx* (MPIWG)**The Earwitness Thomas Kuhn**May 10, 2016, *Anke te Heesen* (Humboldt-Universität zu Berlin)**Sound Modernities: Histories of Architecture, Design, and Space**June 14, 2016, *Olga Touloumi* (Bard College)**How the Turn to Sound Studies Could Modulate Method**July 5, 2016, *Trevor Pinch* (Cornell University)**Disciplining the Sense of Hearing: Practices of Auditory Remembering in Sixteenth-Century Calvinist Geneva**October 25, 2016, *Anna Kvičalová* (MPIWG)**Clicking Cameras and Sliding Drawers: Analyzing Sounding Objects at the Stasi and the Rise of Sound Intelligence**November 15, 2016, *Karin Bijsterveld* (Maastricht University)**Authors' Voices on Records and Radio in Germany, 1889–1932**December 6, 2016, *Reinhard Meyer-Kalkus* (Universität Potsdam)**Colloquium Series 2017****Wireless Communication, Physiology, and Electric Music: The Trautonium in Berlin during the 1930s**January 24, 2017, *Myles Jackson* (New York University)**Sonic Refugia: Nature, Architecture, and Landscape Design in West Berlin**February 14, 2017, *Sandra Jasper* (University College London)



**Anna O.'s Nervous Cough: Historical Perspectives on Neurological and Psychological Approaches to Music**

March 14, 2017, *James Kennaway* (University of Groningen)



**Roentgenizdat: Music on the Bone**

April 6, 2017, *Stephen Coates* (Antique Beat, London)

**From Pillow-Talk with the State to Huxley's Loudspeaker: The Dystopian Sounds of Control during the Cold War**

May 9, 2017, *Alexandra Hui* (Mississippi State University)

**Reading as Listening: The Birth of Cultural Acoustics**

June 13, 2017, *Tanvi Solanki* (Cornell University)

**“Don’t Write! Just Speak!” Personal Audio Postcards 1905–1907: Rediscovering a Forgotten Chapter of the Media Archaeology of Voice Mail**

June 26, 2017, *Thomas Y. Levin* (Princeton University)

**Opelt’s Siren and Music Theory circa 1830**

June 27, 2017, *Alexander Rehding* (Harvard University)

**The Sonic Subject: Sound and Listening in the Legal Imagination**

July 11, 2017, *Veit Erlmann* (University of Texas at Austin)

**The Unnatural Attitude in Weimar Musical Thought**

September 12, 2017, *Benjamin Steege* (Columbia University)

**Sensing the Limits of the World**

October 10, 2017, *David Trippett* (University of Cambridge)



**Hearing Objectified: (Re)producing Noise through Decibel Measurements and Audio Recordings under Taiwan’s Noise Management System**

November 7, 2017, *Jennifer Hsieh* (Stanford University) (held jointly with Dept. III)

**The Speed of Sound: Sequences from the History of Time Stretching and Pitch Shifting**

December 12, 2017, *Mara Mills* (New York University) and *Jonathan Sterne* (McGill University)

## Artist-in-Residence

Raviv Ganchrow (Institute of Sonology, University of the Arts The Hague)

### Padded Sounds: The Latent Aurality of Anechoic Chambers

What sonic models propagate in anechoic setups? What spatial ontologies and sonic materialities are fostered in echoless surroundings? How do environmentless anechoic practices assert modes of sonic attention that in turn environ the quotidian? This project experimentalized contemporary auditory settings by applying a retroactive hearing to formative anechoic procedures.



Raviv Ganchrow

Anechoic chambers—specialized echo-dampened facilities where acoustics, electroacoustics, and psychoacoustics have been calibrated since the 1940s—evolved in the historical context of tactical sound propagation and reception in combat situations. The physics of aeronautic vibration, battlefield voice transmission, and communication psychoacoustics intersect at the anechoic chamber, formulating a set of problems in terms of mechanical noise control, speech comprehension, and auditory fatigue respectively.

Anechoic Chamber, Delft University of Technology, Faculty of Applied Sciences, Department of Imaging Physics, 2015 © Raviv Ganchrow.

Acoustic norms, psychoacoustic thresholds, and electroacoustic innovations pioneered in the chamber carry over into civilian categories of telecommunication, aviation, architectural technology, and the auto and entertainment industries. Arguably, today, disparate examples of personal and public audio techniques manifest a kind of latent anechoic reverb where the control and formatting of acoustic energy within the chamber produce modes of sound and hearing elsewhere. The “Padded Sounds” project researched particular framings of sonic attention enforced in anechoic practices and followed their haphazard recurrence within the commonplace.



Follow this link to hear an excerpt from Raviv Ganchrow’s *Site 02*, part of the “Padded Sounds” project:

<https://acoustics.mpiwg-berlin.mpg.de/node/1231>

Max Planck Research Group: Epistemes of Modern Acoustics

## Publications 2015–2017

### Testing Hearing

Bruyninckx, Joeri. “Trading twitter: amateur recorders and economies of scientific exchange at the Cornell Library of Natural Sounds.” *Social Studies of Science* 45 (3 2015): 344–370.

Bruyninckx, Joeri and Alexandra Supper. “Sonic skills in cultural contexts: theories, practices and materialities of listening.” *Sound Studies* 2 (1 2016): 1–5.

Hui, Alexandra. “Aural rights and early environmental ethics: negotiating the post-war soundscape.” In *Current directions in ecomusicology: music, culture, nature*, eds. Aaron S. Allen and Kevin Dawes. 176–187. New York: Routledge, 2016.

Hui, Alexandra E. “Muzak-mens-du-jobber: muzikkprogrammer i industrien, 1919–1948.” *Arr – Idéhistorisk Tidsskrift* (1 2015): 13–27.

- 1 Hui, Alexandra E. “Walter Bingham und die Universalisierung des individuellen Hörers.” In *Wissensgeschichte des Hörens in der Moderne*, ed. Netzwerk Hör-Wissen im Wandel. 41–64. Berlin: De Gruyter, 2017.

Morat, Daniel, Viktoria Tkaczyk, and Hansjakob Ziemer. “Einleitung.” In *Wissensgeschichte des Hörens in der Moderne*, ed. Netzwerk Hör-Wissen im Wandel. 1–19. Berlin: De Gruyter, 2017.

Steege, Benjamin A. “Between race and culture: hearing Japanese music in Berlin.” *History of Humanities* 2 (2 2017): 361–374.

Tkaczyk, V. see also Morat, Tkaczyk and Ziemer

- 2 Wittje, Roland. *The age of electroacoustics: transforming science and sound*. Transformations: studies in the history of science and technology. Cambridge, Mass.: The MIT Press, 2016.

Wittje, Roland. “Concepts and significance of noise in acoustics: before and after the Great War.” *Perspectives on Science* 24 (1 2016): 7–28.

Wittje, Roland. “Ferdinand Trendelenburg.” In *Neue Deutsche Biographie*. Bd. 26, 399–400. Berlin: Duncker & Humblot, 2016.



## Betwixt and Between

Bijsterveld, Karin. “Ethnography and archival research in studying cultures of sound.” In *Sound as popular culture: a research companion*, eds. Jens Gerrit Papenburg and Holger Schulze. 99–109. Cambridge, Mass.: The MIT Press, 2016.

Bijsterveld, Karin. “Nichts zu sehen, aber viel zu hören: Lärmschutzwände und die Einführung von KFZ-Audiosystemen.” In *SenseAbility: mediale Praktiken des Sehens und Hörens*, eds. Beate Ochsner and Robert Stock. 189–205. Bielefeld: Transcript Verlag, 2016.

Birdsall, Carolyn. “Can we invent a field called ‘Radio Preservation Studies?’” *Flow: A critical forum on television and media culture* 21 (5 2015): <https://www.flowjournal.org/2015/05/can-we-invent-a-field-called-radio-preservation-studies/>

Birdsall, Carolyn. “Die urbanen Soundscapes des Luftkriegs: Forschungsperspektiven aus Sound Studies, Geschichts- und Medienwissenschaft.” *Geschichte in Wissenschaft und Unterricht* 66 (11/12 2015): 681–702.

Birdsall, Carolyn. “Resounding city films: Vertov, Ruttmann and early experiments with documentary sound aesthetics.” In *Music and sound in documentary film*, ed. Holly Rogers. 20–40. New York: Routledge, 2015.

Birdsall, Carolyn. “Sound and media studies: archiving and the construction of sonic heritage.” In *Sound as popular culture: a research companion*, eds. Jens Gerrit Papenburg and Holger Schulze. 133–148. Cambridge, Mass.: The MIT Press, 2016.

Birdsall, Carolyn. “Sound memory: a critical concept for researching memories of conflict and war.” In *Memory, place and identity: commemoration and remembrance of war and conflict*, eds. Danielle Drozdowski, Sarah De Nardi, and Emma Waterton. 111–129. London: Routledge, 2016.

Birdsall, Carolyn. “Divisions of labour: radio archiving as gendered work in wartime Britain and Germany.” In *Gender and archiving: past, present, future*, eds. Noortje Willems and Sylvia Holla. 107–133. Hilversum: Verloren, 2017.

Birdsall, Carolyn and Danielle Drozdowski. "Capturing commemoration: using mobile recordings within memory research." *Mobile Media & Communication* 6 (2 2018): 266–284. Online 2017.

Birdsall, Carolyn, Manon Parry, and Viktoria Tkaczyk. "Listening to the mind: tracing the auditory history of mental illness in archives and exhibitions." *The Public Historian* 37 (4 2015): 47–72.

Kvíčalová, Anna. "Listening and knowledge in Reformation Europe (1500–1650): workshop report." *Sacra* 13 (1 2015): 38–40.

Lydon, Steven. "Nietzsche's interpretation of Chladni's sound figures." *Maynooth Philosophical Papers* 8 (2016): 83–89.

Meyer-Kalkus, Reinhart. "Goethe als Vorleser, Sprecherzieher und Theoretiker der Vortragskunst." *Deutsche Vierteljahrsschrift für Literaturwissenschaft und Geistesgeschichte* 90 (4 2016): 529–565.

Meyer-Kalkus, Reinhart. "Martin Heideggers Hölderlin-Lesungen – im Zeichen von Norbert von Hellingrath und Stefan George." *Deutsche Vierteljahrsschrift für Literaturwissenschaft und Geistesgeschichte* 91 (2 2017): 188–202.

Meyer-Kalkus, Reinhart. "Von Klopstock bis zum Poetry Slam: eine kleine Geschichte der literarischen Vortragskunst in Deutschland in 5 Etappen." In *Auf ein Wort: Vortragskunst in Antike und Gegenwart*, 19–31. Stuttgart: Akademie für gesprochenes Wort, 2017.

Tkaczyk, V. see also Birdsall, Parry and Tkaczyk

Tkaczyk, Viktoria. "The making of acoustics around 1800, or how to do science with words." In *Performing knowledge, 1750–1850*, eds. Mary Helen Dupree and Sean B. Franzel. 27–55. Berlin: De Gruyter, 2015.

Tkaczyk, Viktoria. "The shot is fired unheard: Sigmund Exner and the physiology of reverberation." *Grey Room* 60 (2015): 66–81.

Ziemer, Hansjakob. "Der Mengelbergskandal: Kommunikation, Emotion und Konflikt im Konzertsaal vor dem Ersten Weltkrieg." In *Kommunikation im Musikleben: Harmonien und Dissonanzen im 20. Jahrhundert*, eds. Sven Oliver Müller, Jürgen Osterhammel, and Martina Rempe. 139–153. Göttingen: Vandenhoeck & Ruprecht, 2015.

Ziemer, Hansjakob. "Konzerthörer unter Beobachtung: Skizze für eine Geschichte journalistischer Hörertypologien zwischen 1870 und 1940." In *Wissensgeschichte des Hörens in der Moderne*, ed. Netzwerk Hör-Wissen im Wandel. 183–206. Berlin: De Gruyter, 2017.

Ziemer, Hansjakob. "Opferstiere und Barbaren im Konzert: zu einer historischen Anthropologie des Musikhörens der 1920er Jahre." In *Geschichte und Gegenwart des musikalischen Hörens: Diskurse – Geschichte(n) – Poetiken*, eds. Klaus Aringer, Franz Karl Praßl, Peter Revers, and Christian Utz. 257–274. Freiburg i.Br.: Rombach Verlag, 2017.

Zorn, Magdalena. "Wie hör' ich das Licht? Stockhausen and Wagner in the echo chamber of music history." In *The musical legacy of Karlheinz Stockhausen: looking back and forward*, eds. Morag Josephine Grant and Imke Misch. 123–137. Hofheim: Wolke, 2016.

### Sound Objects

Brody, Martin Alan. "Theory, as a music." In *Music in time: phenomenology, perception, performance*, eds. Suzannah Clark and Alexander Rehding. 293–311. Cambridge, Mass.: Harvard University Press, 2016.

Fischer, Sabine von. "Das laute Leben der anderen." *Werk, Bauen + Wohnen* 12 (2015): 84–87.

Fischer, Sabine von. "Dynamique ou uniformisation? A propos de la normalisation dans la conception de projets et l'industrie du bâtiment, à travers l'exemple de la réglementation acoustique." *Matières* 12 (2015): 32–47.

Fischer, Sabine von. "Listening and the League of Nations: acoustics are the argument." In *Le Corbusier, 50 years later: international congress, Valencia 18th–20th November 2015*, 1–19. 2015. <http://dx.doi.org/10.4995/LC2015.2015.495>

Fischer, Sabine von. "A visual imprint of moving air: methods, models, and media in architectural sound photography, ca. 1930." *Journal of the Society of Architectural Historians* 76 (3 2017): 326–348.

Hui, Alexandra E. "The naturalization of built environments: two case studies." *Ethnomusicology Review* 21 (2016): <http://ethnomusicologyreview.ucla.edu/content/naturalization-built-environments-two-case-studies>

Laqua, Anna. "Die Vollkommenheit der Schauspieler und Gehörlosen: theatrales Körperwissen in den medizinisch-naturphilosophischen Texten John Bulwers." *Paragrana* 25 (1 2016): 154–175.

Tkaczyk, Viktoria. "Theater und Phonographie um 1900." In *Sound und Performance: Positionen, Methoden, Analysen*, eds. Wolf-Dieter Ernst, Nora Niethammer, and Berenika Szymanski-Düll. 119–137. Würzburg: Königshausen & Neumann, 2015.



Tkaczyk, Viktoria. “Écouter en cercle(s): le drame parlé et les architectes du son entre 1750 et 1830.” In *Le son du théâtre (XIXe–XXIe siècle): histoire intermédiaire d’un lieu d’écoute moderne*, eds. Jean-Marc Larrue and Marie-Madeleine Mervant-Roux. 91–115. Paris: CNRS Éditions, 2016.

Tkaczyk, Viktoria. “L’École d’ingénierie scénique de Giulio Parigi, 1608–1680.” *Artefact: Techniques, Histoire et Sciences Humaines* 4 (2016): 99–117.

Tkaczyk, Viktoria. “Hochsprache im Ohr: Bühne – Grammophon – Rundfunk.” In *Wissensgeschichte des Hörens in der Moderne*, ed. Netzwerk Hör-Wissen im Wandel. 123–152. Berlin: De Gruyter, 2017.

Tkaczyk, Viktoria. “‘Which cannot be sufficiently described by my pen’: the codification of knowledge in theater engineering, 1480–1680.” In *The structures of practical knowledge*, ed. Matteo Valleriani. 77–114. Cham: Springer, 2017.

Wolf, Rebecca. “The sound of glass: transparency and danger.” In *Performing knowledge, 1750–1850*, eds. Mary Helen Dupree and Sean B. Franzel. 113–136. Berlin: De Gruyter, 2015.

Wolf, Rebecca. “Daniel Gottlob Türk.” In *Neue Deutsche Biographie. Bd. 26*, 498–499. Berlin: Duncker & Humblot, 2016.

Wolf, Rebecca. “Spielen und bedienen: das selbstspielende Klavier als virtuose Maschine.” In *Spiel (mit) der Maschine: musikalische Medienpraxis in der Frühzeit von Phonographie, Selbstspielklavier, Film und Radio*, ed. Marion Saxer. 137–156. Bielefeld: Transcript Verlag, 2016.

Wolf, Rebecca. “Musik im Zeitsprung: Victor-Charles Mahillons Instrumente zur Rekonstruktion und Neubelebung von historischem Klang.” In *Wissensgeschichte des Hörens in der Moderne*, ed. Netzwerk Hör-Wissen im Wandel. 153–182. Berlin: De Gruyter, 2017.

Wolf, Rebecca and Albrecht Riethmüller. “Musik.” In *Handwörterbuch der antiken Sklaverei (HAS). Bd. 2*, ed. Heinz Heinen. 1990–1992. Stuttgart: Steiner, 2017.

Max Planck Research Group

# Historical Epistemology of the Final Theory Program

RESEARCH GROUP LEADER Alexander Blum (2018–2023)



Research Group Members. Clockwise from back left: Pablo Ruiz de Olano, James Fraser, Tadeusz Hmielorz, Bernadette Lessl, Núria Muñoz, Alexander Blum. In the front: Kseniia Mohelsky.

#### GROUP MEMBERS

*Alexander Blum* (Research Group Leader), February 1, 2018–January 31, 2023

*Pablo Ruiz de Olano* (Research Scholar), February 1, 2018–31 January 31, 2020: The Particle Physics Tradition in the Final Theory Program

*Rocco Gaudenzi* (Postdoctoral Fellow, funded by the Netherlands Organization for Scientific Research), September 1, 2018–August 31, 2020: The Introduction of Emergentist Concepts into the Final Theory Program

*Bernadette Lessl* (Postdoctoral Fellow), July 1, 2018–June 30, 2019: Conceptual vs. Formal Challenges in the Final Theory Program

*James Fraser* (Research Scholar), July 1, 2018–December 31, 2018: History of the Renormalization Group and the Rise of the Effective (Field) Theory Paradigm

*Núria Muñoz* (Predoctoral Fellow), March 1, 2018–28 February 28, 2021: The Emergentist Opposition to the Final Theory Program

In 1916, Albert Einstein suggested for the first time that it would be necessary to merge his newly constructed general theory of relativity and the emerging quantum theory. Some 100 years later, this challenge remains unanswered, and the problem of constructing a theory of “quantum gravity” (as such a hypothetical merging came to be known) has become synonymous with physicists’ search for a final, fundamental theory. The Max Planck Research Group “Historical Epistemology of the Final Theory Program” will reflect on and evaluate this century-long search using the methods of historical epistemology. It is the explicit aim of the group to conduct historical research that connects directly to contemporary physics research, providing a novel, historico-critical view of its status and prospects. To this end the group will be working in collaboration with the Max Planck Institute for Gravitational Physics in Potsdam-Golm.

The research group started its work in February 2018. In a first phase, the researchers of the group will be dealing to a large extent with the preconditions for constructing a final theory, as well as assessing the change in notions of fundamentality and finality in the second half of the twentieth century.

Pablo Ruiz de Olano is investigating the attempts at finding the right formal language in which to express a final theory. The default answer here is quantum field theory, the formal synthesis of quantum mechanics and the special theory of relativity. But this mathematical structure has been beset by great difficulties, as it does not allow for exact answers, only more or less trustworthy approximations. Ruiz de Olano is investigating how this fact changed the assessment of models and research programs over the course of the 1950s and 1960s, as naive comparison with experiment was no longer an option. He is also investigating the rise of alternative languages, in particular that of symmetry.

Núria Muñoz is investigating debates within physics concerning the notion of fundamentality and the possibility of a final theory. These issues were famously debated in the public arena during the congressional hearings on the funding of the (ultimately cancelled) Superconducting Supercollider experiment in the early 1990s. Muñoz is studying the historical origins of these debates in the 1970s, focusing in particular on the perceived dichotomy between reduction and emergence. She is investigating how and why these categories, which originated within the life sciences and debates on the

origins of life and consciousness, were transferred to physics, and what the implications of this transfer were for the perceived dichotomy.

Alexander Blum is investigating the defining traditions of the early final theory genre, which can be traced back to Albert Einstein's post-relativity attempts at crafting his unified field theory. In particular, Alexander is currently studying two final theory programs of the 1950s, which clearly stand in the Einsteinian tradition, but break with it through their acceptance of orthodox quantum theory. One is Werner Heisenberg's Non-Linear Spinor Theory, the ultimate failure of which marked the end of monism as a possible constituent of a final theory. The other is John Wheeler's Daring Conservatism, which rested on the assumption that all the theoretical elements for a final theory were already in place and would only need to be combined and extrapolated to the extreme.

Another final theory attempt, or at least the development of a novel language for such an attempt, is being investigated in the Autonomous S-Matrix Program of Geoffrey Chew, which rose to prominence in the early 1960s. Non-Einsteinian in nature, it rested not on a spatiotemporal description, but merely on a minimalistic positivist scheme of relations between empirical data. This investigation will lead the project towards a second phase in which the history of the current attempts at a final theory will be investigated, most notably String Theory, which has its historical origins in S-Matrix Theory. These issues are already being tentatively explored in dialogue with physicists at the Albert Einstein Institute, for example by discussing founding papers of current quantum gravity research program in the institute's journal club. Further funding for the group is provided by the Netherlands Organisation for Scientific Research (NWO).

Max Planck Research Group

# Experience in the Premodern Sciences of Soul and Body, ca. 800–1650

RESEARCH GROUP LEADER Katja Krause (2018–2023)





William Harvey, *Exercitationes de generatione animalium. Quibus accedunt quaedam de partu: de membranis ac humoribus uteri: et de conceptione*, Amstelodami: Lud. Elzevir 1651, frontispiece.

## Introduction

Most histories suggest that the empirical method, a method encapsulated in the terms “experiment” and “observation,” began in early modern times. Yet what about experience in the Aristotelian sciences before then? Did it exist at all? And if so, where and when? Between ca. 800–1650, the Aristotelian sciences of soul and body spread from the Islamic World to Europe, and then to the Americas and East Asia. By studying experience in the sciences most concerned with the particular—that is, the sciences covering plant, animal, and human souls and bodies—our research group rethinks the enduring myth that experience played at most a minimal role in pre-modern natural knowledge making. Our objective is to reveal the ideals and practices associated with experience, and the material artifacts, cultural conditions, and circulation processes informing and transforming these ideals and practices in the period under our purview.

To this day, historians of science have predominantly placed premodern experience under the domain of Aristotle’s *Posterior Analytics*. Indeed, Aristotle granted experience a narrow role in the production of universals and in the search for causes. With these two roles, he identified experience as a transitional stage of acquaintance with (*empeiria*) an object before acquiring knowledge (*episteme*) about it. Yet historiographies that focus on these technical meanings often ignore the key developments that experience in its broad sense underwent in the Aristotelian sciences of soul and body, especially in its functionality and modality. Likewise, historiographies have bypassed negotiations that took place at the borders of Aristotelian sciences and local knowl-

edge traditions, particularly in the Americas and East Asia during the sixteenth- and seventeenth-century missions and conquests.

One main purpose of our research group is to develop a new appreciation of the ways in which experience factors into the rich epistemological debates of the historical actors. What was the epistemic role assigned to experience in the Aristotelian life sciences that allowed premodern scientists to rely on it as scientific method? To what extent did the ideals and practices of experience in the Aristotelian sciences converge with or diverge from the local knowledge traditions, and why? What were the epistemic foundations of experience as scientific method: the mind or the world? How did these foundations shift or vanish with changing tendencies (e.g. from natural philosophies to natural histories), skeptical underpinnings, humanism, and influences of local epistemologies?

The other main purpose of our research group is to study premodern Aristotelian experience in relation to its contexts. Although inextricably linked to its corresponding material artifacts, cultural conditions, and circulation processes, experience does not transcend history. The Aristotelian sciences of soul and body between 800–1650 shared a common framework, yet their distinct contexts stimulated characteristic emphases, distinctive tensions, and particular utilizations of experience. Experience thus assumed quite different meanings in the Islamic World, Europe, the Americas, and East Asia. For instance, the founding of the first American universities in Peru and Mexico in 1551 echoed European curricula. Concurrently, natural histories on exotic animals and plants were written—histories that turned their attention to the world around them, relying on Aristotelian and Humanistic epistemologies. The group’s procedural approach for this complex theme of relations between contexts and scientific experience lies in considering the epistemic negotiations of voluntary and involuntary *dynamics and stabilizations*. What are the dominant patterns that occur between premodern scientific experience and its multiple contexts? What influences can be found among all these diffusive and interactive (as opposed to parallel and autonomous) spaces? How and for what reasons did these developments influence (trans-)formations of premodern scientific ideals and practices of experience?

The research topic is considered under three large thematic frameworks—(F1) Aristotelian experience and how it develops in the Islamic World (800–1200 and beyond), (F2) Aristotelian experience and how it travels in and beyond Europe (1150–1550), and (F3) Aristotelian experience and how it discovers the world (1520–1650)—and under a Foundational Themes Module (FTM), in which we raise overarching meth-

odological questions of interdisciplinary relevance. Three working groups, each with 12–15 researchers, will meet repeatedly over the course of five years. Together with the postdoctoral researchers, the working groups will create state-of-the-art collected volumes and a textbook with primary sources on the global history of premodern experience in the sciences of soul and body.

The research group “Experience in the Premodern Sciences of Soul and Body, ca. 800–1650” is complemented by an interdisciplinary board of external Senior Advisors. Members of this Board include:

- (F1) Peter Adamson (LMU Munich, Germany), Steven Harvey (Bar-Ilan University, Israel), Ahmed Ragab (SRC, Harvard Divinity School, USA), Richard Taylor (Marquette University, USA)
- (F2) José Meirinhos (Universidade do Porto, Portugal), Yosef Schwartz (Cohn Institute, Tel Aviv University, Israel), Loris Sturlese (Università del Salento, Italy)
- (F3) Luís Lopez-Farjeat (UP Mexico), Roberto Hofmeister Pich (Pontifícia Universidade Católica do Rio Grande do Sul, Brazil), and Dong Xiu Yuang (Shandong University, China).

Our group also works in close collaboration with the following existing research projects: *Science, Religion, and Culture Program* (Harvard Divinity School, USA), *Heirs of Avicenna and Natur in politischen Ordnungsentwürfen* (both LMU Munich, Germany), *Animal Rationale Mortale, Petrus Hispanus medicus*, and *From Data to Wisdom* (Universidade do Porto, Portugal), *Making Mysticism* (Albert-Ludwigs-Universität Freiburg, Germany), and the *Aquinas and “the Arabs” International Working Group* (Marquette University, USA).

Max Planck Research Group

# The Construction of Norms in 17th- to 19th-Century Europe and the United States

RESEARCH GROUP LEADER Sabine Arnaud (Ended October 2016)



Roch-Ambroise Cucurron Sicard,  
Anonymous Alphabet, in *Cours  
d'instruction d'un sourd-muet de naissance*  
[Course of Instruction for a Deaf-Mute  
from Birth], Paris: An VIII (1799-1800)  
© UCL Ear Institute & Action on Hearing  
Loss.

The research group of Sabine Arnaud examined medical categories and norms regarding normalcy and the abnormal within the broader field of the history of knowledge in Europe and the United States between 1700 and the First World War. One of the main aims of the group was to demonstrate how medical knowledge shaped our understanding of the human condition and led to the strategic development of norms about the human with respect to human interaction with society and humanity as a species.

In its final phase, the research group addressed deafness and other human variations as so many case studies that can exemplify the construction of norms. While norms are most often presented in terms of an average or an ideal, this research has demonstrated that they are by no means as straightforward as supposed. Far from possessing any stable or linear history, norms have been constructed as products of a struggle for authority between the human and medical sciences. For this purpose, the investigations examined how conflicts between these disciplines led to constant redefinitions of their boundaries. The working hypothesis of the group was that the history of deafness can be seen as the crystallization of an encounter between multiple fields of knowledge (pedagogy, medicine, psychology, psychiatry, anthropometry, criminology, law, linguistics, philosophy), each of which built its own access to shared objects such as “deafness.” Setting out the norms of the human allowed doctors and educationists to claim universal knowledge. While disciplines were establishing their spheres of influence and authority in the nineteenth century, deafness was typically constructed as a problem to be solved. Through the question of deafness, this research examined conflicting new conceptions and norms of humanity from the eighteenth century until the present day, part of the classification of mankind according to the concept of normalcy that was taking shape at the time. The development of criteria to define normalcy resulted in a definition of the deaf by inclusion into or exclusion

from the rest of the population, along with a host of new categories marking this difference (backwardness, indocility, idiocy, mental retardation). By the late nineteenth century, the deaf were seen as belonging to the category of abnormal people.

While verifying this hypothesis, the group came to consider how, in the case of deafness, forms of emancipation emerged and displaced specialist determinations through linguistic practices. The deaf and activists kept challenging such determinations towards the redefinition of citizens' rights and the conception of the human being since the late eighteenth century. Across these conflicts, deafness offered an opportunity to assert repeatedly that the mastery and particular use of language were key to rethinking the limits of any definition of the individual and his or her relation to society, and to displacing the fields of knowledge involved.

The last phase of her stay at the MPIWG allowed Sabine Arnaud to open two new areas of inquiry complementing her work on deafness and norms, and to draw a series of conclusions about the research completed during her time at the Institute.

