5 History of Physics

Monday, 21.06.2010, Room 119

Time	ID	**History of Physics** *Chair: J. Lacki, Uni Genève*
13:15	**501**	**The evolution of Physics teaching instruments and of their use between 1830 and 1930** *Paolo Brenni* *Fondazione Scienza e Tecnica in Florence, Via Giusti 29, IT-50100 Florence* In the decades between 1830 and the beginning of the 20th Century didactic instruments changed remarkably. In the first half of the 19th Century, the core of a typical teaching collection was composed by apparatus, which were very similar to the ones proposed in the 18th century by 's Gravesande, Nollet, Desaguliers and others. Since 1850 circa, new didactic instruments were introduced. Most of them concerned the fast developing branches of physics such as wave optics, electromagnetisms and acoustics. Instrument makers (and many scientists as well) were extremely prolific in inventing new devices for better demonstrating all the laws of physics and for clearly visualizing all its phenomena. Therefore, around 1900 all the most important German, French and British makers proposed in their thick catalogues thousands of didactic apparatus. But were all these instrument really used? Many were acquired by schools and universities as "status symbol" to complete their collection.
13:45	**502**	**The making of a microscope in the XVIIIth century** *Marc Ratcliff, Faculté de Psychologie et des Sciences de l'Education,* *Université de Genève, 40, Boulevard du Pont-d'Arve, 1211 Genève 4* During the eighteenth century, the making of microscopes was characterized by a large diversity in Europe, with various types of markets changing according to cultural differences. Competing markets characterized England, Holland and Germany, while in France corporations hindered the competition. If cultural differences are at stake to understand the varieties in production and advertisement, yet, instrumental innovation was mainly independent from this cultural factor. Among several patterns that led to innovation for microscopes, I shall focus on a pattern that links the user to the maker, particularly when the user turned himself into a conceiver. Especially, concrete problems in the laboratory ask for historians to consider the function which an instrument played in a laboratory. To illustrate this, I shall explore the uses of the microscope by Abraham Trembley, so as to capture more precisely certain features of the innovation process, through unexplored material such as letters and other manuscripts.

14:15	**503**	**The Physics Museum at UNIL/EPFL** *Jean-François Loude, EPFL, SB-IPEP-LPHE, 1015 Lausanne* After a brief history of experimental physics at the Academy of Lausanne (University from 1890), I shall review the inventory of ancient instruments, begun in 2003 after the transfer of the department of physics of UNIL to EPFL, and comprising now more than 860 documented objects. The most remarkable of them (about 160) are now publicly displayed in 13 showcases. The Museum (*http://museephysique.epfl.ch*) is located in a hall of the Cubotron/ BSP. An opening ceremony took place in January 2009. Additional interesting instruments having been discovered, an extension (four more showcases) is in progress. I will end showing a few instruments of historical importance, dating from the end of the XVIIIth century to 1960 or so.
14:35	**504**	**Histoire des instruments de physique expérimentale: de l'Académie au Musée d'histoire des sciences de Genève** *Laurence-Isaline Stahl Gretsch* *Musée d'histoire des sciences de Genève, 128 rue de Lausanne, 1202 Genève* La présentation de cours publics de physique expérimentale à Genève débute à la fin du 17e siècle avec Jean-Robert Chouet. Mais c'est surtout avec Marc-Auguste Pictet (1752-1825) que cette discipline prend son essor. Des documents d'accompagnement des cours présentent les instruments utiles aux expériences illustrant les différentes disciplines de la physique. Ce sont ces mêmes instruments qui constituent l'une des collections phare du Musée d'histoire des sciences de Genève. Ainsi, on suit au travers des siècles le destin de ces instruments qui passent du cabinet de physique à l'Académie, puis dans un musée. Qu'ont-ils encore à nous dire aujourd'hui ?
14:55	**505**	**Jost Bürgi brachte die Neuzeit zum Ticken** *Fritz Staudacher, formerly Leica Geosystems AG, Fahrgasse 12, 9443 Widnau* Der Toggenburger Jost Bürgi schuf nicht nur als Uhrmacher, Mathematiker und Astronom Spitzenprodukte, sondern erschloss auch ganz neue Dimensionen. Als Uhrmacher entwickelte er die erste Sekundenuhr der Welt, als Mathematiker die Logarithmen und als Instrumentenkonstrukteur Proportionalzirkel, Triangulationsgerät und kunstvollste Himmelsgloben. Dazu praktizierte er als Erster die wissenschaftliche, sekundengenaue Messung astronomischer Durchgangszeiten. Und all dies während eines halben Jahrhunderts, davon acht Jahre am Kaiserhof in Prag zusammen mit Johannes Kepler. Jost Bürgi unterstützte ihn während der Entdeckung der beiden ersten Keplerschen Gesetze und beschleunigte mit seinen Rechenmethoden, Himmelsbeobachtungen und Sextanten weit umfassender als bisher bekannt auch die Erstellung der «Rudolfinischen Tafeln».
15:15		*Discussion*
15:30		***Coffee Break***

