+++ Thursday 4:00-5:30 pm Opening Session & First Keynote Address +++

KEYNOTE I

UNIVERSITY COLLECTIONS IN EUROPE: WHERE WE HAVE COME FROM AND WHERE WE ARE GOING

Marta C. Lourenço

Researcher
Museum of Science, University of Lisbon

Compared with only five years ago, university museums and collections are enjoying an increase of interest from universities, conferences of rectors, governments and European institutions. Even with this attention, information remains scattered and is not widely disseminated, thus deepening the sense of isolation among university museums and distancing all of us from the common goal of protecting and promoting university heritage. Scientific instrument collections, in particular, offer a valuable and resource for research and teaching. This paper describes how we arrived at the present situation, and how we can develop concrete policies for the future.

Thursday evening at the Museum

THE BARLOW PLANETARIUM

Jamie Day
Transylvania University

In 1841, Thomas Barlow, an agricultural industrialist living in Lexington, Kentucky conceived of a mechanical model to teach his grandchildren astronomy. Barlow labored for eight years before completing a prototype and over a decade before arriving at his final design: a thirteen-foot diameter mechanism of wood, glass, filigreed iron and precision gears. For nearly fifty years Barlow and his son, Milton, manufactured and marketed the planetarium. Acclaim was high—the planetarium won the highest award for mechanical models in the 1867 Exposition Universelle in Paris—but sales were sluggish due to the high cost of manufacture, war-time economies at home and abroad, and perhaps the finicky nature of the machinery. Despite the high praise received for the planetarium, as well as other more mundane industrial enterprises, both Thomas and Milton Barlow died in poverty.

Shortly after Milton's death, his daughter tabulated the condition of the nineteen instruments known to her. The vast majority were wrecked, lost or burned. Two were in basements and one thought to be in storage. Of one, however, she stated "I am told much prized and cared for." Fortunately, more than a century later, this antebellum instrument is still much prized and cared for at the University of Mississippi, where it continues to delight the modern viewer.

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+++ Friday 8:30 – 10:00am Session A : Scholarly Significance of Collections +++

A-1

THE HASSELAER-AUCTION OF 1776: THE TRANSMISSION OF SCIENTIFIC INSTRUMENTS FROM THE PUBLIC TO THE ACADEMIC SPHERE

Huib J. Zuidervaart
Department of History and Social Aspects of Science, Vrije Universiteit Amsterdam
and
Tiemen Cocquyt
Assistant Curator of the Collection of Scientific Instruments
Utrecht University Museum, The Netherlands.

In 1776 in the Dutch city of Utrecht an auction was held, in which a large collection of scientific instruments was sold, which was brought together in mid 18th-century by the Amsterdam Burgomaster and East India Company Director Gerard Aarnout Hasselaer (1698-1766).

In this sale a large portion of the instruments was bought by scientific professionals *avant la lettre*. These buyers were *inter alia* academic professors like Rossijn, Hennert and Luchtmans of Utrecht University; Prof. Chernac of the Deventer *Athenaeum*, as well as scientific lecturers such as Martinus Van Marum at Haarlem (who would become the founder of the famous Teyler Instrument Collection) and Henricus Aeneae at Amsterdam (soon afterwards becoming the Physics Lecturer of the Amsterdam Felix Meritis Society).

With the apparatus acquired at the Hasselaer-auction they founded – or supplemented – the scientific instrument collection of several Dutch institutions. Some of these Hasselaer-instruments can be identified in the present instrument collections of the University Museum at Utrecht; the Teylers Museum at Haarlem and the Museum Boerhaave at Leiden.

In this presentation the history of the contemporary use of the Hasselaer collection and its dispersion will be sketched as a case study of the transmission of scientific instruments from the public to the academic sphere. In this approach the importance of a combined approach in the study of scientific instruments will be underpinned. By tracing the former owners of the apparatus in archival sources and combining this historical information with the preserved instruments in present day museums, the cultural value of these scientific instruments, as well as the history of popular and professional science can be enhanced.

A-2

AN EARLY SLIT LAMP USED BY EDWARD W. D. NORTON AND A LIEBREICH'S OPHTHALMOSCOPE AT BASCOM PALMER EYE INSTITUTE, UNIVERSITY OF MIAMI MILLER SCHOOL OF MEDICINE

Martha L. Reiner

Miami-Dade College and Florida International University

This paper describes two optics-ophthalmology instruments, an early slit lamp and a Liebreich's ophthalmoscope, at the Bascom Palmer Eye Institute in Miami.[1] It also analyzes contexts in practitioners' guides, scientific medical writings, invention reports, and atlases of split lamp microscopy studies on living persons' eyes from the late 19th century to the mid-20th century. These monographs, journals, and reference works are at the Norton Library and Kirsch Rare Book Room of the Bascom Palmer Eye Institute and at the University of Miami Miller School of Medicine Calder Library. Edward W. D. Norton, M.D., a founder of the hospital named for Bascom Palmer, a pioneer ophthalmologist in Miami in the 1920s, used the slit lamp in his practice. The slit lamp sends a narrow intense slit light beam working along with a biomicroscope toward the cornea and the retina.[2] The Liebreich's ophthalmoscope, a predecessor instrument for examination of the retina, is from Peter Thomas Skaggs, M.D., a founder of Miami City Hospital, which was started in 1918 and then named Jackson Memorial Hospital, for James M. Jackson, M.D., who served as company doctor for Flagler's Florida East Coast Railway and as the hospital's chief of staff from 1920 to 1931.[3] The ophthalmoscope is in a display case at the Norton Library and Kirsch Rare Book Room. Herman von Helmholtz, who introduced the ophthalmoscope in 1851, observed, as translated by Thomas Hall Shastid in 1916, "It is, namely, a combination of glasses, by means of which it is possible to illuminate the dark background of the eye, through the pupil, without employing any dazzling light. . . ."[4] Richard Liebreich, a student of Helmholz's, produced an ophthalmological atlas while working at Von Graef's clinic in Berlin.[5] The slit lamp, along with an opticokinetic drum and other materials of ophthalmology practice, is in a display case at the Bascom Palmer Eye Institute honoring Dr. Norton's service. The library and rare book room preserve 3,000 texts, including many early optics and ophthalmology books published from 1496 to 1900.[6] The libraries' texts are useful for exploration of many themes in scientific instrumentation studies, especially international diffusion of invention and discovery related to optics and ophthalmology, national and international interactions in medical practice including psychotherapy and epidemiology, interplay of physical and biological sciences, and changes and continuities in scientific and medical rhetoric.

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[1] Cynthia Birch and Manuel Figueroa at the Norton Library were excellent resources for this study.

[2] *Merriam-Webster Medical Dictionary;* Harold A. Stein, Bernard J. Slatt, and Raymond M. Stein, *Ophthalmic Terminology Speller and Vocabulary Builder*. C. V. Mosby, St. Louis, Washington, D.C., Toronto, 1987.

[3] Jackson Health System web page; "The Alamo," Miami Centennial Quilt, Historical Museum of Southern Florida web page.

[4] Helmholtz, Herman von. *Beschreibung eines Augenspiegels.* Berlin, 1851. Translated by Thomas Hall Shastid, *The Description of an Ophthalmoscope*. Cleveland Press, 1916.

[5] Ravin, James G., and Christie Kenyon, "From Von Graefe's Clinic to the Ecole des Beaux-Arts. The Meteoric Career of Richard Liebreich." *History of Ophthalmology*, Vol. 31, Issue 3 (November-December 1992), 221-28.

[6] Treasures of South Florida Libraries: A Celebration of Rare and Unique Materials. Bascom Palmer Eye Institute. The Mary and Edward Norton Library of Ophthalmology; scholar.library.miami.edu/treasure/chapters/chapter1.html. Dr. and Mrs. Ralph Kirsch Rare Book Room. Bascom Palmer Eye Institute – Library Services. http://bascompalmer.org/site/info/info_library/index.asp#RareBookRoom

A-3

STRANGE MONKEY TRICKS – THE STORY OF THE METRONOSCOPE

Latif Nasser

Dartmouth College

Throughout the 20th century, research in eye movement was popular in American psychology, particularly as a means to understand both how we read and how we may improve how we read. The former concerned, among others, behavioral psychologists starting with B. F. Skinner. The latter was (and, likely still is) important to students of a variety of ages across the country, and consequently, their teachers. This interest led to a demand in tachistoscopic devices, the first of which was described as early as 1859 by physiologist A. W. Volkmann.

One such device was the 'metronoscope', invented by James Y. Taylor, a Texan businessman and his two brothers in 1931. The machine uses an electric motor to pull a scroll-like strip of paper (32 inches wide, with 200 lines of text) at variable speeds through a slit, where three windows open from left to right in rapid succession to condition the eyes in the direction of reading. The brothers patented their device in 1933, and the American Optical Company (a 100-year-old lens and goggle manufacturer in Massachusetts) produced it for them. It was widely used in the 1930s-1950s for reading clinics – for example, those held at NYU, by reading professor Stella Center who used a metronoscope to teach celebrities to speed-read.

We have recently accessioned a metronoscope (with 17 reels of text, each with a silly title: ‘Odd Facts About Postage Stamps’, ‘Those Snake Stories’, ‘Strange Monkey Tricks’) in the King Collection at Dartmouth College. Along with the Curator of the King Collection, Professor Rich Kremer, I will help restore the metronoscope to function as it did in the 1930s.