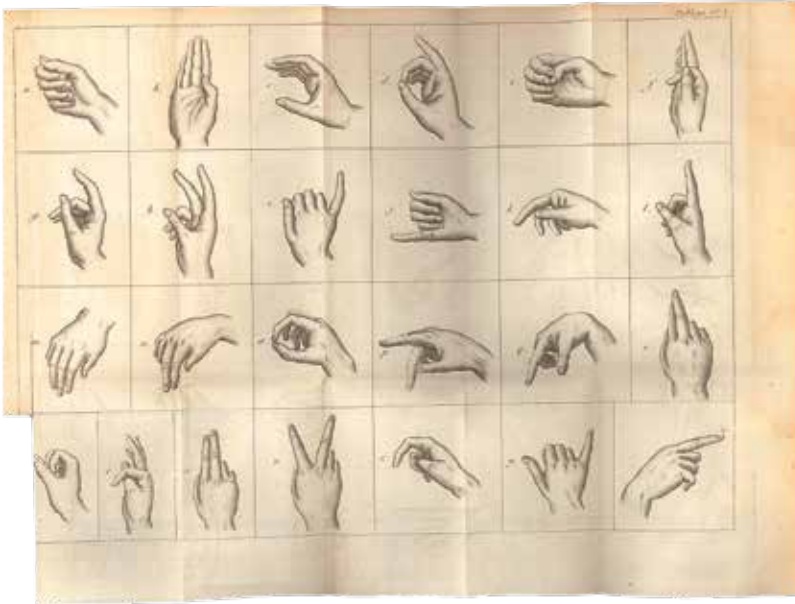
This first area of investigation considered the complicated and partially controversial process of the reception of the technology of cochlear implants. Since the 1950s, the cochlear implant has been championed by the medical community as a tool not only to enable hearing, but also to promote better articulation among deaf users. The introduction of this technology has been accompanied by sometimes contentious debates about the role of technology in compensating for hearing loss. However, these debates should be historically contextualized. Thus, for the hearing men of letters of the late eighteenth century, if a machine could speak, then why not deaf people? By resorting to the metaphor of "speaking machines" to talk about deaf people, writers were not only alluding to the contemporary fascination for automatons; they were also referring to a much wider controversy, the question of the human being as machine, which spread throughout the eighteenth century. Inventions by Jacques Vaucanson, Wolfgang von Kempelen, and Abbé Mical gave a new turn to the mechanistic understandings of the human body that had been one of the key foci of philosophical investigation since René Descartes's work. What drove this fascination for, and reaction to, mechanics? How was it used to understand the body? What pedagogical potential did observers imagine for speaking machines? In this quest for communication, the speaking machine could be used as a tool for recording, learning, and understanding the words to formulate ideas, but



Wolfgang von Kempelen, *Sprechapparat* [Speaking Machine], © Deutsches Museum Munich.



could not supplement the expression of emotions, which remained a domain reserved for the living. According to these writers, the lack of speech was not the biggest loss; the lack of expression was. Hearing and speaking people, just as much as deaf people, questioned at the time the powers of the mechanical production of language, and how much of what makes us human is characterized by faculties that these mechanics cannot reproduce.



Roch-Ambroise Cucurron Sicard, Fingerspelling, in *Cours d'instruction d'un sourd-muet de naissance* [Course of Instruction for a Deaf-Mute from Birth], Paris: An VIII (1799–1800) © UCL Ear Institute & Action on Hearing Loss.

The second area of investigation concerned the invention of sign languages throughout the eighteenth and nineteenth century, focusing on the invention of fingerspelling alphabets, called “dactylogies.” Fingerspelling is nowadays in common use within national sign languages to communicate names or introduce new words. If a sign is unknown to the interlocutors or has yet to be created, switching back and forth from signing to fingerspelling allows for the swift integration of new concepts and names in sign language communication. The use of fingerspelling currently represents between 12 and 35 percent of sign language, which might make us think that its use has always

gone along with sign language as a necessary complement. Yet that is far from being the case. While many of its defenders saw in fingerspelling a pedagogical, intellectual, and social tool, offering new versions of it and striving for its improvement, its detractors looked upon it with distrust, because fingering represents letters, which express sounds and not meanings. As a method of expressing phonological signs, the use of one system of dactylogy became a defining feature of linguistic choices, as well as a problematic asset, attracting the interest of some and the disapprobation of others. Sabine Arnaud examined the stakes that motivated the use of fingerspelling from its limited adoption, congruent with the development of deaf education in France in the 1760s, up to the 1880 Milan Congress, which was followed by a ban on sign language and fingerspelling in favor of speech. These publications, whose breadth and depth are testament to an incredible creativity that constantly rethought dactylogical systems, have nonetheless been totally forgotten.

Max Planck Research Group: The Construction of Norms in 17th- to  
19th-Century Europe and the United States

## Publications 2015–2017

Arnaud, Sabine. “Fashioning a role for medicine: Alexandre-Louis-Paul Blanchet and the care of the deaf in mid-nineteenth-century France.” *Social History of Medicine* 28 (2 2015): 288–307.

- 1 Arnaud, Sabine. *On hysteria: the invention of a medical category between 1670 and 1820*. Chicago: The University of Chicago Press, 2015.

Arnaud, Sabine. “Quand des formes de vie se rejoignent: langue des signes et citoyenneté en France au tournant du 19e siècle.” *Raisons Politiques* 57 (1 2015): 97–110.

Chiletti, Silvia. “Grossesses ignorées au prisme de l’infanticide: savoirs médicaux et décisions de justice en France au XIXe siècle.” *Revue d’Histoire du XIXe Siècle* 50 (2015): 165–179.

Chiletti, Silvia. “Infanticide and mental illness: theories and practices involving psychiatry and justice (Italy 19th–20th–century).” *Histoire, Médecine et Santé* 6 (2015): 17–31.

Cooter, Roger and Claudia Stein, eds. *The history of medicine. 4 Volumes*. Critical concepts in historical studies. London: Routledge, 2016.

Cooter, Roger and Claudia Stein. “The vicissitudes of fundamental change.” In *The history of medicine. Vol. 1: Ancient and medieval medicine*, eds. Roger Cooter and Claudia Stein. 1–32. London: Routledge, 2016.

Du Plessis, Rory. “The principles and priorities of Dr T. D. Greenlees, medical superintendent of the Grahamstown Lunatic Asylum, 1890–1907.” *Historia* 60 (1 2015): 22–46.

Dyde, Sean. “Cullen, a cautionary tale.” *Medical History* 59 (2 2015): 222–240.

Dyde, Sean. “George Combe and common sense.” *The British Journal for the History of Science* 48 (2 2015): 233–259.



1

Grote, Mathias and Lara Keuck. “Conference report ‘Stoffwechsel. Histories of metabolism’, workshop organized by Mathias Grote at Technische Universität Berlin, November 28-29th, 2014.” *History and Philosophy of the Life Sciences* 37 (2 2015): 210–218.

Harrington, Anne. “Mother love and mental illness: an emotional history.” *Osiris* 31 (1 2016): 94–115.

Stein, Claudia *see also* Cooter and Stein

Stein, Claudia. “Die ‘Geschichte der Hygiene’ in der Internationalen Hygiene-Ausstellung 1911 in Dresden.” In *Erkenne Dich selbst! Strategien der Sichtbarmachung des Körpers im 20. Jahrhundert*, ed. Sybilla Nikolow. 59–71. Köln: Böhlau, 2015.

Stein, Claudia and Roger Cooter. “Die Geschichte des Gesundheits- und Hygieneplakats neu betrachtet: die ökonomische Neuerung des Wissens über das Selbst.” In *Erkenne Dich selbst! Strategien der Sichtbarmachung des Körpers im 20. Jahrhundert*, ed. Sybilla Nikolow. 357–376. Köln: Böhlau, 2015.

Stein, Claudia and Roger Cooter. “History and the politics of ‘Life.’” In *The care of life: transdisciplinary perspectives in bioethics and biopolitics*, eds. Miguel de Beistegui, Giuseppe Bianco, and Marjorie Gracieuse. 135–147. London: Rowman & Littlefield International, 2015.

Werner, Anja. “Why give him a sign which hearing people do not understand...? Public discourses about deafness, 1780–1914.” In *In our own hands: essays in deaf history, 1780–1970*, eds. Brian Greenwald and Joseph J. Murray. 1–17. Washington, D. C.: Gallaudet University Press, 2016.

Werner, Anja. “Behindert oder sprachlich-kulturelle Minderheit? Eine kulturhistorische Perspektive auf gehörlose Menschen in Deutschland.” In *“Disability Studies” meets “History of Science”: körperliche Differenz und soziokulturelle Konstruktion von Behinderung aus der Perspektive der Medizin-, Technik- und Wissenschaftsgeschichte*, eds. Dominik Groß and Ylva Söderfeldt. 105–129. Kassel: Kassel University Press, 2017.

Max Planck Research Group

# Modern Geometry and the Concept of Space

RESEARCH GROUP LEADER Vincenzo De Risi (Ended September 2016)



Van Dyck, A. Portrait du R. P. Jean-Charles della Faille, de la Compagnie de Jésus (inv. 6254) © Royal Museum of Fine Arts of Belgium, Brussels / photo: J. Geleyns – Art Photography.

The Max Planck Research Group on *Modern Geometry and the Concept of Space* was established in January 2011 and ended its activities in September 2016. It had the aim of investigating the transformation of ancient geometry into modern geometry, as read specifically through the transformation of the object of geometrical enquiry. Indeed, one of the central goals of the Research Group was to prove that the most important revolution in the history of this science occurred when the ancient geometry of *figures*—that is to say, the Euclidean mathematics of straight lines, triangles, circles, or polyhedra—became the modern geometry of *space* and spatial structures. It should be noted,

in fact, that, whereas our modern conception of geometry leads us to describe and understand it as *the science of space*, and we cannot even properly form the thought of geometry without referring to spatial structures (be they topological, projective, Riemannian, Euclidean, or non-Euclidean), in the ancient and early modern world spatial concepts were not part of the description or the practice of geometry. The whole of the *Elements* of Euclid, for one, contains no mention of space or spatial notions at all. The problem was therefore to understand how, when, and why it happened that the notion of space entered the realm of geometry, and how this new concept turned geometry on its head, transforming it from a science of figures into a science of structures, thus paving the way for modern mathematics. This kind of investigation must necessarily range across several different topics, since the emergence of a geometry of space entailed, and was produced by, many different developments in the history of science and culture. The internal evolution of geometry surely played an important role, and a few spatial notions were indeed introduced into this science in order to answer specific technical problems that were raised by early modern mathematicians. Several applied mathematical sciences contributed to this transformation as well. The Renaissance theory of perspective, for instance, or the new cosmography and modern mechanics, produced a deep change in the way in which the proper object of geometry was looked at and thought about (just as these applied sciences were, in their turn, deeply affected by the transformed geometrical ideas). An even greater role was played by metaphysics, and the development of the modern conception of space as a three-dimensional infinite extension was largely due to the working out of certain purely philosophical and theological problems, even though such new ideas immediately acquired geometrical meaning. Putting all these threads together was the main goal of the Research Group, with the aim of producing a consistent and encompassing picture of this important transformation in the history of science.

Since the conceptions of space and geometry in Antiquity and the Renaissance had already been extensively investigated in previous years, in 2015–2016 the Research Group especially concentrated on Early Modern developments of geometry as the science of space. This work represented the culmination of the previous historical studies, and was aimed at showing how the new spatial notions introduced in geometry in the previous centuries had shaped and changed modern geometry. In this connection, a special relevance has been accorded to the thought of G.W. Leibniz, whose project of an *analysis situs* (analysis of situation) was the most mature outcome of the “spatial turn” of geometry in the Early Modern Age. Several activities of the research group were, in fact, directed toward a better understanding of Leibniz’s revolutionary views on the aims and the foundations of geometry.

In 2015–2016, the Research Group continued to host a very successful *Colloquium*, inviting leading experts to talk about the history of geometry and the history of the notion of space. The Group could also avail itself of a number of externally funded visiting scholars and PhD students, who were able to usefully interact with one another and participate in the Group’s research. In 2015–2016, in particular, Edward Slowik (Winona State University, USA), Delphine Bellis (University of Montpellier, France), Eunsoo Lee (Stanford University, USA), Nabeel Hamid (University of Pennsylvania, USA), and Pierluigi Graziani (University of Urbino, Italy) visited the Research Group for several months.

The Research Group continued to have a fruitful collaboration with the Scuola Normale Superiore in Pisa (with which the Group co-organized three conferences in 2012–2014), and Vincenzo De Risi spent two months in Pisa in Winter 2015, teaching a seminar at the Scuola on the history of the epistemology of geometry. The Group established a good collaboration with the French CNRS, with which it organized two workshops on the geometry of John Wallis and Isaac Barrow, one held in Paris and the other at the MPIWG, with the participation of Philip Beeley (Oxford), Niccolò Guicciardini (Bergamo), Jesper Lützen (Copenhagen), Antoni Malet (Barcelona), Marco Panza (CNRS Paris), Siegmund Probst (Leibniz-Archiv, Hannover), Edward Slowik (UC San Diego), Moredechai Feingold (Caltech), and Ian Stewart (King’s College, Halifax). It also continued to enjoy significant cooperation with the Max Planck Institute for Mathematics in the Sciences in Leipzig. The main outcome of such a collaboration was the organization of a very successful Summer School on Leibniz in Summer 2016, which hosted some 30 students (mostly PhD students, but also some early-career postdocs and late-stage masters



Gottfried Wilhelm Leibniz © Archiv der Berlin-Brandenburgischen Akademie der Wissenschaften (ABBAW), Abteilung Sammlungen, Gelehrten Gemälde, Gottfried Wilhelm Leibniz, VZLOBO-0031/ photo: H. Kupfer.



students) in Leipzig for a week, with classes on Leibniz given by Daniel Garber (Princeton), Maria Rosa Antognazza (King's College, London), Donald Rutherford (University of California, San Diego), Justin Smith (University Paris-Diderot), Massimo Mugnai (Scuola Normale Superiore, Pisa), and Vincenzo De Risi.

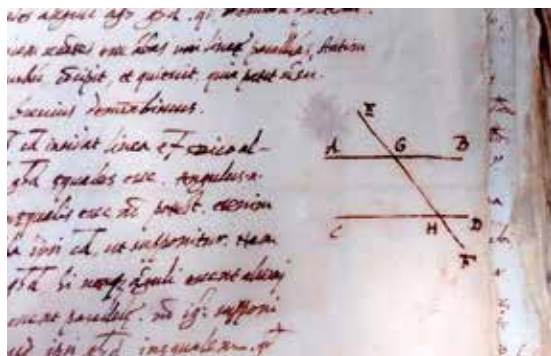
Two further international conferences on Leibniz were organized in Leipzig in 2016, in order to celebrate Leibniz's tercentenary (1716–2016) in his hometown, establishing further collaborations between the Research Group, the MPI for Mathematics in the Sciences, and the University of Leipzig: a large conference on *Theatrum naturae et artium. Leibniz und die Schauplätze der Aufklärung* in September 2016, with more than 40 speakers, and an important workshop on Leibniz and the Sciences, with the participation of Eberhard Knobloch (Berlin), Daniel Garber (Princeton), Richard Arthur (McMaster University, Canada), Maria Rosa Antognazza (King's College, London), François Duchesneau (Montréal), Justin Smith (Paris-Diderot), Philip Beeley (Oxford), André Wakefield (Pitzer College, USA), Martin Carrier (Bielefeld, Germany), Jürgen Jost (Leipzig), and Claus Kiefer (Köln).

Finally, the Research Group organized a closing conference on space and geometry, attended by several former fellows of the Group, at which some general conclusions on the research developed since 2011 were drawn. The conference was held in Summer 2015, with the participation of John Mumma, David M. Miller, Marius Stan, Valérie Debuiche, Delphine Bellis, Davide Crippa, Tal Glezer, Tzuchien Tho, and Angela Axworthy.

The collection of papers *Mathematizing Space*, edited by Vincenzo De Risi and published by Birkhäuser in 2015, marks one of the collective outputs of the Research Group. It offers several different perspectives on the relations between geometry and the notion of space from antiquity to the eighteenth century, written by leading authorities in the field, with chapters by Henry Mendell, Alexander Jones, David Rabouin, Franco Farinelli, Gary Hatfield, Douglas Jesseph, Andrew Janiak, Daniel Garber, Graciela De Pierris, Jeremy Gray, and Michael Friedman.

A second volume, dedicated to the contributions of Leibniz in this field, is currently under review and forthcoming with Springer. It hosts a few contributions of former fellows of the Research Group, as well as those of renowned international scholars.

Excerpt of a mathematical manuscript by Commandino © Library of the University of Urbino / photo: V. De Risi.



It should finally be mentioned that the publisher Birkhäuser is currently establishing a new series of monographs, titled *Frontiers in the History of Science* and edited by Vincenzo De Risi, that has in preparation several volumes dealing with topics related to the research of the MPIWG Group and written by former MPIWG fellows.

## Max Planck Research Group: Modern Geometry and the Concept of Space

## Publications 2015–2017

Axworthy, Angela. “La notion géométrique de flux du point à la Renaissance et dans le commentaire des *Éléments* de Jacques Peletier du Mans.” In *Miroir de l’amitié: mélanges offerts à Joël Biard à l’occasion de ses 65 ans*, ed. Christophe Grellard. 453–464. Paris: Vrin, 2017.

Axworthy, Angela. “The debate between Peletier and Clavius on superposition.” *Historia Mathematica* 45 (1 2018): 1–38. Online 2017.

De Risi, Vincenzo, ed. *Mathematizing space: the objects of geometry from antiquity to the early modern age*. Trends in the history of science. Cham: Springer, 2015.

De Risi, Vincenzo. “The development of Euclidean axiomatics: the systems of principles and the foundations of mathematics in editions of the *Elements* in the Early Modern Age.” *Archive for History of Exact Sciences* 70 (2016): 1–86.

De Risi, Vincenzo. “Francesco Patrizi and the new geometry of space.” In *Boundaries, extents and circulations: space and spatiality in early modern natural philosophy*, eds. Koen Vermeir and Jonathan Regier. 55–106. Cham: Springer, 2016.

De Risi, Vincenzo. *Leibniz on the parallel postulate and the foundations of geometry: the unpublished manuscripts*. Science networks: historical studies 51. Basel: Birkhäuser, 2016.

Glezer, Tal. *Kant on reality, cause, and force: from the early modern tradition to the critical philosophy*. Cambridge: Cambridge University Press, 2018. Online 2017.



## Research Services

# Research Library

HEAD OF LIBRARY Esther Chen

### Overview

The MPIWG Library's mission derives from the research projects conducted within the departments and research groups. The collections and services are designed with a strong focus on an increasingly globalized history of science. As the largest service unit and the heart of the Institute, the Library supports interdisciplinary research at the MPIWG with a multi-faceted research infrastructure on various levels.

In 2015–2017, a first focus was the expansion of the Digital Research Infrastructure towards a cutting-edge system built on Linked Data technology, conducted by the new Head Librarian Esther Chen in close collaboration with the Research IT group. In the course of this development, the Library is expanding its scope in the area of research data management and data modeling.

A second focus was to strengthen the Library's collection and collaborative network through new agreements with collections and archives worldwide, aiming to reflect the recent trend in the history of science to extend its purview to previously overlooked geographical areas.

Thirdly, numerous projects focused on increasing service usability and the collection's visibility: a three-year roadmap was drawn up, which included migrating the catalog, setting up a discovery system as a single entry point for searching all collections, and introducing an automated check-out system for books.

The Library has undergone some changes in the past years, most notably with the retirement of its longtime head, Urs Schoepflin, who left in October 2015. Schoepflin, who had been the head of the Library since the founding of the Institute in 1994, built the collections and services from scratch, shaping them for more than 20 years to cre-



ate an important collection for the history of science. He not only served the needs of MPIWG scholars and guests, but also strongly influenced digitization projects such as the open access platform ECHO: Cultural Heritage Online in its pioneer years.

### Digital Infrastructure

→ p. 386

In 2015–2017, the Library’s development of its digital infrastructure prioritized the cataloging system, the search environment, and the long-term availability and inter-connection of research data. The Library contributed to the Institute website’s re-launch and took the opportunity to revise the structure and content of its own web presence to increase the service’s usability.

### Digital Research Infrastructure

→ pp. 373ff.

The most challenging task, and among the most crucial ones for the Institute’s Digital Humanities projects, was to redesign the Digital Research Infrastructure. A new infrastructural architecture was designed to support Digital Humanities projects in an efficient way and to assure the long-term accessibility and visibility of the digitized sources and research data. The project began in 2016, in close collaboration with the Research IT department. Its goals are:

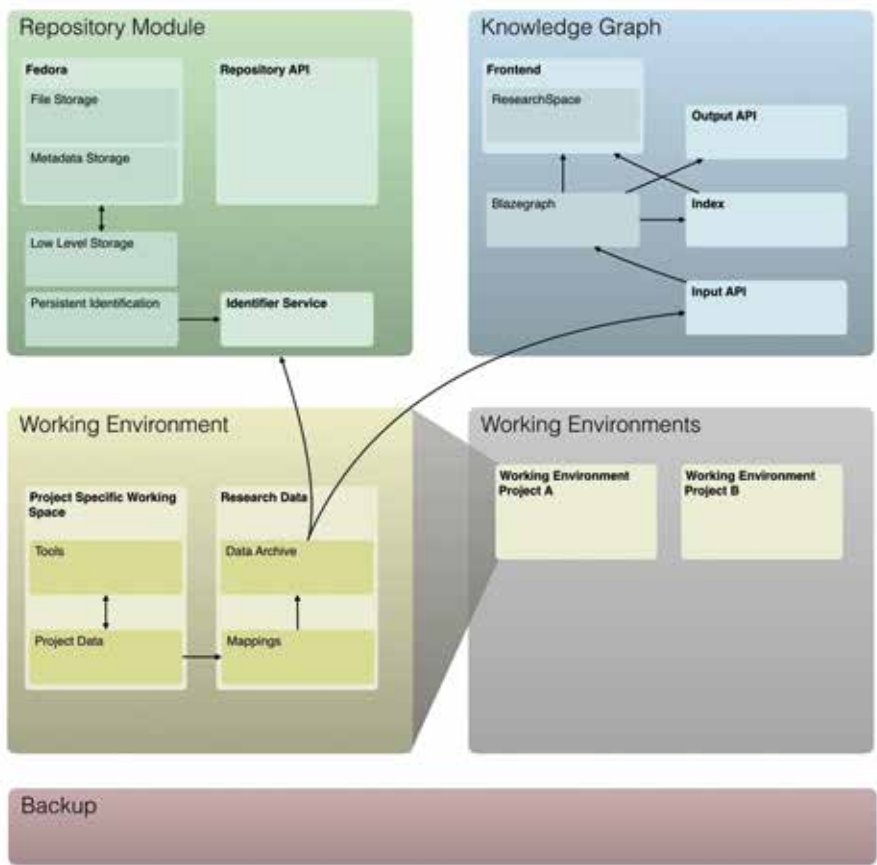
1. to streamline data management overheads, allowing advanced research results to be integrated into an accessible and sustainable information system
2. to create a clear picture of workflows and procedures for generating, storing, accessing, and preserving data at the MPIWG
3. to retroactively bring research projects into a common information space
4. to plan proactively for facilities that allow scholars to generate data in a way that benefits from sustainable integration into a common information graph
5. to create an information access and navigation space that integrates reference systems and research data, both in-house and for selected external sources.

This infrastructure will take advantage of semantic technology to enable data interoperability among the Institute’s heterogeneous data sources, including research project output and Institute infrastructural data resources such as the ECHO sources. At its core is a graph database using RDF triples based on the standard data model CIDOC-CRM.

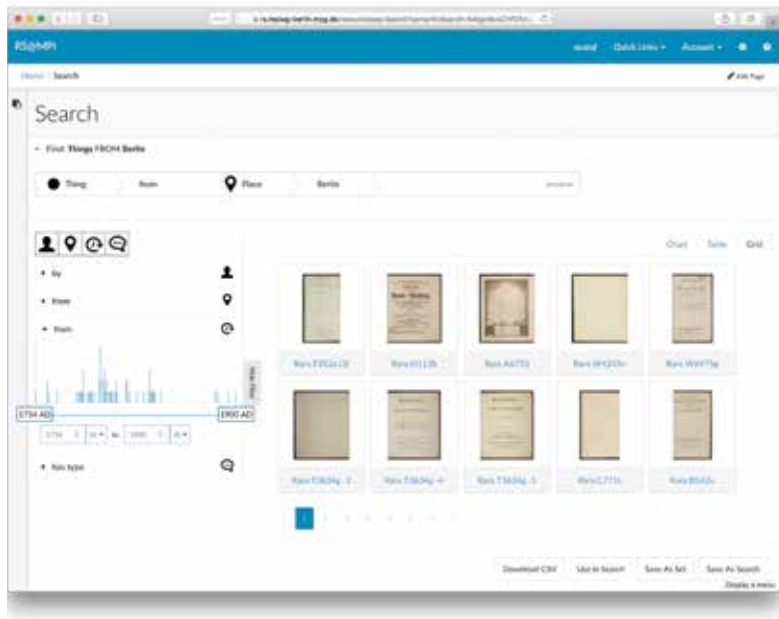
→ pp. 43–44

The project’s architecture was designed with careful attention to the needs of completed, current, and upcoming digital research projects. Matteo Valleriani’s “The Sphere: The Creation of Shared Scientific Knowledge in Europe” served as a pilot project to address the intellectual and practical challenges. In particular, the Library and the Research IT tested the effectiveness and feasibility of deploying semantic data structures using CIDOC-CRM as a base standard to enable semantic interoperability of data within and beyond the Institute.

By developing the infrastructure in this way, the Library is expanding its responsibilities in the area of research data management and data modeling. To do justice to this task and enhance their qualifications, the librarians completed training in data modeling with CIDOC-CRM.



Infrastructure diagram: The architecture of the Digital Research Infrastructure consists of a repository module and knowledge graph for persistent storage and access to research data and digital objects, flexible working environments for researchers, and an underlying backup system.



ResearchSpace: The digital collection of the Institute has been converted to RDF triples according to the CIDOC-CRM standard. This data can then be accessed through linked data platforms such as ResearchSpace, a system for working with cultural heritage data developed at the British Museum.



### Library Catalog

The Library joined the Common Library Network GBV (Gemeinsamer Bibliotheksverbund) and migrated the catalog to a new software system, hosted in Göttingen. This is based on common data standards, making it easier to share and reuse meta-data. The online catalog is now open to the public, helping scholars to plan their work ahead of their arrival at the Institute and enhancing the visibility of the Library's collections.

### Discovery System: MPIWG Search

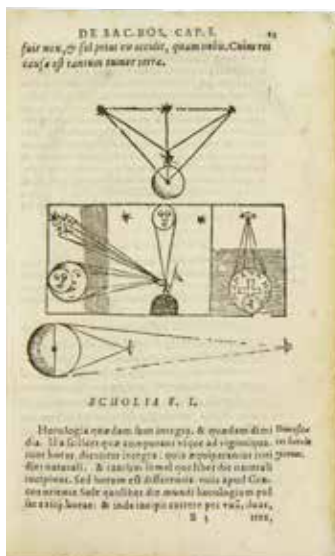
The MPIWG benefits from several features developed by the GBV. One example is a discovery system that allows users to search more than one collection at once—through the MPIWG catalog search function, scholars can also find digital and digitized collections, with direct access to full texts or images.

### Automated Loan System

During 2017, the Library's collection was fitted with RFID (Radio Frequency Identification) chips to enable an automated loan system. The system, introduced in 2018, opens up other opportunities as well: research project bibliographies can be produced automatically and features such as information resource networks can be added to the catalog.

## The Library's Collections

*Sphaera Ioannis de Sacrobosco emendata.* Antverpiae: Bellerus, 1582.



The Library attempts to facilitate research in many areas of the history of science and in addition caters to the needs of the MPIWG departments and research groups. It is not open to the public, but provides around 500 MPIWG scholars per year with a print collection of more than 85,000 books and microforms, as well as 10,000 twentieth-century archival items. Thanks to the basic provision of the Max Planck Digital Library (MPDL) and the ongoing National Licensing Program of the German Research Foundation (DFG), the Library can also offer access to over 30,000 electronic journals, over 200 full-text and reference databases, and 650,000 e-books.

