History of Physics Division
Fachverband Geschichte der Physik (GP)

Julia Bloemer
Europa-Universität Flensburg
Institut für Physik und ihre
Didaktik und Geschichte
Auf dem Campus 1
24943 Flensburg
julia.bloemer@uni-flensburg.de

Arianna Borrelli
Technische Universität Berlin
Sekr. H 23
Straße des 17. Juni 135
10623 Berlin
borrelli@tu-berlin.de

Johannes-Geert Hagmann
Deutsches Museum München
Leitung Abteilung AII Technik
Museumsinsel 1
80538 München
j.hagmann@deutsches-museum.de

Peter Heering
Europa-Universität Flensburg,
Institut für Physik und ihre
Didaktik und Geschichte
Auf dem Campus 1
24943 Flensburg
peter.heering@uni-flensburg.de

Michelle Mercier
Europa-Universität Flensburg,
Institut für Physik und ihre
Didaktik und Geschichte
Auf dem Campus 1
24943 Flensburg
michelle.mercier@uni-flensburg.de

Arne Schirrmacher
HU Berlin, Institut für
Geschichtswissenschaften
Unter den Linden 6
10099 Berlin
arne.schirrmacher@hu-berlin.de

Physics and the Environment in Historical Perspectives

Environmental issues are among the most relevant subjects of current scientific research. Addressing these concerns requires multidisciplinary approaches and the ability to integrate physics with other scientific disciplines, like biology, earth sciences or chemistry, and with approaches from the humanities such as transformation studies or economics. To understand the diversity of environmental structures and dynamics, a wide range of physical methods must be combined tailored to the specific objectives at hand.

Throughout history, we witness a variety of developments that sought to exclude or at least to control 'the environment' (which is not a timeless concept) from the production, communication, and adaptation of physical knowledge. The development and standardization of laboratories along with its related practices and instruments, but also approaches such as simulations (not necessarily only mathematical) and modelling can be seen as attempts to stabilize knowledge production against the disorder and unpredictability of the environment.

Many modern topics in environmental science can be seen as responses to the limits of human activity that are set by the environment, that these limits can no longer be ignored, and that we need to draw consequences from these boundaries and act within them. Additionally, for field scientists and particularly their instruments, dealing with unfamiliar environments has brought and still brings exposure to dangers and threats such as temperatures and temperature fluctuations, humidity or dryness, instabilities, etc. However, these environments provide not only challenges but also opportunities for new and different research. Gaining a better understanding of the world as a complex system required that large amounts of data needed to be taken and combined. At the same time, the interaction with representatives of different knowledge systems who, however, had a profound understanding of their own specific environment, led to conflicts that helped to charter the rules as well as the limits of scientific knowledge production.

Overview of Invited Talks and Sessions

Plenary Talk of the History of Physics Division

PV III	Tue	9:00– 9:45	ELP 6: HS 3+4	**Physics as an environmental science: The case of climate history** — •Richard Staley

Invited Talks

GP 1.1	Mon	16:30–17:30	ELP 3: HS 2.33	**Competition, Cooperation, Representation. The Many Faces of the International Geophysical Year from the German Perspective** — •Beate Ceranski
GP 4.1	Tue	16:30–17:30	ELP 3: HS 2.33	**Infusoria, Cress, and Tulips: Physical Experiments with Living Organisms** — •Caterina Schürch

Invited Talks of the joint Symposium How to Cope with Apocalyptic Narratives? (SYAN)

See SYAN for the full program of the symposium.