15:45	**506**	**The 18th-century battle over lunar motion** *Siegfried Bodenmann* *WTWG, University of Berne / Euler-Archiv, Basel, Eichenstrasse 45, 4054 Basel* Simultaneously attracted by the Earth and by the Sun, the Moon confronts the mathematicians with a complex system of equations. In 1747, Clairaut had observed that Newton's inverse square law could not sufficiently explain the motion of the Moon's apsides. He therefore proposed to add a $1/r^3$ term to the gravitational formula, but soon retracted it, realising that a way could exist to reconcile Newton's theory with the observations. Thus began a frenetic competition between him, Euler and d'Alembert, to solve this problem. By the end of 1748 it had grown into an important controversy. More than a step towards adoption of gravitational law in Continental Europe, the debate shows scientists at work, building networks, arguing for their points, and using strategies to fight for their "truth". It reveals that although sciences can be understood as a collective activity, they also take form through disputes, polemics and controversies.
16:15	**507**	**Recursive kinetic theory of gravitation: from Lesage to Thomson and Maxwell** *Hugues Chabot* *LEPS-LIRDHIST, EA 4148, Université Lyon 1, LIRDHIST La Pagode, FR-69622 Lyon* Should history of science only deal with success stories? Actually, mistaken ideas and unsatisfactory solutions are the very common place of laboratory life, and shortcomings in theories or experiments appear to be so in retrospection. With scrutinizing ancient hypotheses and the way they were refuted or abandoned, history of science can teach a lot about the construction of scientific facts and practices. In this respect, kinetic theories of gravitation are a good individual case. Our story takes place in 1871, with William Thomson (1824-1907), Lord Kelvin-to-be. But it began in 1784, when Georges-Louis Lesage (1724-1803), a physicist from Geneva, published the theory of gravitation which Thomson resumes a century later. This mechanical explanation of the Newtonian attraction was neglected in the eighteenth century, for it was considered as irrelevant as Cartesian vortices to explain the laws of planetary motion. So how did Thomson come to defend it?
16:45		*Discussion*
		Chair: B. Braunecker
17:00	**508**	**Sphaera mundi of Johannes de Sacrobosco – a medieval "textbook" for the subject "Astronomy" at the universities from 13th up to 17th century** *Werner Frank, University of Ulm, Ferdinand-Arauner-Straße 4, DE-91807 Solnhofen* The medieval course of artes liberales – the seven free arts – was obligatory for every student at the universities in old Europe. The seven subjects were: grammar, rhetorics and dialectics, arithmetic, geometry, music and astronomy. For each of these subject the „canon" was defined in a scriptum playing the role of a modern „textbook". For the subject of astronomy this was the „sphaera mundi", written by the dominican monk Johannes de Sacrobosco within the first half of 13th century. Actually it is a simplified version of the „Almagest" of Ptolemaeus from ca. 150 AD.