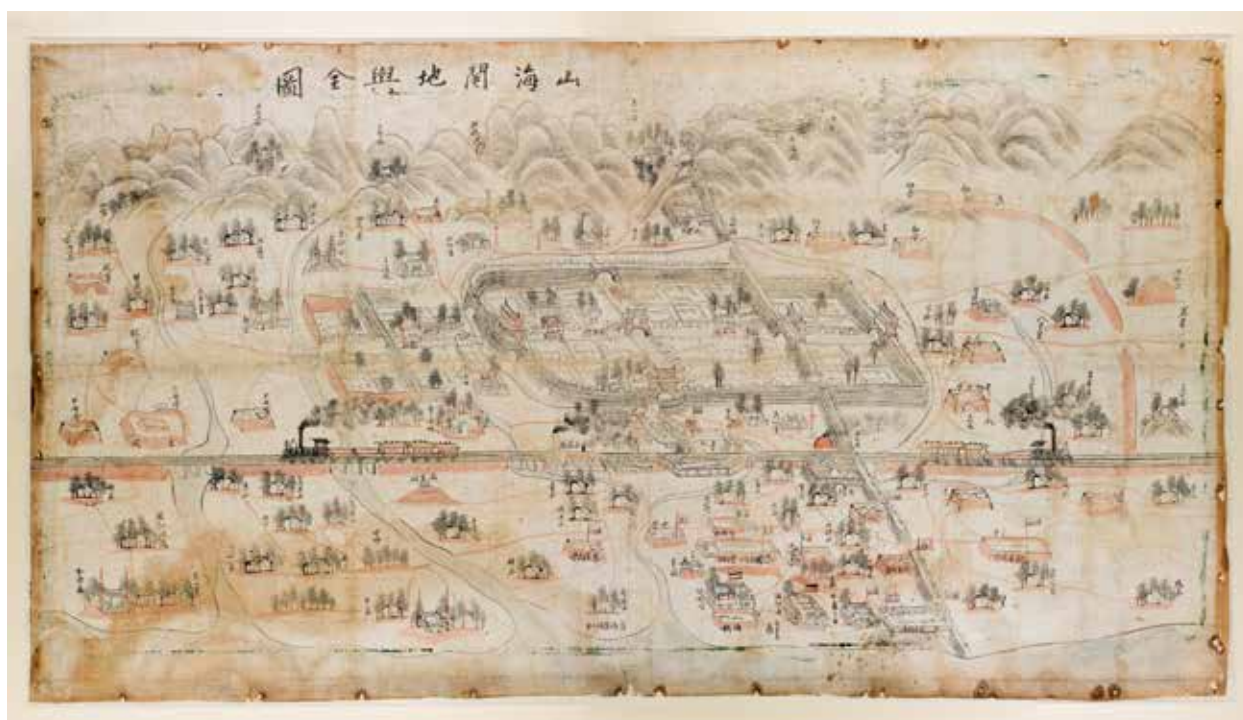
In the reporting period, the Library devoted special efforts to helping the collection meet the needs of Department III. This involved not only buying and cataloging literature and sources, but also building up expertise in East Asian canonical texts and collections—not previously part of the Library to this degree. The Library team welcomed a new colleague, trained Sinologist Cathleen Paethe, as Subject Librarian for Chinese Studies. In close collaboration with scholars from all three Departments, she is extending the Library's collection in line with the current fields of research in the East Asian region. Her expertise provides invaluable support for research projects

using Chinese sources, such as “Manchu and the Study of Language in China” by → p. 177  
 Mårten Söderblom Saarela, “The Circulation of Arabo-Persian Medical Knowledge in → pp. 177f.  
 China, Thirteenth to Eighteenth Centuries” by Dror Weil, and the joint project of  
 Departments I and III, “Visualization and Material Cultures of the Heavens: Image  
 Database Eurasia and North Africa.” East Asian books are purchased taking into ac- → p. 28, pp. 258ff.  
 count the extensive East Asia collection of the State Library, Berlin. The cooperation  
 between the MPIWG and the State Library includes the option of holding certain  
 works at the Institute on permanent loan.

An important component of the print collection is rare books, numbering approxi-  
 mately 3,500 volumes. This collection focuses on books from the sixteenth, seven-  
 teenth, and eighteenth centuries and topics including the history of mathematics,  
 mechanics, astronomy, botany, and medicine. It is carefully extended to support on-  
 going research projects. One of the focal points for acquisition in 2015–2017 was the → pp. 43f.  
 project “The Sphere,” for which the rare book collection acquired different editions of  
 Johannes de Sacrobosco’s treatise *De Sphaera*. The bibliographical information and  
 digitized images were fed into the project database and the books became part of an  
 exhibition accompanying the project. Apart from purchasing rare books, the Library  
 supported the project by locating different editions of *De Sphaera* in collections  
 worldwide and ordering digitized copies for the database.

A further emphasis in rare book acquisition was nineteenth- and twentieth-century  
 Chinese and Japanese maps. This very rare material was digitized by the Library and  
 is currently being explored by scholars from Department III. → p. 257

Shanhaiguan diyu quantu.  
 山海關地輿全圖.



Acquisitions in the print collection focused particularly on the purchase of reference works and sources in Chinese, Japanese, Arabic, and Persian—following the advice given by the Advisory Board in 2015 to adapt the collection to an increasingly globalized history of science.

### The Library's Services

The Library's service portfolio is tailored to the researchers' needs, and is regularly revised and extended.

#### Interlibrary Loan

Interlibrary loan (ILL) remains one of the Library's core services. It complements access to the Library's collections and the electronic resources of the Max Planck Digital Library. ILL is in high demand, with a continuing level of between 8,000 and 10,000 loans per year. This special service offers rapid delivery of print and digital documents, supplying items from over 500 national and international collections within days of a scholar's request and responding flexibly to the wide variety of research topics pursued at the Institute. In 2017, the collaborating network of libraries and archives was successfully extended in East Asia, especially in China, Japan, and Taiwan.

#### Reproductions, Digitization on Demand, and Conference Recording

The Library established a dedicated digitization group, equipped and qualified to digitize material to high professional standards at a rate of more than 100,000 pages per year. It is digitizing the rare book collection of the Library as high-quality color facsimiles and making these available to the public on the open access platform ECHO: Cultural Heritage Online. This material is also presented to a broader audience through the German Digital Library (Deutsche Digitale Bibliothek, DDB) and the European Digital Library Europeana.

The "Digitization on Demand" service reacts flexibly to individual researchers' short-term needs, as well as collaborating closely with larger MPIWG research projects over longer periods of time. A highlight of the service was cooperation between the Library and the Deutsches GeoForschungsZentrum (GFZ) collection in Potsdam to digitize records of nineteenth- and twentieth-century European and international grade measurement, the "Protokolle der Verhandlungen der Europäischen und der Internationalen Erdmessung." The Library digitized the GFZ material for environmental historian Wilko Graf von Hardenberg (Department III), who is investigating the history of the mean sea level.

→ p. 263

Another key project was to digitize the papers of the recently deceased Engelbert Schücking, who contributed importantly to the fields of cosmology and relativistic

astrophysics in the second half of the twentieth century. Working with Roberto Lalli from Department I, the Library managed to obtain permission from Schücking's heirs to digitize the papers for scholarly exploration. The papers are especially relevant for Department I's project "The Renaissance of General Relativity in the Post-World War II Period." They will subsequently be archived by New York University. → pp. 50ff.

Also in the field of digitization, a challenge was posed by the digitization and online display of the Library's recently purchased collection of Chinese and Japanese maps. The formats of the maps (for example, scrolls) required digitization workflows and techniques to be adapted.

In 2015, the digitization group was also intensively involved in training the "History of the Max Planck Society" project's digitization group and passing on its knowledge and expertise to new colleagues.

Conference recording has only recently become an integral part of the Library's services. It offers scholars the opportunity to record conferences and workshops as video or audio, and includes production, editing, and archiving of the recordings. The video material is disseminated in the Mediathek as part of the MPIWG's public outreach or made available to the workshop participants in a password-protected environment.

### **Copyright and Permission Requests**

The Library supports scholars in ordering high-resolution images and obtaining permission for publication from collections and archives all over the world. In 2015–2017, it worked with more than one hundred institutions from Europe, North America, and Asia to acquire publication rights for MPIWG scholars. There have been two amendments to German copyright law recently, and scholars also have to take account of regulations from the Max Planck Society or their home institutions that may require open access publication or republication of their work. The Library helps scholars find their way through this complex environment, whether by offering advice on publishing contracts or by giving general introductions to copyright law and open access publishing. To foster awareness and acceptance of open access, the Library supplies information on the open access process, publishing standards, and electronic publishing in repositories.

### **The Institute's Bibliography and Reference Management**

The Library is responsible for producing and publishing the Institute's Bibliography. In line with the Max Planck Society's open access policy, the Institute's Bibliography is uploaded to the publication server PuRe. On this server, the publication's bibliographical data and, where possible, full text are made available for internal or general use. To support scholars in their individual production of bibliographies, administration of data, and use of full texts, the Library gives general and individual introductions to reference management databases such as Zotero and Endnote.

## Cooperation and Outreach

The Library is involved in numerous collaborations around its digital infrastructure and the exchange of sources and expertise. The concept and architecture of the Digital Research Infrastructure, especially, has generated great interest within the Max Planck Society and beyond. Close partners in this project are the Bibliotheca Hertziana in Rome, the Villa I Tatti in Florence, the Swiss Art Research Infrastructure (SARI) in Zurich, and the ICS-FORTH in Heraklion, where the data model CIDOC-CRM is published. The data model is being developed further by a special interest group within FORTH that fosters collaboration with the MPIWG Library and Research IT department. Through workshops and conferences in Berlin (MPIWG, Humboldt-Universität), Atlanta (HSS), Rome (Bibliotheca Hertziana), Shanghai (Shanghai Library), and Taipei (DADH), the Digital Research Infrastructure has been introduced to a broad range of experts.

During a trip to Japan, China, and Taiwan in October 2017, Esther Chen was able to intensify cooperation between the MPIWG Library and important institutions in East Asia, such as the National Diet Library and The Oriental Library (Toyo Bunko) in Tokyo, the National Library of China, the Shanghai Library, and the National Central Library of Taiwan, with the objective of exchanging digitized sources and Digital Humanities expertise.

The Library organized a number of lectures and workshops in 2015–2017, covering topics such as open access, copyright law, and publication services. It hosted the CCS Library Lecture “Embracing and Fostering Innovation in Libraries” in 2015. To communicate the Library’s key concepts, Esther Chen frequently gave presentations at conferences for librarians and scholars.

As part of its involvement in library education, the Library has assumed another responsibility: it regularly offers internships to students of library and information science who are preparing for a career in library management. These internships prove beneficial for both sides.

As a member of the Expert Advisory Board of the German Digital Library (DDB), Esther Chen offers advice from the research library perspective.

Library team  
Sabine Bertram, Cathleen Paethe,  
Ralf Hinrichsen, Ruth Kessentini,  
Beate MacPhail, Ellen Garske,  
Urte Brauckmann, Esther Chen,  
Anke Pietzke, Matthias Schwerdt,  
Hartmut Kern (Research IT).



## Research Library

## Publications 2015–2017

Baum, Constanze and Esther Chen. “Peer Review-Verfahren und ihre Rahmenbedingungen.” *DHd: Digital Humanities im Deutschsprachigen Raum; Working Papers* (3 2016): <http://dhd-wp.hab.de/?q=content/3-peer-review-verfahren-und-ihre-rahmenbedingungen>

Bertram, Sabine. “Liddel’s published and unpublished works.” In *Duncan Liddel 1561–1613: networks of polymathy and the northern European Renaissance*, eds. Pietro Daniel Omodeo and Karin Friedrich. 264–284. Leiden: Brill, 2016.

Chen, Esther. “Gemeinsame Strategie notwendig: Podiumsdiskussion ‘Wissenschaftsschranke im Urheberrecht – eine Chance für Urheber, Verlage und Wissenschaft?’” *BuB: Forum Bibliothek und Information* 67 (2-3 2015): 84–85.

Chen, Esther. “Die Bibliothek als Verlag? Bibliotheken verorten sich (neu) als Partner im Rahmen wissenschaftlichen Publizierens.” In *Strategien für die Bibliothek als Ort: Festschrift für Petra Hauke zum 70. Geburtstag*, eds. Konrad Umlauf, Klaus Ulrich Werner, and Andrea Kaufmann. 356–368. Berlin: De Gruyter, 2016.

Pramann, Bianca, Jessica Drechsler, Esther Chen, and Robert Strötgen. “Subject indexing of textbooks: challenges in the construction of a discovery system.” In *Analysis of large and complex data*, eds. Adalbert F. X. Wilhelm and Hans A. Kestler. 621–627. Cham: Springer International Publishing, 2016.





# Digital Humanities

Robert Casties, Shih-Pei Chen, Brent Ho,  
Florian Kräutli, Dirk Wintergrün

### Research IT

Research IT acts as a central hub for Digital Humanities research at the Institute, developing new digital methods, supporting scholars in their digital research, and facilitating exchange and collaboration across the Institute and beyond. The team consists of Shih-Pei Chen, Robert Casties, Dirk Wintergrün, Brent Ho, Hartmut Kern (currently supports the work of the Library), and Florian Kräutli. Each of the Institute's three departments is assigned one member as its main contact person for digital research, to coordinate digital projects within the department and feed back activities and requirements of the scholars to the Research IT team. In Summer 2016 the group grew by two members who work outside the departments at the Institute's level. Brent Ho collaborates with the library and individual researchers on the implementation of common digital research services. Florian Kräutli joined to coordinate digital research activities across the Institute and to help develop its digital research infrastructure.

The Research IT group works closely together with the service units of the MPIWG and collaborates on projects where areas of work overlap. Examples include the Institute's website relaunch and its microsite platform, which provides a fundamental infrastructure for both communication and scholarly publishing, and the close collaboration with the library on the Institute's digital research infrastructure. Apart from working on technical solutions, such collaboration involves the specification of workflows and the growing role of the library in the area of research data management.

→ p. 386

→ pp. 364ff.

In addition to the core Research IT team, a number of other staff members contribute to the Institute's digital research. This includes researchers who use digital methods as part of their individual work, researchers involved in common projects with a strong digital focus, and colleagues working on projects that include custom software devel-

opment. Increasingly, the Institute employs additional staff members to work exclusively on the software development aspects of a research project—addressing the need for dedicated research software engineers in the Digital Humanities community and increasing the quality of in-house software development. This extended Research IT community at the MPIWG frequently collaborates in workshops and training sessions, and jointly contributes to the Institute’s digital research strategy and infrastructure.

### Work and Common Challenges

Support for digital research projects at the Institute ranges from offering advice to individual researchers on how to structure their data or which tool to employ for particular research questions, to collaborating on the application and development of more advanced technologies for Digital Humanities research. Wherever possible, existing solutions developed within industry and academia are adopted and extended in order to focus the efforts of Research IT on the specific scholarly needs and non-trivial aspects of our Digital Humanities research.

Research projects are generally conducted in parallel across the Institute and new digital methods are constantly being developed and employed to solve domain-specific research questions. These valuable experiences are shared in the weekly Research IT group meetings. Communication is crucial for addressing common challenges and how they apply to domain-specific research questions in order to continuously refine the Institute’s digital strategy, to maximize the coverage of the shared research infrastructure, and to complete the digital research lifecycle.

Common challenges include, but are not limited to, the following questions: How can one effectively analyze a large corpus in terms of textual aspects, relations in context and content, and spatial and other dimensions? This relates to the broader challenge of turning sources and research material into usable data through text mining, natural language processing, and machine learning. How can one then help researchers to intuitively and usefully explore the data? This challenge concerns visual analytics, geographical information (GIS), networks, and complex systems. At the same time, how can the Institute effectively preserve, reuse, and provide long-term service for the results of these domain-specific, heterogeneous projects? Here the concerns revolve around data modeling, knowledge organization, digital publication, long-term availability, and the design of access and retrieval systems for heterogeneous datasets.

### Data-Centered Digital Research

Since 2015, the Research IT team has been working on a major reformation of the in-house digital projects. Key drivers are the effort to get away from maintaining software to focus on the research aspects of the group’s work and the urge to better preserve the data produced in digital research projects. Research data is often accessible

only through the software that has been applied or developed within the projects. As technologies develop so rapidly, earlier research projects now face the problem that their data is no longer accessible since the software is no longer maintained. Therefore, the Research IT team follows the principle of strictly separating research data from software, so that the data can have a life of its own without being tied to specific software. This data-centric method not only can preserve research data, but also allows data from current, future, and legacy projects to be reused: new DH tools can interact with the data to provide new ways of presenting, understanding, and working with the data.

The Research IT team has been taking several approaches to reach this goal. By employing standard data models such as CIDOC-CRM, research data is now created in or being transformed into a common format that is independent of software and remains usable in the long term. Moreover, by sharing the same data model and data formats, research data produced all over the Institute can then be queried together via a generic interface and thus can interact in combination regardless of which project it was produced in. Consistently applying Linked Data principles is a key objective, as is a shift in focus from custom software development to the implementation of standard APIs, such as the International Image Interoperability Framework (IIIF). Below, specific projects that the Research IT team has been working on during the past three years are briefly introduced to demonstrate how the data-centric principle is realized in practice. For readers who are interested in learning more about the research aspects of these projects, please refer to the sections on departments and research groups for detailed information.

The *Asia Network* project works on bridging the gap between digital resources and DH tools. Digital resources, especially in the context of Asian Studies, are held by various database owners who provide open or commercial access. Research tools are generally openly accessible, but they all require scholars to prepare their source data to match specific input formats—a task that requires knowledge in data preparation and transformation. Asia Network defines a set of APIs to be shared among resource providers and tool developers. Asia Network currently acts as a broker, bridging the gap between resources and research tools. However, the API for source and tool providers is identical. This means the broker can eventually disappear, allowing tools and resources to communicate directly. → pp. 250ff.

*Local Gazetteers* serves as a case example for the kind of research that this will enable. Within the project, tools that allow researchers to collect data from digitized texts of the Local Gazetteers are developed. Researchers can convert search results into data tables, creating datasets from the textual genre that serve as the basis for further research. These can then be analyzed through existing visualization and mapping tools, which are accessible from within Local Gazetteers and enable immediate overview and intuitive filtering of the extracted research data. → pp. 251ff.

For working not only with digital facsimiles of sources that are available as images but increasingly also with full text, researchers benefit from recent advancements in the area of Optical Character Recognition methods (OCR). There are a growing number

Local Gazetteers allows researchers to analyze their collected data using geographic maps, timelines, and other visualization formats.



→ p. 78

of projects that deal with twentieth-century sources where OCR has a significantly lower error rate when converting images into processable texts. To make the processed sources available, an environment for displaying OCRed texts in different formats, for searching corpora, and for analyzing sources using text mining has been developed and is now being used in production within the *History of the Max Planck Society* project. While the current workflow is based on commercial OCR software, another version that adopts open source technologies based on Ocropus (<https://github.com/tmbdev/ocropy>) and Tesseract (<https://github.com/tesseract-ocr/tesseract>) is being developed in cooperation with the Digital Innovation Group at Arizona State University.

→ pp. 364ff.

Workflows and components that are developed within research projects all feed into the architecture of our *Digital Research Infrastructure*, which is developed jointly with the Institute's library. The infrastructure provides the foundation of our data-centric approach by creating, as one of its main components, a central Knowledge Graph. Research data produced across research projects feeds into the Knowledge Graph and becomes discoverable, usable, and maintainable in the long term. Besides the technical implementation, efforts focus on enabling this Knowledge Graph by developing CIDOC-CRM-based data models to harmonize heterogeneous research data, and on training library and Research IT staff to be equipped with the necessary expertise.

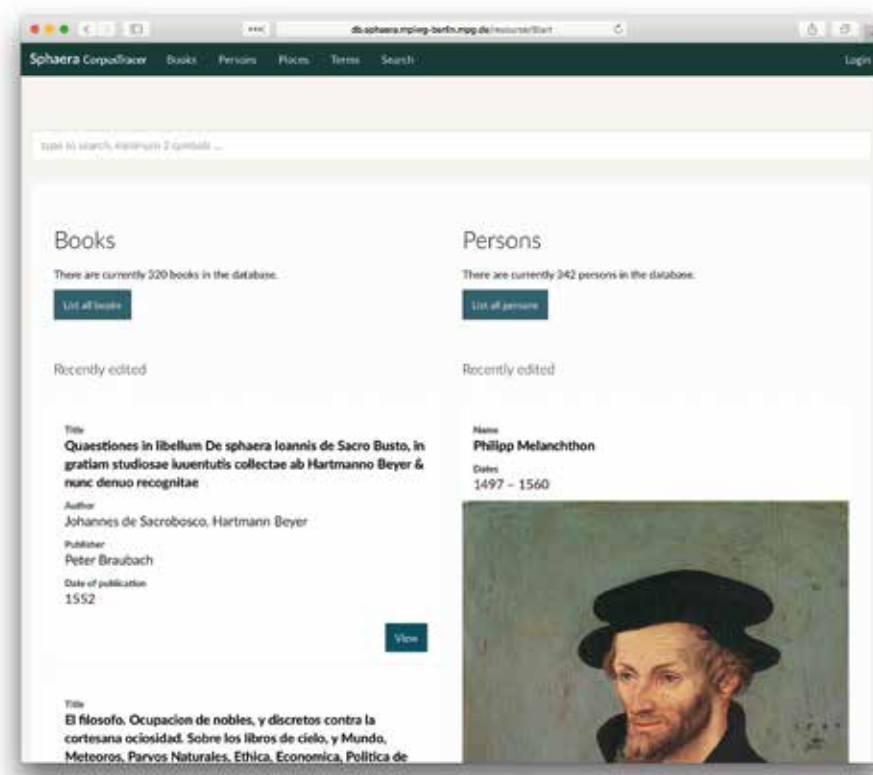
→ pp. 42ff.

Knowledge graphs allow well-documented and semantically meaningful storage and retrieval of inter-connected datasets. This makes it possible to discover links between data from different origins, e.g. information about persons, places, or institutions, if authority files are used as common reference points. Moreover, this semantically rich data enables the creation of different kinds of networks, which then can be investigated by means of methods from social network analysis.

→ p. 43f.

The project *The Sphere: Knowledge System Evolution and the Shared Scientific Identity in Europe* serves as a test case of how we can achieve data-centered research output

and what the benefits of a Linked Data approach might be. The project's complex need to not only capture bibliographic data surrounding a corpus of books, but also to represent every book's content structure along with text reuse, was met by modeling the data using FRBRoo, the CIDOC-CRM extension for bibliographic records. As there are currently limited tools available for editing CIDOC/RDF datasets in a user-friendly manner, the team requested advanced access to a platform for semantic data creation that is being developed within the ResearchSpace (<http://researchspace.org/>) project. Based on this platform an environment for semantic data creation was configured that allows a team of researchers to create, analyze, and also publish the dataset as Linked Open Data. As the configuration is based on a standard data model, it has already successfully been reused within different projects at the Institute.



The public database of the *Sphere* project offers researchers access to the data via a web-frontend and a SPARQL endpoint. Additional data, such as biographical details, are retrieved from Wikidata.

The database project of the *Islamic Scientific Manuscript Initiative* (ISMI) is one of the longest-running development projects at the Institute, having undergone several technical iterations since its inception in 2006. The data model was continually developed in close contact with the project's leading scholars, incorporating many unique features born from scholarly experience, such as the ability to record misattribution of authorship and misidentification of manuscript exemplars, or events such as the documented reading of a manuscript. The data model is based on a property-graph structure of semantic objects (texts, manuscripts, persons) and relations. Due to a lack of suitable software that could accommodate these requirements, a custom architecture was created in 2009 that allows ongoing data entry and cleaning. Since 2015 the database has been accessible through a publicly available custom frontend ([ismi.mpiwg-berlin.mpg.de](http://ismi.mpiwg-berlin.mpg.de)). Researchers can work with a preliminary dataset of 130

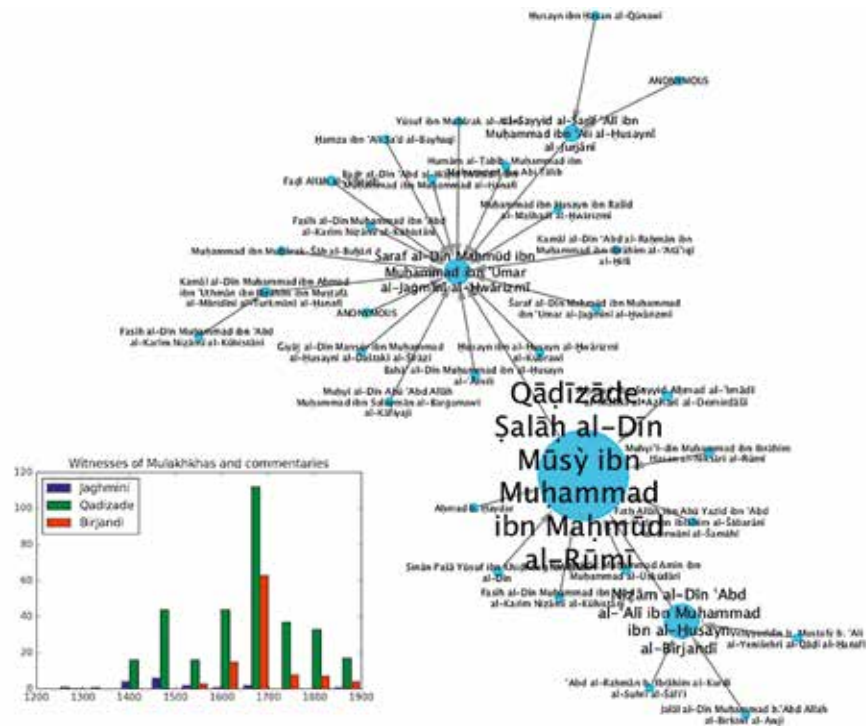


→ pp. 171ff.

scanned codices through viewers and visualization tools that have been put to successful use as part of a workshop held with invited international scholars in 2016.

The ISMI project is currently preparing to move away from the custom development of its past towards the standard technologies of the Institute’s new digital research architecture: the data model will be migrated to CIDOC-CRM, manuscript images will be displayed using IIIF, and a Drupal Microsite will be used for public display.

Graph of commentators of astronomical work *al-Mulakhkhas fi 'ilm al-hay'a* by *al-Jaghmini* (fl. 1200CE), scaled by number of witnesses, with diagram of temporal distribution, showing use of the text well into the 19th c.



→ p. 386

The *Drupal Microsite Architecture* has been developed as part of the Institute’s web-relaunch led by the Communications team. The architecture allows web-presentations for different purposes—whether standard websites, research databases or digital collections—to be set up and managed centrally. This alleviates the involvement of Research IT in the maintenance of web presentations and allows tasks to be distributed. Content for the public website can be managed by the Institute’s Communications department while technical maintenance can be assumed by IT support or an external company. The architecture easily meets common requirements, such as for the public website for the *Sphere* (sphaera.mpiwg-berlin.mpg.de) project, and also allows the quick development of more complex web projects, such as the *Reading Early English Medicine* (reem.mpiwg-berlin.mpg.de) database.

→ p. 185

In addition to “traditional” web presentations, the team is working on new ways of publishing findings that have been derived using digital research tools. Arguments

based on computational methods have to be verifiable by the reader. Research data therefore needs to be openly accessible. The same, however, applies to the algorithms and tools used to produce and process such data. The Institute has a long track record of digital publications, encompassing sources, research databases, and the *Edition Open Access* as a hybrid publication of enriched online versions and books that are available as print on demand. In recent years additional methods for publishing data (<https://dataverse.mpiwg-berlin.mpg.de>) and algorithms have been implemented using *Jupyter* notebooks and are now available as beta-versions to the entire Institute.

→ pp. 78f.

→ pp. 79f., 293f.

## Outlook

The Research IT team has taken the outlined approach towards digital research in response not only to the Institute's internal requirements, but also to the wider developments within the Digital Humanities community. In particular one can identify a growing consensus on the data standards and interfaces that are being employed. This is a key development that makes the described data-centric approach viable and enables Research IT to take advantage of the growing number of methods and research tools that are being developed within and outside the field of Digital Humanities. In addition, a shared understanding of standards already enables closer collaboration with other Institutes in the Max Planck Society and beyond, making digital research output accessible, and facilitating the joint development and sharing of digital research methods.



# Cooperation and Communication

Hansjakob Ziemer

### **The Berlin Center for the History of Knowledge and Exchange Programs**

Since its inception in 2011, the Berlin Center for the History of Knowledge—the MPIWG’s cooperation with the Freie Universität (FU), the Humboldt-Universität zu Berlin (HU), and the Technische Universität Berlin (TU)—has come to form a crucial network linking the four institutions in both intellectual and institutional terms. The Center is a forum for dialogue on innovative research agendas in the history of knowledge, exploring case studies and offering space for theoretical reflection; at the same time, it provides an infrastructure to support postdoctoral careers, promote research groups, and envision a new curriculum for teaching the history of knowledge. The Center is run by the board of the cooperation agreement, in which all four partner institutions are equally represented. The board’s term ended in fall 2017 and new members have been appointed by the presidents of the partner institutions.

The Berlin Center for the History of Knowledge has three main areas of activity. First, it aims to sharpen the intellectual profile of the history of knowledge. In 2015 and 2016, the board initiated two spring colloquium series in which board members and selected early-career and more senior scholars from the participating institutions debated the boundaries of science and knowledge. Framed as dialogues between speakers from two different institutions, the events presented case studies that showed the range and richness of new approaches. Topics included ancient Babylonian medicine; Japanese fishing methods in the twentieth century; the knowledge gathered in extreme environments such as deserts, oceans, and mountains; and knowledge production in Chinese bureaucracies or medieval weather forecasting. The discussions brought to light not only the enormously varied history of knowledge production and dissemination, but also the breadth of sources and methodologies—from textual

analysis to the study of chemical materials. The second colloquium series concluded in June 2016 with a panel discussion prepared by the Center's postdoctoral scholars, where the speakers raised more fundamental questions such as the limitations of existing vocabulary for explaining the historicity of knowledge production and transmission. The two colloquium series formed a starting point for conversations conceptualizing a curriculum for the history of knowledge, and will lead to new collaborative initiatives in graduate teaching for spring 2018.