We intend, with our research, to understand the technical details of the machine, and to determine how it was used both by behavioral psychologists and in speed-reading clinics. In addition to our findings, we intend to bring to SICU2, a video showing the machine in action (and possibly also some of the aforementioned monkey tricks).

A-4

SCIENCE AND ITS INSTRUMENTS: MATERIAL CULTURE AND THE RECONSTRUCTION OF KNOWLEDGE

Yaakov Zik and Giora Hon

University of Haifa, Israel

Theories of physical science need an interface between symbolic representations and the real world. Observations, experiments, and the technological means that facilitate them may provide such interface. Instruments are used in various activities as artifacts that attend to the specific needs for which they were designed. However, once introduced into a scientific inquiry, instruments enter a symbolic relationship with the theories within which they are employed. Addressing these fundamental issues, we propose to establish a new methodology: The study of a scientific instrument as an object that bears knowledge. In contrast to the traditional view, we propose to "read" the instrument as if it were a manuscript that exhibits propositional knowledge. For example, the way an instrument is being manipulated shows with hindsight whether the scientist knows what he/she is doing or not.

Two case studies will be discussed here: (1) the innovations Kepler presented in chapter 11 of his *Optics* of 1604, where he shows how to measure the diameters of the luminaries and minimize the chance to err. And (2) Galileo's telescopic enterprise, which he first mentioned in 1610 in his *Sidereus Nuncius*. We argue that Kepler and Galileo were aware of the fact that theoretical results crucially depend on observational practices and the instruments that facilitate them. Put succinctly, errors in the design and construction of optical instruments, the deployment of instruments in astronomical observations and the interpretation of the recorded data require close scrutiny in order to obtain reliable astronomical knowledge.

Our combined analysis of theory and practice demonstrates how conclusively material culture contributed to astronomical observations and their association with astronomical theories. By using modern analytical techniques we are able to obtain new insights into the optical instruments of the time. This in turn allows us to reconstruct the knowledge embedded in these instruments, knowledge that is not exhibited propositionally. Our presentation takes a balanced approach that seeks to understand not only the theoretical aspect of astronomical observations but also the material aspect of it, an aspect historians of science have neglected and indeed ignored for too long.

This study is supported by the Israel Science Foundation (grant no. 136/04).

A-5

THE INSTRUMENT AS OBJECT: A DIFFERENT PERSPECTIVE

Albert Sperath

Director, University Museum and Historic Houses
The University of Mississippi

In addition to illustrating a principle or process, the scientific instrument can have significance in a museum setting as an object. For some it can take on an aesthetic significance, a tour de force of engineering and execution, a mystery to remain or be solved, or a myriad of other contexts. Visitors carry their own contexts and pre-dispositions, and despite everything you do to lead them into a directed state of mind, you will likely fail. At least you will with me.

I will present, as an example of a different perspective, my own view as a contemporary sculptor. I will show artifacts from the Millington and Barnard collection that can function as art as well as instrument. Whether it is a mathematical rendering of light waves or a glass and brass object, the potential for multiple interpretations is significant and real and perhaps can be exploited to put the object into a new context.

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+++ **Friday 10:15 – 11:30am Session B:** Scholarly Themes and Challenges +++

B-1

EXPERIENCES WITH THE INSTRUMENTS USED BY ANCIENT MARINERS

Malhão Pereira

Portugese Navy, retired

During all my career in the Portuguese Navy, where I had the opportunity of navigating in motor and sailing vessels, I recognised how difficult it should be for the ancient mariners of all cultures and areas of the world, to find their way through the Oceans with so rudimentary instruments, charts and pilots. And the more I knew the moods of the sea, the more I admired our predecessors who first discovered the sea routes, and how they managed to return to previous visited harbours, mainly with the help of heavenly bodies, which were observed with very rudimentary instruments.

For better understanding the geometrical and mechanical principles of these ancient instruments of navigation, I have made replicas of the majority of them, and tried them onboard sailing vessels. The experiences were mainly made with replicas of the Chinese *star boards*, the *kamal*, the *quadrant*, the *astrolabe* and the *cross-staff*. The measurements were taken by different observers, mainly cadets of the Naval Academy or officers of the ships where I served, and also pupils of the University where I teach. The results of the experiences, which were made, made mainly onboard the square rigger *Sagres*, (which I commanded of four years, and served for many more) sister ship of the Coast Guard Bar Eagle, were statistically studied and published in Portugal. I feel that the results of my my experiences are very useful and representative of the the accuracy that was obtained during the early periods of Ocean Navigation.

I will show briefly to the the audience, with the help of images, the geometrical principle of the majority of the instruments used by ancient mariners and also some photographs of the attitudes of the observers during the experiences, and the accuracy of the instruments, found by comparison of the simultaneous observation with the sextant. I feel that to share these experiences with the collectors of nautical instruments can be useful to them, and give some better ideas of their use aboard ships and their usefulness for maritime navigation.

B-2

ENGEL'S INGENIOUS MODELS FOR THE ILLUSTRATION OF THE WAVE THEORY AND DOUBLE REFRACTION

Gerard Buskes

Department of Mathematics, University of Mississippi

In the Millington-Barnard collection of instruments at the University of Mississippi, we find artifacts that at first sight appear to be both art and model. Amongst these a special place is occupied by the mathematical plaster models made by F. Engel. An immigrant into New York, F. Engel had learned the trade of making mathematical models in Berlin and attended the University of Berlin. The University of Berlin's mathematics department created the new paradigm of how to teach mathematics in the second half of the nineteenth century. In New York, Engel lived a few doors down from Pike, who had a famous instrument maker's shop. Assuming that Engel found a commercial outlet for his artistic geometric models via this instrument shop, where possibly his work was on display, it is easy to speculate that Barnard (with strong New York connections), in search of instruments came across them. Their mathematical content is closely linked with the beautiful and somewhat rare book "Darstellende Optik" that Engel made in collaboration with Schellbach, an influential mathematics pedagogue in Berlin. This treasure also is in the University Museum collection. The models themselves are connected with Fresnel waves and a special theory of refraction, which in turn is connected with a group of mathematicians like Hamilton, Kummer, and Plucker, who finished off, mathematically, a topic that had been started by Fresnel and Fourier on the basis of intuition. When later in the third and fourth quarter of the nineteenth century, innovations in teaching of mathematics crossed the ocean from Europe to the United States of America, the European mathematicians that traveled along with the innovations found themselves right at the divide between concrete mathematics and a truly big change in direction for the general research area of geometry. Right at the beginning of that third quarter, Barnard bought the models at a time when they were in vogue and where they may have represented a forefront of pedagogy. However, whereas by the end of the third quarter of the nineteenth century the innovator J.J. Sylvester while teaching at John Hopkins University made sure that an expensive set of models, under objections of the administration, was on the budget, it is unlikely that later generations attached the same importance to them. We have little evidence of the intensity of use of the models here at the University of Mississippi, though the plaster clearly is worn in many places. The Engel-Schellbach way of looking at geometry, as evidenced in their breathtakingly beautiful book, simply gave way to a mode of mathematics where models and pictures were less needed. We will reflect on the role the models play as a sort of archeological finds to explain the history of teaching of mathematics (and physics).

B-3

SOVIET SCIENTIFIC INSTRUMENTS IN NORTH AMERICA: THE CANADIAN CONNECTION

David Pantalony

Curator, Physical Sciences and Medicine
Canada Science and Technology Museum, Ottawa, Ontario, Canada.

In the late 1950s, following significant trade expansion by the USSR, Soviet scientific instruments arrived in the United States. Several of them (now housed at Dartmouth College and Harvard) were basic teaching apparatus. The importation of these instruments created a large stir on Capitol Hill, as conservative legislators vowed to protect American schools and industry from communist influences. Another Soviet technology that came to North America was a cheap and successful kerosene thermoelectric generator used to run radios in remote regions. In response to this apparent threat, the US government commissioned the 3M company of Minnesota to make an equivalent device. Thermoelectricity was a hot topic in the late 50s and early 60s with far reaching applications in space, transportation, household appliances and medicine. Engineers and physicists at the National Research Council of Canada, intrigued by the Soviet and American work, did extensive studies on these topics, including a comparison of the American and Soviet generators. Two of these generators are now housed at the Canada Science and Technology Museum in Ottawa, Canada. This paper will describe these artifacts and place them in the context of Cold War research and applications in thermoelectricity.

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B-4

A CHALLENGE FOR UNIVERSITY COLLECTIONS: MATHEMATICS AND SCIENCE EDUCATION IN THE AGE OF SPUTNIK

Peggy A. Kidwell

Curator of Mathematics
Smithsonian Institution

October 4 2007 will be the fiftieth anniversary of the Soviet Union's launch of Sputnik, the first artificial satellite to orbit the earth. In the years immediately before, and most especially after, Sputnik, American teachers, university professors, parents, philanthropists and legislators devoted time, attention and money to improving the general level of mathematics and science education in the United States. Audiovisual aids, toys for young children, new elementary and high school curricula, and university apparatus and science buildings reflect this concern. The anniversary is an appropriate time to examine collections of this period. Searching the collections of National Museum of American History and consulting with colleagues has revealed a rich array of treasures, some of which will be shown in an on-line exhibition. University collections undoubtedly also would reveal treasures.