SYAN 1.1	Mon	14:00–14:40	ELP 6: HS 4	**The Apocalyptic Moment Is Over - And It Won't Come Back Anytime Soon** — •Frank Uekoetter
SYAN 1.2	Mon	14:40–15:20	ELP 6: HS 4	**Shaping Cold War Futures through the Nuclear Winter Study: Narratives, Imaginaries and Legitimacy** — •Egle Rindzeviciute
SYAN 1.3	Mon	15:20–16:00	ELP 6: HS 4	**The Role of Storytelling in Climate Communication** — •Denise Müller-Dum

Sessions

GP 1.1–1.3	Mon	16:30–18:30	ELP 3: HS 2.33	**Understanding the Environment**
GP 2	Mon	19:00–20:00	ELP 3: HS 2.33	**Meeting of Early Career Scholars**
GP 3.1–3.3	Tue	14:00–15:30	ELP 3: HS 2.33	**Dirty Physics**
GP 4.1–4.3	Tue	16:30–18:30	ELP 3: HS 2.33	**Exploring the experimental approach**
GP 5	Tue	18:30–20:00	ELP 3: HS 2.33	**Members' Assembly**
GP 6.1–6.3	Wed	11:00–12:30	ELP 3: HS 2.33	**Crossing Disciplinary and Institutional Boundaries**
GP 7.1–7.4	Wed	14:00–16:00	ELP 3: HS 2.33	**Instruments and Exhibitions**
GP 8.1–8.3	Wed	16:30–18:00	ELP 3: HS 2.33	**Closing Session**

Meeting of Early Career Scholars

Monday 19:00–20:00 ELP 3: HS 2.33
Contact: Michelle Mercier (michelle.mercier@uni-flensburg.de)

Members' Assembly of the History of Physics Division

Tuesday 18:30–20:00 ELP 3: HS 2.33

GP 1: Understanding the Environment

Time: Monday 16:30–18:30 Location: ELP 3: HS 2.33

Invited Talk GP 1.1 Mon 16:30 ELP 3: HS 2.33
Competition, Cooperation, Representation. The Many Faces of the International Geophysical Year from the German Perspective — •Beate Ceranski — Universität Stuttgart

Since the 18th century at least, research for understanding the environment has been intrinsically global, especially with regard to data acquisition. It has thus been deeply entangled with both infrastructural and political developments.

In my talk I will follow such entanglements with regard to one of the most prominent undertakings in the history of environmental research, the International Geophysical Year (IGY) 1957/58. IGY's carefully equilibrated innovative data management as well as the negotiation and competitive exploration of new research frontiers in antarctica and space have been analyzed as hallmarks of science during the Cold War. The IGY provides an excellent case study for both scientific cooperation and competition and their relationship with one another. My paper deals with the IGY from the German point of view which until now has not been much studied. Whereas in the FRG/BRD the IGY participation evolved quietly within the national research infastructure, there was an interesting debate in the GDR/DDR who was to represent the country in the national IGY committee.

GP 1.2 Mon 17:30 ELP 3: HS 2.33
Air, Ice and Smoke: the Discourse Sourrounding an Experimental Model in Meteorology circa 1850 — •Johannes-Geert Hagmann — Deutsches Museum, Munich

Simulations play a crucial role in contemporary climate research. The exploration of describing and, ideally, predicting global weather phenomena through modeling has been a subject of inquiry since the 19th century. Around 1850, Friedrich Vettin (1820-1905), a physician and amateur researcher, investigated air flow using a simplified model. His laboratory experiments visualized the interaction between cold and warm zones on a rotating disk through the use of smoke. This case study revisits the discussion surrounding the unconventional use of experimental models in an emerging discipline. We argue that, despite slow acceptance, Vettin's approach made a lasting methodological contribution to meteorology.

GP 1.3 Mon 18:00 ELP 3: HS 2.33
Ringing and shooting. Thunderstorm defence practices in the 18th century — •Julia Bloemer — Europa-Universität, Flensburg, Deutschland

The lightning rod is regarded as a prime product of the Enlightenment in the eighteenth century: It materialised the benefits of natural science and marked a liberation from superstition. However, this obscures the fact that older protective practices already existed and continued to be discussed and used even after the lightning rod became widespread. In the foothills of the Alps, these were the so-called thunderstorm ringing and thunderstorm shooting. Using the example of two prize questions of the Bavarian Academy of Sciences, this paper shows how the discussion of these practices contributed significantly to the understanding of meteorological relationships. The change from the original pious practices to physical phenomena and their investigation via electrical experiments shows how broad the discussion was alongside the lightning rod and that it was anything but mono-directional.