### Colloquium Series of the Berlin Center

	Presenters	Topic
2015		
Jan 22	<i>Philipp Felsch</i> HU <i>Peter Geimer</i> FU <i>Anke te Heesen</i> HU	History of Knowledge/History of Science: A Dialogue with Philipp Sarasin
Feb 12	<i>Lorraine Daston</i> MPIWG <i>Gerd Graßhoff</i> HU	Weather Forecasting: Observation, Rules, and Prediction in Ancient Mesopotamia and Early Modern Europe
Mar 5	<i>Dagmar Schäfer</i> MPIWG <i>Jürgen Renn</i> MPIWG	Pillars and Roofs: Institutions, Practices, and Processes
May 21	Friedrich Steinle TU Jutta Müller-Tamm FU	Color Knowledge
2016		
Mar 16	<i>Markham Geller</i> FU <i>Philip van der Eijk</i> HU	Medicine in Babylonia and in Ancient Greece: Narratives of Continuity and Change
Apr 18	<i>Anke te Heesen</i> HU <i>Viktoria Tkaczyk</i> MPIWG/ HU	Fieldworks of the Ear
May 26	<i>Nadin Heé</i> FU <i>Philipp Lehmann</i> MPIWG	From Oceans to Deserts: Extreme Environments as Sites and Objects of Knowledge Production
Jun 30	Berlin Center Postdoctoral Fellows	Panel Discussion on the Boundaries of Knowledge and Science

Second, the Center hosts a joint postdoctoral program. Established in 2013, this program has been highly competitive, yielding truly international contingents of postdocs from a great variety of fields who have greatly contributed to achieving synergies among the four institutions. Sponsored by the MPG, the HU, the FU, and the TU, two cohorts of postdoctoral scholars have participated, the present one being due to finish in 2018. The program grants them great freedom to develop and publish their own research while benefiting from Berlin's rich intellectual context and access to all the

resources of the participating institutions. Each scholar is supported by one university chair or MPIWG department, and at the same time is affiliated with at least one other institution in Berlin in order to foster institutional exchange. The postdoctoral fellows have the opportunity to organize workshops, lectures, or masterclasses, inviting scholars from Berlin and beyond to discuss their own work in progress. The first cohort finished their residencies in 2015 with joint publications from the respective workshops; the second cohort, selected with two focus areas (“fieldworks of knowledge” and “practical knowledge”), began in 2016 with a series of reading groups that explored relevant sources and methods from topics as diverse as ancient mathematics, medieval medicine, and early modern geometry. The postdoctoral fellows also created a series of public lectures and masterclasses to be held in May and June 2018, reflecting their own research and the Center’s more general interests. Increasing the Berlin Center for the History of Knowledge’s international visibility, the program has also strengthened links between its institutions, resulting in a remarkable employment record for the first cohort and an enrichment of scholarly life at both the universities and the MPIWG.

Third, the cooperation institutionalizes joint research projects and groups within Berlin’s university landscape, and has proved an excellent model for other collaborations between MPIs and universities. At the heart of the cooperation agreement is the joint appointment of scholars as Max Planck Research Group Leaders (MPRGL) and university professors. Demonstrating the success of this model, Viktoria Tkaczyk was appointed leader of the Max Planck Research Group “Epistemes of Modern Acoustics” in 2015 and was simultaneously appointed W2 professor of the history of acoustic knowledge at the HU. The HU subsequently appointed her as tenured W3 professor, and in negotiations with the MPIWG it was agreed that the HU will allow her a reduced teaching load so that she can maintain her duties at the Institute until 2020, when she will make the full transition to the HU. The HU also appointed Philipp Felsch as a full and tenured W3 professor, his previous associate professorship having formed part of the HU’s contribution to the cooperation agreement. And for the first time, a joint appointment has been made by the MPIWG and the TU: after an international search in 2016, Katja Krause was appointed by the MPG as a new MPRGL and by the TU as professor of the history of science, to start in the fall of 2018. The TU has begun the search for a new W2 professor to fulfill the cooperation contract.

The Berlin Center’s network is complemented by a number of smaller-scale initiatives such as the compilation of an annotated seminar list and a series of doctoral workshops (“Studentag Literatur und Wissenschaftsgeschichte,” now in its eleventh year, currently organized by Jutta Müller-Tamm of the FU and Donatella Germanese of the MPIWG). These activities, alongside the success of the postdoctoral program, have prompted discussion on the next steps for the Berlin Center. The existing program will be consolidated and continued while focusing more strongly on providing support for doctoral students and the need for a new curriculum in the history of knowledge.



### Berlin Center Board Members and their Affiliations

FU *Peter Geimer, Jutta Müller-Tamm* (substitute: *Markham Geller*)  
HU *Philipp Felsch, Anke te Heesen* (substitute: *Gerd Graßhoff, Philip van der Eijk*)  
TU *Friedrich Steinle, Hans-Christian von Herrmann* (substitute: *Marcus Popplow*)  
MPIWG *Jürgen Renn, Lorraine Daston* (substitute: *Dagmar Schäfer*)

### Berlin Center Postdoctoral Scholars (second cohort) and their Host Institutions

*Maria Avxentevskaya* (MPIWG)  
The Physician's *Stammbuch*: Humanist Cultures of Knowledge Networking  
*Angela Axworthy* (TU Berlin)  
The Status of Practical Geometry and Its Relations to Theoretical and Applied Geometrical Knowledge in Sixteenth-Century Treatises of Practical Geometry  
*Irene Calà* (HU Berlin)  
Bleeding for Health: Galen's Views on Phlebotomy and Their Reception in Medical Works of Late Antiquity  
*Martin Jähnert* (TU Berlin)  
Photometry at the Lighthouse: Practical Knowledge between Field and Laboratory  
*Minakshi Menon* (HU Berlin)  
Hortus Oceanus Indicus: The Calcutta Botanic Garden and the Making of the Indian Ocean Environment, 1786–1847  
*Elizabeth Merrill* (MPIWG)  
Fieldworks of Architectural Knowledge in Renaissance Italy  
*Robert Middeke-Conlin* (MPIWG)  
Numerical Literacy in the Old Babylonian Kingdom of Larsa  
*Ion Mihailescu* (MPIWG)  
Weather Charts: History of Graphical Representation in Eighteenth-Century Meteorology  
*Anja Sattelmacher* (TU Berlin)  
Making Things Alive: Animation as Cultural and Epistemic Practice  
*Ylva Söderfeldt* (MPIWG)  
Knowing and Being Known: Hay Fever and the Fieldwork of Medical Knowledge 1897–1968  
*Dror Weil* (MPIWG)  
Transmission of Medical Knowledge Embedded in Islamic Texts to China, Seventeenth–Nineteenth Centuries  
*Isaiah Lorado Wilner* (MPIWG)  
Narratives of Transformation: The Globalization of Indigenous Knowledge  
*Adrian Young* (HU Berlin)  
“Going Native”: Becoming the Other as a Mode of Knowledge-Making in the British Imperial World

## Berlin Center Postdoctoral Scholars (first cohort) and their Placement Record

Scholars	New Position
<i>Teri Chettiar</i> Humboldt-Universität zu Berlin	Collegiate Assistant Professor, University of Chicago
<i>Rohan Deb Roy</i> MPIWG	Lecturer in South Asian History, University of Reading
<i>Damien Janos</i> MPIWG	Assistant Professor of Classical Islamic Thought and Dialogue, Trinity College Dublin
<i>Han Lamers</i> Humboldt-Universität zu Berlin	Assistant Professor, Department of Philosophy, Classics, History of Arts and Ideas, University of Oslo
<i>Thomas Morel</i> Technische Universität Berlin	Maitre de Conférences, University of Lille
<i>Giuditta Parolini</i> Technische Universität Berlin	Research Fellow, TU Berlin
<i>Cesare Pastorino</i> Technische Universität Berlin	Research Fellow, TU Berlin
<i>Michael Stanley-Baker</i> MPIWG	Assistant Professor of History, Nanyang Technological University, Singapore

The Institute's close ties with the Berlin universities also enable its scholars to meet new colleagues and find teaching opportunities. In past years, we have considered how to facilitate MPIWG scholars' access to the teaching experience that is so crucial for those without a tenured position. Besides the Berlin universities, in 2016–17 the MPIWG negotiated formal agreements with three new partners: Bard College Berlin, Sydney University, Australia, and the Cohn Institute/Minerva Center at Tel Aviv University in Israel. The latter two include a fellowship for MPIWG scholars and the obligation to teach one course at the partner institution; in exchange, scholars from Sydney and Tel Aviv may conduct their research as visiting scholars in one of the Institute's departments. Matteo Valleriani, Giulia Rispoli, and Monica Colominas (all Department I) visited Tel Aviv in 2016 and 2017, while Christine von Oertzen (Department II) was a guest scholar in Sydney in 2017. The MPIWG has selected various scholars to teach at Bard College Berlin.

→ pp. 423ff.

## Communication and Outreach Activities at the Institute

→ pp. 64ff.

The period 2015–17 was a busy one for outreach activities. The hundredth anniversary of Albert Einstein’s general theory of relativity in 2015 attracted a great deal of attention, not least due to the exhibition organized with the Institute’s support. There were major conferences such as “One Hundred Years of Chemical Warfare” and the Anthropocene Lectures (organized with the Haus der Kulturen der Welt and the Institute for Advanced Sustainability Studies). The Institute continued successful initiatives such as the Journalist-in-Residence program, and attracted increased media coverage, with scholars commenting on political and social issues including climate change and “fake news.” The largest project was the redesign of the Institute’s website and digital communications.

### Website Relaunch

As recommended by the Advisory Board, the Institute’s website underwent a fundamental revision of its design, content, and structure. The Institute welcomed Stephanie Hood as Communications Editor to plan and coordinate this project. Stephanie brought to the position a background in biology and history of science, and experience as an editor at the Rachel Carson Center for Environment and Society in Munich.



Landing page of the old website, in Drupal 7.

The relaunch, in Drupal 8, was managed as a bottom-up project, involving scholars and staff across the Institute. Its UI/UX design optimally combines the Institute’s complex internal and international communication requirements as well as serving as an open access research tool. Created by Novamondo, the responsive website’s index-card-style system emphasizes connections among people, projects, events, media, news, and publications. The new website integrates the previously separate Mediathek and Library pages, and uses an optimized keyword system enabling users to discover content by themes.

The Institute’s website relaunch was complemented by a new intranet, which went online in August 2017. This serves as an internal communication and information tool, offering internal news and events, administrative documents, and personal or career development opportunities. The Welcome Page—a platform providing information for guests—was also relaunched in the new design. A reorganization of the online editorial workflow and style guide supported the projects.

A major feature of these relaunch projects was the Drupal 8 “microsite” infrastructure, coordinated with the Institute’s Research IT members. The system provides a frame for additional websites with the aim of presenting more complex research, enabling greater efficiency and flexibility than the previous system with a clear framework and consistent, recognizable design.



Landing page of the new website, in Drupal 8.

### Journalist-in-Residence Program

The Journalist-in-Residence program has drawn much attention to the Institute since it began in 2013. It supports journalism in the history of science, fosters communication with the broader public, and improves dialogue between the humanities, social sciences, and natural sciences. Journalists stay at the MPIWG for around two months, chosen on the basis of their interest in the history of science and their journalistic credentials. They take an active part in the Institute's academic life, share their expertise in journalistic writing, and offer a workshop or seminar for scholars. In 2015, the program welcomed Andreas Bernard, a contributor to the *Süddeutsche Zeitung* and *Frankfurter Allgemeine Sonntagszeitung*, and in 2017, Christian Schwägerl—staff writer for the *Frankfurter Allgemeine Zeitung* and now a freelance science journalist and founder of *RiffReporter*, an online platform on science journalism. Both ran seminars reflecting on the affinities between the history of science and journalism, and the ways in which current changes in journalism may affect writing in the history of science.

#### Christian Schwägerl

For a journalist, especially a freelancer, one project tends to follow hard on the heels of the next. Impressions of scientific institutions are usually brief—even a day or two spent at an institute is a luxury. My residency at the Max Planck Institute for the History of Science in January and February 2017 gave me a valuable opportunity to dig deeper and get to know scholarship from the inside. During my eight-week stay, I was able to explore a whole spectrum of themes in conversation with scholars. I also found the space to work more intensively on a topic of my own: the history of coral reef research and the usefulness of the reef metaphor for the journalism project I co-founded, *RiffReporter*. Access to the MPIWG Library and its wonderful holdings was another great benefit, including for my work on the Anthropocene. I presented the results of my residency in a closing seminar, where participants raised many constructive and inspiring questions. I greatly appreciated the chance to take a break from day-to-day writing. My only regret was that journalism's code of ethics meant I could not turn my many intriguing impressions straight into news articles—but the longer-term impact of those insights and contacts will continue to enrich my work.



Christian Schwägerl, who conducted the seminar “Building a Media Coral Reef: Can Ecosystem Research Inspire Journalism in a Time of Media Crisis?”



Andreas Bernard, who gave a workshop on “Writing Journalism, Writing History of Science: Contradiction or Complement?”

### Andreas Bernard

My stay as Journalist in Residence at the Max Planck Institute for the History of Science, from August 15 to September 30, 2015, was a valuable and productive time for me in terms of both journalism and research. The Library’s unique resources and the many conversations with colleagues at the Institute enabled me to lay the groundwork for a scholarly study on the self in digital culture, *Komplizen des Erkennungsdienstes: Das Selbst in der digitalen Kultur*, which was published by Fischer in September 2017. I was also able to gather ideas for several popular science articles that appeared from fall 2015 onward, mainly in the *Frankfurter Allgemeine Sonntagszeitung*, where I am a staff journalist. The MPIWG program offered ideal conditions for my work at the intersection of journalism and the history of science; I benefited especially from regular workshops held by my two host departments and from their presentations and debates. For researchers like myself who constantly cross the borders between journalism and academia, the MPIWG’s Journalist-in-Residence program appears to be unique in the German-speaking world: an opportunity to spend several weeks concentrating fully on both domains and both styles of writing, surrounded by outstanding scholarship and free of the distractions imposed by day-to-day work in the editorial office.

### New Cooperation with *The Conversation*

In 2017, the Institute entered a new cooperation with *The Conversation*, an independent online platform for academics to publish their findings for a broad audience. Interdisciplinary Editor Josephine Lethbridge led several writing training seminars and offered editorial assistance on contributions published in the fall of 2017. These articles are republished in the “Feature Stories” section of the Institute’s new website. The opportunity to publish on *The Conversation* was welcomed by MPIWG scholars wishing to write for the general public, and has become a continuing feature of the Institute’s outreach activities.

### Articles published on *The Conversation*, 2017



“How to Live with Bears,” *Wilko Graf von Hardenberg* (Research Scholar, Department III), August 17, 2017.



“‘Sound of a Dog Barking’: History Reveals the Significance of this North Korean Insult to Trump,” *John DiMoia* (Visiting Scholar, Department III), September 25, 2017.



“Into the Fascist Forest: A Real Italian Controversy,” *Wilko Graf von Hardenberg* (Research Scholar, Department III), October 9, 2017.



“What Yemen Can Learn from the Historical Experience of Cholera,” *Edna Bonhomme* (Postdoctoral Fellow, Department III), October 11, 2017.



“How the Catalan Economy Benefited under Franco—and What This Means for the Ongoing Stalemate,” *Lino Camprubí* (Postdoctoral Fellow, MPRG Acoustics), October 25, 2017.



“Flying Chariots and Exotic Birds: How Seventeenth-Century Dreamers Planned to Reach the Moon,” *Maria Avxentevskaya* (Postdoctoral Fellow, Department II), December 1, 2017.

### **MPIWG in the Media and Publications for a Broader Audience**

Media coverage increased in 2015–17, both in the number of appearances and in the breadth of outlets. The Institute’s work was quoted in most major German newspapers, from the *Frankfurter Allgemeine Zeitung* and *Süddeutsche Zeitung* to *Der Spiegel*. Growing attention came from international media, including the *New York Times*, *Jerusalem Post*, *The Guardian*, *Neue Zürcher Zeitung*, and science publications including *Spektrum der Wissenschaft* and *Physics Today*.

Print journalism remains the most important channel, but there has been a continual increase in scholars’ appearances on major national broadcasting stations. Lorraine Daston and Jürgen Renn have been invited guests on “Scobel” (3Sat-TV), a major primetime TV discussion format, while Dagmar Schäfer was interviewed for the video series “TechnoViews.”

Media appearances have taken various forms: scholars have appeared as experts on historical events and persons or on the history of innovations and scientific developments, or as commentators to reflect on current issues. The Institute’s scholars appeared in reviews of publications including Jürgen Renn’s *The Road to Relativity: The History and Meaning of Einstein’s “The Foundation of General Relativity”* (with Hanoeh Gutfreund), which enjoyed a wide and high-profile reception. The 2015 centenary of Einstein’s theory of relativity occasioned around 50 media appearances, an exhibition, and an ARTE documentary.



The Institute has begun new ways of disseminating its research, using the relaunched Mediathek to publish films featuring MPIWG scholars and events that took place at the MPIWG or as part of cooperations for a wide audience. Our first video in the “Research Topics” series appeared in 2017, as an interview and tour of the Institute with Sonja Brentjes.

### Media Appearances 2015–2017 (Selection)

The note \* indicates authorship by a MPIWG scholar

#### Newspapers

“Geschichte schreiben, Geschichte machen,” interview with Jürgen Renn on the relationship between philosophy and history of science, *Berliner Zeitung* and *Frankfurter Rundschau*, January 2, 2015.

---

“Königliche Grabanlage als Innovationsmotor.” Dagmar Schäfer is quoted in this article on large-scale projects, *Der Tagesspiegel*, January 14, 2015.

---

“DH Summit: Tagung zur Zukunft der digitalen Geisteswissenschaften,” a report on the Digital Humanities Summit 2015, organized by the MPIWG and the SUB, *Göttinger Tageblatt*, March 5, 2015.

---

“Die Neuvermessung des elektronischen Speicheruniversums,” on Jürgen Renn’s talk at the conference “Zukunft der Wissensspeicher,” *Frankfurter Allgemeine Zeitung*, March 11, 2015.

---

“Pro und Kontra digitale Archive: Das Beste aus beiden Welten.” Jürgen Renn is quoted in this article on digital archives, *Stuttgarter Zeitung*, March 17, 2015.

---

“Als die Chemie Krieg führte,” quoting Florian Schmaltz, Research Scholar at the MPIWG, on the use of poison gas in World War I, *Stuttgarter Zeitung*, April 17, 2015.

---

“Der Krieg des Chemikers,” report on the conference on chemical warfare (coorganized by the MPIWG), *Süddeutsche Zeitung*, April 23, 2015.

---

“Moral war ganz egal,” a report on the conference “100 Jahre Giftgaskrieg,” *Frankfurter Allgemeine Zeitung*, April 29, 2015.

---

\* “Reiches Forscherleben.” Dieter Hoffmann, Research Scholar at the MPIWG, comments on the article “Das Chemieunglück” of April 12, 2015, *Der Tagesspiegel*, April 26, 2015.

---

“Pluralität statt Gegensatz,” review of Hans-Jörg Rheinberger’s essay “Kultur und Natur im Spiegel des Wissens,” *Frankfurter Allgemeine Zeitung*, July 8, 2015.

---

\* “Brisant,” article on the public book presentation of *Das Anthropozän: Zum Stand der Dinge*, edited by Jürgen Renn and Bernd Scherer, on December 1, 2015, *Berliner Zeitung*, November 26, 2015.

---

“Wie Berliner Wissenschaftler das Leibniz-Erbe verwalten,” Vincento De Risi on Gottfried Wilhelm Leibniz, *Berliner Zeitung*, February 21, 2016.

---

“Die Wahrheit im Blatt,” an article by Lorraine Daston about objectivity in research and history of science, *MaxPlanckForschung*, April 26, 2016.

---

“Wer das Rad erfand,” article on “Atlas of Innovations,” a digital project of the MPIWG, German Archaeological Institute, and Excellence Cluster TOPOI, *Frankfurter Allgemeine Zeitung*, September 7, 2016.

---

\* “Everest Is Not the World’s Tallest Mountain—and Here’s Why,” Wilko Graf von Hardenberg on divergent average sea levels, *New Scientist*, February 8, 2017.

“Mit dem Grabstichel. Ein Essay über Gaston Bachelard und Albert Flocon,” review of Hans-Jörg Rheinberger’s book *Der Kupferstecher und der Philosoph*, *Frankfurter Allgemeine Zeitung*, March 1, 2017.

“Was ich gesehen habe, hat meine Befürchtungen noch übertroffen.” Florian Schmaltz discusses his findings from research at the Max Planck Institute for Psychiatry, *Süddeutsche Zeitung*, March 14, 2017.

“Wissenschaften sind veränderliche Kulturtechniken.” Hans-Jörg Rheinberger calls for an interdisciplinary perspective on nature and culture, *Neue Zürcher Zeitung*, August 3, 2017.

“Du lebst und tust mir nichts?” Hans-Jörg Rheinberger is mentioned in article about dioramas and the relationship between visual arts and stuffed animals, *Frankfurter Allgemeine Zeitung*, October 17, 2017.

“Historia Obscura,” Research Scholar Sonja Brentjes on the presentation of Islamic history at Berlin Science Week, *Frankfurter Allgemeine Sonntagszeitung*, November 5, 2017.

#### Online

“Giftgas: Der unsichtbare Feind,” report on the conference on one hundred years of chemical warfare, coorganized by the MPIWG, *Solarify*, April 22, 2015.

“Press Reviews for World Factory at The New Wolsey Theatre, Ipswich and The Young Vic, London,” a survey of reviews of Zoë Svendsen’s play *World Factory*, *Metis Arts*, April 30, 2015.

“How to Turn a Liberal Hipster into a Capitalist Tyrant in One Evening,” interview with Zoë Svendsen on her new play *World Factory*, *The Guardian*, May 24, 2015.

“Licht hat auch eine Kulturgeschichte,” interview with Jürgen Renn and Matthias Schemmel on the cultural history of light, *www.mpg.de*, May 26, 2015.

“Die Physiker.” Dieter Hoffmann is quoted in this article about Nazi research on the atomic bomb, *Süddeutsche Zeitung*, July 5, 2015.

“Wissenschaftsgeschichte Asiens,” interview with Dagmar Schäfer, Head of Department III, on history of science in Asia, *forschergeist.de*, July 6, 2015.

“Ein letztes Mal: 50 Jahre deutsch-israelische Beziehungen,” interview with Jürgen Renn on the role of the sciences in German–Israeli relations, *Bayerischer Rundfunk*, July 22, 2015.

“Wie viel wiegt ein Kilo?” Dieter Hoffmann on the weight of the kilogram, *n-tv.de*, November 9, 2015.

\* “Konnektivität und Verbindlichkeit: An interview with Jürgen Renn.” Jürgen Renn on future prospects of the history of science and the possibilities of new digital methods, *shellsandpebbles.com*, November 17, 2015.

\* “*The Invention of Science: A New History of the Scientific Revolution* by David Wootton Review: A Big Bang Moment,” by Lorraine Daston, *The Guardian*, November 28, 2015.

“Rice: Global Networks and New Histories,” interview with Dagmar Schäfer and Francesca Bray, *New Books in East Asian Studies*, December 14, 2015.

“Wenig Worte über den nötigen Verzicht,” report on Jürgen Renn and Bernd Scherer’s publication *Das Anthropozän: Zum Stand der Dinge*, *Deutschlandradio Kultur*, February 10, 2016.

“Gravitational Waves: Ripples in the Fabric of Spacetime Lost and Found,” blog article by Hanoch Gutfreund, coauthored with Diana K. Buchwald and Jürgen Renn, *Huffington Post*, February 12, 2016.

\* “Gravitationswellen—verloren und wiedergefunden,” article by Jürgen Renn, coauthored with Diana K. Buchwald and Hanoch Gutfreund, *Frankfurter Allgemeine Zeitung Online*, February 19, 2016.

“Experimenteller Geist,” interview with Hans-Jörg Rheinberger on epistemology, *Lettre International*, April 19, 2016.

“Topoi—wissenschaftliches Publizieren von Objekten.” Jürgen Renn is quoted in this article about the publication platform Edition Topoi, *Deutschlandfunk*, April 20, 2016.

\* “Kann der Mensch es besser machen als die Evolution?,” article by Hans-Jörg Rheinberger on the history and future of genetic engineering, *Neue Zürcher Zeitung*, May 31, 2016.

“Gibt es einen Imperialismus der Naturwissenschaft?” Lorraine Daston is quoted in an article on science and modernity, *Deutschlandfunk*, June 16, 2016.

\* “Can Liberal Education Save the Sciences?,” article by Lorraine Daston, *The Point*, June 22, 2016.

“Menschheitsgeschichte—Wissenschaftsgeschichte,” an article discussing Lorraine Daston’s Einstein Forum lecture in Potsdam, *Neue Zürcher Zeitung*, June 25, 2016.

“How the Artisan Spirit Transcends Time,” a Chinese newspaper reviews Dagmar Schäfer’s book *The Crafting of the 10,000 Things*, *Jiefang Daily*, August 6, 2016.

“Bauchgefühl ist nicht Wahrheit,” Lorraine Daston on “post-truth” and opportunities for new ideas, *Tages-Anzeiger / Der Bund*, February 18, 2017.

“Die Gesetzlosigkeit des Netzes wird kaltblütig ausgenützt,” interview with Lorraine Daston on the “post-truth” era, *Süddeutsche Zeitung*, March 7, 2017.

“Journalistic Practices and Knowledge Production,” report on a workshop organized by the MPIWG in cooperation with the DHI in Washington, DC, *historyofknowledge.net*, April 26, 2017.

“Steckt die Wissenschaft in einer Vertrauenskrise?” Lorraine Daston discusses the state of science in the post-fact era, *Die Zeit*, June 28, 2017.

“Forschung im postfaktischen Zeitalter.” Lorraine Daston is mentioned in this article about the increasing pressure faced by science, *vdI nachrichten*, July 27, 2017.

“The Sound of the Oceans,” interview with Lino Camprubí on marine acoustics research and what marine biologists have learned, *www.mpg.de*, August 4, 2017.

“The Inconstant Level of the Sea,” Wilko Graf von Hardenberg on the inconstancy of a geographical reference point, *www.mpg.de*, August 9, 2017.

“Die Welt als Muskel und Bewegung,” review of Emeritus Scientific Member Hans-Jörg Rheinberger’s book *Der Kupferstecher und der Philosoph. Albert Flocon trifft Gaston Bachelard*, *Neues Deutschland*, December 2, 2017.

“Antropoceno: E se formos os últimos seres vivos a alterar a Terra?,” featuring the cooperation of Jürgen Renn and the Anthropocene Curriculum with Haus der Kulturen der Welt, *Publico*, December 2, 2017.

“24. Dezember 1938: Weihnachtsspaziergang ins Atomzeitalter,” an article on Lise Meitner’s and Otto Frisch’s discovery of nuclear fission, quoting Annette Vogt, *Der Standard*, December 23, 2017.

---

## Radio

“Die Abschaffung der Gene.” Hans-Jörg Rheinberger is quoted in this radio feature about the history of genetics, *Deutschlandfunk*, February 8, 2015.

---

“Suche nach der Weltformel. Wie Physiker das Universum erklären wollen.” Jürgen Renn reflects on particle physics and how it influences philosophy and society, *Deutschlandradio Kultur*, March 19, 2015.

---

“Die Natur lässt sich nicht zwingen,” interview with Hans-Jörg Rheinberger on the history and philosophy of the experiment, *ORF*, April 7, 2015.

---

“Wie hoch ist der Meeresspiegel?,” an interview with Wilko Graf von Hardenberg, *Deutschlandradio Kultur*, March 9, 2017.

---

“The Inconstant Level of the Sea,” Wilko Graf von Hardenberg on the inconstancy of a geographical reference point, *RBB-Kulturradio*, August 4, 2017

---

“Das Nullniveau schwankt,” interview with Wilko Graf von Hardenberg on measuring the sea level, *RBB-Kulturradio*, August 9, 2017.

---

“In Publica Commoda—zum Wohle aller,” Hans-Jörg Rheinberger on the role of science in society, *NDR Info*, November 22, 2017.

---

“Das trügerische Gefühl der bevorstehenden Katastrophe,” interview with Lorraine Daston on the effect of climate change on nature, *Deutschlandfunk*, November 30, 2017.

---

“Kleine Teilchen – Große Hoffnung,” Jürgen Renn is cited in RBB Kulturradio feature on quantum physics, *RBB Kulturradio*, December 21, 2017.

---

## TV

“Ein letztes Mal: 50 Jahre deutsch-israelische Beziehungen,” interview with Jürgen Renn on the role of the sciences in German–Israeli relations, *Bayerischer Rundfunk*, July 22, 2015.

---

“Scobel: Einsteins Irrtümer,” Jürgen Renn guests on the program *Scobel*, *3Sat*, November 7, 2015.

---

“Mythos Einstein—Leben und Werk eines Rebellen,” documentary produced with support by the MPIWG, *ARTE*, November 19, 2015.

---

“Comeniusgarten in Berlin: Integration von Jugendlichen,” social project Comenius-Garten, an MPIWG cooperation partner, celebrates 25 years, *ARD*, July 24, 2016.

---

“Seefahrer des Orients-Chinas Aufstieg zur Seemacht,” Dagmar Schäfer interviewed in a documentary, *ARTE*, December 23, 2016.

---

“Thema des Tages: ‘Werkstatt des Wissens’ im Comenius-Garten eröffnet,” feature on the social project Comenius-Garten, an MPIWG cooperation partner, *TV.Berlin*, March 28, 2017.

---

“Scobel: Fakes & Fakten,” Lorraine Daston is a guest on the program *Scobel*, *3Sat*, August 31, 2017.

---

## Media Coverage of the Einstein Anniversary 2015

Entries with \* indicate authorship of the MPIWG researcher

---

“Tutto Albert nella rete,” Jürgen Renn and Roberto Lalli on Albert Einstein’s correspondence, *Domenica*, January 4, 2015.

---

“Suche nach der Weltformel. Wie Physiker das Universum erklären wollen,” Jürgen Renn on particle physics and how it influences philosophy and society, *Deutschlandradio Kultur*, March 19, 2015.

---

“Diede un volto più umano alla scienza,” an interview with Jürgen Renn, *Sette*, April 3, 2015.

---

“Weltweiser und Revolutionär,” Jürgen Renn and Alexander Blum are interviewed on Albert Einstein, *ORF*, April 17, 2015.

---

“Der wertvollste Fund meines Lebens,” a radio feature quoting Jürgen Renn on Albert Einstein, *Deutschlandfunk*, May 24, 2015.

---

“Was aber ist die Zeit?” Jürgen Renn is interviewed on Einstein and his theory of relativity, *Berliner Zeitung*, May 31, 2015.