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+++ Friday 11:45 – 12:45pm Lunch-time Poster Session +++

poster

THE PHYSICS APPARATUS COLLECTION AT THE UNIVERSITY OF RENNES 1 (BRITTANY – FRANCE)

Dominique Bernard, Alain Canard & Jean-Paul Taché

Unités Mixtes de Recherche CNRS :
Sciences Chimiques, Biodiversité, PALMS - Université de Rennes 1, France.

The Faculté des Sciences at the University of Rennes (France) was founded in 1840 and its substantial heritage includes paleontology, archeology, zoology, botany and historic books. The collection of physics apparatus is equally rich : we have identified and photographed some 600 items from the period 1800-1900. Highlights of the collection include :

- A Gregorian telescope built by James Short in 1740 ;
- An extensive collection of optical instruments made by Soleil, Duboscq and Pellin (80 items) ;
- Acoustical apparatus by Rudolph Koenig (tuning forks, sirens, organ pipes, Helmholtz resonators, Fourier analysis…) ;
- Instruments devised by the French physicist Léon Foucault : his rare gyroscope (built by Dumoulin-Froment), his induction-current apparatus, and a clockwork-driven recording cylinder regulated by a Foucault governor ;
- In Mechanics and Fluids : Archimedes' screw, Hero's fountain, Watt's machine ;
- In Electricity and Electrostatics : Clarke's and Gramme's machines, Ampere's tables, a de la Rive Tube, measurement apparatus built by J. Carpentier.

We have also found three pieces of apparatus built by Jacques, Pierre & Marie Curie for radioactivity measurements : a gold-leaf electroscope, piezoelectric quartz, and a quadrant electrometer.

Some of the apparatus has been presented in outreach at festivals and exhibitions for schools and teachers.

A project incorporating conservation and a natural history museum is underway in Rennes. Work on 20th century heritage has also begun in association with the Conservatoire National des Arts et Métiers in Paris (CNAM, D. Thoulouze and C. Cuenca).

Internet site : http://cst.univ-rennes1.fr/index_13_02.htm

poster

"THE FULLEST ILLUSTRATION OF EVERY IMPORTANT FACT AND PRINCIPLE." INSTRUCTION IN NATURAL PHILOSOPHY AND ASTRONOMY IN 1856

Maribeth Stolzenburg and Thomas C. Marshall

Department of Physics and Astronomy, University of Mississippi

The Millington-Barnard Collection of Physics Demonstration Apparatus at The University of Mississippi dates from the beginning of the University in 1848. Much of this apparatus was purchased under the direction of Professor Frederick Augustus Porter Barnard, who came to the University in 1854 to teach mathematics, civil engineering, astronomy, chemistry, and natural philosophy and left in 1861 at the outbreak of the Civil War. Throughout his tenure, Barnard aspired to build this institution into a "true university of all learning" with a "distinguished preeminence in science." In his purchases of apparatus, effective teaching via "experimental lectures" was a primary concern. He assembled a teaching collection "to embrace whatever could be practically useful in impressing the facts and principles upon the mind through the eye; and all the instruments selected have been the best in their class." By 1860 the University's collection of physics demonstration apparatus was among the best, in both quality and comprehensiveness, of any institution in the United States.

In 1856, just after becoming the University President, Barnard wrote a lengthy description of the instruction in Natural Philosophy and Astronomy for the University *Catalog for the Ninth Session*. This 3000-word advertisement is organized around a course of study based on Olmsted's *An Introduction to Natural Philosophy*. In it, Barnard purposefully and specifically mentions at least 143 pieces or sets of apparatus, from the finest instrument makers in the world, that would be used for instruction. Three additional major pieces of apparatus are described as soon to arrive, and there is an allusion to the "larger instruments of the observatory" that were soon to be ordered. This presentation will give a pictorial overview of the Millington-Barnard Collection today, using Barnard's own words of the principles that each piece conveys.

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+++ Friday 1:00 - 2:15pm Session C: Collection Development Strategies +++

C-1

COLLECTIONS OF SCIENTIFIC INSTRUMENTS IN BRAZIL: CURRENT SITUATION AND PROSPECTS

Marcus Granato

Coordinator of Museology, D.Sc.
Museu de Astronomia e Ciências Afins, Rio de Janeiro, Brazil

This work will present an overview of Brazilian scientific heritage, particularly instruments of science and technology. Few institutions are dedicated to preserving such collections and their work is compromised by a shortage of funding and skilled personnel. However, there are some cases that deserve be mentioned. The MAST, or Museu de Astronomia e Ciências Afins, under the auspices of the Ministry of Science and Technology, Rio de Janeiro, has a collection of 2000 objects that is considered as one of the most representative and significant of its kind. Objects in the collection are mostly astronomical, optical, calculation, drawing, electrical, geodetic, metrological, meteorological and chronometric instruments acquired from the Brazilian Imperial Observatory between 1850 and 1930. More recently, the collection has been enlarged through the acquisition of artifacts pertaining to areas such as nuclear engineering and mineral technology. Another institution with an important collection is Museu de Ciência da Escola de Minas – Federal University of Ouro Preto, Minas Gerais State. Founded in the 19th century, the museum has an impressive collection of c. 400 astronomical, design, electrotechnical, metallurgic and topographic artifacts originally from one of Brazil's oldest schools of engineering. Other collections of note are held by the Centro de Memória da Engenharia – Federal University of Minas Gerais, in Minas Gerais State; at the Observatório Astronômico, owned by the Instituto de Física – Federal University of Rio Grande do Sul, in Rio Grande do Sul State; and the Museu Nacional, the Museu da Escola Politécnica and the Instituto de Química, all three at the Federal University of Rio de Janeiro. Additionally, MAST has carried out research in partnership with the Museu de Ciência of the University of Lisbon, identifying other potential sources of collections and was also recently engaged in a study of objects documenting the history of nuclear energy in Brazil, which produced some interesting results that may be of assistance for a broader project of surveying scientific and technological instruments and artifacts.

C-2

REGIONAL SCIENCE IN MEXICO
SCIENTIFIC INSTRUMENTS IN THE PUEBLA STATE COLLEGE 1880-1930

Elsa Hernández M., Mónica Azcárate S., Jorge D. Cortés M., Carlos Contreras C.,

Benemérita Universidad Autónoma de Puebla (BUAP).

During the second half of XIX century, Puebla city lived a deep process of change and modernization. This process included urbanization, economic growth, science and education. In this process the *Colegio del Estado* (State College) --now the State University named Benemérita Universidad Autónoma de Puebla-- entered into a deep process of change in academic structures and values.

As well as in Europe and United States, in Puebla State College, in the classrooms, several sciences like physics, Chemistry, Astronomy, Medicine, Natural Sciences, Humanities and culture were taught and developed. During this period, the State College created specialized scientific teams and facilities with *state of the art* instruments imported mainly from Europe. In the same way, the library of the Puebla State College named *José María Lafragua* was enriched with the most recent scientific texts that students and professors read and studied, likewise in Europe and The United States, with the newest knowledge.

In the following decades, especially after the second world war, most of those instruments became obsolete and gradually were spreading out until the scientific teams finally were transformed into units of study and research. Unfortunately, during the 1960's decade, some instruments got lost and stopped being cultural treasures of the University.

However, with the reopening, past October 2006, of the interactive university museum named *Casa de los Muñecos* of the State University (Benemérita Universidad Autónoma de Puebla BUAP) –which remained closed after the 1999 earthquake--our university is interested in rescuing, classifying, rebuilding and showing part of the scientific instruments used in Physics, Chemistry, Natural History and Astronomy. With this objective, the university is designing an internal policy to divulge amongst students, university teachers and public in general the vast diversity of the university´s treasures constituted between mid 19^{th} and early 20^{th} centuries.

C-3

PRESERVING MEMORY WITH THE FACULTY OF SCIENCE (UNIVERSITY OF PORTO) COLLECTION

Marisa Monteiro, L. M. Bernardo, J. M. Araújo

University of Porto

The Faculty of Science of the University of Porto has its roots in the Royal Navy and Commerce Academy, created in 1803, and financially supported by Porto wine farmers and merchants. Octants, sextants, an astronomical quadrant, a graphometer, a compensated pendulum and two impressive globes, updated with the latest discoveries of that time, presently rare survivors in their kind, were brought from London for Math classes – given for navigation purposes - and a large selection of engravings by great masters served as models for students in Drawing classes. Natural Philosophy would only be taught with books, as there were no instruments to perform practical demonstrations.

Following major reforms in public education, in 1837, the Royal Academy became the Polytechnic Academy: Physics and Natural History Cabinets, and a Chemical Laboratory were duly created. For the next 3 or 4 decades, sporadic purchases were made for the Physics Cabinet, from E. M. Clarke, Cary and Secretan, among others, always out of scarce funding.

By the turn of the century, efforts wer' made to complete the Academy's building, whose construction had started 100 years earlier, and suitably equip cabinets and laboratories, for which there was extensive purchasing from well-known European manufacturers.

The exact science collection, presently under study, cleaning and, whenever necessary, re-assemblage and restoration, comprises apparatus and instruments from the Physics, Chemistry and Geology Cabinets/Laboratories. Used as science teaching tools in the past, long considered obsolete, yet, in many cases, not disposed of in order to evade tedious bureaucratic procedures, these holdings have come to make up a considerably large and assorted collection, where the History of Science, and of the institution itself, in the past two centuries, somehow unfolds.

