GP 9: History of Physics

Chair: Peter Heering

Time: Wednesday 15:40–17:00 Location: GP-H7

GP 9.1 Wed 15:40 GP-H7

M. I. Kaganow und die Elektronentheorie der Metalle — •Peter Bussemer[1] und Vladimir Rzhevskij[2] — [1]Cooperative University Gera-Eisenach — [2]Lomonosov-University Moscow

Moisej I. Kaganow (1921-2019) war einer der letzten Repräsentanten der sowjetischen Schule der Festkörpertheorie, begründet in Charkow um 1930 von Lew Landau und dort bis 1970 fortgeführt von Ilja M. Lifschitz (1917-1982), danach in Moskau. Unter dessen Leitung war Kaganow wesentlich an modernen Entwicklungen beteiligt: Quantenmechanik von Elektronen mit beliebigem Dispersionsgesetz, Topologie der Fermi-Flächen (Fermiologie) mit der Möglichkeit offener Elektronenbahnen, Oszillationen thermodynamischer Größen im Magnetfeld, HF-Eigenschaften-veröffentlicht in Deutsch 1975 in "Elektronentheorie der Metalle" mit Lifschitz und Asbel. Seine Untersuchungen zu den Lifschitzschen topologischen Phasenübergängen 2 1/2-ter Ordnung sind ein früher Vorgriff auf die aktuellen Anwendungen der Topologie bei Phasenübergängen. Kaganow war ein brillanter Hochschullehrer: Von 1970-1994 bildete er an der Moskauer Universität mehrere Studentengenerationen aus. Ebenso ein engagierter Wissenschaftsvermittler, verfasste er zahlreiche populäre Einführungen in die Quanten- und Festkörperphysik mit Übersetzungen in Deutsch, Englisch und Polnisch. Enge Kontakte pflegte er zur DDR und Polen: Dr.h.c. TU Wroclaw 1988. Nach 1994 lebte er als jüdischer Emigrant in den USA.

GP 9.2 Wed 16:00 GP-H7

JOHN HERSCHEL, NOT ONLY AN ASTRONOMER, IN THE FOOTSTEPS OF FATHER AND AUNT — •Harald Gropp — VIGN,Heidelberg, Germany

150 years ago, on May 11, 1871 John Herschel died in Hawkhurst, Kent. He is mainly known as an astronomer but also contributed to mathematics, chemistry, philosophy of science and related fields. Together with the astronomical couple, his aunt Caroline (1750-1848) and his father William (1738-1822), John(1792-1871) covers a period of more than 130 years of astronomical research. Caroline is probably the least known of them. She not only assisted her male colleague (brother) William, but was paid a salary for her work.

In this paper the cooperation of 3 astronomers will be discussed, between William and Caroline directly, but also independently, between William and John by John following in his father*s footsteps. Letters between John in England (and South Africa) and his aunt Caroline back in Germany played a main role in the last period. They were edited by John*s wife, *Mrs. John Herschel* (1810- 1884) and tell interesting details about the *collective work*

GP 9.3 Wed 16:20 GP-H7

"Reducing physics to pure mathematics": Johann I Bernoulli on Brook Taylor's taut string problem — •Iulia Mihai — Ghent University (Belgium)

The vibrating string problem is outstanding in the history of eighteenth-century mathematical physics. This paper focuses on the conception of the continuous string that was dominant for three decades before the use of partial differential equations at the end of the 1740s. Scholars have emphasized the novel mathematical techniques in Johann I Bernoulli's reappraisal (1732) of Brook Taylor's initial investigation (1713), but the standard view has it that the conception of the string with which they work remains unchanged. By contrast, this paper argues that how the string is conceived evolves due to the conceptual changes brought about by Bernoulli's scientific practice. Whereas Taylor approaches the string (also) by drawing analogies with other mechanical objects on the basis of shared (physical and geometrical) properties, Bernoulli steers clear of physical analogies in investigating the string's properties. Moreover, Bernoulli's extensive use of algebraic symbolism enables innovative notational interventions which result in a more robust handling of both physical and geometrical quantities; this goes beyond the fact that Bernoulli uses the differential calculus and Taylor the fluxional calculus. Ultimately, it is Bernoulli's methodology of "reducing physics to pure mathematics" which is behind the evolving conception of the string.

GP 9.4 Wed 16:40 GP-H7

Black Hole Imaging and Framings of the Observer — •Emilie Skulberg — Institute of Physics, University of Amsterdam

Based on the study of an extensive collection of visual representations of black holes from 1970 to the present, I trace the history of visual and textual framings of the observer in the context of black hole imaging. I argue that the framing of the observer changed significantly in this period. Some peer-reviewed papers containing early visual representations of the immediate surroundings of black holes had brief references to telescopic observation. More commonly, such images were framed as part of thought experiments of what an observer (appearing in thought experiments as a hypothetical human being) would see or photograph if equipped with a camera directed at a black hole. The observer here became a point of view in a visual sense as images showed what an observer "saw" or "photographed". Towards the new millennium, visualizations from simulations began to form part of arguments that observing the shadow of a black hole would in fact be possible. Rather than an observer with a camera in thought experiments, visualizations showed how a specific celestial object believed to be a black hole might look if observed from Earth using Very Long Baseline Interferometry. This method, in which data from observations by multiple telescopes placed far apart are combined, was what would later enable the Event Horizon Telescope Collaboration to produce images such as the first observation of the shadow of a black hole. At the same time, virtual reality now offers the immersive and embodied experience of seemingly being an observer approaching a black hole.