---

“Und es expandiert doch ...,” a radio broadcast on the expansion of the universe with Jürgen Renn, *Deutschlandfunk*, June 23, 2015.

---

“Albert Einstein’s stupendous work: It’s all relative,” a review of Hanoch Gutfreund’s and Jürgen Renn’s new publication “The Formative Years of Relativity: The History and Meaning of Einstein’s Princeton Lectures” (Princeton University Press, 2017), in *The Jerusalem Post*, August 2, 2015.

---

“For an Einstein anniversary, some new knowledge,” review of the new book by Hanoch Gutfreund and Jürgen Renn, *The Washington Post*, August 19, 2015.

---

\* “Dellen in der Raumzeit,” Jürgen Renn on Einstein, *Süddeutsche Zeitung*, September 28, 2015.

---

“The Road to Relativity,” review of the book by Hanoch Gutfreund and Jürgen Renn, *Science News*, October 8, 2015.

---

“Der kleine Wiener Beitrag zur Relativitätstheorie,” interview with Alexander Blum, *Der Standard*, October 8, 2015.

---

“Relativitätstheorie ‘voll im Schwung,’” Jürgen Renn on Einstein’s General Theory of Relativity, *Wiener Zeitung*, October 8, 2015.

---

“Einsteins Fehler – und was sich daraus lernen lässt,” Jürgen Renn on Einstein’s correction of mistakes, *Der Standard*, October 15, 2015.

---

“Die erste Pop-Ikone der Wissenschaft,” interview with Jürgen Renn, *Wirtschaftsblatt*, October 29, 2015.

---

“Einstein stellt seine Allgemeine Relativitätstheorie vor,” interview with Jürgen Renn, *Deutschlandfunk*, November 5, 2015.

---

\* “Arch and scaffold: How Einstein found his field equations,” article by Michel Janssen and Jürgen Renn on Einstein’s writings on the General Theory of Relativity, *Physics Today*, November 5, 2015.

---

\* “History: Einstein was no lone genius,” article by Jürgen Renn and Michel Janssen, *Nature*, November 20, 2015.

---

\* “Ihm ist nichts zugeflogen,” article on Einstein’s Theory of Relativity by Jürgen Renn, *Der Spiegel*, November 20, 2015.

---

“Comprender el funcionamiento del Universo era la religión de Einstein,” Jürgen Renn is interviewed on Einstein’s Theory of Relativity, *El Mundo*, November 23, 2015.

“Verstehen Sie Einstein?,” review of Hanoch Gutfreund’s and Jürgen Renn’s book on Einstein’s Theory of Relativity, *Frankfurter Allgemeine Zeitung*, November 25, 2015.

“100 Jahre Allgemeine Relativitätstheorie,” a radio broadcast on Einstein’s Theory of Relativity with Jürgen Renn, *Deutschlandfunk*, November 25, 2015.

dpa published an article on the Einstein centenary with quotations from Jürgen Renn and Alexander Blum. Wide coverage with over 30 reprints in German newspapers such as: Frankfurter Rundschau, taz, Focus online, Mittelbayerische Zeitung, Augsburg Allgemeine, November 26, 2015.

“Einsteins Weg zur allgemeinen Relativitätstheorie,” article on Einstein’s Theory of Relativity by Jürgen Renn and Michel Janssen, *Spektrum*, November 26, 2015.

“Einstein: Missionary of Science,” article by Jürgen Renn for the blog series on the 100th Anniversary of Einstein’s General Theory of Relativity, *Princeton University Press Blog*, November 26, 2015.

“Einstein war oft auf dem falschen Pfad,” a radio broadcast about Einstein’s Theory of Relativity with Jürgen Renn, *Deutschlandradio Kultur*, November 26, 2015.

“Die vierte Dimension und die Kunst,” a radio broadcast about Einstein’s Theory of Relativity and its influence on art with quotations from Jürgen Renn, *Deutschlandradio Kultur*, November 26, 2015.

“A 100 años de la Teoría de la Relatividad, que permitió entender mejor al Universo,” article on Einstein’s Theory of Relativity with quotations from Jürgen Renn, *Tiempo Argentino*, November 26, 2015.

“Der Durchbruch zur Relativitätstheorie,” article on Einstein’s Theory of Relativity with quotations from Jürgen Renn, *Bild der Wissenschaft*, November 26, 2015.

“Einstein’s legacy, 100 years on,” blog article on Einstein with a video comment by Jürgen Renn, *physicsworld.com*, November 26, 2015.

\* “Einstein inside. Eine Wanderausstellung zu 100 Jahre Relativitätstheorie,” article about an Einstein exhibition by Alexander Blum and others, *Sterne & Weltraum*, December 18, 2015.

“The Road to Relativity,” review of Hanoch Gutfreund’s and Jürgen Renn’s publication, *pro-physik.de*, February 17, 2016.

“Die Timeline der Genies,” Jürgen Renn is quoted in this article on the concept of a digital Einstein Archive, *Hannoversche Allgemeine Zeitung*, May 6, 2016.

“Soldat, der Schwarze Löcher vorhersah,” Matthias Schemmel quoted in an article on Karl Schwarzschild’s contribution to the General Theory of Relativity, *ORF*, May 11, 2016.

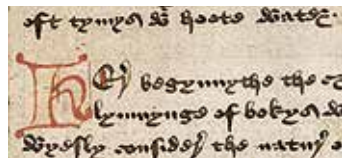
“The Chirps and Ripples in the Universe That Prove Einstein Was Right,” review of Hanoch Gutfreund’s and Jürgen Renn’s book, *The New York Times*, August 25, 2017.



### Research Topics Online and in Print

The MPIWG has continued its “Research Topics” format, where researchers present a relevant aspect of their research issue: 53 had been published by the end of 2017. Each appears on the Institute’s home page, as a printed flyer, and as a poster in the entrance hall. The new website enabled development of the format, to include more images and videos from the Mediathek. This paves the way for increased frequency, wider distribution (including sharing on social media), and connections with other media.

#### Research Topics 2015–17 (Nos. 38–53).



38 *Sylvie Neven*  
Colors and Their Contexts



39 *Viktoria Tkaczyk*  
From Sound to Knowledge



40 *Elena Aronova*  
Do Data Have Politics?



41 *Alexander Blum*  
The Renewal of Einstein’s Theory of Relativity



42 *Wilko Graf von Hardenberg*  
How High Is the Sea?



43 *Alexander Blum, Roberto Lalli,  
and Jürgen Renn*  
One Hundred Years of Gravitational Waves



44 *Philipp Lehmann*  
Mapping Climatology



- 45 *Emily Brownell*  
Refugee Housing



- 46 *Joyce van Leeuwen*  
Early Modern Adaptation of the Aristote-  
lian Mechanics



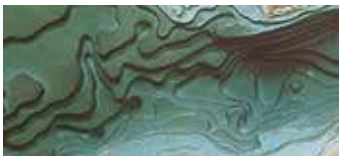
- 47 *Joeri Bruyninckx*  
Scientific Scores and Musical Ears



- 48 *Sebastian Felten*  
Data and Decisions in Early Modern  
Mines



- 49 *Tina Asmussen*  
Mountain Clamor!



- 50 *Lino Camprubi*  
The Strait in the Cold War



- 51 *Tamar Novick*  
The Wonders of Bodily Waste



- 52 *Wilko Graf von Hardenberg*  
How to Live with Bears



- 53 *Sonja Brentjes*  
Visualization and Material Cultures of the  
Heavens in Eurasia and North Africa  
(4000 BCE–1700 CE)

## Outlook

The Institute's new website widens our opportunities in online communication. Future projects will include the Mediathek, search engine optimization, blogs, and expansion of the "Research Topics" series. Attention to social media and training of scholars in writing for the public will run alongside these developments.

Print media will be relaunched to fit the new digital design. These developments will be complemented by a stronger focus on public outreach activities, including the Anthropocene Lectures, Science Slams, Max Planck Day, and Lange Nacht der Wissenschaften in cooperation with other Berlin institutions. Planning is also underway for events and activities to celebrate the MPIWG's 25th anniversary in 2019.

# Joint Activities

RESEARCH COORDINATOR Ohad Parnes

As a complement to research activities within Departments and Research Groups, certain activities take place on a cross-departmental basis. These activities are often organized by ad hoc steering teams, composed of representatives of Departments and Research Groups, with the support of the Research Coordinator.

### **Institute's Colloquium Series**

Since its establishment in 1994, the Institute's Colloquium has become both an important in-house forum and an internationally recognized venue for the discussion of cutting-edge trends in the history of science. Since 2016, the scheme has been extended and modified: speakers in the Series are invited to stay at the Institute for an entire week, enabling an exchange with MPIWG scholars, and in addition to their public talk they also participate in a seminar dedicated to a specific aspect of their research. Most of the speakers in the academic years 2016/17 and 2017/18 were invited following suggestions made by younger members of the Institute (pre- and post-doctoral fellows), following an MPIWG-wide call for nominations for this series.

### **Institute's Colloquium 2015/2016**

#### **Institutions of Science in History**

ORGANIZED BY MEMBERS OF DEPARTMENT I

*Giulia Giannini, Pietro Daniel Omodeo, and Matthias Schemmel*

October 13, 2015

Institutions of Knowledge in Islamicate Societies: Patronage, Books, Families,  
the Arts

*Sonja Brentjes (MPIWG)*

---

November 3, 2015  
Citizen Science in the 19th and 21st Centuries  
*Sally Shuttleworth* (MPIWG)

---

December 15, 2015  
A Cluster of Excellence? The Museion in Alexandria and the Development of  
Ancient Geography  
*Klaus Geus* (MPIWG)

---

January 26, 2016  
Forms of Knowledge and Their Settings: Some Ancient Greek Cases  
*Markus Asper* (MPIWG)

---

February 23, 2016  
Knowledge and Institutions in the Middle Ages  
*Johannes Helmuth* (MPIWG)

---

March 15, 2016  
The Commercialization of Science within the Max Planck Society  
*Jaromir Bacar* and *Alexander von Schwerin* (MPIWG)

---

April 26, 2016  
Time(s) for Planning: Labor as Scientific Object in Socialist Romania  
*Alina-Sandra Cucu* (MPIWG)

---

Mai 24, 2016  
Knowledge Institutions: A Search for Traces in European Prehistory  
*Michael Meyer* (MPIWG)

---

June 7, 2016  
The Max Planck Institute for Human Development: Education, Human  
Development, and Gender Issues  
*Ulrike Thoms* and *Birgit Kolboske* (MPIWG)

---

June 28, 2016  
Paradox and Propositio: Arguing against Received Opinion in and outside the Early  
Modern University  
*Anita Traninger* (MPIWG)

---

**Institute's Colloquium 2016/2017****Beyond the Horizon: The History of Science in Context**ORGANIZED BY *Ohad Parnes*, Research Coordinator

October 18, 2016

How Did East Asians Become Yellow?

*Michael Keevak* (National Taiwan University)

November 22, 2016

The Unbearable Lightness of History: Comparing German and Vietnamese Refugees in East and West Germany

*Peter van der Veer* (Max Planck Institute for the Study of Religious and Ethnic Diversity, Göttingen, Germany)

December 20, 2016

Gender and Technology in Twentieth-Century China: Textile Production between Household and Factory

*Jacob Eyferth* (University of Chicago, USA)

January 31, 2017

Artful Nature in Early Modern Times: A Case Study in the Field of Widespread Topos

*Robert Felfe* (Universität Hamburg, Germany)

February 13, 2017

Humanists and Time, or: Kepler Wagging his Tail

*Gadi Algazi* (Tel Aviv University, Israel)

March 21, 2017

Speech, Slavery, and Natural History in the Anglo-Caribbean World

*Miles Ogborn* (Queen Mary University of London, UK)

April 4, 2017

Institutions, Identities, and Historical Practices in Science and Medicine

*Ludmilla Jordanova* (Durham University, UK)

May 2, 2017

Who Gets the Credit? The Production of the Future under Modern Capitalism

*Timothy Mitchell* (Columbia University, New York City, USA)

May 30, 2017

The Scientific Journal: A Political History

*Alex Csiszar* (Harvard University, Cambridge, USA)



June 19, 2017

Evening Talk and Screening. Forgotten Paths of Empire: Firestone and the Promise of Liberia

*Gregg Mitman* (University of Wisconsin-Madison, USA)

---

July 4, 2017

On the Parallelism between Big Data and Divinatory Semantic

*Elena Esposito* (University of Modena and Reggio Emilia, Italy)

---



**Institute's Colloquium 2017/2018**

**Beyond the Horizon: The History of Science in Context**

ORGANIZED BY *Ohad Parnes*, Research Coordinator

November 14, 2017

Popular Medicine in Antiquity

*William Harris* (Columbia University, New York City, USA)

---

December 5, 2017

The Worldwide Rise of "No Religion" and Its Significance

*Linda Woodhead* (Lancaster University, UK)

---

January 8, 2018

Wave Science and Its Forms

*Stefan Helmreich* (Massachusetts Institute of Technology, Cambridge, USA)

---

February 20, 2018

Knowledge and Description

*Michael Squire* (King's College London, UK)

---

March 20, 2018

Digital History, Quantitative History: Between the Humanities and the Social Sciences

*Claire Lemerrier* (Research Director CNRS, Paris, France)

---

April 24, 2018

Medieval Computus: Three Arguments for Its Significance to Historians of Science

*Faith Wallis* (McGill University, Montreal, Canada)

---

May 22, 2018

Information, Knowledge, and the Copernican Delay

*Clifford Siskin* (New York University, USA)

---

June 19, 2018

Media History and Its Objects

*Lisa Gitelman* (New York University, USA)

---

July 3, 2018

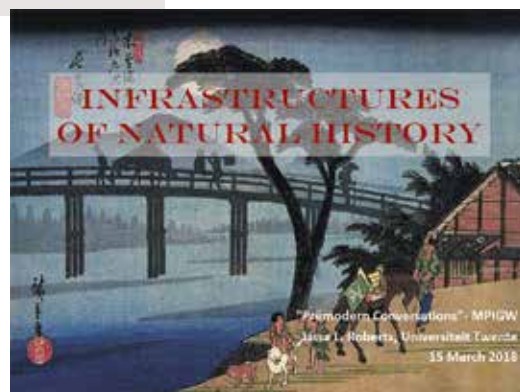
Pre-War Kulturwissenschaft in Cold War Berlin

*Elizabeth Sears* (University of Michigan, Ann Arbor, USA)

---

### “Premodern Conversations” Seminar Series

Premodern Conversations is a monthly seminar on pre-modern and early-modern topics, aiming to offer researchers at postdoctoral level and higher an informal space to discuss their work-in-progress. The meetings are also intended to provide a convivial meeting place where pre-modernists and early-modernists can meet their colleagues visiting the Institute and find fruitful connections across the intellectual breadth of the MPIWG. The seminars are also widely attended by scholars affiliated with various other research institutions in Berlin: HU Berlin, FU Berlin, TU Berlin, ICI Berlin, Institute for the History of Medicine of the Charité, etc.



In the academic year of 2016/2017 the series was organized by Marius Buning (Department III) and Jaya Remond (Department II) and in 2017/2018 by Maria Avxentevskaya (Berlin Center for the History of Knowledge/Department II) and Marius Buning.

The seminar emerged as a cross-departmental activity, reflecting the common interest of scholars from all Departments and Groups in pre- and early-modern historical research. Starting in the academic year of 2018/19 the series will be integrated as the main research colloquium of the Junior Research Group “Experience in the Pre-Modern Sciences of Soul and Body, ca. 800–1650” led by Katja Krause.

→ pp. 347ff.

### 2015/2016

January 21, 2016

Rethinking the “One-Sex” Body: Sex, Gender, and Medicine in the Medieval World  
*Katharine Park* and *Ahmed Ragab* (Harvard University, Cambridge, USA)

---

February 18, 2016

Expertise (on the material of early modern Russian history)  
*Clare Griffin* (MPIWG)

---

March 17, 2016

Gestures and Experiment as Historical Method  
*Daniel Jaquet* (Centre d’Etudes Supérieures de la Renaissance, Tours, France)

---

April 21, 2016

Categorical Binaries (on the material of the history of Chinese medicine)  
*Michael Stanley-Baker* (MPIWG)

---

June 16, 2016

Sanskrit, Plants, and Paper: Botanical Knowledge Making in East India Company Bengal, c. 1790

*Minakshi Menon* (MPIWG)

---

July 21, 2016

The Notion of Industry

*Kaijun Chen* (Brown University, Providence, USA)

---

October 10, 2016

Toward the History of Everything? How to Move between the History of Science, History of Technology, and Global History

*Lissa Roberts* (University of Twente, The Netherlands)

---

November 23, 2016

Uncertainty, Risk, and Fortune

*Tina Asmussen* (MPIWG)

---

## **2017/2018**

January 16, 2017

Transits in Time, Transits on Paper: Charles Plumier's Iconographic Archive of Nature, 17th–19th centuries

*Jose Juan Beltran* (Ecole Normale Supérieure, Paris, France)

---

February 9, 2017

The Physician's Album Amicorum: Vitality, Vividness, and Values

*Maria Avxentevskaya* (MPIWG)

---

March 9, 2017

Money as a Problem for Early Modern People (and for Historians who Study Them)

*Sebastian Felten* (MPIWG)

---

September 28, 2017

Spirits Coming Alive: The Subtle Alchemy of Francis Bacon's *Sylva Sylvarum*

*Dana Jalobeanu* (University of Bucharest, Romania)

---

November 1, 2017

Orality and Memorization in the Indian Intellectual Tradition

*Meera Nanda* (Indian Institute of Science Education and Research, Mohali)

---

January 25, 2018

Coal in the Early Modern History of Resources

*Helge Wendt* (MPIWG)

---

March 15, 2018

Infrastructures of Natural History

*Lissa Roberts* (University of Twente, The Netherlands)

---

March 29, 2018

Epistemological Reflections in the Prize Contests of the French Academies  
(1720–1760)

*Martin Urmann* (SFB 980 “Episteme in Bewegung,” Freie Universität Berlin, Germany)

---

May 16, 2018

Chinese and European Renaissances? Neo-Confucian and Neo-Stoic Military  
Planning

*Barend Noordam* (Freie Universität Berlin/ Hebrew University of Jerusalem, Israel)

---

May 31, 2018

A History of Rules: Algorithms, Patterns, and Recipes

*Lorraine Daston* (MPIWG)

---

## Forgetting Knowledge

Collaborative Cross-Departmental Project

In studying the evolution of knowledge, historians have traditionally focused on processes of transmission and succession of knowledge, memory being a central category for the explanation of these processes. But what about the failures, the knowledge that was forgotten? In order to understand why and how knowledge has traveled, we must also understand why and how knowledge has been lost, suppressed, misunderstood, rejected, or simply forgotten. But what does it mean to define knowledge as forgotten? What does forgetting mean? And can forgetting be understood and defined as such, as an active process that is not necessarily the “other side” of memory?

In an attempt to address these and related questions, and following the collaboration between the Research Group of Sven Dupré (2011–2015), the Descartes Centre (Utrecht), and the Netherlands Institute for Advanced Study (NIAS) on “The Global Knowledge Society,” a collaborative research project has been established between the MPIWG and three Dutch Institutions: The Descartes Center (Utrecht University), The Vossius Center (University of Amsterdam), and Huygens ING, dedicated to exploring the notion of Forgetting in the history of science and knowledge. Scholars from all three Departments as well as Research Groups at the MPIWG took part in a preparatory workshop in Berlin in April 2017, which was followed by the establishment of four working groups, each focused on one aspect of Forgetting: Epistemologies of Forgetting; Dimensions of Forgotten Knowledge; Dynamics of Forgetting (processes and practices); and Materialities of Forgotten Knowledge. The collaborative endeavor culminated with a joint workshop that took place in Berlin in February

2018. The workshop was organized around four sessions, each focusing on one aspect of forgotten knowledge. Each session was jointly organized by colleagues from the MPIWG and at least one of the collaborating institutions, structured around input talks with a follow-up discussion. The keynote speech was given by Ann Laura Stoler (New School for Social Research, New York City, USA).

### *Tacit Knowledge Series*

The concept of tacit knowledge was proposed by Michael Polanyi to describe all aspects of professional capabilities that one knows how to do but cannot easily explain. Tacit knowledge is difficult or impossible to formalize and hard to put into words—yet it is necessary knowledge, about necessary skills. Tacit knowledge is therefore also skillful knowledge, and as Polanyi notes, “skillful knowing and doing is performed by subordinating a set of particulars, as clues or tools, to the shaping of a skillful achievement, whether practical or theoretical.”

The “Tacit Knowledge” series at the MPIWG aims to identify such skills, offering a framework for enhancing and, hopefully, improving the professional capabilities of our scholars. Becoming and remaining a productive scholar requires many skills that are not part of the normal curriculum for a university degree. These include note-taking, participating in an intellectual debate, and giving talks, but also more prosaic matters such as writing a résumé or preparing a book proposal. These, and many more, are not merely auxiliary aspects of the scientific endeavor. They form an essential part of research skills—or what Polanyi called “the scientist’s capacity to pursue [a problem], guided by his sense of approaching its solution.”

The program is coordinated by the Research Coordinator together with a steering team composed of representatives of Departments and Research Groups. Some of the seminars are repeated yearly but their content is customized and modified in an attempt to address the changing needs of MPIWG scholars and in particular of its post-doctoral fellows.

The following “Tacit Knowledge” sessions were offered to MPIWG scholars in the academic year 2017–18:

September 28, 2017

Healthy Academic Scheduling: Introductory Event for Early Career Scholars at the MPIWG

---

October 12, 2017

Job Application Process (Writing a Cover Letter, CV, etc.).

---

November 1, 2017

Rehearsal Session for MPIWG Members Participating in the HSS Meeting

---

January 18, 2018

Preparing a Book Proposal

---

February 22, 2018

Taking Notes: Techniques of Arranging Your Ideas towards a Publication

---

March 15, 2018

The Knowledge of Workshop Organization (and Its Publication)

---

April 09/10, 2018

Presentation Skills Seminar (external coach)

---

### **Predocctoral Meetings**

The Predocctoral Fellows of the Max Planck Institute for the History of Science undertake dissertation projects that form an integral part of the main research projects of the Institute. All the Predocctoral Fellows at the MPIWG are affiliated with one of the Departments or Research Groups of the Institute and undertake their research as part of the research activities of the respective unit. At the same time, and as part of the cross-departmental activities of the Institute, the Predocctoral Fellows of all Departments and Research Groups meet regularly for a joint seminar.

The Predocctoral Fellows of the Institute meet once a month. The meetings are intended to be as informal as possible in order to provide an open platform for exchange among the Predocctoral Fellows. Presentation forms and modalities therefore vary accordingly. The meetings also serve as an opportunity for the exchange of general information about life and work at the Institute, as well as for joint excursions.

The meetings are organized by the Predocctoral Representative of the Institute, Teresa Hollerbach, together with the Research Coordinator.



## Obituaries



Giuseppe Castagnetti

### **Giuseppe Castagnetti (1949–2016)**

Giuseppe Castagnetti was a historian of science and a politically engaged intellectual with a wide range of interests. He studied history and philosophy of science in Milan and later completed his doctoral degree with a thesis on the history of biology at the University of Pavia. In 1990 he became a collaborator of the Albert Einstein working group funded by the Berlin Senate at the Max Planck Institute for Human Development. He was one of the first scientific collaborators of the Max Planck Institute for the History of Science and later also a contributing editor of the Collected Papers of Albert Einstein. His passion was archival work, for which he had an extraordinary talent. He succeeded in identifying numerous important sources for the history of twentieth-century physics and in placing them in their institutional and political contexts. Together with the physicist and historian Hubert Goenner he investigated the early history of the Kaiser Wilhelm Institute of Physics and made pioneering contributions to an institutional history of the quantum revolution. With his untimely death, we have lost a dear friend, a creative scholar, and an acute mind. Giuseppe was an inexhaustible source of knowledge and the doyen of the substantial Italian community of scholars at our Institute. Last but not least he was an extraordinary human being, who mastered the most difficult challenges he encountered in the bravest manner imaginable.



Nuria Monn

### **Nuria Monn (1962–2017)**

We commemorate Nuria Monn, who passed away peacefully, after a long illness, on July 24, 2017. Nuria served as secretary to Department III under Hans-Jörg Rheinberger from 1997 to 2011, and later under Dagmar Schäfer from April 2013 to July 2015. Nuria helped build up Department III from day one and saw to it that as the department grew intellectually, it also grew socially. She was the gentle and welcoming point of contact for newcomers and returnees. The Institute's interns appreciated her guidance, experience, and support. Colleagues enjoyed her kindred spirit and her open mind. We are thankful for the time we were granted with her.



Antje Radeck  
© Wissenschaftskolleg zu Berlin.

### **Antje Radeck (1963–2018)**

We mourn the sudden death of Antje Radeck, the long-term secretary of former Department III. Antje died completely unexpectedly on July 25, 2018. Antje shaped the atmosphere of Department III (Rheinberger) from its very beginning in 1996 until 2011, when she moved on to become head of the Rectorate of the Wissenschaftskolleg zu Berlin. In addition, over many years, Antje Radeck served as chairwoman of the works council of the Institute and made great efforts to promote the needs of both staff and scientists. Antje will be sorely missed by all who knew her.

**John Forrester (1949–2015)**

John Forrester, professor of the History and Philosophy of Science at the University of Cambridge, served as a member of the MPIWG's Scientific Advisory Board from 2012 until his untimely death on 24 November 2015. An internationally renowned historian and philosopher of the human sciences in the British, French, and German traditions, John joined the Scientific Advisory Board at just the moment when the MPIWG began to expand its focus on the history of the natural sciences to embrace the human sciences as well. John's own historical and philosophical explorations of psychoanalysis, widely read and translated into at least a half-dozen languages, inspired a new generation of brilliant younger scholars, some of whom the MPIWG was fortunate enough to host as Pre- or Postdoctoral Fellows. Even more influential was his seminal 1996 essay "If p, then what? Thinking in Cases", expanded in his posthumously published book *Thinking in Cases* (2017). He was an unflagging defender of scholarly values against all manner of managerial and bureaucratic onslaughts, but his attitude toward such burdensome regulations was sportif, much in the spirit of his chess matches with computers: know the rules well enough to use them to promote one's own aims – in John's case, allowing good scholars to do good work. The MPIWG gratefully remembers his wise counsel and the enduring inspiration of his work.



John Forrester  
Courtesy of Cambridge University.

**Jean Gayon (1949–2018)**

The Max Planck Institute for the History of Science mourns the loss of Jean Gayon, Professor emeritus at the University of Paris 1 (Panthéon-Sorbonne) and Director of the Institute for History and Philosophy of Science and Technology (IHPST-CNRS) in Paris. A historian and philosopher of the life sciences on a grand scale, Jean Gayon taught at the University of Dijon before joining the faculty of the University of Paris 7 (Paris-Diderot). He worked in the tradition of French historical epistemology from Gaston Bachelard to Georges Canguilhem to François Dagognet, whose work he continued and brought into fruitful interaction with the new trends in the international community of historians, philosophers, and sociologists of the life sciences. He wrote and edited about twenty books covering topics from Georges Buffon to Jacques Monod, from organic form to function, from questions in biology to their social and political repercussions. Jean Gayon served on the First Advisory Board of the MPIWG from 1998 to 2003 and contributed extensively to the Institute's work, being particularly involved in the Department of Hans-Jörg Rheinberger. We will miss a great friend of the Institute and a fine personality.