GP 2: Meeting of Early Career Scholars

Time: Monday 19:00–20:00 Location: ELP 3: HS 2.33

Contact: Michelle Mercier (michelle.mercier@uni-flensburg.de)

GP 3: Dirty Physics

This session consists of two speakers and a commentary by Richard Staley.

Time: Tuesday 14:00–15:30 Location: ELP 3: HS 2.33

GP 3.1 Tue 14:00 ELP 3: HS 2.33
Cleaning a Dark Matter Detector: Contamination and the Limits of High Energy Physics, 1980-2020 — •Jaco de Swart — Massachusetts Institute of Technology, Cambridge, MA, United States of America

In dark matter detection experiments, Xenon tanks are being used to find traces of dark matter particles that are hypothesised to crisscross the universe. For such detection to succeed, the Xenon in the tanks has to be clean. But what is clean? In this context, it means that no background mimics the signs of dark matter particles. In practice, such cleanliness is difficult to achieve – as soaps may be radioactive, steel may spread electronegativity, and humans are altogether dangerously filthy. In this talk, I discuss the idiosyncratic cleaning practices of the XENONnT experiment, and I place them in the context of the history of dark matter research. What does ensuring a detector's cleanliness entail? And how does one know whether the detector is, in fact, adequately clean? I particularly address how the XENONnT experiment, while cleaning their detector, also had to ensure that it did not interfere with environmental cleanliness.

GP 3.2 Tue 14:30 ELP 3: HS 2.33
'Dirty' spillovers: (geo)physical spillovers between the oil industry and early nuclear projects — •Michiel Bron — Maastricht University, Maastricht, The Netherlands

The development of nuclear physics and the geophysical understanding of uranium deposits during the Twentieth Century has pulled together many environmental actors from both the physical sciences and the oil industry. More than other subfields of the history of science, historians of scientific instrumentation have paid close attention to the commercial and industrial dimensions of scientific knowledge-making. A few industries have figured repeatedly in histories of instrumentation: e.g., telecommunications; agriculture and food production; armaments and defence. One industry in particular, however, has played an outsize, but often under-appreciated, role in the development of scientific instruments during the Twentieth Century: the oil industry. This article shows how specific scientific instruments - crucial to both the development of nuclear (geo)physics, and the commercial applications of uranium enrichment and exploration - were applied, scaled up, and developed during the Manhattan Project in close collaboration with the oil sector based on the (geo)scientific knowledge fostered within the petrochemical industry. The same knowledge and technologies that would later set up new collaborations during the environmental and scarcity debates of the long 1970s between oil companies as Exxon and well-known physicists like Hans Bethe.

Discussion GP 3.3 Tue 15:00 ELP 3: HS 2.33
Commentary to Panel — •Richard Staley — University of Cambridge, United Kingdom

Modern physics is built on dreams of purity. Historians have meticulously analysed the attempts of physicists to obtain orderly theories and uncluttered experimental data. But if conceptual order and messiness have received a lot of interest in the history of physics, material dirt and cleanliness remained in the background. In this panel, we explore different ways in which physicists have realized, affected, and impinged upon realities of pollution, contamination, waste, and otherwise. We explore institutional, intellectual, and material aspects in the history of twentieth century physics and geophysics as they relate to

questions of dirt and cleanliness. How were polluting industries entangled in the development of physics theories? What kinds of cleaning practices have laboratories depended on? And how have physics experiments dealt with contamination and waste? Our cases range from the entanglement of the oil industry in the development of nuclear physics and environmental debates in the 1970s, to the construction of extremely clean experiments to detect hypothetical particles starting in the 1990s. With three panelists and one commentator, the panel aims to further explore how physics relates to its earthly surroundings.

