rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium

Leiden/Haarlem, 3-7 September 2018

Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Journey of medical instruments from Harappa to Gandhara

Naila Abbasi,

House 206 Lane 7 Askari 10 Rawalpindi 46000 Pakistan

abbasinaila@gmail.com

Keywords: Harappa, Gandhara, medical instruments

Abstract

The Harappan civilization in the northwest of South Asia stands as the sixth oldest and as the third largest civilization in world history. Otherwise known as the Indus valley civilization (IVC), it flourished between 3000-1300 BCE. It was followed by the Gandhara civilization, which developed to the north of the Harappan between 1000 BCE and its demise in 1000 AD.

In 1931, Sir John Marshal, who pioneered archeological excavations in IVC, mentioned various instruments of domestic use with possible applications in medical and surgical practice, which testify to the scientific acme of the Harappan civilization. Numerous studies have been dedicated to the extant scientific artifacts of Harappa. Most are focused on weights and measures, symbols, and manuscripts, some of which still remain to be deciphered. While some instruments have been fully studied in terms of their function and evolution, many pottery artifacts are yet to be studied in depth. The peculiar shape of some pots and pitchers in particular suggests that they were much more than simple

ornamental accessories and common use items. On the other hand, the Gandhara civilization produced highly advanced tools and instruments with unambiguous applications in the medical sciences. This study aims to revisit the Harappan tools and instruments by focusing on their medical applications, and by comparing them with later artifacts from the Gandhara civilization.

Short biography and research interests

Naila Abbasi is a pharmacist by profession. She holds a master's degree in pharmacology, teaching in a local university as Assistant Professor. She attended the XXXVth SIC Symposium in2016 in Istanbul, and this raised her interest in the history of pharmaceutical instruments.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

The Abstract Submission Form

THE IMMATERIAL TURN?

S.J.M.M. Alberti [a b]

[a] National Museums Scotland, Chambers Street, Edinburgh, EH1 1JF, United Kingdom
[b] University of Stirling, Stirling, FK8 1NZ, United Kingdom

s.alberti@nms.ac.uk

Keywords: ***history of science, museums, Material Turn, stored collections***

Abstract

The Scientific Instruments Commission has long aimed to encourage the study of material culture in the history of science. Studies of scientific things have blossomed in recent decades, and many university-based scholars now write eloquently about instruments, their history and their use.

And yet if we look closer at the 'material turn', how has this translated into hands-on use of instruments? How many historians access instruments in collections as a matter of course, and how many deploy object study in history of science publications? This short evidence-based provocation will consider the value and use of scientific instruments in scholarship (and other elements of museums' missions). Among the many fine publications about material culture, how many historians use material culture? Does this matter?

Short biography and research interests

Sam Alberti is Keeper of Science & Technology at National Museums Scotland and Honorary Professor at the University of Stirling Centre for Environment, Heritage and Policy. His research interests are in museum history and the role of science collections.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

THE JACQUARD LOOM : AN UNEXPECTED SCIENTIFIC INSTRUMENT IN THE *ARTE DELLA LANA* MUSEUM OF STIA (ITALY)

E. Angelini[a], A. Gori[b]

[a]Dipartimento di Scienza Applicata e Tecnologia, Politecnico di Torino, Corso Duca degli Abruzzi 24, Torino, 10129, Italy

[b]Museo dell'Arte della Lana, Via Giovanni Sartori 1, Stia (Arezzo), 52017, Italy

emma.angelini@polito.it

Keywords: ***technological heritage, museum, mechanical revolution, scientific instruments***

Abstract

The *Arte della Lana* Museum is located in Stia in Casentino Valley (Tuscany) in the complex of a woolen mill, recently restored after decades of neglect. The woolen mill, nowadays a wonderful sample of industrial archaeology, after many vicissitudes and events ceased production in 1985, thus ending its glorious and venerable history.

The Museum, illustrating wool production, exhibits a number of looms from draw-looms for weaving operated entirely by hand to semi-automated and automated weaving looms, including the Jacquard loom. The latter may be considered the *precursor computer*, since the weaving and textile industry greatly influenced the development of modern digital technology.

In 1801 Joseph Marie Jacquard patented the Jacquard loom, which used perforated cards to control the movements of some parts. Similar to the operation of binary code, the presence or absence of holes allowed counterweights to move, changing the position of the wires. The basic concept of the mechanics of the Jacquard loom is the following: each hook in the loom attempts to push the warp to the opposite side of the weft; this is either permitted or prevented depending on the punch card. The warp is pushed when that location corresponds to a hole in the punch card that holds a pre-set pattern that is read by the loom and guides it.