Access to this collection has been permitted to graduate students and will, very briefly, be extended to the general public with the forecoming creation of a cross-reference database congregating online information on all the University's collections.

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C-4

HOW COMPLETE IS COMPLETE? MECHANICS AND THE MILLINGTON-BARNARD COLLECTION

Steve Case
Department of Physics & Astronomy, University of Mississippi

In 1856, just eight years after the University of Mississippi was founded, Professor F. A. P. Barnard wrote a detailed description of the course of instruction in Natural Philosophy in *The Catalogue for the Ninth Session of the University of Mississippi*. Filled with bold statements, this description is resource for us today in understanding the history of the Millington-Barnard Collection. For example, Barnard wrote:

> "The apparatus employed for illustration of mechanical principles embraces not only every article which is usually found in such collections, but many which are less common; especially models of machinery, and contrivances for exhibiting the various modifications and transformations of motion employed in mechanics."

We have recently begun conducting a preliminary survey of period textbooks and relevant catalogues in an attempt to determine the "completeness" of the Millington-Barnard Collection, specifically in the area of mechanics. I will give a brief overview of the instruments commonly used for teaching and illustrating mechanics concepts at the time of the Collection's creation (1850's). A comparison will be made to the instruments in the Millington-Barnard Collection, based on their being mentioned in *The Catalog* (1856) or listed on a detailed inventory completed by Barnard in 1861, and on the current status of the Collection. What instruments were commonly used for teaching and illustrating mechanics concepts at the time of the Collection's creation? How many of these instruments can be found in the Collection? Are there any conspicuous absences? The overall completeness of the Collection will be discussed, as well as the conspicuous absences.

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+++ Friday 2:30 - 3:45pm Session D : Collection Management Issues +++

D-1

A TIME TO KEEP, AND A TIME TO CAST AWAY: THOUGHTS ON ACQUISITIONS FOR UNIVERSITY INSTRUMENT COLLECTIONS

Richard L. Kremer
Dartmouth College

National museums add to their instrument collections via acquisition policies, budgets, and the careful cultivation of potential donors. Private collections grow by the passions and deep pockets of their owners and the vagaries of the market for "vintage" apparatus (as eBay quaintly puts it). University collections, on the other hand, might appear to grow simply by accident and whimsy. Located at the sites where instruments pass over from active use into obsolescence and decay, university collections, if they are making acquisitions at all, often involve the first in a series of decisions that ultimately will shape the material culture of science past to be preserved for future generations.

Based on an informal survey of acquisition policies at various university collections as well as a review of the history of acquisitions for Dartmouth's King Collection, I will offer some general reflections on how caretakers for such collections might think through what to keep and what to cast away. Although various university collections have evolved quite different acquisition policies, I will seek to identify some of the common processes by which old stuff moves from today's laboratories to landfills, salvage companies, and tomorrow's instrument collections.

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D-2

THE CHEMICAL HERITAGE FOUNDATION OBJECT COLLECTION: CHALLENGES AND SOLUTIONS FOR MANAGING A DIVERSE COLLECTION

Rosie DiVernieri

Collections Coordinator
The Chemical Heritage Foundation, Philadelphia, Pa

As the saying goes, not all things are created equal. This is especially true in the world of scientific instrument collections. The objects can be as diverse as the term "science" itself, ranging in size, shape, and complexity. Unlike other types of collections, scientific collections also carry an inherent risk. Caretakers must worry about exposure to hazardous materials, heightened fire potentials, and other unknown side effects related to the original use of the object. With all of these hurdles, scientific instrument collections have found a way to grow and thrive, despite the challenges.

Using the Chemical Heritage Foundation object collection as a case study, this presentation will look at the challenges and solutions created to help facilitate the management of such a diverse collection. Special attention will be paid to hazardous materials within the collection (chemicals, radioactivity, etc), solutions for size and weight issues, and a brief discussion on disaster planning.

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D-3

THE GREENSLADE COLLECTION

Thomas B. Greenslade, Jr.

Professor Emeritus of Physics
Kenyon College, Gambier, Ohio

The theme of this conference is scientific apparatus collections *in* the university. My talk is about apparatus collections *from* the university. At the first SICU meeting at Dartmouth, I gave a talk on hidden apparatus collections. The ultimate in hidden collections is the private one. Today I will talk about my own collection, obtained almost entirely by gifts from college and university physics departments. By and large, physics departments are poor shepherds of early apparatus; my professional colleagues quite properly want the most up to date apparatus for research and undergraduate laboratory use, and regularly pitch older apparatus. Starting in the summer of 2000, a dozen departments and a number of private individuals have contacted me about saving early demonstration and laboratory apparatus. Consequently, I ended up with about 450 items that spread all over the house. In 2005 a museum wing was added to display some of the more interesting pieces of apparatus. Now I am concerned with the future of the collection. It forms a valuable study collection that ought to be preserved intact. How do I do this?

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D-4

A DISTRIBUTED MUSEUM LINKED BY THE WEB

Richard A. Paselk

Robert A. Paselk Scientific Instrument Museum
Humboldt State University

The Humboldt State University Scientific Instrument Museum was one of the earliest instrument museums on the web, launching in the spring of 1997 with a small collection of early 20th century apparatus. The web museum was extensively upgraded and expanded fall 1997. Local recognition of the web museum resulted in the creation of a small physical museum located in the University library in Fall 2000. This event was accompanied by a major redesign and enhancement of the website, and a renaming of the museum as the Robert A. Paselk Scientific Instrument Museum (in honor of my father). This museum was briefly reported at SICU1 at Dartmouth College in 2004.

In this presentation I describe the expansion of the physical museum into distributed displays. These new displays are associated with particular disciplines and located near the disciplinary teaching spaces. The various displays are integrated through a common web museum accessible via Ethernet and/or wireless connections. The use of the web to provide in-depth information to complement the limited display text will also be discussed.

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+++ Friday 4:00 - 5:15 pm Session E: Collection Development Strategies +++

E-1

LOST AND FOUND: HEARING AIDS AND DISABILITY HISTORY AT KENT STATE

Mara Mills

Department of the History of Science, Harvard University

This paper will describe the Kenneth W. Berger Hearing Aid Museum and Archives at Kent State University and their significance to disability history. The world's largest collection, the museum includes over 3000 models—from pre-electric trumpets to electronic in-the-ear aids. While the museum receives frequent visitors, the archives have very rarely been used.

The museum consists of a long hallway display in the Speech Pathology and Audiology Clinic. Dr. Kenneth Berger, who directed the audiology department at Kent, began the collection of hearing aids somewhat fortuitously. According to museum literature:

> After an interview in 1966 with the editor of NATIONAL HEARING AID JOURNAL (now HEARING JOURNAL), Professor Kenneth Berger mentioned a "desire" to have a hearing aid "display" in the Speech and Hearing Clinic; the published article used the word "museum." Soon, parcels of old hearing aids began arriving from all over the United States and overseas. The largest donation came from A. J. Schneider of Reading, Massachusetts. He had been in the hearing aid business since the 1930's and sent more than 500 different models.[1]

The collection offers a visual timeline of the trend toward miniaturization in hearing aid manufacture. For those interested in the cultural history of disability, the artifacts help make sense of the stigma of prosthesis so often described in memoirs of hearing loss.[2] As such, they provide a crucial counterbalance to the study of advertisements and industry literature. The "camouflaged" hearing aids of the pre-electric era tell of the class backgrounds and tastes of their wearers. The artifacts have also provided evidence for patent attorneys involved in disputes over circuit design and other innovations.

The archive, on the other hand, is housed in a row of filing cabinets in a utility closet. Despite its unassuming placement, this archive contains rare first-hand accounts of hearing loss and hearing aid use. While conducting research for his hearing aid textbook, Berger wrote to every major hearing aid company in the United States, Britain, and Germany to request photographs and other records.[3] As a result, he amassed a collection that includes scrapbooks, letters exchanged between hearing aid wearers and dealers, training manuals for door-to-door salespeople, and a wide range of ephemera.

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[1] <http://dept.kent.edu/hearingaidmuseum/history.htm> (22 January 2007)

[2] Frances Warfield's memoirs, for instance, variously describe the drawbacks of speaking tubes, church "deaf sets," and carbon electric hearing aids. Her writing forms a major part of the bibliography for Erving Goffman's *Stigma: Notes on the Management of Spoiled Identity*.

[3] Kenneth Berger, *The Hearing Aid: Its Operation and Development* (Michigan: The National Hearing Aid Society, 1970).

E-2

THE INSTRUMENT AND APPARATUS COLLECTION OF THE ARCHIVES OF THE HISTORY OF AMERICAN PSYCHOLOGY, THE UNIVERSITY OF AKRON

David B. Baker

Director-Archives of the History of American Psychology
Professor of Psychology, The University of Akron

The collections and materials of The Archives of the History of American Psychology (AHAP) at the University of Akron in Akron, Ohio are of considerable significance to the discipline of psychology and related fields of study. This collection of approximately 8,200 cubic feet represents an extensive national and international resource. A thematic repository, AHAP is recognized as the largest archival collection of its kind in the world. The items that are preserved as the tangible resources for research in the history of psychology are varied, yet limited to those that are not in the public domain or are not preserved in other repositories. Founded in 1965, the AHAP became a Smithsonian Affiliate in 2004. Designation as an affiliate was based in large measure on the strength of the AHAP Instrument and Apparatus Collection. With more than 1,000 objects, the collection tells the story of the history of both the science and practice of psychology. Types of artifacts include laboratory equipment, measurement and testing equipment, research apparatus, and demonstration and instruction items. Increasingly, these materials are becoming objects of study in their own right by scholars and historians of science. Such objects also offer pedagogical opportunities especially through the use of simulations and replications. This proposed session will provide an introduction and overview of the objects available at the Archives of the History of American Psychology.