GP 4: Exploring the experimental approach

Time: Tuesday 16:30–18:30 Location: ELP 3: HS 2.33

Invited Talk GP 4.1 Tue 16:30 ELP 3: HS 2.33
Infusoria, Cress, and Tulips: Physical Experiments with Living Organisms — •Caterina Schürch — TU Berlin

This talk examines examples – from the mid-eighteenth century to the early twentieth century – of physicists using living organisms in their experiments. Not surprisingly, the decision to work with biological material required different justifications at different times. In the mid-eighteenth century, experimental physicists moved quite naturally from experiments with non-living material to experiments with organized bodies, whereas in the early twentieth century, working with biological systems was considered highly problematic. While prominent biologists suggested that there should be a biologist in every physics laboratory and a physicist in every biology laboratory, there was little interest among physicists in working with complex organisms that were difficult to control. Only in exceptional cases did it make sense for them to use living objects in their experiments. In the early decades of the nineteenth century, however, living animals and plants were still part of the physicist's repertoire. Analyzing the debates about living organisms in physics experiments offers us a promising angle for exploring the changing methodological standards of experimental research in the physical sciences and beyond.

GP 4.2 Tue 17:30 ELP 3: HS 2.33
Trapping single particles - excluding the enviroment in experimental quantum optics, 1979 — •Eckhard Wallis — Deutsches Museum, Munich

The trapping of single ions can be seen as one of the most ambitious attempts of excluding "the environment" from the study of atomic structure. The first observation of single trapped ions was achieved in 1979 by the group of Peter Toschek (1933-2020) in Heidelberg, in close collaboration with the later Nobel laureate Hans Dehmelt (1922-2017) at University of Washington, Seattle. Techniques from particle trapping and laser cooling allowed them to control not only the number of atoms inside their trap but also the motion of the ion. This talk will study the motives behind the pursuit of single trapped ions: A "fundamental" line of argumentation linked the experiments to Ernst Mach's opposition to atomism. However, unperturbed ions also promised useful applications in frequency metrology. The Deutsches Museum will present several artefacts related to this story in the new exhibition "Light and matter".

GP 4.3 Tue 18:00 ELP 3: HS 2.33
Thomas Young's Eriometer: a useful instrument and tool for Young, a failed instrument for everyone else — •Michelle Mercier — Europa-Universität Flensburg

Thomas Young (1773-1829) is best known today for his double-slit experiment. Almost unknown - even today - is an instrument that can be regarded as the first practical application of the results of his earlier investigations on diffraction and interference: the Eriometer. Young, a physician and physicist, claimed to be able to determine the diameter of homogenous samples of small particles and fibers with this instrument. In London, I was able to trace two Eriometers made by Young. One was part of a letter to Joseph Banks (1810). The other one is in the collection of the Royal Institution. Although experimental studies with a reconstruction of the instrument showed that measurements with a high degree of accuracy could be achieved, the instrument and the principle could not establish itself in England at the beginning of the 19th century. In this talk I will analyze the instrument from different perspectives and discuss possible factors for the rejection of the instrument in England at the beginning of the 19th century.

GP 5: Members' Assembly

Time: Tuesday 18:30–20:00 Location: ELP 3: HS 2.33

Invitation and agenda will be sent out separately

GP 6: Crossing Disciplinary and Institutional Boundaries

Time: Wednesday 11:00–12:30 Location: ELP 3: HS 2.33

GP 6.1 Wed 11:00 ELP 3: HS 2.33
Interplay of physics and chemistry at the University of Padua in the 18th century: a case of cross-fertilization among scientific disciplines — •Valentina Roberti — valentina.roberti@unipd.it