		Circumference of the earth, motions of the 7 planets, sun- and moon eclipses etc. were ordinary facts to be learned from all students. First the book was handwritten, after the invention of Guttenberg's press more than 60 editions are reported.
17:20	**509**	**Erinnerungen an Dr. Max Herzberger (1899 – 1982) und dessen Verdienste auf dem Gebiet der Strahlenoptik** *Jakob Jütz, Optical Consulting, Steinbergweg 10, 9472 Grabs* Max Herzberger hatte in Berlin Mathematik studiert und sich bald dem Gebiet der mathematischen Optik zugewandt. Seine Forschungsarbeiten befassten sich mit Theorien und Methoden zur Analyse und Verbesserung der Abbildungsqualität optischer Systeme, die aus brechenden und/oder reflektierenden Flächen bestehen. Die Abbildungsqualität und Korrektion solcher Systeme basieren im Kern der Sache auf der Geometrischen Optik (Strahlenoptik). Von dieser Wahrheit war Max Herzberger fest überzeugt. Deshalb konzentrierte er sich in seinen Arbeiten auf die Strahlenoptik. Er verschloss sich jedoch nicht der Wellenoptik, welche er allerdings bloss als Ergänzung zur Strahlenoptik betrachtete. Er entwickelte sogar eine eigene Dispersionsformel, eine physikalische Formel zur Berechnung der Brechzahl vieler optischer Materialien in einem weiten Wellenlängenbereich. Darauf aufbauend berechnete er den ersten Superachromaten, ein für einen grossen Wellenlängenbereich farbkorrigiertes optisches System. Seine Arbeiten fanden bald grosse internationale Anerkennung. Stätte seines Wirkens waren u.a. Jena, Rochester (USA), die ETH Zürich (1965 – 1969) und die Universität New Orleans.
17:40	**510**	**The classical revolutionary physics of Walter Ritz** *Jan Lacki, Histoire et Philosophie des Sciences, Université de Genève, 24, quai Ernest Ansermet, 1211 Genève 4* Walter Ritz achieved in his short but scientifically intense life some remarkable results in atomic physics. He obtained also remarkable results in the domain of mathematical physics. He is lesser remembered for his opposition to then current views on electrodynamics and relativity where he did not hesitate to confront Einstein, and to his scepticism with respect to quanta. Together with Max Abraham and Heinrich Hertz, Ritz is the perfect example of a-turn-of-the-century classical physicist whose indisputable genius went invested into physics which shortly were to be overthrown.
18:00	**511**	**Die drahtlose Telegraphie - die Einführung des Schwingkreises - der Nobelpreis 1909 - G. Marconi und F. Braun** *Klaus Stadler, retired, Reckholderstrasse 18, 8524 Uesslingen* Der Wunsch nach drahtloser Telegraphie war nach der Entdeckung der elektromagnetischen Wellen durch H. Hertz formuliert worden; viele Forscher beteiligten sich an der Suche z.B. Popow. Der entscheidende Fortschritt gelang Ferdinand Braun mit der Einführung des Schwingkreises; damit öffnete sich die erdumspannende Telegraphie. Die Verdienste von G.Marconi und F. Braun werden auf Grund der Nobel-Verleihungsansprache geschildert. Als Nachkomme sei es mir erlaubt, in einem zweiten Teil auf das Leben, die Person und andere Beiträge zur Physik von F. Braun einzugehen: Braun’sche Röhre, Entdeckung des Halbleitereffektes etc.

18:20	**512**	**The Pleasure to drive an Accelerator** *Bernhard Braunecker, SPS Secretary, Haldenweg 10, 9445 Rebstein* Tandem van-de-Graaff Accelerators can produce nanosecond pulses of mono-energetic beams of heavy ions with energies <100 MeV. They were installed in the sixties of the last century for high resolution nuclear spectroscopy, and many are still in use e.g. in medicine or material science. The excellent beam quality is set at the low energy side by the ion generation, the ion extraction out of the plasma, the acceleration and the charge transfer. Ignoring their subtle mutual dependence and driving the ion source by ‚brute force' methods once led to a big fire at the university in Erlangen. This could have been avoided if the operators would have studied the 'Tabellen der Elektronenphysik, Ionenphysik und Übermikroskopie' of Manfred v. Ardenne. We show that driving an accelerator needs a permanent fine tuning of the machine parameters, which at least at that time was an art, and gave us great pleasure.
18:40		***Postersession, Apéro, Barbecue; END***