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E-3

COLLECTING HISTORIC PSYCHOLOGICAL INSTRUMENTS – THE PASSAU COLLECTION

Horst Gundlach

Institut fuer Geschichte der Psychologie
der Universitaet Passau, Passau, Germany.

Historic scientific instrument collections rarely take into consideration the category "Psychological instruments". One of the reasons is the ambiguity of the concept "Psychological". Its denotation varies considerably depending on whether it is understood as referring to the scientific field of psychology or to the much younger scientific discipline of psychology. Essential problems of the field of psychology have been studied until the nineteenth century under the heading of physics, and are still studied under various headings like physiology, neurophysiology, psychiatry, biology, etc. In sharp contrast to the old and venerable field of psychology, the discipline of psychology is a recent invention of the 20th century. This ambiguity and its import for the category "Psychological instruments" and the collecting of such instruments is explained.

The second part delineates the 25 years since the founding of the Passau Institute and the growth of its collections, especially the instrument collection which is now the largest in Europe.

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E-4 *[A RECENT ADDITION, BY REQUEST OF THE SICU2 ORGANIZING COMMITTEE]*

TIPPING THE SCALE - CHRISTOPHER BECKER REDISCOVERED

Jan Waling Huisman

Curator Scientific Instruments
University Museum Groningen, the Netherlands.

This presentation will focus on the electric motors made by Christian Becker during his time in Groningen and some other instruments, mainly of astronmical nature.

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Friday evening at Johnson Commons Ballroom

PHYSICS EDUCATION WITH HISTORIC SCIENTIFIC INSTRUMENTS: A CALL FOR ACTION

Thomas C. Marshall and Maribeth Stolzenburg

Department of Physics and Astronomy, University of Mississippi

At the University of Mississippi we have an interesting collection of scientific instruments that were purchased in the 1850's for the purpose of educating the university's students. In the late 1970's these instruments were moved from the physics department and are now displayed in the university museum. We are seeking ways to make better use of these instruments for teaching science and history. One continuing challenge is that people, even scientists, who come across historic instruments on display in the museum often find it hard to comprehend how the objects function because they cannot use them or watch them work. Written descriptions of how the instruments work often fail. We have been developing ways of showing the instruments in action with video clips and/or with sequences of frames from a video clip. In this presentation we show the results of these efforts for several instruments, including the brachistochrone & tautochrone and the Franklin electric chimes. In addition, we will make a pitch for establishing a community website of instruments-in-action videos and animations.

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+++ Saturday 8:30 - 9:15 am Second Keynote Address +++

KEYNOTE II

HISTORIC INSTRUMENTS AS A RESOURCE IN UNDERGRADUATE TEACHING

P. Frank Winkler and Kenneth J. Pohlman
Middlebury College, Vermont

We will describe our experience in teaching a course, "Early Scientific Instruments: Exhibiting Artifacts from Middlebury's First Century," during the 4-week intensive-study term at Middlebury College in January 2006. Neither of the instructors is a historian of science nor a specialist in instruments; rather we are, respectively, an astrophysicist (who has inherited a small role as amateur "curator" of Middlebury's instrument collection) and the designer at the College Museum of Art. Six enthusiastic students, most with little background in science, each selected a few instruments from Middlebury's collection, researched the objects themselves and the context in which they were used, and wove their stories together into an exhibit: "Beauty, Ingenuity and Function: Rediscovering Middlebury's Philosophical Instruments." The students not only curated the exhibit, they also studied basic principles of museum design and developed a critical eye through field trips to three very different museums. Over the course of the brief term they designed the layout, wrote and produced labels, and installed the exhibit at the College Library. We believe this model can be replicated at other colleges and universities, simultaneously providing students with a unique experience and giving greater visibility to often "hidden" instrument collections.

We will also touch on other areas where our instrument collection has proved a resource for teaching, including bachelor's honors theses, lecture demonstrations, and use as stage props in theatre productions.

+++ Saturday 9:30 - 11:00 am Session F : Educational Significance +++

F-1

USING HISTORICAL COLLECTIONS WHEN TEACHING A BROADENED SCIENCE CURRICULUM

Staffan Andersson

Department of Physics, Uppsala University,
and Museum Gustavianum, Uppsala University, Sweden

In many curriculum reforms the scope of science courses has broadened, to include more than just content knowledge of the subject. The relevance of the subject for society in general should be addressed. Other aspects such as practices, history and culture of the subject should also be considered. In my presentation, I will discuss this trend and also exemplify it from current Swedish curriculum reforms on different levels.

Historical collections can be used in many different ways when teaching such a broadened curriculum. They are powerful tools when teaching the historical development of the subject, but many other aspects such as the interplay between the subject and society can also be illustrated. This will be discussed in general based on some different curriculums. Specific examples will also be given from different projects done at Museum Gustavianum, the Uppsala University museum. These have been done for all teaching levels from pre-school to introductory university level courses.

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F-2

EXPERIENCING THE HISTORY OF MEDICINE

Stefanie Rookis

Curator and Assistant Professor
Alabama Museum of the Health Sciences
University of Alabama at Birmingham Lister Hill Library

The Alabama Museum of the Health Sciences at the University of Alabama at Birmingham traces the evolution of health care through seven centuries of progress and innovation. Collection treasures include an ivory anatomical model used by medical students in the 16th century, a surgical set from the 1850s, and an early Emerson Respirator, a.k.a "iron lung," used at UAB Hospital in the 1950s. While objects have been collected since the 1940s, the Museum was established in the early 1980s and has grown alongside its current floor mate, the Reynolds Historical Library. I am the first and only full time staff to provide exclusive care for the Museum objects and exhibitions. Inventorying the collections and processing pieces that have been in and out of storage is an on-going project. This endeavor has provided many challenges, but the results have allowed for more thorough research and use of the material in a variety of interesting ways. The Museum, the Reynolds Historical Library and the UAB Archives make up UAB Historical Collections and our individual and combined special programs and outreach are as unique as our collections. An example of the benefit that can be gained from this collection can be seen in one popular Honors Studies course, Experiencing the History of Medicine, which introduces students to the history of health care through its material culture. Through directed readings and a show-and-tell approach, students literally see the history of medicine unfold. After giving the students background into the development of medicine in Western culture as seen through major classics such as Vesalius' De fabrica (1543) and Harvey's De motu cordis (1628), the course emphasizes 19th century scientific and medical developments that foretell modern practice. Just as these students find the history of medicine informative and interesting, further information on the practices and outreach efforts of the Alabama Museum of the Health Sciences can help workshop attendees enhance the experience of their own efforts in the History of Medicine.

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F-3

USING TEACHING COLLECTIONS IN HISTORY OF SCIENCE TEACHING

Roland Wittje

Department of Physics
Norwegian University of Science and Technology, Trondheim, Norway

At the Norwegian University of Science and Technology (NTNU) in Trondheim we have for the first time tought a course in history of science to science teacher students. We used parts of the historical teachnig collections from the physics and chemistry departments, as demonstrating Carl Anton Bjerknes' hydromechanical analogies of electricity and magnetism and splitting water using a replica of a voltaic pile and a 1910 apparatus for decomposing water. The students set up a small exhibition in the library, labled 'blue in 1910', aiming at the teaching collection's samples of natural and synthetic dies and color pigments, which the chemistry department of the Norwegian Institute of Technology acquired in 1910.

In my presentation I will focus on my demonstration of Carl Anton Bjerknes' hydromechanical analogies of electricity and magnetism in a lecture on 19th century physics. The experiments exemplify the 19th century search for a mechanical understanding of electromagnetic phenomena. The apparatus I was using is an original instrument from 1910 which I had to repair and complement. Drawing upon this example I would like to discuss the controversial issue of using original instruments, and the role of historical experiments in the understanding of scientific concepts and practice in history of science teaching.

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F-4

LOOKING FOR THE SCIENCE IN SCIENTIFIC INSTRUMENTS: THE CHEMICAL BLOWPIPE

Steven Turner

Curator, Physical Sciences Collection
National Museum of American History, Smithsonian Institution

Scientific instruments differ from other historic objects partly because they are designed to do things, to produce some kind of physical effect. Accordingly, it is often necessary to present audiences with an experience of these instruments being used before a wider discussion of their importance or meaning can be introduced. In the case of the blowpipe, seeing the instrument being used not only adds to an understanding of the instrument itself but also to the context in which it was understood. In the 19th century, when the nature of chemistry changed, the blowpipe was recast to fit into a new, more precise kind of science.