Established in 1222, the University of Padua experienced a vibrant scientific era during the 18th century. The scientific disciplines that emerged within the context of the scientific revolution found a place in academic yearbooks. Concurrently, the Republic of Venice promoted the establishment of the first scientific institutions for educational and research purposes. This contribution explores case studies of cross-fertilization between physics and chemistry, which significantly contributed to the advancement of scientific knowledge, shaping the history of the University of Padua. Particular emphasis will be placed on the role played by Giovanni Poleni, appointed in 1739 to the chair of experimental philosophy, and Marco Carburi, professor of chemistry since 1759, in facilitating and promoting knowledge exchange using scientific instruments. Giovanni Antonio Dalla Bella and Nicolò da Rio, keen experimenters and students of Poleni and Carburi, respectively, were directly involved in the creation of a secret society, the so-called Società dei filochimici, with the aim of reproducing the pioneering experiments conducted in France by Antoine-Laurent de Lavoisier. An analysis of the interplay between physics and chemistry will reveal connections between local scientists and the national and international scientific community.

GP 6.2 Wed 11:30 ELP 3: HS 2.33
Anpassungsstrategien unter Umweltstress: Das Zentralinstitut für Astrophysik der DDR im Einigungsprozess — •Henrik Rose — Institut für Philosophie, Literatur-, Wissenschafts- & Technikgeschichte, Technische Universität Berlin — Institut für Physik und Astronomie, Universität Potsdam

Darstellungen der Umgestaltung des Forschungssystems in Ostdeutschland nach 1990 orientieren sich häufig an polarisierenden Deutungen, die entweder eine westdeutsche Kolonisierung beklagen oder aber eine erfolgreiche und notwendige Erneuerung begrüßen. Gemein ist ihnen die Annahme einer disruptiven Veränderung, die vorrangig aus dem Westen getragen wurde. Der Vortrag stellt dem eine alternative Betrachtung über das Fortbestehen von Forschungslinien in inhaltlicher, institutioneller und personeller Hinsicht entgegen. Als Beispiel

schildere ich die Umgründung des Zentralinstituts für Astrophysik in Potsdam als Ergebnis einer sich beständig entwickelnden Behauptungsstrategie, die trotz größerer Personaleinbußen die Fortführung von seit den 1980er Jahren entwickelten Forschungslinien erreichte. Ich zeige, dass der Erfolg vorrangig auf der Mobilisierung verschiedener außerwissenschaftlicher Ressourcen beruhte, was teils bereits in Aushandlungssituationen im Forschungssystem der DDR eingeübt, teils adaptiv unter den neuen Bedingungen erprobt wurde.

GP 6.3 Wed 12:00 ELP 3: HS 2.33

Developing an understanding of the impact of the first stereoscope on the model of Wheatstone — •Andreas Junk — Europa-Universität Flensburg

The design of the stereoscope on the model of Charles Wheatstone was introduced to the scientific community by an 1838 article in the Philosophical Transactions of the Royal Society. The apparatus is canonised today as the first of its kind to demonstrate, that two two-dimensional images or drawings are enough to evoke a spatial impression in an observer. In my paper I will present our experiences in the replication of the apparatus as on display at the King's College London and experiences from our reenactment process. While the stereoscopic effect mentioned above could be reproduced with our replica, the use of Wheatstone's drawings from the 1838 article generated more questions about the contemporary status of research on the physiology of vision and the demands on the images to be used with the instrument.

GP 7: Instruments and Exhibitions

Time: Wednesday 14:00–16:00 Location: ELP 3: HS 2.33

GP 7.1 Wed 14:00 ELP 3: HS 2.33

On a 17th Century Telescope Lens Grinding Machine — •Wolfgang Engels — HistEx GmbH, Germany, Marie-Curie-Str. 1, 26129 Oldenburg