Jean Gayon

## Overviews 2015–2017

### Workshops and Conferences

February 5–6, 2015, Workshop

**Learning How: Training Bodies, Producing Knowledge**

---

April 27–28, 2015, Workshop

**Chinese Local Gazetteers: Historical Method, Computerized Data Collection, and Analysis**

---

May 27, 2015, Workshop

**Bernardino Telesio, the Natural Sciences and Medicine in the Renaissance**

Co-organized with the Collaborative Research Center SFB 980 “Episteme in Bewegung”, Freie Universität Berlin, Germany and Centro Internazionale di Studi Telesiani Bruniani e Campanelliani, Cosenza, Italy

---

May 28–29, 2015, Workshop

**Making the Qing Palace Machine Work**

---

June 11–12, 2015, Workshop

**Economies of Reproduction**

---

June 11–12, 2015, Workshop

**(In)visible Labor: Knowledge Production in the Human Sciences**

---

June 15, 2015, Conference

**Land Ahoy!**

---

June 22–26, 2015, Workshop

**Learning How: Reconvening for Special Issue**

---

June 26–27, 2015, Workshop

**Towards a History of Epistemic Genres: Textbook and Commentary, Case and Recipe in the Making of Medical Knowledge**

Co-organized with Freie Universität Berlin, Germany, Johns Hopkins University, Baltimore, USA, and Ruhr-Universität Bochum, Germany

---

July 2–4, 2015, Workshop

**The Practice of Historical Research: Continuity and Change in Making Historical Knowledge from the Eighteenth to the Nineteenth Century**

Co-organized with Georg-August-Universität Göttingen, Germany, Universität Hamburg, Germany and Deutsche Forschungsgemeinschaft (DFG)

---

July 6–8, 2015, Conference

**Geometry and Space in the Early Modern Age**

---

July 15 and 17, 2015, Workshop

**Making the Qing Palace Machine Work, Part II**

---

November 17–20, 2015, Conference

**Narratives on Translations**

Co-organized with Universidad de Sevilla, Spain

---

November 30–December 2, 2015, Conference

**A Century of General Relativity: The 100th Anniversary of Einstein's Field Equations**

Co-organized with the Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Potsdam, Germany

---

December 2–5, 2015, Conference

**Centenary Conference on the History of General Relativity**

---

December 3, 2015, Conference

**A Century of General Relativity: 1—The Road to General Relativity and the Low-Water-Mark Period**

---

December 4–5, 2015, Conference

**Testing Hearing: Science, Art, Industry I**

---

December 4, 2015, Conference

**A Century of General Relativity: 3—The Postwar Renaissance of General Relativity**

---

December 5, 2015, Conference

**A Century of General Relativity: 5—Theoretical Tools and the Renaissance of General Relativity**

---

December 17–18, 2015, Workshop

**Toward a History of Error**

Co-organized with Ludwig-Maximilian-Universität, Munich, Germany and Forschungszentrum Gotha, Universität Erfurt, Germany

---

January 6–8, 2016, Conference

**Working with Paper: Gendered Practices in the History of Knowledge**

Co-organized with Loyola Marymount University, Los Angeles, USA

---

January 26–27, 2016, Conference

**Material Cultures of Knowledge: Netze wissenschaftspolitischer Beziehungen zwischen Taiwan und Deutschland in Früher Neuzeit und Moderne**

Co-organized with Technische Universität Braunschweig, Germany

---

February 2, 2016, Workshop

**Die Bibliothek als Verlag? Bibliotheken als Dienstleister im Rahmen wissenschaftlichen Publizierens**

---

February 4–6, 2016, Workshop

**Experiencing the Global Environment**

---

February 11–13, 2016, Conference

**Listening to the Archive: Histories of Sound Data in the Humanities and Sciences**

Co-organized with Humboldt-Universität zu Berlin, Germany

---

February 29–March 1, 2016, Workshop

**Using the Islamic Scientific Manuscripts Initiative (ISMI) Database**

Co-organized with the Institute of Islamic Studies (IIS) at McGill University, Montreal, Canada and Staatsbibliothek zu Berlin, Germany

---

February 19, 2016, Workshop

**Citizen Science in Historical Perspective**

Co-organized with the Constructing Scientific Communities Project, the University of Oxford, UK

---

April 21, 2016, Colloquium

**Humboldts Preußen**

---

April 25–29, 2016, Workshop

**Moving Crops**

---

May 26–27, 2016, Workshop

**New Directions in the Cultural History of Medicine**

Co-organized with the University of Warwick, UK

---

May 2, 2016, Conference

**Schrödinger and the EPR Argument**

---

May 2–4, 2016, Workshop

**Sacred Cures: Situating Medicine and Religion in Asia**

---

June 1–2, 2016, Workshop

**Accounting for Uncertainty**

Co-organized with the International Consortium for Research in the Humanities (IKGF)

---

June 2–3, 2016, Workshop

**Birders of Africa: The Politics of a Network**

---

June 10–11, 2016, Workshop

**Colonial Sciences and Indigenous Knowledge Systems in South Asia**

Co-organized with Humboldt-Universität zu Berlin, Germany and the Center for the History of Knowledge, Berlin, Germany

---

June 15, 2016, Workshop

**Sound Modernities? Histories of Architecture, Design, and Space**

---

June 22, 2016, Conference

**Bildarchiv**

Co-organized with archives of the Max Planck Society

---

July 18–19, 2016, Workshop

**Moving Crops**

---

August 1–19, 2016, Workshop

**Chinese Local Gazetteers: Local Materiality in the History of Science, Technology, and Medicine**

---

August 25–27, 2016, Workshop

**Commentaries on Ancient Texts dealing with Mathematical and Medical Sciences**

Co-organized with Scuola Normale Superiore di Pisa, Italy, the University of Chicago, USA, PHARE Université de Paris, France, and Freie Universität Berlin, Germany

---

August 31–September 1, 2016, Workshop

**Complexity: Accounting for Uncertainty**

---

September 15–16, 2016, Workshop

**Sound Objects in Transition: Knowledge, Science, Heritage**

---

October 21–22, 2016, Authors' Workshop

**Testing Hearing: Science, Art, Industry II**

---

November 10–11, 2016, Workshop

**Ownership of Knowledge: Appropriation in Art & Technology**

---

November 29, 2016, Workshop

**Political Epistemology I**

---

November 30, 2016, Workshop

**Practical and Pragmatic Literature in Legal and Science History**

---

January 12, 2017, Workshop

**Colonial, Postcolonial, Settler, and Fascist Citizens: How to Resist the Masterplan**

Co-organized with the University of California, Irvine, USA

---



January 17–18, 2017, Symposium

**Energy Transformations: Perspectives from the Humanities**

---

February 13, 2017, Seminar

**Vygotskij Resettled: The Reception of Soviet Psychology in Argentina**

Co-organized with Universidad de Buenos Aires, Argentina

---

February 13–14, 2017, Workshop

**Material Culture of Knowledge**

---

February 26, 2017, Workshop

**Movement, Temporality, and Exchange: Animals in Mongol Eurasia**

Co-organized with the Hebrew University of Jerusalem, Israel

---

March 1–7, 2017, Workshop

**Building Materials in Chinese Local Gazetteers: Brainstorming**

---

March 3–4, 2017, Workshop

**Observing the Everyday: Journalistic Practices and Knowledge Production in the Modern Era**

Co-organized with the German Historical Institute, Washington DC, USA

---

March 9–10, 2017, Workshop

**Open Access to Convivencia: People and their Representations in the Iberian World and Beyond**

---

March 13–17, 2017, Workshop

**Moving Crops**

---

March 14, 2017, Conference

**Vetting Animals**

---

March 27–28, 2017, Workshop

**Present Absence: Animals in World History**

Co-organized with Harvard University, Cambridge, USA

---

March 29–April 2, 2018, Workshop

**Empires of Knowledge**

Co-organized with ASEH, Chicago, USA

---

April 21–22, 2017, Workshop

**The Uses of Anomalies**

Co-organized with the University of Chicago, USA

---

April 27–28, 2017, Workshop

**Technology and the Self: E-Privacy**

Co-organized with Harvard University, Cambridge, USA

---

May 2–3, 2017, Workshop

**“The Engine of Modernity”: Construing Science as the Driving Force of History in the Twentieth Century**

Co-organized with Columbia University, New York City, USA

---

May 3–4, 2017, Workshop

**Accounting for Uncertainty: Prediction and Planning in Asia’s History**

Co-organized with IKGF and Friedrich-Alexander-Universität Erlangen-Nuremberg, Germany

---

May 12, 2017, Workshop

**The Material Culture of Citizen Science**

Co-organized with the Constructing Scientific Communities Project, the University of Oxford, UK

---

May 25–27, 2017, Conference

**Knowing Nature: The Changing Foundations of Environmental Knowledge**

Co-organized with Renmin University of China, Beijing

---

June 1–3, 2017, Conference

**Beyond Data: Knowledge Production in Bureaucracies across Science, Commerce, and the State**

Co-organized with the German Historical Institute, Washington DC, USA

---

June 12–16, 2017, Workshop

**Decolonizing the Plan I**

---

June 15–30, 2017, Workshop

**Estimated Truths**

---

June 21–23, 2017, Conference

**Aristotelianism and Natural Knowledge at Early-Modern Protestant Universities**

---

June 23–24, 2017, Workshop

**Translating Medicine in the Premodern World**

Co-organized with the University of York, UK and the University of Cambridge, UK

---

June 26–30, 2017, Workshop

**Decolonizing the Plan II**

---

June 28–29, 2017, Workshop

**Accounting for Uncertainty—Prediction and Planning in Asia’s History**

---

June 28–July 2, 2017, Workshop

**Empires of Knowledge**

Co-organized with ESEH, Zagreb, Croatia

---

July 3–31, 2017, Workshop  
**Chinese Local Gazetteers “Terminology”**

---

July 7–8, 2017, Workshop  
**Translating Medicine in the Premodern World**  
Co-organized with Royal Holloway University of London, UK, and Wellcome Library London

---

July 13, 2017, Conference  
**Political Epistemology Series: The Restless Clock**

---

August 16–17, 2017, Workshop  
**Estimated Truths: Water, Science, and the Politics of Approximation**

---

September 17–18, 2017, Workshop  
**Text and Labor**

---

September 26–27, 2017, Workshop  
**Medical Commentaries and Comment(aries) on Medicine**

---

October 19–21, 2017, Workshop  
**The Intelligence of Algorithms**

---

October 25–28, 2017, Conference  
**East-West Encounter in the Science of Heaven and Earth**  
Co-organized with Kyoto University, Japan

---

November 7, 2017, Conference  
**Popularisierung von Wissensgeschichte in vormodernen Gesellschaften Asiens und Afrikas**  
Co-organized with Freie Universität Berlin, Germany, the Islamic Museum Berlin, and the Oriental Seminary of the Albert-Ludwigs-Universität Freiburg, Germany

---

November 21–22, 2017, Workshop  
**Unlocking Skills: Gaining and Performing Expertise in Pre-1911 China**  
Co-organized with IKGf and Friedrich-Alexander-Universität Erlangen-Nuremberg, Germany

---

December 13–22, 2017, Workshop  
**Moving Crops**

---

December 18–19, 2017, Conference  
**Rulers as Authors in the Islamic World: Knowledge, Authority, and Legitimacy**  
Co-organized with CSMC, Hamburg, Germany, and Humboldt Foundation

---

## Academic Achievements, External Activities, and Collaborations

### Professorships

*Lorraine Daston* is Professor at the University of Chicago, USA and Honorary Professor at the Humboldt-Universität zu Berlin, Germany.

*Gerd Graßhoff* is Professor at Humboldt-Universität zu Berlin, Germany.

*Dieter Hoffmann* is Adjunct Professor at Humboldt-Universität zu Berlin, Germany.

*Ursula Klein* is Adjunct Professor at Universität Konstanz, Germany.

*Katja Krause* is Professor at Technische Universität Berlin, Germany.

*Glenn W. Most* is Professor at the Scuola Normale Superiore di Pisa, Italy, and Visiting Professor on the Committee on Social Thought at the University of Chicago, USA.

*Jürgen Renn* is Honorary Professor for History of Science at Humboldt-Universität zu Berlin and Freie Universität Berlin, Germany.

*Hans-Jörg Rheinberger* (Emeritus Scientific Member) is Honorary Professor at Technische Universität Berlin, Germany.

*Dagmar Schäfer* is Honorary Professor at Technische Universität Berlin, Adjunct Professor at Freie Universität Berlin, Germany, and Guest Professor at Shanghai Jiao Tong University and Tianjin University, China.

*Viktoria Tkaczyk* is Professor at Humboldt-Universität zu Berlin, Germany.

*Matteo Valleriani* is Honorary Professor at Technische Universität Berlin, Germany and Professor by Special Appointment at Tel Aviv University, Israel.

*Annette Vogt* is Honorary Professor at Humboldt-Universität zu Berlin, Germany.

### Awards

*Sabine Arnaud* (Research Group Leader) received the prize of the Académie des Sciences morales et politiques and the prize of l'Académie de Médecine et de la Société Française d'Histoire de la Médecine for her book "L'invention de l'hystérie au temps des Lumières" (2014), 2015.

*Maria Avxentevskaya* (Postdoctoral Fellow) received The British Society for Literature and Science Essay Prize 2015 for her essay "The Spiritual Optics of Narrative: John Wilkins's Defence of Copernicanism" (Journal of Literature and Science, 2015).

*Qun Che* (Postdoctoral Fellow) received the 101 Talents Award for the History of Geography/History of Science, 2016.

*Lorraine Daston* (Director) received the Bavarian Maximiliansorden, Bavaria's highest recognition for achievements in science and art, 2016.

*Lorraine Daston* (Director) received an honorary doctorate from Hebrew University, of Jerusalem, Israel, 2016.

*Lorraine Daston* (Director) was elected as Member of the American Philosophical Society (as of May 2017).

*Lorraine Daston* (Director) received the Dan David Prize, 2018.

*Sébastien Dutreuil* (Postdoctoral Fellow) received the Prix de la chancellerie des Universités de Paris (Aguirre-Basualdo Prize) for his dissertation, 2017.

*Teresa Hollerbach* (Predoctoral Fellow) was awarded the Fondazione Comel – Institutio Santoriana “Santorio Fellowship for Medical Humanities,” 2017.

*Alexander Immer* (Student Assistant) won the programming competition “Hackzurich,” 2015.

*Lara Keuck* (Postdoctoral Fellow) received the Branco Weiss Fellowship of the ETH Zurich, 2015.

*Ursula Klein* (Senior Research Scholar) received the 2016 HIST Award for Outstanding Achievement in the History of Chemistry, sponsored by the American Chemical Society.

*Katja Krause* (Postdoctoral Fellow) received the Society for Medieval and Renaissance Philosophy (SMRP) Founders Award 2016 for her article “Transforming Aristotelian Philosophy: Alexander of Aphrodisias in Aquinas’s Early Anthropology and Eschatology” (*Przegląd Tomistyczny*, 2015).

*Whitney Laemli* (Predoctoral Fellow) received the bi-annual prize from the History of Science Society’s Forum for the History of the Human Sciences for her dissertation “The Choreography of Everyday Life: Rudolf Laban and the Making of Modern Movement”, 2016.

*Philipp Lehmann* (Research Scholar) received the Harold K. Gross Prize for Best Dissertation in History at Harvard University and the Rachel Carson Prize for Best Dissertation of the American Society for Environmental History for his dissertation “Changing Climates: Theories of Desiccation and the Rise of Geoengineering, 1870–1950”, 2015.

*Philipp Lehmann* (Research Scholar) received the Alice Hamilton Prize for Best Article of the American Society for Environmental History for his article “Infinite Power to Change the World: Hydroelectricity and Engineered Climate Change in the Atlantropa Project” (*American Historical Review*, 2016), 2017.

*Glenn W. Most* (External Scientific Member) received the Anneliese-Maier Research Prize awarded by the Alexander von Humboldt Foundation, 2015.

*Glenn W. Most* (External Scientific Member) was appointed Academia Europaea member, 2015, and member of the Labex TransferS Program, École Normale Supérieure, Paris, France (April–May 2017).

*Pietro Daniel Omodeo* (Research Scholar) received the ERC Consolidator Grant, 2017.

*Gunthild Peters* (Predoctoral Fellow) received the Georg-Ushmann-Preis für Wissenschaftsgeschichte awarded by the Nationale Akademie der Wissenschaften Leopoldina, 2017.

*Dagmar Schäfer* (Director) was awarded the Choice Outstanding Academic Title 2015 for her co-edited book “*Rice: Global Networks and New Histories*” (2015).

*Dagmar Schäfer* (Director) received a prize at the East China Outstanding Philosophical and Social Science Book Conference, Nanjing, for her book “The Crafting of the 10,000 Things: Knowledge and Technology in Seventeenth-Century China” (2011), 2017.

*Elena Serrano* (Research Scholar) received the 2017 DHST (Division of History of Science and Technology of the International Union of the History and Philosophy of Science and Technology) Prize for Young Scholars for her dissertation “Science for Women in the Spanish Enlightenment (1753–1808)” (Universitat Autònoma de Barcelona, Spain).

*Elena Serrano* (Research Scholar) received the Premio Divulgación Feminista Carmen de Burgos award for feminist popularization for her article “Mujeres y ciencia en la España de la Ilustración. Ciencia en sitios insospechados,” 2017.

### Academic Appointments

*Elena Aronova* (Research Scholar September 2012–November 2015) was appointed Assistant Professor for History of Biology at the History Department, University of California, Santa Barbara, USA.

*Jenny Bangham* (Research Scholar June 2015–August 2016) was appointed as Wellcome Trust Medical Humanities Research Fellow, Department of History and Philosophy of Science, University of Cambridge, UK.

*Joeri Bruyninckx* (Research Scholar June 2015–May 2018) was appointed Assistant Professor of Science and Technology Studies in the Department of Technology and Society, Maastricht University, The Netherlands (since June 2015).

*Lino Camprubí* (Research Scholar September 2014–August 2017) was appointed Ramón y Cajal Research Fellow (tenure track) Universidad de Sevilla, Spain.

*Qun Che* (Postdoctoral Fellow October 2016–December 2017) was appointed Assistant Professor at Shanghai Jiaotong University, China.

*Kaijun Chen* (Postdoctoral Fellow September 2014–August 2016) was appointed Assistant Professor of East Asian Studies at Brown University, Providence, RI, USA (since July 2016).

*Sébastien Dutreuil* (Postdoctoral Fellow January 2017–September 2017) was appointed Chargé de Recherche at the CNRS, Centre d'Épistémologie et d'Ergologie Comparatives (CPERC), Aix-Marseille University, France.

*Anna Echterhölter* (Postdoctoral Fellow September 2014–April 2015) was appointed Professor for History of Science, Universität Wien, Austria.

*Sebastian Felten* (Research Scholar September 2015–December 2018) was appointed University Assistant at Universität Wien, Austria (as of January 2019).

*Sietske Fransen* (Postdoctoral Fellow January 2015–August 2015) was appointed as MPG Research Group Leader at the Bibliotheca Hertziana, Rome, Italy (since September 2018).

*Jacob Gaboury* (Postdoctoral Fellow September 2015–August 2016) was appointed Assistant Professor of Film and Media at the University of California, Berkeley, USA (since 2017).

*Yan Gao* (Visiting Postdoctoral Fellow January 2017–February 2017) was appointed Research Associate at Duke University, Durham, NC, USA (since August 2017).

*Clare Griffin* (Postdoctoral Fellow September 2015–August 2017) was appointed Assistant Professor for History of Science and Technology, Department of History, Philosophy and Religious Studies, Nazarbayev University, Astana, Republic of Kazakhstan.

*Yuzhen Guan* (Visiting Postdoctoral Fellow January 2017–February 2017) was appointed Assistant Professor at Hefei University of Science and Technology, China.

*Sonam Kachru* (Predoctoral Fellow September 2014–August 2015) was appointed Assistant Professor, Department of Religious Studies, University of Virginia, Charlottesville, VA, USA.



*Abram Kaplan* (Visiting Predoctoral Fellow January 2017–June 2018) was awarded a three-year Postdoctoral Fellowship of the Harvard Society of Fellows, Cambridge, MA, USA (since September 2018).

*Robert Kett* (Postdoctoral Fellow September 2015–August 2017) was appointed Curatorial Assistant at San Francisco Museum of Modern Art, Architecture + Design (2016–2017) and Emerging Curator, Canadian Centre for Architecture, Montreal (since 2017).

*Katja Krause* (Postdoctoral Fellow September 2014–August 2016) was appointed Lecturer in Medieval Thought, Durham University, UK. In spring 2017, she was appointed MPG Research Group Leader, in conjunction with a W2 Professorship in History and Philosophy of Science at the Technische Universität Berlin, Germany.

*Anna Kvičalová* (Predoctoral Fellow January 2013–December 2015) was appointed Vědecký Pracovník (Research Fellow) at the Charles University and the Czech Academy of Sciences, Prague.

*Whitney Laemml* (Predoctoral Fellow January 2015–June 2015) was appointed Lecturer in History and Fellow of the Society of Fellows in the Humanities at Columbia University, New York City, USA; as of August 2019, she will be Assistant Professor of History of Technology in Carnegie Mellon University's Department of History, Pittsburgh, PA, USA.

*Jung Lee* (Postdoctoral Fellow September 2016–August 2017) was appointed Assistant Professor at the Institute for the Humanities, Ewha Womans University, Seoul, Korea.

*Philipp Lehmann* (Postdoctoral Fellow September 2014–June 2017) was appointed Assistant Professor at the Department of History, University of California Riverside, USA.

*Elaine Leong* (MPG Minerva Research Group Leader September 2012–February 2019) was appointed Wellcome University Award Lecturer at the Department of History, University College London, UK (as of January 2019).

*Xiaochang Li* (Postdoctoral Fellow September 2017–August 2019) was appointed Assistant Professor in the Department of Communication, Stanford University, California, USA (as of September 2019).

*Michelle Malina McCoy* (Predoctoral Fellow October 2017–January 2018; Postdoctoral Fellow February–August 2018) was appointed Assistant Professor for Premodern Chinese Art, Pittsburgh University, PA, USA.

*Montserrat de Pablo* (Visiting Scholar October 2015–September 2016) was appointed Assistant Professor of Photography, Fine Arts Faculty in Cuenca, University of Castilla-La Mancha, Spain (since 2016).

*Hans-Jörg Rheinberger* (Emeritus Scientific Member) was appointed Senior Fellow, Institute for Cultural Research (IKF), Vienna, Austria, 2015 and was appointed as Distinguished Visiting Max Kade Professor, Northwestern University, Evanston, IL, USA, 2016.

*Vincenzo De Risi* (Research Group Leader) Leibniz Professor, Universität Leipzig (2016–2017) and CR1 Senior Research Fellow (tenure track), CNRS–Centre National de la Recherche Scientifique, Paris, France (since 2017).

*Dagmar Schäfer* (Director) was appointed Honorary Professor of Sinology at Freie Universität, Berlin (since 2016).

*David Sepkoski* (Senior Research Scholar September 2012–August 2018) was appointed Thomas M. Siebel Chair in History of Science at the University of Illinois, Urbana-Champaign, IL, USA.

*Mårten Söderblom-Saarela* (Postdoctoral Fellow since September 2015) was appointed Assistant Research Fellow in the Institute of Modern History at Academia Sinica, Taiwan (as of January 2019).

*Ylva Söderfeldt* (Visiting Postdoctoral Fellow August 2016–August 2017) was appointed Associate Senior Lecturer at Department of History of Science and Ideas, University of Uppsala, Sweden (since 2017).

*Michael Stanley-Baker* (Postdoctoral Fellow February 2017–August 2017) was appointed Assistant Professor at Nanyang Technological University and Lee Kong Chian School of Medicine, China (joint appointment) (since 2017).

*Honghong Tinn* (Postdoctoral Fellow August 2014–July 2015) was appointed Assistant Professor of History, Earlham College, Indiana, USA (since 2015).

*Matteo Valleriani* (Senior Research Scholar and Group Leader) was appointed Honorary Professor in History of Science at the Technische Universität in Berlin, Germany (since 2017) and Professor by Special Appointment at Tel Aviv University, Israel (since 2018).

*Benjamin Wilson* (Postdoctoral Fellow September 2015–August 2017) was appointed Assistant Professor of the History of Science, Department of the History of Science, Harvard University, Cambridge, MA, USA.

*Rebecca Wolf* (Postdoctoral Fellow March 2015–April 2016) was appointed Research Fellow at the Institute for the History of Science and Technology, Deutsches Museum, Munich, Germany.

### Completed PhD Dissertations

*Noam Andrews*: Irregular Bodies: Geometry and Material Culture in Early Modern Germany. (Harvard University, Cambridge, MA, USA, 2016)

*José Beltran*: Scribal Scholars: The Manuscript Economy of Overseas Natural History in France, 1660–1760. (European University Institute, Florence, Italy, 2017)

*Johanna Biank*: Pseudo-Proklos' Sphaera: Die Sphaera-Gattung im 16. Jahrhundert. (Humboldt-Universität zu Berlin, Germany, 2018)

*Dorit Brixius*: French Empire on the Ground: Plants, Peoples, and Knowledge in the Service of Eighteenth-Century Isle de France. (European University Institute, Florence, Italy, 2017)

*Nele Diekmann*: Talbot's Tools: Scientific Notebooks as a Laboratory of Victorian Scholarship. (Freie Universität Berlin, Germany, 2015)

*Joppe van Driel*: The Filthy and the Fat: Oeconomy, Chemistry and Resource Management in the Age of Revolutions, 1700–1850. (University of Twente, The Netherlands, 2016)

*Martin Fechner*: Kommunikation von Wissenschaft in der Neuzeit: Vom Labor in die Öffentlichkeit. Eine Untersuchung zum Wandel des Publikationsverhaltens erfolgreicher Wissenschaft am Beispiel der Spektralanalyse und des Lasers. (Humboldt-Universität zu Berlin, Germany, 2016)

*Zhou Gu*: A Study About the Relationship Between Chinese Faience and Early Glass. (University of Chinese Academy of Sciences, Huairou, China, 2015)

*Nabeel Hamid*: Being and the Good: Natural Teleology in Early Modern German Philosophy. (University of Pennsylvania, USA, 2017)

*Evan Hepler-Smith*: Nominally Rational: Systematic Nomenclature and the Structure of Organic Chemistry, 1889–1940. (Princeton University, USA, 2016)

*Hajime Inaba*: Historical Investigations into the Development of Classical Statistical Mechanics. (Kyoto University, Japan, 2015)

*Martin Jähnert*: Practicing the Correspondence Principle in the Old Quantum Theory: A Transformation through Implementation. (Technische Universität Berlin, Germany, 2016)

*Anna Jerratsch*: Der frühneuzeitliche Kometendiskurs im Spiegel deutschsprachiger Flugschriften. (Humboldt-Universität zu Berlin, Germany, 2018)

*Marta Jordi*: Transformation of Optical Knowledge from 1870 to 1925: Optical Dispersion between Classical and Quantum Physics. (Humboldt-Universität zu Berlin, Germany, 2017)

*Sonam Kachru*: Minds and Worlds: A Philosophical Commentary on the Twenty Verses of Vasubandhu. (University of Chicago, USA, 2015)

*Anna Kvičalová*: Disciplining the Sense of Hearing: Auditory Practices in Sixteenth-Century Calvinist Geneva. (Freie Universität Berlin, Germany, 2017)

*Whitney Laemmler*: The Choreography of Everyday Life: Rudolf Laban and the Making of Modern Movement. (University of Pennsylvania, USA, 2016)

*Michelle Malina McCoy*: Astral Visuality in the Chinese and Inner Asian Cult of Tejaprabha Buddha, ca. 900–1300 AD. (University of California, Berkeley, USA, 2017)

*Daniel Messner*: Die Erfindung der Biometrie: Identifizierungstechniken und ihre Anwendungen, 1870–1914. (Universität Wien, Austria, 2015)

*Gunthild Peters (nee Storeck)*: Zwei Gulden vom Fuder. Mathematik der Fassmessung und praktisches Visierwissen im 15. Jahrhundert. (Technische Universität Berlin, Germany, 2016)

*Anja Sattelmacher*: Anschauen, Anfassen, Auffassen: Eine Wissensgeschichte mathematischer Modelle. (Humboldt-Universität zu Berlin, Germany, 2017)

*Tillmann Taape*: Hieronymus Brunschwig and the Making of Vernacular Medical Knowledge in Early German Print. (University of Cambridge, UK, 2017)

*Stefan Trzeciok*: Alvarus Thomas und sein *liber de triplici motu*. Naturphilosophie an der Pariser Fakultät. (Freie Universität Berlin, Germany, 2015)

*Elisabeth Wallmann*: Enlightening Insects: Insects and the Formation of the French Enlightenment. (University of Warwick, UK, 2016)

*Václav Zatloukal*: Applications of Path Integrals in Quantum Theory and Statistical Physics. (Czech Technical University in Prague, Czech Republic, 2016)

## Teaching Activities

### Spring/Summer 2015

*Lorraine Daston*: Origin Stories: Religion and Science Narrate the World. (Seminar, University of Chicago, USA)

*Vincenzo De Risi*: On Kant's Philosophy of Mathematics. (Seminar, Scuola Normale Superiore, Pisa, Italy)

*Philipp Lehmann*: Histories of Climate and the Climates of History. (Seminar, University of Chicago, USA)

*Glenn W. Most*: Wisdom Literature in East and West (co-taught with Prof. Michael Puett). (Kosmos Summer University Seminar, Humboldt-Universität zu Berlin, Germany)

*Dagmar Schäfer*: Energy and Environment: China and Asia 900–1800. (Seminar, University of Manchester, UK)

*Viktoria Tkaczyk*: Ohrwürmer, Leitmotive, und Déjà-entendus: Zur Kulturgeschichte des auditiven Gedächtnisses. (Graduate seminar, Humboldt-Universität zu Berlin, Germany)

*Annette Vogt*: History of Statistics. (Seminar, Humboldt-Universität zu Berlin, Germany)

### Winter 2015/2016

*Joeri Bruyninckx*: Sound Technologies and Cultural Practices. (Graduate seminar, Maastricht University, The Netherlands)

*Lorraine Daston*: Master Classes taught at the University of California, Los Angeles, USA and École Normale Supérieure, Paris, France.

*Judith Kaplan*: Early Modern Science. (Seminar, Bard College Berlin, Germany)

*Anna Kvičalová*: Religion and Sensory Instruction. (Undergraduate seminar, University of Amsterdam, The Netherlands)

*Christine von Oertzen*: Deutsche Teilung: Politik, Kultur, Alltag. (Excursion graduate seminar in Berlin, Universität Braunschweig, Germany)

*Pietro Daniel Omodeo*: History and Philosophy of Science: Early Modern Science (co-taught with colleagues from the MPIWG). (Undergraduate seminar, Bard College Berlin, Germany)

*Dagmar Schäfer*: Staatsmanufakturen: Wissenschaft und nützliche Künste in Eurasiens Weg in die Moderne. (Seminar, Technische Universität Berlin, Germany)

*Viktoria Tkaczyk, Britta Lange, and Jochen Henning*: Das Ohr am Archiv: Kultur- und Wissenschaftsgeschichte akustischer Daten. (Graduate seminar, Humboldt-Universität zu Berlin, Germany)

*Annette Vogt*: History of Statistics. (Seminar, Humboldt Universität zu Berlin, Germany)

*Rebecca Wolf*: Von Heron bis Welte: Frühe Mechanik und Speicher von Musik. (Graduate seminar, Technische Universität Berlin, Germany)

*Rebecca Wolf*: Historische Instrumentenkunde. (Seminar, Ludwig-Maximilians-Universität München, Germany)

Spring/Summer 2016

*Lino Camprubi*: A Global History of Cold War Science and Technology. (Seminar, University of Chicago, USA)

*Lorraine Daston*: Science, Modernity, and Anti-Modernity. (Seminar, University of Chicago, USA)

*Lorraine Daston*: Master Class taught at Northwestern University, Evanston, IL, USA.