The mechanical revolution of Jacquard would have remained incomplete without the inventions of the nephew of the mechanic Jean-Antoine Breton, a M. Berly, who in 1818 developed a card press that industrialized punch card production. The evolutions of Jacquard mechanics increased the production rates and improved the pattern execution, thus allowing the progressive mechanization of textile production.

Short biography and research interests

Emma Angelini is full professor of Applied Physical Chemistry in Politecnico di Torino, she is vice-president of the ICC - International Corrosion Council. Her research areas are corrosion and protection of metallic materials, plasma chemistry, safeguard and valorization of Cultural Heritage, from materials characterization to environmental monitoring. She is involved in intercultural dialogue activities between different audiences carried out in the Arte della Lana Museum and in the Galileo Museum of Florence.

Andrea Gori is the director of the Arte della Lana Museum of Stia and is responsible for the didactic section of the Galileo Museum of Florence. He develops programs of guided visits and laboratory activities on numerous topics of the history of science for schools and for the general public, with experiences allowing participants to manipulate reproductions of some of the exhibits.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Marrākushī's Globe and Its Impact on Globe-Making in the Islamic World

Dr. Taha Yasin Arslan

Istanbul Medeniyet University, Kadikoy, Istanbul, 34000, Turkey

tahayasinarslan@gmail.com

Keywords: *Abū al-Ḥasan al-Marrākushī, Jāmiʿ al-mabādī wa al-ghāyāt fī ʿilm al-mīqāt, astronomical instruments, celestial globes.*

Abstract

Abū al-Ḥasan al-Marrākushī was a Mamluk astronomer active in Cairo in the second half of the thirteenth century. He was famous for his voluminous work *Jāmiʿ al-mabādī wa al-ghāyāt fī ʿilm al-mīqāt* (*An Encyclopaedia of Timekeeping: From A to Z*) which deals with the construction and use of dozens of instruments ranging from universal plates to sundials. Although many of the instruments were already known before Marrākushī, some are of his own design. He introduced a celestial globe with a quadrant and two rings. The quadrant was a unique addition to the traditional globe; its main purpose was to achieve high accuracy in calculations. Unfortunately, no globes of this type are extant; indeed, there is no mention of a celestial globe with a quadrant in any of the relevant sources. This seems contradictory since Marrākushī was extremely influential in instrumentation and his work was widely used around the Islamic world. This paper argues for the utility of Marrākushī's model and questions the lack of its influence on globe-making traditions in the Islamic world from the thirteenth to the nineteenth centuries.

Short biography and research interests

Taha Yasin Arslan is an assistant professor in the Department of the History of Science Istanbul Medeniyet University in Istanbul, Turkey. He specializes on the timekeeping and the astronomical instruments of the Islamic world. He also makes digital and physical replicas of the instruments. His recent focus is on the transition of knowledge in the Islamic world between the 12^{th} and 16^{th} centuries within the context of the astronomical instruments and texts.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

Integrating Historical Technologies into a University Natural History Museum

A.S. Baker

Division of Historical Scientific Instruments, Peabody Museum of Natural History, Yale University, P.O. Box 208118, New Haven, CT, 06520-8118, USA

alexi.baker@yale.edu

Keywords: ***Museums, Universities, Education, Outreach***

Abstract

Yale University's Peabody Museum houses a rich Historical Scientific Instrument collection [HSI] representing more than 500 years (and counting) of the history of science and technology. It compares very favorably to other university instrument collections in the diversity, quality, historical significance, and uniqueness of its objects. Professor Derek J. de Solla Price brought together much of the original core collection from the 1960s until his death in 1983. Over time, HSI moved from the Department of the History of Science to different university locations and finally to the Peabody, while continuing to grow from de Solla Price's hundreds of objects to at least 10,000 objects.

HSI includes not only historical technologies which today would be deemed "scientific" but also all manner of other technologies and related artefacts. Many were used in the sorts of economic, political, and public works projects being discussed at this conference. This diversity is a typical result of the nature of pre-modern technology and knowledge

formation, as well as of the continued celebration of science alongside all kinds of technology in contexts such as world's fairs and Museums of Science and Industry.