Some years ago, a telescope was discovered during excavations in Delft that could originate from the first half of the 17th century. The instrument is suggested to represent a surviving sample of one of the oldest in the Netherlands. The principle of these terrestrial telescopes is the use of a planoconvex objective lens and a planoconcave eyepiece. Surprisingly, the very unusual shape of the planoconvex objective lens of the find corresponds nicely to a grinding method that was suggested by the Capuchin monk Anton Maria Schyrleus of Rheita in 1645 (Oculus Enoch et Eliae...). The polished curvature of the actual objective lens is centred on a piece of flat glass from which it was cut, leaving the surrounding edge rough and unpolished. Rheita claimed that his apparatus was designed to machine both spherical and hyperbolic planoconvex lenses. Based upon Rheita's publication, the machine has been replicated and some lenses have been produced. To date, no finds of early aspherical lenses are known, but further finds of spherical lenses with the typical shape now indicate that Rheita's processing method could have been used on a large scale.

GP 7.2 Wed 14:30 ELP 3: HS 2.33

's Gravesande's parabola - when motion becomes tangible — •Linnéa Bergsträsser — Institute of physics, its didactics and its history, Flensburg, Germany

In the 18th century, Willem Jacob 's Gravesande mentioned an apparatus that was supposed to visualise the flight path of a heavy body. A marble rolls down a ramp and exits in a horizontal direction. The interaction of this horizontal movement with the accelerating force of gravity creates the motion curve of the marble: The parabola. As this flight motion is far too fast for the human eye, 's Gravesande came up with an idea: first with steps, later with rings, he was able to visualise the marble's flight. This apparatus was a typical mechanical demonstration experiment from the 18th century.

At this time Galileis and Newtons mechanics were very popular and I will show the link between Galileis and Newtons mechanics and 's Gravesandes demonstration of motion.

At the Europa-Universität Flensburg, we have a reconstruction of the respective apparatus kept at the Museum Boerhaave. As part of my PhD project, I am working with this device and I analyse the accuracy of this demonstration experiment.

In working with this device, the key function of the instrument is that the ball moves through the rings. To ensure this, I had to learn to work with all my senses and not just trust my eyes. This was also the challenge for demonstrators in the 18th century. They needed to develop a certain way of dealing with demonstration experiments before they showing them to the students in the lectures.

GP 7.3 Wed 15:00 ELP 3: HS 2.33

Light and Matter - Insights into exhibiting quantum optics at the Deutsches Museum — •Katharina Stuhrberg — Deutsches Museum, Munich

For the year 2024, the Deutsches Museum is developing an exhibition on quantum optics with the title "Light and Matter". The new exhibit covers the subjects of quantum physics, lasers and spectroscopy in their historical context. A variety of hands-on demonstrations, objects, as well as "Szenoramas" - a new form of artistic storytelling - are deployed in our exhibition to make quantum physics, optics and their history accessible for all visitors of various backgrounds that come to the Deutsches Museum. This talk will outline the exhibition's concept and discuss how quantum optics and its historical background will be introduced to the public.

GP 7.4 Wed 15:30 ELP 3: HS 2.33

Two Astrolabic Quadrants from 14th Century Damascus and 17th Century London — •Enes Tepe — Europa Universität Flensburg. Institute for Physics, its Didactics and its History. Auf dem Campus 1, 24943 Flensburg, Germany

In the previous (virtual) history of physics DPG conference in Heidelberg, I presented my study about different portable quadrant traditions in the Islamic World and the Western Europe. One of the conclusions of that study was that the astrolabic quadrants from astronomers and instrument-makers of Mamluk and Stuart dynasties can be considered among the most well-founded timekeeping instruments of their respective cultures. In my PhD project, I am researching the practices with two astrolabic quadrants from these periods according to the replication method. One of the instruments is an almucantars / trigonometric quadrant that was made by Muhammad ibn Ahmad al-Mizzi in 1329, Damascus, and now exhibited in David Collection, Copenhagen. The other one is a large quadrant of inverse projection that was made by Henry Sutton in 1658, London, and now kept in the History of Science Museum, Oxford. At the current phase of the project, I am reconstructing these two instruments with the necessary adaptations to 2024 and Flensburg in order to be able to analyze the practices based on their re-enactments. In this talk, I am going to introduce the two astrolabic quadrants and make a comparison of their general features.