*Katja Krause*: History and Philosophy of Early Modern Science. (Seminar, Bard College Berlin, Germany)

*Anna Kvičalová*: Religion and Sound Media: Cultural History of Sense Perception. (Undergraduate seminar, Freie Universität Berlin, Germany)

*Elaine Leong*: Books and Plants. (Hands-on session as part of the “Early Modern Science” course organized by *Judith Kaplan*, Bard College Berlin, Germany).

*Pietro Daniel Omodeo*: Die Wissenschaftliche Revolution als historisches und historiographisches Problem. (Undergraduate seminar, Freie Universität Berlin, Germany)

*Hans-Jörg Rheinberger*: Studies in Communication and Culture: On Historical Epistemology. (Seminar, Northwestern University, Evanston, IL, USA)

*Dagmar Schäfer*: Historiography of Science of Science of East Asia in the West. (Summer school, Shanghai Jiaotong University, China)

*Dagmar Schäfer*: Textiles and Labor. (Seminar, University of Chicago, USA)

*Viktoria Tkaczyk*: Psyche und Schall: Theorien und Praktiken eines langen Verhältnisses. (Graduate seminar, Humboldt-Universität zu Berlin, Germany)

*Annette Vogt*: From Paul A. Samuelson to Elinor Ostrom: History of Economic Thought in the 20th Century. (Seminar, Humboldt-Universität zu Berlin, Germany)

*Annette Vogt*: Four sessions on the history of mathematics (as part of the lecture class “Geschichte der Physik” by *Barbara Sandow*). (Seminar, Humboldt-Universität zu Berlin, Germany)

Winter 2016/2017

*Sonja Brentjes*: Visitors of the Heavens on Earth. (Session, Freie Universität Berlin, Germany)

*Sonja Brentjes*: Visualization of the Heavens. (Session, Universität Konstanz, Germany)

*Sonja Brentjes*: Classification of the Sciences. (Session, CSIC, Madrid, Spain)

*Joeri Bruyninckx*: Sound Technologies and Cultural Practices. (Graduate seminar, Maastricht University, The Netherlands)

*Vincenzo De Risi*: On Leibniz’s Theory of Space. (Seminar, Universität Leipzig, Germany)

*Vincenzo De Risi*: On Kant’s Theory of Space. (Seminar, Universität Leipzig, Germany)

*Vincenzo De Risi*: On History and Epistemology of Geometry. (Università di Urbino, Italy)

*Clare Griffin* and *Jaya Remond*: Representations of Nature in the Early Modern World. (Graduate seminar, Bard College Berlin, Germany)

*Glenn W. Most*: Sophocles, *Ajax*. (Corso Ordinario, Scuola Normale Superiore, Pisa, Italy)

*Pietro Daniel Omodeo*: Gelehrsamkeit, Wissenschaft und Medizin im Nordeuropa des 16. und 17. Jahrhunderts. (Graduate seminar, Freie Universität Berlin, Germany)

*Viktoria Tkaczyk*: Test, Test, Test...: Techniken, Praktiken und Medien von Testverfahren. (Graduate seminar, Humboldt-Universität zu Berlin, Germany)

*Annette Vogt*: Four sessions on the history of mathematics (as part of the lecture class “Geschichte der Physik” by *Barbara Sandow*). (Seminar, Humboldt-Universität zu Berlin, Germany)

*Helge Wendt*: Wissen über Kohle im 18. und 19. Jahrhundert: Einwicklungen auf den Britischen Inseln, in Frankreich und Preußen. (Seminar, Technische Universität Berlin, Germany)

#### Spring/Summer 2017

*Maria Avxentevskaya* and *Sebastian Felten*: Practical Knowledge in Early Modern Europe. (Seminar, Bard College Berlin, Germany)

*Angela Axworthy*: The Status of Mathematics from Antiquity to the Renaissance. (Seminar, Technische Universität Berlin, Germany)

*Sonja Brentjes*: Teaching the Sciences, Medicine, and Philosophy at Madrasas and Mosques (12th–17th centuries). (Seminar, Oxford University, All Souls College, UK)

*Lorraine Daston*: The Humanities as a Way of Knowing. (Seminar, University of Chicago, USA)

*Lorraine Daston*: Master classes taught at the University of Warwick, UK and the University of Washington, Seattle, USA

*Anna Kvičalová*: Náboženství a zvuk. (Graduate seminar, Masaryk University in Brno, Czech Republic)

*Glenn W. Most*: Éditer les Présocratiques aujourd’hui (Seminar, Labex Transfer, École Normale Supérieure, Paris, France)

*Christine von Oertzen*: Humanity’s Baby Steps. (Honors Seminar, University of Sydney, Australia)

*David Sepkoski*: Catastrophic Thinking: Extinction in Culture and Science. (Seminar, University of Chicago, USA)

*Viktoria Tkaczyk* and *Anke te Heesen*: Wissen, Ökonomie, Ästhetik: Modellsammlungen um 1800. (Graduate seminar, Humboldt-Universität zu Berlin, Germany)

*Annette Vogt*: Selected Topics in the History of Statistics. (Seminar, Humboldt-Universität zu Berlin, Germany)

#### Winter 2017/2018

*Joeri Bruyninckx*: Research and Writing. (Undergraduate seminar, Maastricht University, The Netherlands)

*Joeri Bruyninckx*: Sound Technologies and Cultural Practices. (Graduate seminar, Maastricht University, The Netherlands)

*Lorraine Daston*: Master classes taught at the University of Sydney, Australia, the University of Queensland, Brisbane, Australia, the University of Amsterdam, The Netherlands, and Humboldt-Universität zu Berlin, Germany



*Teresa Hollerbach and Matteo Valleriani: Nachbau der ersten Personenwaage – die Materialität der frühneuzeitlichen statischen Medizin. (Seminar, Technische Universität Berlin, Germany)*

*Glenn W. Most: Aristofane, *Le Rane*. (Corso Ordinario, Scuola Normale Superiore, Pisa)*

*Glenn W. Most: Sophocles, *Ajax*. (Seminar, University of Chicago, USA)*

*Glenn W. Most: The Return of Homer: The Iliad and Odyssey in Contemporary English Language Fiction and Poetry. (Seminar, University of Chicago, USA)*

*Ohad Parnes: Einführung in die Geschichte des Lebenswissenschaften. (Seminar, Technische Universität Berlin, Germany)*

*Giulia Rispoli: The Anthropocene Turn: Contexts and Narratives. (Seminar, Tel Aviv University, Israel)*

*Dagmar Schäfer: Cultures of Innovation in East Asia's History with a Focus on Scientific, Medical, and Technological Change (co-taught with Angela Ki Che Leung). (Seminar, University of Hong Kong)*

*Dagmar Schäfer: China – eine etwas andere Entwicklungsgeschichte. (Seminar, Freie Universität Berlin)*

*Viktoria Tkaczyk: Applied Humanities: Grundlagentexte eines vernachlässigten Forschungsprogramms. (Graduate seminar, Humboldt-Universität zu Berlin, Germany)*

*Viktoria Tkaczyk and Anke te Heesen: Wissen, Ökonomie, Ästhetik: Modellsammlungen um 1800. (Graduate seminar, Humboldt-Universität zu Berlin, Germany)*

*Annette Vogt: From Paul A. Samuelson to Elinor Ostrom: History of Economic Thought in the 20th Century. (Seminar, Humboldt-Universität zu Berlin, Germany)*

*Helge Wendt: Energiewenden in der Vergangenheit. (Wissens)historischen Konzeption eines aktuellen Themas. (Seminar, Technische Universität Berlin, Germany)*

## Cooperation Partners

Aga Khan University, London (UK)  
 Amsterdam Center for Cultural Heritage and Identity, Amsterdam (Netherlands)  
 Atelier de recherche sur l'intermédialité et les arts du spectacle (ARIAS), Paris (France)  
 Bard College Berlin, Berlin (Germany)  
 Berlin-Brandenburgische Akademie der Wissenschaften (BBAW), Berlin (Germany)  
 Biblioteca Nacional de Portugal (BNP), Lisbon (Portugal)  
 Bibliotheca Hertziana—Max-Planck-Institut für Kunstgeschichte, Rome (Italy)  
 Bibliothèque de l'Observatoire de Paris, Paris (France)  
 Botanischer Garten und Botanisches Museum Berlin, Berlin (Germany)  
 British Library, London (UK)  
 Caltech, Pasadena, California (USA)  
 Centre de recherche sur l'intermédialité (CRI), Montréal, Quebec (Canada)  
 Centro Internazionale di Studi e Documentazione Leonardo da Vinci, Vinci (Italy)  
 Centro Internazionale di Studi Telesiani Bruniani e Campanelliani "Alain Segonds" e "Giovanni Aquilecchia," Cosenza (Italy)  
 Chinese Academy of Sciences (CAS), Beijing (China)  
 Chung-Hwa Institute of Buddhist Studies, Taiwan  
 Deutsches Archäologisches Institut (DAI), Berlin (Germany)  
 Deutsches Luft- und Raumfahrtzentrum (DLR), Berlin (Germany)  
 Deutsches Museum München, Munich (Germany)  
 École Nationale des Chartes, Paris (France)  
 Ethnologisches Museum Berlin, Berlin (Germany)  
 Europeana Foundation, The Hague (Netherlands)  
 Freie Universität Berlin (FU), Berlin (Germany)  
 Friedrich-Alexander Universität Erlangen-Nürnberg (FAU), Erlangen (Germany)  
 Friedrich-Schiller-Universität Jena, Jena (Germany)  
 Fritz Haber Institute of the Max Planck Society, Berlin (Germany)  
 Georg-August-Universität Göttingen, Göttingen (Germany)  
 Harvard University—Fairbank Center for Chinese Studies, Cambridge, Massachusetts (USA)  
 Haus der Kulturen der Welt, Berlin (Germany)  
 Hebrew University, Jerusalem (Israel)  
 Humboldt-Universität zu Berlin (HU), Berlin (Germany)  
 Indiana University Bloomington, Bloomington, Indiana (USA)  
 Indian Institute of Technology Madras, Chennai (India)  
 Institut für Deutsche Sprache, Mannheim (Germany)  
 Institute for Advanced Sustainability Studies, Potsdam (Germany)  
 Institute Vienna Circle, Vienna (Austria)  
 Istituto di Scienze Marine, Venice (Italy)  
 Jiao Tong University, Shanghai (China)  
 Julius-Maximilians-Universität Würzburg, Würzburg (Germany)  
 Karl-Franzens-Universität Graz, Graz (Austria)  
 La Fundación Canaria Orotava de Historia de la Ciencia, La Orotava (Spain)  
 Laboratoire SPHERE, Le Chesnay (France)

Latin American Center of Physics (CLAF), Rio de Janeiro (Brazil)  
 Ludwig-Maximilians-Universität München, Munich (Germany)  
 Madison University Library, Madison, Wisconsin (USA)  
 Max Planck Institute for European Legal History (MPIeR), Frankfurt am Main (Germany)  
 Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Potsdam (Germany)  
 Max Delbrück Center for Molecular Medicine, Berlin (Germany)  
 McGill University—Islamic Scientific Manuscripts Initiative, Montréal, Quebec (Canada)  
 Ministério da Ciência, Tecnologia e Inovação (MCTI), Brasília (Brazil)  
 Mississippi State University, Starkville, Mississippi (USA)  
 Museo Galileo, Florence (Italy)  
 Museum für Islamische Kunst, Berlin (Germany)  
 Nanjing University of Information Science and Technology, Nanjing (China)  
 National Museum of Iran, Tehran (Iran)  
 National Taiwan University, Taipei (Taiwan)  
 New York University, New York City (USA)  
 Niels Bohr Library—Archive for the History of Quantum Physics, New York City (USA)  
 Norwegian Institute of Palaeography and Historical Philology (PHI), Oslo (Norway)  
 Palace Museum, Beijing (China)  
 Rachel Carson Center, Munich (Germany)  
 Research Centre for the Humanities (RCH), Athens (Greece)  
 Scuola Normale Superiore di Pisa, Centro di Ricerca Matematica “Ennio de Giorgi” Pisa (Italy)  
 Sociedad Cubana de Física, Universidad de La Habana, Havana (Cuba)  
 Sociedad Cubana de Historia de la Ciencia y la Tecnología (SCHT), Havana (Cuba)  
 Staatliche Museen zu Berlin (SMB), Berlin (Germany)  
 Staatsbibliothek zu Berlin, Berlin (Germany)  
 Stiftung Preußischer Kulturbesitz (SPK), Berlin (Germany)  
 Technische Universität Berlin (TU), Berlin (Germany)  
 Technische Universität Darmstadt, Darmstadt (Germany)  
 Tel Aviv University, Tel Aviv (Israel)  
 Tufts University, Medford, Massachusetts (USA)  
 Universidad de Córdoba, Cordoba (Spain)  
 Universidad de la República Uruguay, Montevideo (Uruguay)  
 Universidad de Las Palmas de Gran Canaria (ULPGC), Las Palmas de Gran Canaria (Spain)  
 Universidad de Sevilla, Seville (Spain)  
 Universidad Nacional Autónoma de México (UNAM), Mexico City (Mexico)  
 Universidade de Lisboa, Lisbon (Portugal)  
 Universidade de São Paulo (USP), São Paulo (Brazil)  
 Universidade Federal da Bahia (UFBA), Salvador da Bahia (Brazil)  
 Università degli Studi di Bergamo, Bergamo (Italy)  
 Università degli Studi di Modena e Reggio Emilia (UNIMORE), Modena (Italy)  
 Università degli Studi di Torino, Turin (Italy)

Università degli Studi di Urbino “Carlo Bo,” Urbino (Italy)  
 Università di Bologna, Bologna (Italy)  
 Universitat de Barcelona, Barcelona (Spain)  
 Universität für Angewandte Kunst, Vienna (Austria)  
 Universität Regensburg, Regensburg (Germany)  
 Universität Rostock—Zentrum für Logik, Wissenschaftstheorie und Wissenschafts-  
 geschichte, Rostock (Germany)  
 Universiteit Utrecht, Utrecht (Netherlands)  
 University of Amsterdam, Amsterdam (Netherlands)  
 University of California (UCLA), Los Angeles, California (USA)  
 University of Cambridge, Cambridge (UK)  
 University of Chicago, Chicago, Illinois (USA)  
 University of Hong Kong, Hong Kong (China)  
 University of Oklahoma, Norman, Oklahoma (USA)  
 University of Sydney, Sydney (Australia)  
 University of Texas at Arlington, Arlington, Texas (USA)  
 Van Leer Jerusalem Institute, Jerusalem (Israel)

### Preprints 2015–2017

The Institute’s Preprint Series publishes the results of ongoing research projects, both individual and those originating from Working Groups. Many of these papers can be seen later in journals or edited volumes. The following Preprints appeared in the evaluated period.

**467** Meyer, Carl H. and Günther Schwarz. *The theory of nuclear explosives that Heisenberg did not present to the German military*. 2015.

**468** Boltz, William and Matthias Schemmel. *Theoretical reflections on elementary actions and instrumental practices: the example of the Mohist canon (TOPOI – Towards a historical epistemology of space)*. 2015.

**469** Olariu, Dominic. *The misfortune of Philippus de Lignamine’s herbal or new research perspectives in herbal illustrations from an iconological point of view*. 2015.

**470** Castro Diaz-Balart, Fidel. *On the development of nuclear physics in Cuba*. 2015.

**471** Laubichler, Manfred and Jürgen Renn. *Extended evolution*. 2015.

**472** Christie, John. *Chemistry through the “Two Revolutions”: chemical Glasgow and its chemical entrepreneurs, 1760–1860*. 2015.

**473** Lehner, Christoph and Helge Wendt. *Mechanik in der Querelle des Anciens et des Modernes*. 2015.

**474** Bulatovic, Natasa, Bastien Saquet, Marco Schlender, Dirk Wintergrün, and Frank Sander. *Digital scrapbook: can we enable interlinked and recursive knowledge equilibrium?* 2015.

**475** Laubichler, Manfred Dietrich, Dirk Wintergrün, Jürgen Renn, Roberto Lalli, and Matteo Valleriani. *Netzwerke als Wissensspeicher*. 2015.



- 476 Lefèvre, Wolfgang. “Das Ende der Naturgeschichte”, neu verhandelt: historisch genealogische oder epigenetische Neukonzeption der Natur? 2016.
- 
- 477 Fechner, Martin. *Kommunikation von Wissenschaft in der Neuzeit: vom Labor in die Öffentlichkeit; eine Untersuchung zum Wandel des Publikationsverhaltens erfolgreicher Wissenschaft am Beispiel der Spektralanalyse und des Lasers*. 2016.
- 
- 478 Blum, Alexander S., Jürgen Renn, and Matthias Schemmel. *Experience and representation in modern physics: the reshaping of space*. 2016.
- 
- 479 Sachse, Carola. *Die Max-Planck-Gesellschaft und die Pugwash conferences on science and world affairs (1955–1984)*. 2016.
- 
- 480 Fourès-Bruhat, Yvonne. *Existence theorem for certain systems of nonlinear partial differential equations*. 2016.
- 
- 481 Morel, Thomas, Giuditta Parolini, and Cesare Pastorino. *The making of useful knowledge*. 2016.
- 
- 482 Gebhardt, Wolfgang. *Erich Kretschmann: the life of a theoretical physicist in difficult times*. 2016.
- 
- 483 Serrano, Elena. *Spreading the revolution: Guyton’s fumigating machine in Spain; politics, technology, and material culture (1796–1808)*. 2016.
- 
- 484 Bangham, Jenny and Judith Kaplan, eds. *Invisibility and labour in the human sciences*. 2016.
- 
- 485 Hoffmann, Dieter and Ingo Peschel, eds. *Man möchte ja zu seinem Fach etwas beitragen. Peter Fulde: Physiker, Organisator, Brückenbauer*. 2016.
- 
- 486 Hsu, Elisabeth and Chee Han Lim. *Enskilment into the environment: the Yijin jing worlds of Jin and Qi*. 2016.
- 
- 487 Høyrup, Jens. *Archimedes: knowledge and lore from Latin Antiquity to the outgoing European Renaissance*. 2017.
- 
- 488 Høyrup, Jens. *Otto Neugebauer and the exploration of ancient Near Eastern mathematics*. 2017.
- 
- 489 Valleriani, Matteo, Rifat-Sara Pearl, and Liron Ben Arzi. *Images don’t lie (?)*. 2017.
-





## Index

### A

*Abdounur, Oscar* 39  
*Abraham, Itty* 239, 240  
*Abuladze, Tamar* 261  
*Achbari, Azadeh* 232  
*Adamson, Peter* 350  
*Ahmed, Asad* 172  
*Alberts, Tara* 171, 182  
*Alder, Ken* 163  
*Algazi, Gadi* 163, 401  
*Allen, Ben Joseph* 240  
*Allen, Stewart* 216, 221, 224, 264  
*Amitai, Reuven* 247  
*Andreeva, Anna* 216, 236  
*Andrews, Noam* 179, 421  
*Antognazza, Maria Rosa* 360  
*Anzulewicz, Henryk* 160  
*Aparicio, Mónica Colominas* 30  
*Aricanli, Sare* 247  
*Arnaud, Sabine* 15, 351, 352, 353, 354, 417  
*Arom, Naàma* 247  
*Aronova, Elena* 128, 129, 132, 133, 134, 138, 396, 419  
*Arthur, Richard* 360  
*Asmussen, Tina* 67, 68, 397, 404  
*Asper, Markus* 10, 400  
*Aubin, David* 146  
*Aurières, Elise* 128  
*Avxentevskaya, Maria* 130, 158, 384, 389, 403, 404, 417, 425  
*Axworthy, Angela* 44, 360, 384, 425

### B

*Babu, D. Senthil* 27, 175, 261  
*Bacar, Jaromir* 400  
*Badino, Massimiliano* 62  
*Bai, Lanling* 216  
*Baldanza, Kathlene* 216, 253  
*Bangham, Jenny* 138, 144, 152, 419  
*Baracca, Angelo* 33

*Bardi, Alberto* 45  
*Bargheer, Stefan* 135  
*Barnett, Lydia* 163  
*Bates, David* 154  
*Baumann, Brian* 247  
*Bayoumi, Soha* 163  
*Becchi, Antonio* 38  
*Beeley, Philip* 359, 360  
*Behr, Wolfgang* 235  
*Belhoste, Bruno* 163  
*Belknap, Geoff* 155  
*Bellanger, Pierre* 157  
*Bellis, Delphine* 359, 360  
*Bello, David* 216, 227, 237, 246  
*Belouin, Pascal* 216, 251  
*Beltran, José* 179, 404, 421  
*Benninghaus, Christina* 168  
*Benson, Etienne* 132, 134, 136, 156, 232  
*Berger, Susanna* 180  
*Berman, Lex* 252  
*Bernard, Andreas* 387, 388  
*Berson, Josh* 152  
*Bevilacqua, Fabio* 10  
*Bhattacharyya, Debjani* 232  
*Biagoli, Mario* 223  
*Bian, He* 216, 253  
*Biank, Johanna* 45, 421  
*Bijsterveld, Karin* 326, 334, 335  
*Biran, Michal* 247, 248  
*Birdsall, Carolyn* 321, 322, 325, 334  
*Bisaha, Nancy* 174  
*Bittel, Carla* 165, 166, 168, 183  
*Blacker, Sarah* 155, 216, 239, 241, 275  
*Bloor, David* 216, 231  
*Blum, Alexander* 15, 50, 51, 52, 53, 55, 56, 343, 344, 346, 396  
*Böhmer, Maria* 153  
*Bol, Marjolijn* 216  
*Bol, Peter* 252  
*Boltz, William G.* 26, 216  
*Bondi, Roberto* 39  
*Bonhomme, Edna* 216, 271, 389  
*Bonolis, Luisa* 51, 53

*Bouk, Dan* 134, 166, 168  
*Bourguet, Marie-Noelle* 163  
*Bowen, Sian* 156  
*Bower, Alex* 249  
*Boyarin, Daniel* 178  
*Braarvig, Jens* 31  
*Braguinski, Nikita* 332  
*Brain, Robert* 163  
*Brara, Rita* 216, 237  
*Bray, Francesca* 171, 242  
*Brenner, Elma* 185  
*Brentjes, Sonja* 28, 29, 30, 35, 175, 235, 236, 258, 260, 397, 399, 424, 425  
*Brill, Dieter* 52, 53  
*Brink-Roby, Heather* 156  
*Brixius, Dorit* 179, 421  
*Brock, Emily* 216, 238, 263  
*Brody, Martin* 331  
*Bronkhorst, Johannes* 234  
*Brooks, Penaloza* 180  
*Brownell, Emily* 216, 239, 241, 397  
*Browne, Janet* 225  
*Brusius, Mirjam* 134, 146  
*Bruyninckx, Joeri* 312, 314, 317, 319, 322, 333, 335, 397, 419, 423, 424, 425  
*Buell, Paul David* 216  
*Bultrighini, Ilaria* 260  
*Buning, Marius* 216, 223, 271, 403  
*Burak, Guy* 151  
*Burton-Rose, Daniel* 216, 236  
*Busse Berger, Anna Maria* 137  
*Büttner, Jochen* 24, 33, 35, 37, 77  
*Bycroft, Michael* 184

### C

*Cabré, Montserrat* 182  
*Caglioti, Angelo Matteo* 232  
*Calà, Irene* 384  
*Campbell, Aurelia* 216, 252, 253, 254  
*Camprubí, Lino* 129, 131, 132, 139, 157, 317, 320, 389, 397, 419, 424

- Carrier, Martin* 360  
*Carson, John* 153, 163  
*Castagnetti, Giuseppe* 408  
*Casties, Robert* 171, 172, 185, 333  
*Cavallo, Sandra* 184, 185  
*Celenza, Christopher S.* 174  
*Cerulli, Anthony* 175  
*Chakrabarti, Pratik* 175  
*Chalmers, Alan* 38  
*Chamayou, Grégoire* 157  
*Chandler, James* 156  
*Chang, Che-Chia* 171  
*Chang, Kevin* 163  
*Chang, Subin* 252  
*Charenko, Melissa* 180  
*Chemla, Karine* 137, 148, 163  
*Chen, BuYun* 216, 224, 245, 246  
*Chen, Esther* 16, 228, 250, 363, 370  
*Cheng, Sijia* 216, 224, 226, 277  
*Chen, Hsi-yuan* 252  
*Chen, Jinhua* 216, 237  
*Chen, Kaijun* 216, 221, 224, 265, 404  
*Chen-Morris, Raz* 174  
*Chen, Shih-Pei* 216, 251, 255, 257, 262  
*Chen, Xi* 216, 254  
*Che, Qun* 216, 227, 235, 251, 257, 268, 417, 419  
*Cheung, Desmond* 216, 227, 246, 253  
*Chowdoury, Irina* 225  
*Christie, John* 163  
*Clarence-Smith, William G.* 247  
*Clark, Ashley* 180  
*Clark, Jessica* 187  
*Coates, Stephen* 336  
*Coen, Deborah* 128  
*Cohen, Brigid* 332  
*Cohen-Cole, Jamie* 137, 155, 163  
*Cohen, Joel* 156  
*Colominas, Monica* 385  
*Cory, Therese* 163  
*Costa, Maria Teresa* 32  
*Cowles, Henry M.* 163  
*Creager, Angela N. H.* 10, 132, 163, 185  
*Creyghton, Camille* 180  
*Crippa, Daniel* 360  
*Cristina Pecchia* 175  
*Csiszar, Alex* 128, 401  
*Cucu, Alina-Sandra* 216, 242, 266, 400  
*Curry, Helen* 163
- D**
- Dahn, Ryan* 180  
*Dai, Lianbin* 151  
*Daiwie, Fu* 239  
*Daston, Lorraine* 3, 12, 121, 127, 128, 129, 132, 133, 137, 140, 146, 147, 148, 149, 153, 154, 155, 156, 157, 171, 290, 382, 384, 389, 405, 417, 423, 424, 425  
*Davies, Surekha* 216, 230, 231  
*Dawson, Gowan* 155  
*Debuiche, Valérie* 360  
*De Ceglia, Francesco Paolo* 184  
*Defaux, Olivier* 297  
*De La Rana, Adele* 53  
*Delille, Emmanuel* 216  
*Deluze, Vincent* 180  
*Dennis, Joseph* 216, 227, 252, 253, 254  
*Dent, Rosanna* 153  
*de Pee, Christian* 216  
*De Pierris, Graciela* 360  
*De Risi, Vincenzo* 15, 36, 357, 359, 360, 420, 423, 424  
*de Swart, Jaco* 53  
*DeVinney, Joslyn* 171  
*Dias, Nélia* 135  
*Dick, Stephanie* 137  
*Diekmann, Nele* 421  
*DiMoia, John P.* 216, 231, 388  
*Divarci, Lindy* 26, 80  
*Dolan, Emily I.* 316  
*Donato, Maria Pia* 136  
*Dong Xiu Yuang* 350  
*Donovan, Kevin* 216, 226, 276  
*Dorato, Mauro* 53  
*Dorofeeva-Lichtmann, Vera* 216, 228, 257  
*Dry, Sarah* 232  
*Duchesneau, François* 360  
*Dudley, Edith Sylla* 174  
*Dupré, Sven* 154, 405  
*Dutreuil, Sébastien* 141, 417, 419  
*Du, Yongtao* 216, 254  
*Dycheyne, Steffen* 163  
*Dykstra, Maura* 130
- E**
- Earle, Rebecca* 184  
*Ecce, Giulia* 149  
*Echterhölter, Anna* 130, 175, 419  
*Eddy, Matthew* 166, 168  
*Edwards, Paul N.* 134  
*Eisenstaedt, Jean* 53  
*Ekhholm, Karin* 184  
*Elshakry, Marwa* 128  
*Engelstein, Stefanie* 128  
*Engler, Olaf* 62  
*Erb, Andreas* 137  
*Erlmann, Veit* 327, 336  
*Ernst, Rose* 163  
*Ertsen, Maurits* 232  
*Esposito, Elena* 137, 402  
*Evans, James A.* 137  
*Evenden, Matthew* 232  
*Eyferth, Jacob* 166, 401
- F**
- Fan, Fa-ti* 132, 216, 246  
*Farinelli, Franco* 360  
*Farridnejad, Shervin* 234  
*Feaster, Patrick* 322  
*Fechner, Martin* 421  
*Feingold, Moredechai* 359  
*Feld, Adriana* 128  
*Feldhay, Rivka* 37, 169, 173, 174  
*Felfe, Robert* 401  
*Felsch, Philipp* 383, 384  
*Felten, Sebastian* 129, 130, 141, 397, 404, 419, 425  
*Fiaschetti, Francesca* 216, 245  
*Fischer, Sabine von* 329, 332, 334  
*Fissell, Mary* 185