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F-5

"HANDS ON" MEETS "HANDS OFF"
HOW SCIENCE EDUCATORS VIEW HISTORIC INSTRUMENT COLLECTIONS

Steven Madewell

Program Coordinator
National Science Resources Center, Smithsonian Institution/The National Academies

Using the Smithsonian Science Education Academies for Teachers as a model, the speaker will describe a process by which curators, educators, working scientists, and historians can form mutually beneficial partnerships. This presentation will also explore the implications of *No Child Left Behind*, as well as other policies affecting science education, museums, and collections. These policies have created obstacles as well as opportunities for collections to contribute to science literacy, accessibility, and science understanding in science education. The often overlooked opportunities for collections to play a role in teacher education and professional development will also be discussed.

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+++ Saturday 11:15 - 12:30pm Session G : Collection Use Strategies +++

G-1

HOW TO UNDERSTAND THE PRINCIPLES INVENTED BY THE BERNOULLI FAMILY (ABOUT 1700)

Jan Waling Huisman

Curator Scientific Instruments
University Museum Groningen, the Netherlands

A few years ago our museum organised an exhibition about the work of the Bernoulli family, mathemicians, originally from Basel, Switzerland, but their knowledge made them popular as teachers all over Europe. In 1692 Johann came to Groningen to become professor. From here he continued his corespondence whit great names such as Leibniz and Newton. One of the results of this was the solving of the brachistochrone problem: which curve does an object have to follow to be the first to be at a certain point. Simple in words, but uneplainable in formula.

Therefore we set it as our task to build this curve and show that the formula was correct and defies our simple brain. A small wooden structure would be a possibility, but regarded as too close to basic. In the end we came up with a computer controlled double curve, with launching and timing performed with just a push on a button and in the meantime giving information in words and graphics. Apart from the formula's of Johann, we also had insight-giving experiments of the works of brother Jakob and son Daniël, all linked to everyday live of the visitors.

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G-2

REPLICATING MATHEMATICAL INSTRUMENTS WITH UNDERGRADUATES

Alistair Kwan

Yale University

A course in early modern mathematical instrumentation was devised in response to undergraduate demand for internalist history of science, interest in working with material and visual sources, and university curriculum needs for courses involving 'quantitative reasoning.' Students built plane astrolabes to learn mathematical content in conjunction with textual, experiential and archaeological approaches to understanding them as manufactured, material objects designed for particular tasks, and according to a particular model of cosmic structure. The astrolabes were therefore built in a way that makes sense for artisans, but which pure mathematicians would consider circuitous. Students finished by researching and fabricating an early modern mathematical instrument of their own choice.

Outline

- Instruments as sources for history of science.
- Supply and demand: externalist and internalist.
- Curricular niche: the residential college seminar programme.
- Mathematicians vs artisans; science vs technology.
- Pedagogical strategies: mathematics plus source analysis.
- Assessment.
- Outcomes.

– Drawing: a lost art recovered?
– Instruments.

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G-3

EXPLORATIVE ACTIVITIES INVOLVING STUDENTS WITH HISTORICAL INSTRUMENTS IN A MUSEUM

Elizabeth Cavicchi

Edgerton Center, Massachusetts Institute of Technology

Science instruments of the past look different from their counterparts today; these features may provoke students' curiosity about historical instruments, their functions, materials and history. By offering class sessions where students explore historical artifacts in a campus collection, we can extend their perspectives in ways not available in present-day classroom environments. This paper uses narratives to chronicle two types of exploratory activities by which students in small groups became involved with instruments in the MIT Museum's storeroom. Museum curator Debbie Douglas facilitated these activities for students in the classes I teach on experimenting and history. In preparation for the first type of activity, the curator and I selected some early telephones having different wiring, power sources, and designs. During the activity, she brought out one at a time, and invited students to discuss what they noticed and how they thought it worked. Then, in response to their queries or to enable new observations, the curator turned the telephone over, or unscrewed a cover, to reveal hidden mechanism or wiring. What the students saw inside deepened, or sometimes challenged, their ideas about its workings. In preparation for the other type of activity, the curator selected a group of different instruments from nineteenth century surveying. She placed all these instruments on a table where students could see everything at once. In introducing this activity, she did not identify anything. Instead, she said that all these items related to each other. She asked the students to look closely for clues about their use and context of operation. Eventually, the students surmised that these were tools for surveying. Through these two activities, my students developed awareness of how details in an instrument's make-up provide evidence about its past, and appreciation for creative ways by which inventors worked with materials, often turning constraints into assets.

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G-4

TEACHING WITH MATERIAL CULTURE: THE UNIVERSITY OF WESTERN ONTARIO MEDICAL ARTIFACT COLLECTION

Michelle A. Hamilton

Postdoctoral Fellow
University of Guelph

In the 1920s, the Faculty of Medicine at the University of Western Ontario began a modest medical historical collection, although it never developed into an official institution until the 1970s when it was transformed into the Medical Museum and Archives at the University Hospital. In the 1990s, the Museum and Archives closed, and the artifacts were dispersed among several local institutions. The objects remaining at the university have been reorganized by the departments of History and the History of Medicine as the UWO Medical Artifact Collection to be used for teaching purposes in Canadian, Medical and Public History. This paper will discuss the process taken by the collections team to restructure and document these artifacts, their use in material culture workshops, and the future plans to develop online teaching modules.

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+++ Saturday 12:45 - 1:45pm Lunch-time Poster Session +++

poster

FOUCAULT GYROSCOPE AND INDUCTION-CURRENT APPARATUS IN THE UNIVERSITY OF RENNES PHYSICS COLLECTION

Dominique Bernard
Sciences Chimiques de Rennes, Equipe Verres & Céramiques- Université de Rennes,
and
William Tobin
Vannes, France

The physics apparatus collection at the University of Rennes includes two related items pertaining to experiments devised by the French physicist Léon Foucault (1819-1868) of eponymous pendulum fame.

The first is a gyroscope set acquired *c.*1875 from maker Dumoulin-Froment probably for a price of 1500 francs (~$300). This is a rare item : we know of only four other sets, one of which is only half complete ; moreover, Foucault's original gyroscope from 1852 is lost. The Rennes set is missing one of its two rotors.

The second item is for replicating Foucault's 1855 lecture-theatre demonstration of the conversion of mechanical work into heat, which was very influential in France for spreading ideas of the conservation of energy. In it, induction currents warm a copper disc that is being rotated between the poles of an electromagnet. Such devices were much cheaper (350 francs) and are relatively common. They appeared in instrument-makers' catalogues as late as 1910, but the retractable form of the poles in the Rennes example is unusual, suggesting an early date for its manufacture. The instrument is marked 'Ruhmkorff à Paris'.

There is an immediate visual similarity between the gyroscope and induction-current device because both incorporate a winding crank and gear train to spin the gyroscope rotor or induction-apparatus copper disc. But there is a deeper historical link. When Foucault conceived his induction experiment, he first performed it by spinning his bronze gyroscope torus between electromagnet poles. That this was the obvious and natural thing to do only really struck us when manipulating the instruments ourselves, Foucault's written description notwithstanding. This illustrates, yet again, the importance of hands-on experience as well as theoretical description for full understanding in physics.

poster

REPLICAS OF HISTORIC INSTRUMENTS AND THEIR POSSIBILITIES

Thomas C. Marshall
Department of Physics and Astronomy, University of Mississippi

Working replicas of historic and fragile instruments can be effective tools for showing how the original instruments were used. Many university and college campuses with historic scientific instrument collections have machine shops that could produce replicas; if these shops have computer controlled lathes, milling machines, etc., then developing the computer programs to produce a single replica allows that shop to make additional copies relatively easily. This presentation will include demonstrations using a reproduction of a (circa 1850 model) brachistochrone & tautochrone from our collection. A group of these replicas will be available for hands-on experimentation, indicating another asset of such copies. Making a replica also allows for the addition of interesting and instructive features to the original design, as our replicas will show.

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METEOROLOGICAL INSTRUMENTS IN THE MILLINGTON-BARNARD COLLECTION

Maribeth Stolzenburg and Thomas C. Marshall
Department of Physics and Astronomy, University of Mississippi

The Millington-Barnard Collection of Physics Demonstration Apparatus at The University of Mississippi contains many pieces originally intended for lectures in atmospheric science and meteorology. There are thermometers with various forms and modes of division, including those of Kinnersley, Rutherford, Negretti and Zambra, Waldferdin, and Melloni. There is a plethora of barometers of different materials and construction, some of which are also named for their inventors and makers like Green, Gay-Lussac, Newman, and Bourdon. Principles of atmospheric electricity were demonstrated with various condensers, electroscopes, conductors, electrical bells, and a thunder-house. Applications of pneumatic devices such as air pumps, air guns, and fountains were also used to show different characteristics and theories of the atmosphere that were recognized by the middle of the 19th Century. In this presentation, we will attempt to uncover and demonstrate the principles of some of these meteorological instruments. We will also describe ways in which these apparatus might be used, displayed, understood, and put into current context within public and educational settings.

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+++ Saturday 1:45 - 3:15 pm Session H : Educating the Public +++

H-1

USING INSTRUMENTATION TO TELL THE HUMAN STORY OF THE CHEMICAL AND MOLECULAR SCIENCES

Jennifer S. Landry

Head of Collections
Chemical Heritage Foundation, Philadelphia, PA

In the summer of 2008, the Chemical Heritage Foundation will open the doors on a new 6,000 square-foot permanent gallery that will showcase its unique collections of scientific instruments, apparatus, archives, rare books and fine art. The dream for a permanent exhibition space has existed for over a decade; however, intensive content and design development did not begin in earnest until 2005. Through the new gallery, CHF will seek to tell the story of achievement in the chemical and molecular sciences. Scientific instruments and apparatus will be used to help interpret the human story behind chemistry. At the time of SICU2, CHF will have just completed an intensive design development stage and will be beginning the final design phase.