However, that diversity partly contributed to HSI's largely having been mothballed since its relocation to a natural history museum. Now as the Peabody embarks upon a transformative period, an opportunity has arisen to forge a new identity for HSI which will see its valuable historical objects put on permanent display, incorporated into public outreach and university teaching, and (re)introduced to instrument scholars and enthusiasts worldwide.

Short biography and research interests

Alexi Baker is Collections Manager of Historical Scientific Instruments at Yale's Peabody Museum. Previously at Cambridge University, she was a Mellon-Newton Postdoctoral Interdisciplinary Research Fellow in 2013-15, and in 2010-13 a post-doctoral research associate on the project "The Board of Longitude 1714–1828: Science, Innovation and Empire in the Georgian World". She obtained a D.Phil. in History from Oxford University with a dissertation on the socioeconomics and geography of the instrument trade in 18th-century London.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Diving in the Archives of the Astronomical Society of Geneva

Ricardo Barbosa[a], Stéphane Fischer[b]

[a] Independent Scholar; Société astronomique de Genève, Rue des Terreaux du Temple 4, CH-1201 Genève, Suisse

[b] Musée d'histoire des sciences de Genève, 128, rue de Lausanne, CH-1202 Genève, Suisse

rmpbarbosa@gmail.com

Keywords: Archives, Science Societies, planetary observations, telescopes

Abstract

As part of its current temporary exhibition 'Images of Science', the Museum of the History of Science in Geneva and the Société Astronomique de Genève (SAG) undertook an extensive inventory of the archives and instruments of this amateur astronomers' society, a group almost a century old and yet still active.

Founded in 1923, the SAG was originally called « Société astronomique Flammarion de Genève » in tribute to the outreach and popularization advocated by the French astronomer and publicist Camille Flammarion (1842-1925), activities duly pursued by the Society.

Our exploration of the archives revealed the presence of several thousand sketches and drawings of the Sun, Mars, Jupiter, Moon and comets, made from 1911 to 1960 by one of the founding members. Produced in several stages, these pencil and ink drawings are true

masterpieces of precision. Several of the observing campaigns resulted in articles that were published in specialized journals of the time.

To date, only one of the telescopes used for these observations has been found. Other instruments we discovered include French and German telescopes dating back to the end of the 19th and early 20th century. Our inventory also resulted in some surprises such as a French repeating circle from the end of the 18th century and an interesting educational astronomical kit.

The entire collection and archive underwent conservation work, as necessary, and a selection of astronomical drawings as well as several telescopes and other astronomical instruments discovered at the SAG are currently in display at the Museum of the History of Science in Geneva.

Short biography and research interests

Ricardo Barbosa worked at the Lisbon Astronomical Observatory and at Lisbon University Museums on heritage projects. He presently cooperates with the Musée d'Histoire des Sciences in Geneva. His main research interest is 19th-century astronomy.

Stephane Fischer is assistant curator at the Musée d'Histoire des Sciences.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

RECONSTITUTION OF THE HISTORICAL EXPERIENCE OF MEASURING RADIOACTIVITY BY PIERRE AND MARIE CURIE (1898): PRESENTATION, REALIZATION, ELECTRICAL MEASUREMENTS AND FUTURE DEVELOPMENTS

B. Pigelet[a], D. Bernard[b]

[a]Private sector, 52, rue Carnot, 92300 Levallois, France
[b]Université de Rennes 1, 6 allée du champ Garnier, 35135 Chantepie, France

bernardpigelet@club-internet.fr
domibernard@orange.fr

Keywords: Curie experience of radioactivity, reconstitution, scientific instruments

Abstract

From 1880, Pierre and Jacques Curie began studies on the electrical properties of the crystals. This work led them to the discovery of piezoelectricity. In 1885 the Curie brothers built an instrument using this property: the piezoelectric quartz balance. In 1898, Marie and Pierre used this apparatus to measure the radioactivity of uranium salts and discovered radium and polonium. They would receive (with Henri Becquerel) the Nobel Prize for Physics in 1903.

The experimental device consists essentially of an ionization chamber, which hosts the radioactive sample, an electrometer able to measure very small electric currents (10^{-12} Ampère) and a quartz balance. The strength of the electrical current generated by ionizing radiation is measured by the quartz device; this enables the precise determination of the radioactivity of the sample.

This famous experiment stimulated the spread to many leading universities of "Curie instruments" made by the "Société Centrale de Produits Chimiques" and by other manufacturers such as [give full name] Beaudouin.