- Flemming, Rebecca* 153  
*Flitsch, Mareile* 10  
*Flow, Christian* 180  
*Forrester, John* 153, 409  
*Frampton, Sally* 155  
*Fransen, Sietske* 158, 182, 419  
*Fraser, James* 344  
*Freise, Georg* 171  
*Freudenthal, Gideon* 60, 62  
*Freyberg, Sascha* 62, 63  
*Fridlund, Mats* 233  
*Friedman, Michael* 360  
*Friedman, Robert Marc* 51  
*Friedrich, Markus* 134, 136, 146  
*Friedrich, Susanne* 131, 146  
*Frühstückl, Robert* 58  
*Fu, Daiwie* 216  
*Fuller, Steve* 128  
*Fullilove, Courtney* 216, 243  
*Fulton, Adam Johnson* 180
- G**
- Gaboury, Jacob* 142  
*Gainty, Caitjan* 156  
*Galdon-Clavell, Gemma* 157  
*Galison, Peter* 157  
*Galvany, Albert* 216  
*Ganchrow, Raviv* 337  
*Gänger, Stefanie* 135  
*Gao, Yan* 216, 243, 253, 419  
*Garau, Rodolfo* 40, 61  
*Garber, Daniel* 360  
*Gaudenzi, Rocco* 344  
*Gayon, Jean* 409  
*Geimer, Peter* 384  
*Geller, Florentina Badalanova* 234, 260  
*Geller, Markham* 31, 148, 149, 235, 261, 384  
*Gere, Catherine* 133  
*Germanese, Donatella* 153, 159, 383  
*Gerritsen, Anne* 216, 243  
*Gess, Nicola* 317  
*Geus, Klaus* 400  
*Giannini, Giulia* 49, 399  
*Gibbs, Fred* 137  
*Ginzburg, Carlo* 153  
*Gitelman, Lisa* 402  
*Giulini, Domenico* 51  
*Glezer, Tal* 360  
*Goldschmidt, Asaf* 153, 216, 238  
*Goldstein, Jan* 156  
*Gómez, Pablo F.* 182  
*Gowland, Angus* 184  
*Grace, Joshua* 222  
*Grafit, Sasha* 171  
*Grafton, Anthony* 136, 150, 151  
*Graham, Mark* 157  
*Granada, Miguel Angel* 39, 46  
*Graßhoff, Gerd* 4, 14, 79, 293, 295, 297, 382, 384, 417  
*Gray, Jeremy* 360  
*Graziani, Pierluigi* 359  
*Greene, Jeremy A.* 184  
*Gribenski, Fanny* 330, 333  
*Griffin, Clare* 175, 187, 403, 419, 424  
*Grote, Mathias* 185  
*Gruendler, Beatrice* 10  
*Grzimek, Gina* 216  
*Guan, Xueling* 216, 238  
*Guan, Yuzhen* 216, 261, 269, 419  
*Guicciardini, Niccolò* 359  
*Guillaume, Bertrand* 216, 238  
*Guldi, Joanna* 225  
*Günergrun, Feza* 171  
*Guo, Fuxiang* 216  
*Gurschler, Ivo* 180  
*Gürses Tarbuck, Derya* 168  
*Gusterson, Hugh* 157  
*Gutfreund, Hanoch* 53  
*Gu, Zhou* 224, 226, 422
- H**
- Hagström-Molin, Emma* 180  
*Hahn, Barbara* 216, 242, 243  
*Hall, James* 180  
*Halpern, Orit* 137  
*Hamid, Nabeel* 359, 422  
*Hankinson, Andrew* 172  
*Hansen, Svend* 24  
*Hanson, Marta* 153  
*Harari, Orna* 40, 149  
*Hardenberg, Wilko Graf von* 216, 222, 224, 230, 232, 249, 263, 368, 388, 389, 396, 397  
*Harper, Esther* 249  
*Harrison, Rodney* 136  
*Harris, William* 402  
*Hartz, Thiago* 51, 56  
*Harvey, Steven* 350  
*Harwood, Jonathan* 216  
*Hasegawa, Masato* 216, 247, 268  
*Hatfield, Gary* 360  
*Hautala, Svetlana* 154  
*Heesen, Anke te* 323, 327, 335, 382, 384, 425, 426  
*Heeßel, Nils P.* 149  
*Heinicke, Susanne* 154  
*Heinrichs, Erik A.* 184  
*Helmrath, Johannes* 400  
*Helmreich, Stefan* 402  
*Henderson, John B.* 153  
*Henning, Jochen* 423  
*Hepler-Smith, Evan* 179, 422  
*Herbert, Amanda* 187  
*Herman, Paul* 163  
*Herrmann, Hans-Christian von* 384  
*Hiyama, Satomi* 260  
*Hoffmann, Dieter* 57, 417  
*Ho, Hou Jeong Brent* 251, 252  
*Hollerbach, Teresa* 40, 407, 418, 426  
*Homola, Stéphanie* 216, 231, 236  
*Hon, Giora* 154  
*Hood, Stephanie* 386  
*Hsia, Florence* 133, 146  
*Hsieh, Jennifer* 216, 274, 316, 320, 336  
*Hsiung, Hansun* 143, 182  
*Huang, Fei* 216, 252, 253  
*Huang, Lily* 156, 180  
*Huang, Xing* 216  
*Hu, Danian* 58  
*Hui, Alexandra* 315, 316, 317, 318, 319, 332, 334, 336  
*Hyde, Hallie* 216

**I**

*Immer, Alexander* 418  
*Inaba, Hajime* 422  
*Irani, Lilly* 240  
*Iribarren, Isabel* 163  
*Isahaya, Yoichi* 260  
*Ismail, Shehab* 216, 272

**J**

*Jackson, Myles* 320, 334, 335  
*Jacobs, Nancy* 231  
*Jacoby, Mariko* 72  
*Jähnert, Martin* 55, 384, 422  
*Jalobeanu, Dana* 404  
*Jamil, Ragep* 171  
*Janiak, Andrew* 360  
*Janković, Vladimir* 133  
*Janssen, Michel* 53  
*Jaquet, Daniel* 403  
*Jardine, Boris* 152, 163  
*Jasper, Sandra* 335  
*Jerratsch, Anna* 46, 422  
*Jesseph, Douglas* 360  
*Jewett, Andrew* 128  
*Jiménez, Enrique* 149  
*Johns, Adrian* 156  
*Johnson, Benjamin* 70  
*Johnson, Cale* 149  
*Jones, Alexander* 360  
*Jones, Brian P.* 216  
*Jones, Caroline* 157  
*Jones, Matthew L.* 128, 133, 137  
*Joráti, Hadi* 216, 224, 261  
*Jordanova, Ludmilla* 401  
*Jordi, Marta* 422  
*Jost, Jürgen* 360

**K**

*Kachru, Sonam* 179, 419, 422  
*Kaijun, Chen* 419  
*Kaplan, Abram* 180, 420  
*Kaplan, Judith* 134, 143, 144,  
 152, 153, 155, 322, 423,  
 424  
*Kaster, Robert* 151  
*Katzir, Shaul* 58  
*Kauokji, Natalie* 184

*Keevak, Michael* 401  
*Keller, Agathe* 148, 163  
*Keller, Vera* 190  
*Kennaway, James* 327, 336  
*Kennefick, Daniel J.* 51  
*Kett, Robert* 216, 240, 266, 420  
*Keuck, Lara* 153, 418  
*Ki Che Leung, Angela* 171  
*Kiefer, Claus* 360  
*Kirloskar-Steinbach, Monika* 240  
*Klein, Ursula* 72, 417, 418  
*Klimscha, Florian* 24  
*Klotz, Sebastian* 316  
*Knapp, Keith* 247  
*Knobloch, Eberhard* 360  
*Knowles, Scott Gabriel* 72  
*Kocka, Jürgen* 4  
*Ko, Dorothy* 171  
*Kohlstedt, Sally Gregory* 153, 168  
*Kolboske, Birgit* 400  
*Kolkowski, Aleksander* 334  
*Kósa, Gábor* 261  
*Kraft, Alison* 59  
*Krajewski, Markus* 134, 146  
*Krämer, Fabian* 154  
*Krause, Katja* 4, 15, 160, 248,  
 347, 383, 403, 417, 418,  
 420, 424  
*Kräutli, Florian* 16, 185, 333  
*Krebs, Stefan* 316  
*Kremer, Richard L.* 44, 47  
*Krone, Kerstin von der* 185  
*Krüger, Lorenz* 3  
*Küçük, Harun* 131  
*Kuriyama, Shigehisa* 10, 156  
*Kursell, Julia* 317, 321, 322, 323,  
 327, 334, 335  
*Kurz, Constanze* 157  
*Kusnetzky, Lara René* 216  
*Kusukawa, Sachiko* 184  
*Kvičalová, Anna* 312, 327, 335,  
 420, 422, 423, 424, 425

**L**

*Lackner, Michael* 236  
*Laemmli, Whitney* 128, 153, 179,  
 418, 420, 422  
*Laks, André* 289  
*Lalli, Roberto* 50, 51, 53, 57, 76,  
 78, 369, 396  
*Lange, Britta* 321, 423  
*Lange, Diana* 175  
*Lao, Eugenia* 178  
*Laqua, Anna* 332  
*Laroche, Rebecca* 186  
*Larsson, Elle* 249  
*Lässig, Simone* 130  
*Laubichler, Manfred* 63, 70, 74,  
 76  
*Lean, Eugenia* 128  
*Ledebur, Sophie* 180  
*Lee, Eunsoo* 359  
*Lee, Jung* 161, 216, 420  
*Lehman, Jessica* 232  
*Lehmann, Philipp* 129, 131, 132,  
 144, 231, 396, 418, 420,  
 423  
*Lehner, Christoph* 41, 55, 56  
*Lemercier, Claire* 402  
*Lemov, Rebecca* 133, 134, 135,  
 322  
*Leong, Elaine* 4, 126, 153, 155,  
 156, 164, 165, 166, 169,  
 181, 182, 183, 184, 185,  
 186, 187, 188, 420, 424  
*Lerman, Nina* 221  
*Lessl, Bernadette* 344  
*Lethbridge, Josephine* 388  
*Leung, Angela Ki Che* 153, 426  
*Lev, Efraim* 153, 248  
*Levin, Thomas Y.* 332, 336  
*Lewowicz, Lucía* 33  
*Lichau, Karsten* 327  
*Lidgard, Scott* 156  
*Lieven, Alexandra von* 260  
*Li, Fuqiang* 216, 245  
*Lim, Jongtae* 216, 239  
*Lindee, Susan* 152, 163  
*Ling, Cao* 216, 227, 243, 244,  
 252, 253

- Linker, Beth 166, 168  
 Lin, Nungyao 216, 257  
 Lintott, Chris 155  
 Liu, Daniel 180  
 Li, Xiaochang 312, 314, 322, 324,  
     333, 420  
 Li, Yan 216, 254  
 Longfei, Chu 226  
 Lopez, Raúl Necochea 241  
 Lopez-Farjeat, Luís 350  
 Loporcaro, Michele 235  
 Lourdusamy, John-Bosco 242  
 Luo, Wenhua 216  
 Lütteken, Laurenz 335  
 Lützen, Jesper 359  
 Lu, Zhao 216, 274  
 Lycas, Alexis 216, 272  
 Lydon, Steven 327, 334
- M**
- Macfarlane, Daniel 232  
 Maerker, Anna 156, 166, 168  
 Mak, Bill 235  
 Malet, Antoni 39, 359  
 Malino, Paola 151  
 Mamidipudi, Annapurna 216,  
     238  
 Mancha, José-Luis 30, 236  
 Mandressi, Rafael 154  
 Marchand, Suzanne 133  
 Martinez, Jean-Philippe 53  
 Martin, Johanna Goncalves 221  
 Mayer, Andreas 154, 163  
 May, Timothy 247  
 Mazanik, Anna 216  
 Mazurek, Małgorzata 128  
 McAllister, Karen 241  
 McCausland, Shane 247  
 McCoy, Michelle 216, 260, 261,  
     275, 420, 422  
 McCray, Patrick 134, 146  
 McNamee, Megan 151  
 Mcvaugh, Michael 184  
 McWilliams, Felicity 249  
 Mei, Jianjun 224, 225  
 Meirinhos, José 350  
 Meister, Anna-Maria 180  
 Mendell, Henry 360
- Mendelsohn, Andrew 133, 163  
 Menon, Minakshi 174, 176, 177,  
     384, 404  
 Merrill, Elizabeth 38, 384  
 Messner, Daniel 179, 422  
 Mevissen, Gerd J. R. 261  
 Meyer-Kalkus, Reinhart 327, 335  
 Meyer, Michael 400  
 Miao, Tian 26  
 Middeke-Conlin, Robert 28, 384  
 Mihailescu, Ion 384  
 Milam, Erika 168  
 Miller, David M. 360  
 Miller, Ian Matthew 216, 227,  
     253, 267  
 Miller, Tracy 254  
 Mills, Mara 315, 316, 319, 320,  
     322, 334, 335, 336  
 Mimura, Taro 173  
 Ming, Chen 171  
 Minkowski, Christopher 151  
 Minsky, Lauren 241  
 Mitchell, Adam 252  
 Mitchell, Laura 187, 240  
 Mitchell, Timothy 401  
 Mitman, Gregg 240, 402  
 Mongin, Philippe 163  
 Monn, Nuria 216, 408  
 Moore, Aaron 216, 238, 241  
 Morenas, Leon 241  
 Morgan, Daniel 149, 260  
 Morgan, Ruth 178  
 Morozov, Evgeny 157  
 Morrison, Kathleen 224, 225  
 Morrison, Robert 174  
 Most, Glenn W. 4, 14, 147, 148,  
     149, 150, 151, 157, 163,  
     222, 224, 234, 235, 289,  
     417, 418, 423, 425, 426  
 Motzkin, Gabriel 60  
 Mougey, Thomas 128  
 Moumtaz, Nada 241  
 Muehlmann, Shaylih 135  
 Mugnai, Massimo 360  
 Mukharji, Projit Bihari 175, 183  
 Müller, Philipp 136  
 Müller-Tamm, Jutta 382, 383,  
     384
- Müller-Wille, Staffan 134, 146,  
     154, 301  
 Mulsow, Martin 10, 154, 163  
 Mumma, John 360  
 Muñoz, Núria 344, 345  
 Munroe, Jennifer 186  
 Murphy, Michelle 216, 239
- N**
- Nadim, Tahini 241  
 Nag, Anindita 216, 239, 241  
 Najman, Hindy 235  
 Nakao, Maika 226  
 Nanda, Meera 128, 404  
 Nappi, Carla 216, 246, 248  
 Nasim, Omer 146  
 Neidhöfer, Thilo 180  
 Nelson, Sara 73  
 Németh, András 151  
 Nenci, Elio 35  
 Neven, Sylvie 396  
 Niles, Daniel 70  
 Noordam, Barend 405  
 Nordstroem, Katarina 216, 276  
 Novick, Tamar 216, 224, 240,  
     245, 247, 249, 263, 397  
 Nummedal, Tara 163  
 Nunn, Hillary 186  
 Nutton, Vivian 149
- O**
- Oertzen, Christine von 129, 130,  
     131, 133, 134, 152, 155,  
     156, 164, 165, 166, 167,  
     183, 385, 423, 425  
 Ogborn, Miles 401  
 Ohl, Michael 146  
 Ohnmacht, Felix 180  
 Oldofredi, Andrea 56  
 Olesko, Kathryn 131  
 Omodeo, Pietro Daniel 39, 40,  
     47, 48, 61, 62, 399, 418,  
     423, 424, 425  
 Onaga, Lisa 216, 245, 264  
 Ordine, Nuccio 39  
 Özbek, Leyla 289

**P**

*Paaf, Claudia* 16  
*Pablo, Montserrat de* 36, 420  
*Pádua, José Augusto* 136  
*Paethe, Cathleen* 366  
*Paglen, Trevor* 157  
*Paleari, Stefano* 64  
*Panaino, Antonio* 260  
*Pannhorst, Kerstin* 216, 278  
*Panza, Marco* 359  
*Papenburg, Jens Gerrit* 332  
*Park, Katharine* 178, 403  
*Parnes, Ohad* 4, 16, 63, 399, 401, 402, 426  
*Parrenas, Juno Salazar* 241  
*Parrinello, Giacomo* 231, 232  
*Päthe, Cathleen* 228, 250  
*Peebles, Jim* 51  
*Pee, Christian de* 231  
*Pellegrini, Pablo Ariel* 216, 230, 231  
*Perdue, Peter C.* 10  
*Perler, Dominik* 10  
*Peters, Benjamin* 240  
*Peters, Gunthild* 39, 418, 422  
*Pfeiffer, Judith* 172  
*Phalkey, Jahnavi* 128  
*Philip, Kavita* 216, 239, 241  
*Phillips, Harriet* 154  
*Pich, Roberto Hofmeister* 350  
*Pinch, Trevor* 317, 335  
*Pirtea, Adrian* 260  
*Pitts, Brian* 53  
*Plofker, Kim* 172, 175  
*Pomata, Gianna* 153, 154  
*Pontani, Filippomaria* 151, 235  
*Popplow, Marcus* 384  
*Pormann, Peter* 172  
*Porter, Theodore* 131, 157  
*Präßler, Ulrich* 137  
*Probst, Siegmund* 359  
*Pruszyńska, Joanna* 295  
*Puett, Michael* 137

**R**

*Rabouin, David* 360  
*Radeck, Antje* 408  
*Radin, Joanna* 134, 136, 146, 153  
*Ragab, Ahmed* 154, 178, 183, 247, 248, 350, 403  
*Ragep, Jamil* 169, 172, 173, 174  
*Ragep, Sally P.* 169, 171, 172, 174  
*Ragland, Evan R.* 184  
*Rankin, Alisha* 169, 183, 184, 189, 190  
*Raphael, Renée* 131  
*Raspe, Martin* 172  
*Reardon, Jennifer* 216  
*Rehding, Alexander* 316, 320, 336  
*Reichmuth, Stefan* 154  
*Reidy, Michael* 232  
*Reinhardt, Carsten* 4  
*Reisch, George* 128  
*Remond, Jaya* 189, 403, 424  
*Renn, Jürgen* 3, 4, 11, 19, 24, 26, 29, 33, 37, 40, 50, 51, 53, 55, 57, 62, 63, 66, 69, 70, 73, 74, 76, 382, 384, 389, 393, 396, 417  
*Rheinberger, Hans-Jörg* 3, 14, 301, 317, 417, 420, 424  
*Richardson, Seth* 248  
*Richards, Robert J.* 157  
*Rickles, Dean* 53  
*Rid, Thomas* 157  
*Rieger, Frank* 157  
*Riello, Giorgio* 216, 239, 262  
*Rieppel, Lukas* 146  
*Rietmann, Felix* 180  
*Riordan, Michael* 136  
*Rispoli, Giulia* 62, 70, 71, 385, 426  
*Rius, Mònica* 172  
*Rivest, Justin* 184  
*Roberts, Lissa Louise* 216, 238, 404, 405  
*Robinson, Sam* 140  
*Roeder, Carolin* 216, 273  
*Rohde, Joy* 146  
*Romão, João* 320

*Roos, Anna Marie* 156  
*Rosenberg, Daniel* 133  
*Rosol, Christoph* 66, 69, 70, 71, 73, 74, 80  
*Rossi, Michael* 157  
*Rowe, David* 54  
*Rudolph, Stefanie* 260  
*Ruiz de Olano, Pablo* 344, 345  
*Rusk, Bruce* 216  
*Rutherford, Donald* 360  
*Rütten, Thomas* 154

**S**

*Sabapathy, John* 131  
*Sachse, Carola* 59  
*Salisbury, Donald* 53  
*Samir, Imad* 30, 35  
*Sandow, Barbara* 424, 425  
*Sanhueza, Carlos* 33  
*Saraiva, Tiago* 242  
*Sattelmacher, Anja* 179, 384, 422  
*Sauer, Tilman* 53  
*Schäfer, Dagmar* 4, 13, 28, 171, 175, 215, 216, 222, 223, 234, 235, 236, 238, 239, 242, 247, 249, 251, 258, 262, 382, 384, 417, 418, 420, 423, 424, 426  
*Schatzberg, Eric* 216, 231  
*Schemmel, Matthias* 26, 27, 37, 63, 175, 399  
*Scherer, Bernd* 66  
*Schlögl, Robert* 69  
*Schlünder, Martina* 216, 239, 241  
*Schmaltz, Florian* 4, 57, 58  
*Schmidt, Juliane* 36  
*Schmidt, Susanne* 180  
*Schoefert, Kathryn* 249  
*Schoepflin, Urs* 363  
*Schotte, Margaret* 233  
*Schreiber, Marvin* 260  
*Schulmann, Robert* 54  
*Schüßler, Lotte* 327  
*Schwägerl, Christian* 387  
*Schwartz, Yosef* 350  
*Schwenke, Heiner* 216  
*Schwerin, Alexander von* 400

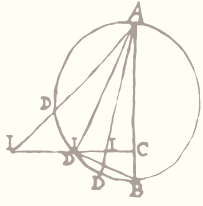
- Scott, Gregory Adam* 216, 253  
*Sears, Elizabeth* 403  
*Secord, James* 163  
*Sela, Ori* 216, 224  
*Selcer, Perrin* 146  
*Senatore, Maria Ximena* 221  
*Sen, Tansen* 170  
*Sepkoski, David* 129, 133, 134, 135, 137, 145, 157, 421, 425  
*Serrano, Elena* 32, 69, 166, 168, 418  
*Seymour, Kelsey* 216, 278  
*Shank, Michael H.* 174  
*Shapin, Steven* 231  
*Shen, Yubin* 216, 273  
*Shu, Changxue* 254  
*Shuttleworth, Sally* 155, 156, 163, 400  
*Siebert, Martina* 221  
*Simões, Ana* 10  
*Siskin, Clifford* 402  
*Sivaramakrishnan, Kavita* 128  
*Skipper, Alison* 249  
*Slowik, Edward* 359  
*Sluiter, Ineke* 151  
*Smith, Andrew Harris* 157  
*Smith, Justin* 360  
*Smith, Kerry* 216, 237  
*Smith, Lisa* 155, 156, 186, 187  
*Smith, Pamela H.* 169, 170, 171  
*Söderblom Saarela, Märten* 177, 216, 222, 234, 235, 266, 367, 421  
*Söderfeldt, Ylva* 216, 267, 384, 421  
*Solanki, Tanvi* 327, 336  
*Solleveld, Floris* 180  
*Soll, Jacob* 131  
*Somsen, Geert* 128  
*Song, Lingping* 216  
*Sorger, Marie-Thebaud* 69  
*Soto Laveaga, Gabriela* 128, 178  
*Spackman, Christy* 232  
*Squire, Michael* 402  
*Staden, Heinrich v.* 149  
*Stadhouders, Henry* 149  
*Stanley-Baker, Michael* 175, 216, 255, 256, 269, 421, 403  
*Stan, Marius* 360  
*Stark, Laura* 152, 163  
*Steege, Benjamin A.* 317, 320, 336  
*Steele, John* 148, 260  
*Stein, Claudia* 184, 189, 216  
*Steingart, Alma* 180  
*Steininger, Benjamin* 68, 69, 70  
*Steinle, Friedrich* 154, 216, 382, 384  
*Sterne, Jonathan* 316, 320, 336  
*Stevens, Hallam* 134, 137  
*Stewart, Ian* 359  
*Stoler, Ann Laura* 406  
*Stol, Marten* 149  
*Strasser, Bruno* 133, 134, 155  
*Stückelberger, Alfred* 296  
*Stuer, Catherine* 216, 254  
*Sturdy, Steve* 163  
*Sturlese, Loris* 350  
*Sundermeyer, Kurt* 53  
*Surdu, Mihai* 153  
*Sürmelihindi, Gül* 35  
*Szalay, Gabriella* 166
- T**
- Taape, Tillmann* 179, 190, 422  
*Taratko, Carolyn* 180  
*Taub, Liba* 133, 154  
*Taylor, Richard* 350  
*Terada, Masahiro* 72  
*Thébaud-Sorger, Marie* 216, 238  
*Thiermann, Alfredo* 332  
*Thoden, Klaus* 80, 81  
*Thomas, Julia Adeney* 136  
*Thoms, Ulrike* 400  
*Tho, Tzuchien* 360  
*Tigner, Amy* 186  
*Tinn, Honghong* 216, 265, 421  
*Tkaczyk, Viktoria* 15, 311, 312, 314, 315, 316, 317, 321, 322, 323, 328, 329, 332, 333, 382, 383, 396, 417, 423, 424, 425, 426  
*Tomaszewski, Marco* 137  
*Tortorici, Zeb* 246  
*Totelin, Laurence* 154, 187  
*Touloumi, Olga* 329, 335  
*Trambaiolo, Daniel* 183  
*Tramelli, Barbara* 180  
*Traninger, Anita* 400  
*Trimble, Virginia* 51  
*Trippett, David* 334, 336  
*Truitt, Elly* 163  
*Trzeciok, Stefan Paul* 39, 422  
*Tsui, Lik Hang* 216, 253  
*Tugendhaft, Aaron* 151  
*Tu, Hsieh-Chang* 252  
*Tupikova, Irina* 48  
*Turchetti, Simone* 138  
*Turnbull, Thomas* 69  
*Tzohar, Roy* 216, 235
- U**
- Uffink, Jos* 56  
*Unschuld, Paul U.* 149  
*Urmann, Martin* 405
- V**
- Valentines-Álvares, Jaume* 163  
*Valleriani, Matteo* 29, 35, 37, 38, 43, 49, 76, 77, 80, 364, 385, 417, 421, 426  
*Van Beurden, Sarah* 216, 231, 238, 239, 240, 242  
*van der Eijk, Philip* 384  
*van der Miesen, Leendert* 327, 328  
*van der Veer, Peter* 401  
*van Driel, Joppe* 226, 421  
*van Hyning, Victoria* 156  
*van Leeuwen, Joyce* 36, 397  
*VanNess Simmons, Richard* 234  
*Varner, Jessica* 180  
*Vasen, Federico* 128  
*Vasquez, Abril de* 180



- Veerstegh, Kees* 234  
*Veit, Raphaela* 172  
*Venkateshvaran, T.V.* 261  
*Vér, Márton* 247  
*Vermeulen, Hans* 31  
*Verran, Helen R.* 216, 240, 242  
*Vetter, Jeremy* 131  
*Vidal, Fernando* 129, 135, 163  
*Vimerio, Ana Carolina* 241  
*Vinklát, Marek* 261  
*Visigalli, Paolo* 151  
*Vogel, Johannes* 155  
*Vogl, Malte* 79, 297  
*Vogt, Annette* 161, 162, 417, 423, 424, 425, 426  
*Vollandt, Ronny* 151  
*Vongsathorn, Kathleen* 153
- W**
- Wagensonner, Klaus* 149  
*Wagner, Roi* 27  
*Wahrig, Bettina* 224  
*Wainer, Zackary* 148, 163  
*Wakefield, André* 360  
*Walch, Sonja* 216  
*Wale, Matthew* 156  
*Walker, Oriana* 180  
*Wallis, Faith* 402  
*Wallmann, Elisabeth* 179, 422  
*Wang, Guangyao* 216, 238  
*Wang, Hongsu* 216, 253  
*Wang, Sean* 216, 251  
*Wang, Sixiang* 131  
*Wang, Xueling* 216  
*Wang, Yijun* 216, 224, 226, 270  
*Warren, Rosanna* 157  
*Watson, Sara* 157  
*Weddigen, Tristan* 216  
*Weil, Dror* 177, 183, 260, 367, 384  
*Weill-Parot, Nicolas* 261  
*Weinberg, Joanna* 151  
*Weisser, Olivia* 184  
*Wels, Volkhard* 47  
*Wendt, Helge* 29, 31, 33, 41, 68, 404, 425, 426  
*Weninger, Karin* 216
- Werrett, Simon* 166, 190  
*White, Paul* 163  
*Widmer, Alexandra* 241  
*Wiggermann, Frans* 149  
*Williams, Alena* 128  
*Wilner, Isaiah Lorado* 216, 270, 384  
*Wilson, Benjamin* 162, 421  
*Wintergrün, Dirk* 51, 76, 77, 78, 80, 81, 172  
*Wise, Elaine* 163  
*Wise, M. Norton* 132, 163  
*Wittje, Roland* 317, 320, 334  
*Wolfe, Heather* 166, 186, 190  
*Wolf, Rebecca* 312, 314, 317, 328, 329, 330, 334, 335, 421, 423  
*Woodhead, Linda* 402  
*Woods, Abigail* 216, 246, 249  
*Wübber, Yvonne* 153  
*Wu, Huiyi* 216, 253  
*Wu, Micha* 252  
*Wüthrich, Adrian* 56  
*Wu, Yangzi* 216, 276  
*Wylie, Caitlin* 153
- X**
- Xiaodong, Yin* 56  
*Xu, Bin* 216, 252, 254
- Y**
- Yale, Elizabeth* 166, 190  
*Yang, Andrew* 163  
*Yang, Qiao* 216, 226, 277  
*Yang, Yulei* 216, 228, 257  
*Yasuhiro, Yokkaichi* 247  
*Yeh, Calvin* 216  
*Yiwen, Zhu* 148, 163  
*Yoeli-Tlalim, Ronit* 171, 183, 261  
*Yongdan, Lobsang* 216, 226, 261  
*Young, Adrian* 384  
*Young, Alden* 241  
*Yu, Gloria* 180  
*Yunli, Shi* 261
- Z**
- Zacharia, Benjamin* 239  
*Zachariah, Benjamin* 240  
*Zachmann, Karin* 10, 216  
*Zhang, Baichun* 26, 27  
*Zhang, Chaonan* 216  
*Zhang, Danyang* 216  
*Zhang, Shuxian* 216  
*Zhang, Yingpin* 216, 254  
*Zhao, Siyuan* 216, 252  
*Ziemer, Hansjakob* 16, , 317, 321, 323, 325, 381  
*Zorn, Magdalena* 327







## MAX-PLANCK-INSTITUT FÜR WISSENSCHAFTSGESCHICHTE

Max Planck Institute for the History of Science

Boltzmannstraße 22, 14195 Berlin, Germany  
T +49 30 22667 0, [www.mpiwg-berlin.mpg.de](http://www.mpiwg-berlin.mpg.de)