This presentation will look at the project to date and examine the successes and challenges of planning a gallery for a preexisting space in the original 1865 portion of CHF's Philadelphia headquarters. From determining content to ensuring best practices in conservation, the development of the gallery is complex. Questions that will be discussed include: how to display mid-twentieth century analytical instruments in a visually-appealing fashion, how to provide safe and secure environments for the display of artifacts and archives, and how to develop a space that will engage both the casual visitor and the scientist. The talk will include a photographic tour of the deconstruction and reconstruction of the gallery space and a selection of current gallery renderings. A look ahead at the challenges of final design and installation will also be discussed.

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H-2

CHARMING TOOLS OF A DEMANDING TRADE: THE HERITAGE OF NINETEENTH-CENTURY ASTROMETRY AT THE ASTRONOMICAL OBSERVATORY OF LISBON

Pedro Raposo

University of Oxford and
Centre for the History of Science of the University of Lisbon

The Astronomical Observatory of Lisbon, founded in 1861 and since 1995 a part of the Faculty of Sciences of the University of Lisbon, houses a splendid collection of nineteenth-century astrometric instruments, mostly placed at their original sites in a building purposely designed for high-precision astronomical measurements. Yet to be studied in depth, this collection, along with its very specific housing infrastructures, has been, for a long time, a pole of attraction for the public. This appeal of complicated apparatuses, embodying elaborated geometrical and mathematical concepts, reinforces the need for research led in such a way that its outcome aims not only at the community of historians and professionals alike but also at a wider audience.

Taking specific examples from the Observatory's collection, I focus on three possible research topics for which I outline a "scholarly" side and a correspondent "public" side: i) material culture as a space for dissemination and appropriation of science/how can an Observatory be created in local moulds according to foreigner standards; ii) the users of instruments as actors of appropriation and innovation/who were the astronomers of the observatory, in which have they succeeded and failed; iii) astrometry and its social and political implications/the importance of geographical coordinates and timekeeping in every day's life.

By means of this twofold approach I intend not to stress the division between "scholarly" and "public", but rather to emphasize how university collections can, at once, provide sources for the historians and means to foster the public understanding of science, assuming that, with history that is researched and written, emerges history to be told, having instruments and their settings as a specially suitable background to reach a wider audience.

H-3

THE FRENCH ASTRONOMICAL HERITAGE INVENTORY AND PUBLIC OUTREACH

Françoise Le Guet Tully

Observatoire de la Côte d'Azur
Nice, France

This inventory, underway since the mid 1990s, provides increasingly thorough information concerning the various components of the French astronomical heritage – buildings, large fixed instruments, small instruments and other objects. The databases include abundant photographic documentation and have been supplemented by archival research. As the inventory nears completion, an overall picture of this national heritage is emerging. It reveals the extent to which this heritage, geographically scattered among the various observatories, can be understood as a consistent whole. This fact mainly the result of the major reorganisation of French astronomy which took place at the end of the 19th century. With this inventory, the present-day participating establishments have at their disposal not only detailed information concerning each instrument but also knowledge of the local, national and sometimes international scientific contexts in which they were created and used. Thanks to this contextual perspective of the individual elements of their collections, each of the observatories is able to design an innovative presentation of its heritage, in its historical context, as part of its public outreach projects. We shall show some examples.

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H-4

HISTORY AND FUTURE OF THE HISTORICAL COLLECTION OF THE MARSEILLE OBSERVATORY (UNIVERSITY OF PROVENCE)

James Caplan

Observatoire astronomique de Marseille-Provence
Université de Provence, Marseille, France

The Marseille Observatory has been a state-dependant establishment since its foundation in 1702 near the Old Port. Originally directed by the Jesuits, who left in the 1760s, the observatory was financed essentially by the navy until the Revolution, then by the Bureau des Longitudes and since the mid 19th century by the education ministry. In the 1860s the Observatory was moved to the Longchamp Plateau, 2 km from the Old Port, becoming for a decade an annexe of the Paris Observatory. The Observatory became affiliated to the local university in 1899. After World War Two the observatory underwent unprecedented expansion in staff as well as laboratory and office construction, but at the same time the site ceased to be used for astronomical observations - a fate shared by urban observatories elsewhere. The Longchamp Plateau was by now totally surrounded by the city; furthermore, only 100 km away, the new, larger telescopes of the Haute-Provence Observatory were made available to the Marseille astronomers.

Around 1990 the Observatory began to assemble its historical heritage - instruments as well as archives and books - placing all but the largest in a small museum. This collection has the potential of becoming the core of a real museum of astronomical history, including 20th century instruments (soon to be collected). This museum would operate in parallel with the observatory's public outreach programme, after the bulk of the observatory's operations move to a new site on the outskirts of Marseille in 2008. (Public outreach is now an official obligation of state-financed research establishments, and historical conservation is a legal requirement - not always respected however.) Not only does the collection possess some very interesting items, including the no. 4 Borda-Lenoir repeating circle (the only one extant) used to measure the meridian during the Revolution, and Foucault's largest glass-mirror telescope, but it is possible that instruments from elsewhere may be deposited in our museum.

The future use of the present site and buildings - municipal property - is the subject of increasing debate between the observatory, the city of Marseille and the University of Provence. This rapidly-evolving situation will be summarized in my talk.

H-5

LIVING WITH DINOSAURS
THE YALE COLLECTION OF HISTORICAL SCIENTIFIC INSTRUMENTS
PEABODY MUSEUM OF NATURAL HISTORY

Shae Trewin

Collection Manager
Peabody Museum of Natural History, Yale University

In 2003, the Yale Collection of Historical Scientific Instruments emerged from almost a decade of inaccessible storage and relative obscurity. Since that time the collection has tried to create more opportunities for public exposure by integrating within the natural history context of the Peabody Museum in which it is housed. Displaying instruments in the Peabody has been challenging considering visitors come to the museum to see the dinosaurs, dioramas and Zallinger's famous "Age of Reptiles" mural. Dinosaurs aside, murals and dioramas are a powerful method of display because they attract and sustain the attention of younger audiences. Moreover, murals and dioramas are useful reference points to juxtapose between individual objects on the museum floor and a collective whole. Similarly, by providing suitable contexts for scientific instruments like Benjamin's Franklin's tercentenary in 2006 or Frankenstein's monster for Halloween, Peabody visitors have been able to learn about instruments and history of science in a manner that is consistent with the rest of the museum. In effect, the collection has had to de-emphasize the scientific properties of objects and instead emphasize their application as tools for understanding the world. This approach has not only made the collection more useful to the museum but also more interesting and relevant to Peabody visitors.

This paper will describe the various activities in which the instrument collection has participated over the past three years including displays, event days, Yale classes and summer schools. This paper shall also describe recent exhibits in the departments of physics and astronomy where an emphasis on the scientific properties of instruments has been applied outside of the museum.

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+++ Saturday 3:30 - 4:15 pm Third Keynote Address +++

KEYNOTE III

DUSTY RELICS OR SPEAKING WITNESSES OF THE PAST? THE POSSIBLE USES OF UNIVERSITY COLLECTIONS

Paolo Brenni

Fondazione Scienza e Tecnica
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and President, Scientific Instrument Commission

In the last decades both in Europe and in the United States, many university collections have been rediscovered, reordered, catalogued. But what can we do today with hundreds of thousands of historical scientific instruments, technical artefacts, models, and natural history specimens ? Certainly all these items are useful for a few scholars and specialists, but I do believe that these collections can also be attractive and interesting for a much wider public. For example, an historical instrument is not simply an old technical device or an obsolete didactic tool. It can be the starting point of a very articulated story concerning science, technology, society, exploration, economics, art, etc. etc. With such an approach historical collections can be an endless source of fascination, and I do believe that only fascination can trigger the curiosity and the desire of learning.

Furthermore, historical collections are not necessarily in competition with science centres or modern science museums. Their cultural potential and their role in public understanding of science is different and complementary. In my paper I will present some experiences and suggestions concerning the possible uses of historical university collections.

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[The following papers will not be presented.]

COMIC AND THE SPANISH SCIENTIFIC HERITAGE: SUPPORTING LOCAL INITIATIVES FROM A NETWORKING PHILOSOPHY

Antonio García Belmar
University of Alicante, Spain

COMIC is a Scientific Instrument Commission created in 2005 with the purpose of encouraging, coordinating and giving technical support to studies on scientific collections that are still preserved in Spanish scientific and educational institutions.

Modern Faculties of Sciences and Secondary Schools were established by the middle of nineteenth-century in many Spanish cities. They were equipped with teaching laboratories and a great number of scientific instruments. For one an half century these institutions augmented collections and many of them are still preserved. Universities and Secondary Schools are, at the present time, one of the most important holders of the scientific heritage. Unfortunately, these collections are not commonly regarded as a relevant part of their cultural heritage. In some cases, the instruments were catalogued, restored and used to be shown in exhibitions and celebrations. In many other cases the collections are just abandoned.

