GP 5: Instruments as tools and subjects of research

Zeit: Dienstag 10:45–14:00 Raum: HS 9

Hauptvortrag GP 5.1 Di 10:45 HS 9

A solution to a number of problems: On the development of the laser as a tool for and a subject of physical research — •Johannes-Geert Hagmann — Deutsches Museum, Munich, Germany

The first laser came into existence in the year 1960. At the time, a popular quote within the community of inventors coined the new light source as "a solution looking for a problem", a phrase frequently repeated and cited up to a level achieving perpetuity. 60 years of development onwards, laser light has reached a distribution over an extremely wide area of scientific and technological applications, creating a sharp antipode to its initially ascribed assessment. Is the laser a tool for physics of comparable scientific agency to say the microscope or telescope in earlier centuries? The the impact of the laser on the development of science and technology has been recognized by a number of historians from a variety of perspectives, including military, technological and economic viewpoints. In this talk, we aim to trace the historical development and the distinction of the use of the laser as a research technology / instrumentation and laser light as a subject of scientific research. We discuss consequences both for the context of the formation of new disciplines and their representation in museum collections.

GP 5.2 Di 11:30 HS 9

Alternative facts * 18th century vacuum experiments on replicas true to the sources — •Wolfgang Engels[1] and Falk Riess[2] — [1]HistEx GmbH, Marie-Curie-Str.1, 26129 Oldenburg — [2]Universität Oldenburg

The re-enactment of historical experiments by making use of faithful replicas can contribute to the clarification of historical laboratory practice and to the determination of the relationship between theoretical ideas and practical, experimental results in the development of science. The procedure and the results generated by such a research approach will be exemplified using the field of vacuum technology in the 18th century.

The design of vacuum pumps is well documented, and several pumps have been preserved. Finally, there are extensive descriptions of instrument makers and experimenters about (actual or alleged) experiments that served to demonstrate this then new knowledge. However, the insights gained from working replicas of vacuum pumps from the early 18th century speak a different language: our experiments show that in some cases the test results cannot be reproduced with the described instruments as claimed by the authors. This is illustrated by some examples, e.g. the silence of a sound source in the air-diluted room of the recipient. The revealed errors and mistakes allow conclusions to be drawn about the scientific concepts and ideas of the protagonists.

It is also noteworthy that, in the case of vacuum pumps, the manufacturers of the instruments often had a greater repertoire of knowledge and practical skills than the actual experimenters and readily passed on this knowledge in the form of letters, handouts or publications. However, competition between manufacturers for financially strong customers also led to copyright infringement being reminiscent of modern forms of industrial espionage or piracy.

GP 5.3 Di 12:00 HS 9

In search of higher vacuum — •Brenni Paolo — Via Pollini 14, 6850 Mendrisio Switzerland

In the second half of the 19th C. the use of vacuum pumps became more and more important in physics laboratories. If the old single or double-barrelled pumps, which had been used and improved since the beginning of the 18th.C, were good enough for lecture demonstrations, the researches in the fields of rarefied gases (with the Geissler, Crookes, Plücker tubes) required better and more performant vacuum pump. New types of mercury pumps were invented by Toepler, Sprengel, Geissler and others allowed to reach higher vacua. With the diffusion of incandescent light bulbs and later the introduction of X-rays tubes, vacuum production became also an industrial affair. In the early 20th c., thanks to the progresses of physics and also of precision mechanics, W.Gaede and others invented various types of vacuum pump (oil or mercury rotatory pumps, diffusion pumps etc.) which opened the way to modern vacuum technology. * In my presentation I will retrace the evolution of this technology and its apparatus between 1850 and 1930 both in the laboratories as well as in industries.

GP 5.4 Di 12:30 HS 9

Research Technologyies and Innovation: Analytical Interferometers — •Christian Forstner — Goethe-Universität, Frankfurt am Main

In this talk I will analyze the history of the analytical interferometer in the perspective of research technologies and innovation theory.

In 1905 Fritz Haber (1868-1934) approached his former school friend, the managing director of Zeiss Siegfried Czapski (1861-1907), with a request for an instrument that could be used to quickly and easily determine gas concentrations within 0.02%. Czapski assigned the work to his colleague Fritz Löwe (1874-1955). Since 1904, Löwe had been head of the measuring instruments department at the Zeiss factories in Jena. In close collaboration with Haber he developed two different types of analytical interferometers for this purpose: one for the academic laboratory and a more robust type for mining. Both were based on the principle a Raleigh interferometer.

The analytical interferometers were used in academic laboratories, in industry to determine the concentration of flammable gases in the air, in mines to determine the methane content of the air, and in medicine for metabolism measurements. Depending on their use all of them have been continuously improved and modified. After the end of World War II, Carl Zeiss Jena first launched a new laboratory interferometer in 1950, followed by a new mining interferometer in a compact design based on a Jamin interferometer in 1955. In 1979, the production of interferometers at the Zeiss plant in Jena was discontinued.

60 min. lunch break