The reconstruction of this experiment with instruments from university collections is often difficult. B. Pigelet has constructed several "copies" of Curie's original instruments and has been able to re-enact the historical experiment in several institutions: ESPCI, Curie Museum, Pantheon (Paris), at the University of Rennes 1 (with original quartz) and at the Museum of Nobel laureates (Stockholm).

After presenting the replicated experiment, we will consider some questions raised by these reconstructions, such as: difficulties of implementation, precision of electrical measurements, interest for the general public, development in other museums, and inventories of other collections.

Short biography and research interests

Bernard PIGELET has oriented his activity on restoration of scientific instruments. He built facsimiles of the historical Curie experiments and produced several exhibitions on this topic. Very recently, he and Dominique BERNARD have restored and operated the Curie apparatus kept at the University of Rennes 1 and provided a full installation to the Nobel Foundation in Stockholm and to Pantheon in Paris.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

The Abstract Submission Form

Material heritage on the map: one field, or many?

A. Boyle

Science Museum, London, UK

alison.boyle@sciencemuseum.ac.uk

Keywords: ***publishing, history of science, instruments, material***

Abstract

SIC's aim in its early decades of 'putting material heritage on the map' has fostered many rewarding interactions between historians of science and groups closely involved in the research, preservation and promotion of scientific instruments. But have these interactions between people working in the two fields led to any major changes in the landscape of instrument-focused publications? Complementing Alberti's investigations into the hands-on use of material culture by historians of science, I will explore where 'instrumental people' share their research. Has the SIC done its job, or is there more work to be done in linking different fields?

Short biography and research interests

Alison Boyle is Keeper of Science Collections at the Science Museum, London. Her current research uses object biographies to explore the public presentation of physics in 20th century Britain.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium

Leiden/Haarlem, 3-7 September 2018

Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

WORK IN PROGRESS: THE CATALOGUE OF ANTOINE LAVOISIER'S INSTRUMENTS

A NEW LIGHT ON A UNIQUE COLLECTION

Paolo Brenni[a], Marco Beretta[b],

[a] CNR, Fondazione Scienza e Tecnica, Via Giusti 29, 50100 Firenze, Italy.
[b] Università di Bologna, Dipartimento di Filosofia e Comunicazione
Via Zamboni 38, Bologna, Italy

p.brenni@museogalileo.it

Keywords: Lavoisier, chemistry, physics, collection, catalogue

Abstract

The Lavoisier collection of scientific instruments, which is preserved in the Musée des Arts et Métiers in Paris, is certainly one the most important of its kind in the world. It consists of about 580 instruments mainly dating from 1750 to 1794, many of which are unique. Although the surviving instruments are just a small part of the ca. 7000 pieces that were inventoried in 1794, they are nevertheless sufficient to illustrate the constant attention paid by the French chemist in updating his laboratory with innovative instruments. Most of the apparatus concerns pneumatic chemistry, calorimetry and electricity, but there is also a considerable number of fine mathematical, surveying, meteorological, mechanical and optical instruments. There are also interesting models of machines, some samples of chemicals, minerals, and a few more tools. The variety and quality of the collection makes it an exceptional example. In addition to famous instrument makers such as Fortin,

Mégnié, Richer, Canivet, and Ramsden, Lavoisier had his instruments made by some 70 different “artists”. In spite of its importance, the collection has not been carefully studied in recent times and no modern systematic catalogue is available.

Thanks to a recent project (begun at the end of 2016) we are now studying and cataloguing the whole collection as well as reordering its very imperfect historical inventory. In our presentation we shall outline the main results we have gained during our researches. Through the selection of a few significant cases, we shall briefly illustrate the main characteristics of the collection. We shall also present the structure and the organization of our forthcoming catalogue.

Short biography and research interests

Paolo Brenni specialised in the history of scientific instruments. He is a researcher at the Italian National Research Council and collaborates with the Fondazione Scienza e Tecnica in Florence and with various museums both in Italy and abroad. He has restored and catalogued several collections of instruments and he is author of many articles.