Cataloguing, studying and preserving such a huge and scattered legacy is a task that can not be undertaken by a singular group or institution. COMIC's aims is to encourage local actors to assume this task and to offer them all the necessary technical, scientific and political support. Some tools are essential to articulate COMIC's way of supporting local initiatives from a networking philosophy. One of them is the establishment of a common cathalographic card and a cataloguing protocol, which aim is to help local actors in their work and to facilitate the data exchange. These tools are also the starting point for a collective catalogue of scientific instruments. From an Internet philosophy of shared knowledge, COMIC's aim is to create a system of online accessible dynamic databases where cataloguers will find valuable data for the identification and description of their own collections and where they will add their own items making their catalogues available for others. The outcome will be a collective catalogue of scientific instruments.

COMIC also aims to encourage local actors to catalogue and digitalize many forgotten printed and manuscript sources that are usually stored in some dusty rooms along with the instruments. One of the most important sources is the large amount of local instrument makers' trade catalogues, whose inventory and further study would offer very interesting clues about the nineteenth-century and early twentieth-century local industry of precision. Here again, the procedure is to create data bases and repositories of digitalized sources (trade catalogues, textbooks, etc.) that cataloguers can consult and also enlarge adding their own sources.

Finally, COMIC aims also to encourage didactic uses of old scientific instruments and historical studies based on them. It is important to offer resources for science teachers who want to employ modern versions of old scientific instruments in their classrooms and to show the richness of material sources when writing the history of science in the periphery. Objects can inform us about local industries of precision, the appropriation of experimental practices in the periphery, the different uses and meanings of an apparatus in the laboratory, the classroom and the industry, the changing pedagogical practices in science classrooms, etc. The paper will summarize COMIC main activities and review recent ongoing projects dealing with scientific instruments in Spanish Secondary Schools and universities.

FROM UTEC TO NABU: RECONSTRUCTING THE PAST AT THE YORK UNIVERSITY COMPUTER MUSEUM

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and
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Few technology museums permit members of the public to interact directly with items in a collection. Static displays, diagrams, and thorough descriptions are often all that can guide visitors in the use or intent of an artifact. A computer museum's exhibits must often remain unpowered and offline, unable to convey the historical user's experiences of writing or executing programs or even playing games. In recent years, some computer museums have sought solutions to this problem via reconstructions of historically significant computers. These are not limited to the physical realm: software based simulations that are available online offer distinct advantages and disadvantages for both museums and visitors.

In 2005, the York University Computer Museum (YUCoM) began a reconstruction project devoted to the NABU Network. The NABU's original public launch in 1983 marked the creation of the first commercial computer network to provide high-speed access to information, software, and digital entertainment directly to homes of personal computer (PC) users. The aim of YUCoM is to recreate the network as historically accurate as possible. It will reside on the Internet, and a user will be able to access it via a standard PC or via an original (and now rare) NABU PC. A similar project is underway to create a simulator for the the University of Toronto Electronic Computer (UTEC). It was the first electronic, digital computer in Canada in 1952, but unfortunate circumstances led to the program's cancellation before UTEC could reach its full potential. A physical recreation is likely impossible but once the simulator is online, museum visitors will be able to read or write simple programs for UTEC. Though these were relatively recent devices, sources are incomplete and considerable archaeological work and even intelligent guesswork is essential to complete each project, prompting issues of historical fidelity, authenticity, and necessity.

FIRST STEPS ON A NEWLY PAVED WAY: LOOKING AT EARLY MODERN SCIENCE THROUGH THE INSTRUMENTS OF THE MUSEUM OF SCIENCE, UNIVERSITY OF LISBON

Samuel Gessner
Centre for the History of Science and Museum of Science (University of Lisbon)

Given their position between universities and society, university museums have a key responsibility towards both the scholars and the public. This responsibility is threefold and concerns the development of research projects, the accessibility of collections for researchers, and the public interpretation of research outcomes in exhibitions and other events. More often than not, these represent a major challenge for university museums. The Museum of Science of the University of Lisbon has recently initiated a three-year research project aimed at responding to this challenge and promoting the use of scientific instruments for research in the history of science. As one of the historians involved in the project, this paper will explore historigraphical issues related to the use of scientific heritage, particularly early modern instruments, as a source for reconstructing past scientific knowledge and practice. I will also discuss the relation between historical research and exhibition.

THE INSTRUMENTS AT THE ASTRONOMICAL OBSERVATORY OF BRESLAU UNIVERSITY IN XVIIITH AND XIXTH CENTURIES

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Founded in 1790, the Astronomical Observatory of Breslau University was equipped in a set of instruments of very different origin, and value. In this paper an account is given of the history of major astronomical tools which were used in the observatory till the end of XIXth century: the meridian line in the Mathematical Tower on the main building of the University, the pendulum clock by Brockbanks, the mural quadrant, the transit instrument by Dollond, the Fraunhofer heliometer, the repeating circle and the universal instrument, both by Utzschneider-Liebherr, the Clark-Repsold refractor, and the Bamberg transit instrument. At least two of them were involved in important episodes in the history of astronomy. In 1813 F. W. Bessel used Dollond transit instrument to inaugurate the work of the Königsberg Observatory. The Fraunhofer heliometer took part in the Venus passage expeditions in 1874 and 1882. The review is restricted to these instruments, which survived to our times. Today they belong to the scientific instrument collection of the University of Wroclaw Museum, founded in 1992.

JOSEPH PLATEAU'S 'CABINET DE PHYSIQUE' – A LEGACY WITHSTANDING THE AGES

Kristel Wautier, Danny Segers, Jos Uyttenhove
Museum for the History of Sciences
Ghent University, Belgium

When mentioning the name of Joseph Plateau, the majority of people will think of him as the founding father of cinema. Although his world-famous work on the after-effects of light on the human retina has irrevocably changed human society, it only represents a minor part of his scientific accomplishments. Joseph Plateau was not only the founding father of the film industry, he also discovered the physical phenomenon of surface tension. Hence, our daily life is still heavily determined by the discoveries of Joseph Plateau. For Ghent University Joseph Plateau has been of even greater importance as he can be considered the initiator of physics education at our Alma Mater.

Plateau joined the academic staff of Ghent University in 1835, and is charged with teaching physics. Yet, he is faced with a poorly equipped physics lab and immediately recognizes the need for proper instruments. In search of funding he turns to the Belgian Government and to Count Jean-Baptiste d'Hane (administrator-inspector of the university). He undertakes multiple journeys to order instruments from the best European instrument makers (in France, the United Kingdom, Germany). In 1843 he proudly writes to the Minister Jean-Baptiste Nothomb that the physics lab in Ghent has become one of the best equipped labs at the time. His efforts did not go unnoticed: his so-called 'Cabinet de Physique' turned out to be a major attraction for students.

Till this day many of these original instruments from Plateau's 'Cabinet de Physique' still exist and are kept at the Museum for the History of Sciences (Ghent University). This remarkable collection is supplemented with original student notes describing demonstrations with these historic instruments (stored at the university's central library). Over 150 years later, Plateau's legacy still draws the attention of many scientists, students, and people from all walks of life.

CREATING "TIME, LIFE, & MATTER" AND A BRIDGE BETWEEN SCIENCE AND THE ARTS IN THE UNIVERSITY

Sara J. Schechner
Department of the History of Science, Harvard University

A year ago, the Collection of Historical Scientific Instruments in the Department of the History of Science, Harvard University opened its new permanent exhibition, Time, Life, and Matter: Science in Cambridge. The exhibition showcases instruments of natural philosophy, astronomy, experimental psychology, physiology, physics, and practical arts such as surveying and navigation. These are arranged into thematic clusters spanning more than four hundred years. Interconnecting threads include politics, religion, commerce, graphical recording and imaging, and epistemology.

The opening of the gallery was the capstone event for the relocation of the Collection into new facilities and the expansion of its teaching and research missions. This talk will describe the process by which the new museum was developed and built. Particular attention will be paid to the strategies and challenges of putting scientific instruments on display with the goal of increasing public understanding of science, its cultural place, and its methods.

INNOVATIVE EFFORTS AND USES OF INSTRUMENT COLLECTIONS IN UNIVERSITY

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Most universities are employing on line digital and web based technologies for preserving and use of the scientific instruments of university. Though these methods are good, at the same time they require enough funding and with passage of time, as technology keeps on changing with time. In this paper we suggest some simple, useful and innovative efforts that can be done for preservation and use of scientific instrument collection of university.

Vast resources of scientific instrument is a pride of any university. In this paper we suggest some small simple innovative activities which can be carried in university to make this heritage useful for students/teachers, scientist and society

1. Encourage new faculty member to carry out at least one experiment or teach one lesson for/to students using instrument lying in collection of university.
2. In university entrance/National test question can be asked from information on university collection instrument.
3. A company/alumina sponsored chair can help scientist/educator working on old instruments present in university collection. An open house exhibition of university instrument could be arranged, for society education.
4. Photographs and description of instrument collection can be included in scrapbooks and text books of schools and undergraduate students to attract students to visit university collection.
5. School students can be encouraged to make projects ,static/working model of instruments present in university collection. Small entry fee can also be charged and quiz can be conducted for students about the construction, uses of instruments present in university collection.

We conclude if above mentioned activities are carried out on regular bases along with use of digital and web-based technologies then vast resources of historic scientific instrument residing in academic institutions can be best utilized for demonstrating, teaching and studying and reaching the public.
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