GP 8: Closing Session

Time: Wednesday 16:30–18:00 Location: ELP 3: HS 2.33

GP 8.1 Wed 16:30 ELP 3: HS 2.33

Die andere Geschichte der Physik — •Grit Kalies[1] und Duong D. Do[2] — [1]HTW University of Applied Sciences, Dresden, Germany — [2]The University of Queensland, Brisbane, Australia

Die Entwicklung der modernen Physik wird nicht selten als Erfolgsgeschichte präsentiert, von der Mechanik, der kinetischen Gastheorie und der Elektrodynamik über die Relativitätstheorien, die Kopenhagener Deutung und die Higgs-Theorie bis hin zu den heutigen Standardmodellen der Teilchenphysik und Kosmologie und der Geometrodynamics, in der das Verhalten der Materie vollständig auf Geometrie reduziert wird. Es ist eine Geschichte physikalischer Theorien, die man auch

"mathematische Phänomenologie" [1] nennen könnte. Zugleich gibt es eine Geschichte von physikalischen Größen, die geprägt ist durch unscharfe Begriffe und Mehrdeutigkeit, eine Vermischung von Kinematik und Dynamik und das Fehlen von Prozessgleichungen. Diese andere Geschichte wird erzählt anhand von Größen wie Kraft, Masse, Impuls, potentielle Energie, Ruheenergie, Entropie, Enthalpie und freie Enthalpie [2]. 1. E. Schatzman: Quantenphysik und Realität. Dtsch. Z. Philos. 2 (1954), 621-641; 2. G. Kalies, D. D. Do, AIP Adv. 13 (2023), 065121, 055317, 095322, 095126.

GP 8.2 Wed 17:00 ELP 3: HS 2.33

Albert Einstein, Alfred North Whitehead — •Christian Thomas Kohl — Freie Universität Berlin, Germany

Modern physics consists not only of new discoveries and inventions through relativity and through quantum physics. Modern physics has also produced new foundations and new ways of thinking, pointed out especially by Albert Einstein and Alfred North Whitehead. Modern physics has abandoned the cliché of black-and-white thinking, for which there are only separate things, without smooth transitions. Since Faraday and Maxwell, there has been a shift in the objects of study: since about 1850, the thought models of modern physics no longer revolve around separate, isolated bodies or building blocks floating in nothingness, but around the flexible webs of relationships between things and around the networks that surround things. Important clues to the modern ways of thinking about physics came from Albert Einstein (1879-1955) when he wrote about Faraday and Maxwell and the newness of physics in the last years of his life: *A courageous scientific imagination was needed to realize fully that not the behaviour of bodies, but the behaviour of something between them, that is, the field, may be essential for ordering and understanding events*.

GP 8.3 Wed 17:30 ELP 3: HS 2.33

Unclear crystals: 18th century projections of crystal formation — •Peter Heering — Europa-Universität Flensburg

"Which is beyond doubt one of the most pleasant observations that can be made with a solar microscope." With these words Wilhelm Friedrich Freiherr von Gleichen genannt von Rußwurm characterized the demonstration of crystallizations with a solar microscope. These projection microscopes were particularly popular in the second half of the 18th century. As I have already discussed, this popularity can be related to a significant degree to the instrument's ability of meeting the cultural standards of the Enlightenment. This understanding benefitted significantly from the practice with two original instruments at the Deutsches Museum. In the meantime, I had the opportunity of continuing to work with a reconstructed solar microscope - this enabled me to work on projecting the above mentioned crystallizations. In this talk I am going to present some of the experiences made in observing crystallisations, In doing so, I am facing a challenge that was already made explicit by the 18th century demonstrators: the projections with a solar microscope go 'beyond the expectation of those who have not seen it'.