Marco Beretta is Professor of History of Science at the University of Bologna. He has published extensively on Lavoisier’s life and work and on ancient and early modern history of chemistry.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

NO POWER WITHOUT RESISTANCE: INSULATION AND THE ELECTRO-MAGNETIC ENGINE

Jenny Bulstrode[a]

[a]Department of History and Philosophy of Science, University of Cambridge, Free School Lane, Cambridge, CB2 3RH, Cambridgeshire

jb597@cam.ac.uk

Keywords: ***instrument construction, materials, techniques, labour relations***

Abstract

Brewer, chemist, and inventor, James Joule understood resistance as 'the prime obstacle to the perfection of the electro-magnetic engine'. Yet in the early decades of the nineteenth century it was precisely resistance on which the communities of electricians and magnetists depended. Indeed, it was the painstaking task of insulating electrical and magnetic components that dominated the correspondence between Joule and his collaborator in the electro-magnetic motor, the whaler, clergyman, and virtuoso magnetist William Scoresby. The fiddly techniques of wrapping and layering insulating materials not only made for common ground between these two distinct technical cultures, just recently having been brought together by the seminal discovery of Hans Christian Ørsted, but further became the central preoccupation in the generation and articulation of power. This paper sets out the essential role of insulating materials - cotton, silk, and mica - and the peculiarities of their application in the development of the electro-magnetic engine. This is an account of materials, technology, and technical ingenuity at the cutting edge of experimental research, but it is also an account of power and resistance in British society.

It is no coincidence that the most fraught labour relations produced the materials of greatest resistance, or that the motor under construction was an engine built to intervene in precisely those relations. In a British society ruled by machines, resistance was indispensible to the generation of power.

Short biography and research interests

Jenny Bulstrode is a Collaborative Doctoral Award student between the University of Cambridge Department of History and Philosophy of Science, and Greenwich National Maritime Museum, researching early nineteenth-century magnetic instrumentation. She has edited a major survey of optical glass-working and published work on flint-knapping, jointly awarded the 2014 BSHS Singer Prize. Her forthcoming publications range from innovations in chronometry to William Scoresby's compound magnets. In 2018 she will take up Sackler and Caird short-term fellowships.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

A THREATENED ASTRONOMICAL INSTRUMENT COLLECTION

J. Caplan

LAM, Aix-Marseille University, 38 rue Frédéric Joliot-Curie
13388 Marseille cedex 13, France

james.caplan@lam.fr

Keywords: ***astronomical instruments, observatory museum, conservation***

Abstract

The Marseille Observatory was established ca. 1700, overlooking the old port. It was moved in the 1860s to the Plateau Longchamp, from which it dominates the city—much like the Stockholm Observatory.

Around 1991 a small museum was established on the ground floor of the *Maison des Astronome*s. I joined the 'museum group' shortly thereafter. Since then, more than twenty of the collection's instruments have been classified *monuments historiques* by the French Ministry of Culture. The archives, in disarray, were organized by the Departmental Archives and have since been digitised (around 100 thousand pages).

But ten years ago the Observatory closed and the staff moved to the new *Laboratoire d'Astrophysique de Marseille* (LAM) on a remote campus of the University. I hoped that our museum would remain on-site at Longchamp, along with two large nineteenth-century telescopes in their separate buildings. I considered the Stockholm Observatory Museum to

be an exemplar. But the Observatory buildings were reassigned by the University and the museum was closed.

In this paper I shall describe the continuing struggle within the University concerning this threatened collection and discuss questions of its appropriate use. Such collections are often valued as a means of interesting young people in science, as a component of *outreach* for educating the general public about astronomy and, especially, as *good publicity* for an observatory and/or university. These may be worthy goals, but the 'usefulness' that I consider paramount—research and presentation of astronomical history *unbiased by institutional hype*—is totally ignored, as are essential conservation practices.

Short biography and research interests

James Caplan, born in Chicago, studied physics at the University of Chicago and obtained a PhD in astronomy from Northwestern University before moving to the Marseille Observatory for research on the interstellar medium using Fabry-Perot interferometers, and now astronomical history. He is an *astronome émérite* at the Université d'Aix-Marseille.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium

Leiden/Haarlem, 3-7 September 2018

Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

Inventory and Classification of Nineteenth-Century Photometers: A Study of Scientific Instruments

C.A.Cardoso[a], D.R.Martins[b], F.P.Gil[c]

[a]Coimbra University, Rua Larga , Coimbra, 3004-516, Portugal
[b]Coimbra University, Rua Larga , Coimbra, 3004-516, Portugal
[c]Coimbra University, Rua Larga , Coimbra, 3004-516, Portugal

cadrianocardoso@gmail.com

Keywords: ***Material Culture, History of Physics, measuring instruments, photometer***

Abstract

We believe that an important part of the history of physics is best understood through the study of its scientific instruments and their use. In this study, we deal with instruments that formed a basis for the precise measurement of the intensity of light, namely photometers. We analyze the context of their development and transformation throughout the nineteenth century.

From the essay published in 1729 on the measurement of luminous intensity by Pierre Bouguer (1698-1758) to the 1760 treatise on lighting by Johann Lambert (1728-1777) and the practical contributions of Benjamin Thompson, Count Rumford (1753-1814), light-measuring devices have proliferated in different forms and configurations. The change of a base, a prism, or a lens, was seen as sufficient to rename the device. As a consequence, a preliminary inventory points to almost a hundred different names for photometers with little typological variation.

The present study has the purpose of inventorying the various photometer designations and outlining a classificatory model based on existing studies on the subject. We have analyzed the classification criteria proposed by these studies and have tried to elaborate an extensive model covering all the inventoried photometers. Our model includes a mapping strategy to pinpoint the extant devices, their location, and ownership status. We believe this will contribute to a better understanding of these instruments and to the evolution of a type of widely used apparatus over two centuries.

Short biography and research interests

Carlos Adriano Cardoso is pursuing a Ph.D. in History of Science and Scientific Education at the University of Coimbra. He has been working on the material culture of physics at the Physics Cabinet of the Science Museum of the University of Coimbra. Cardoso's research also addresses new ways of presenting scientific instruments through data bases[1] for mobiles. His Ph.D. is supervised by Décio Martins and co-supervised by Francisco Gil, both professors of physics at Physics Center of Coimbra University. Décio Martins studies the material culture of the physics teaching and is also the Scientific Advisor of the Physics Cabinet of the Coimbra University Science Museum. Francisco Gil has been researching and directing studies of modeling and simulations of physics' historical instruments.

[1] A knowledge base is a technology used to store complex structured and unstructured information used by a computer system.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

HEIGHTENING ELECTRICITY IN ANALOGY TO LIGHTNING-INSTRUMENTS: INVESTIGATION AND SENSATION

E.M. Cavicchi

Edgerton Center, MIT 4-408, 77 Massachusetts Avenue, Cambridge MA

e.m.cavicchi@gmail.com

Keywords: ***electricity, electromagnetic coil, lightning, science instruments***

Abstract

Plymouth, UK, experimenters William Snow Harris (1791-1867) and Jonathan Nash Hearder (1809-1876) developed science instruments that elevated electricity (today we would say increased its voltage) to discharge in air, yielding means for further understanding lightning. Assisting Harris in the lab during his youth, Hearder was subsequently blinded by an experiment gone awry, yet he continued investigating electricity. Harris and Hearder designed and built instruments ranging from electrical plate machines to induction coils. Lightning-like effects produced by Dutch experimenter Van Marum inspired Harris. Harris constructed a single plate electrostatic machine whose design he adapated from that of Van Marum. With this machine, accompanied by Leyden jars and electrometers he designed, Harris investigated electricity and publicly presented its laws. Concurrently with Harris, Hearder advanced the electromagnetic coil. In working with his medical coils (inspired by Ruhmkorff's coils), Hearder felt sensations akin to plate machines' effects, sensations so heightened that they compensated for his blindness. Hearder developed a series of powerful induction coils which he used to demonstrate

electricity, its dangers and benefits. Harris and Hearder thoroughly documented lightning's damage to ships and steeples. Conductors running from ship masts to the water, invented by 1820 by Harris, were adopted twenty years later by the Royal Navy which garnered him knighthood. Adopting Harris' mission, Hearder installed lightning rods as a business that passed to his son. The lifelong advocacy of Hearder and Harris for protection from lightning was grounded in their extensive experience with discharge effects produced by electrostatic machines they designed.

Short biography and research interests

In teaching at MIT's Edgerton Center, Elizabeth Cavicchi encourages students to explore science, history, and their own experiences. Her Harvard dissertation documented electrical experimenting among her students and in recreating historical instruments. Cavicchi has written and presented internationally, including narratives from her teaching and her re-creations of nineteenth century electromagnetic experiments. Her articles hve appeared in Interchange (2018, 2014, 2011, 2008), Science & Education (2017, 2008), Annals of Science (2006), and Perspectives on Science (2006).

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

The Abstract Submission Form

BLOWN, GROUND, FLAME-WORKED, OR DROPPED?
RE-EXAMINIG LEEUWENHOEK'S MICROSCOPE LENSES

Marvin Bolt[a], Tiemen Cocquyt[b], Michael Korey[c], Huib Zuidervaart[d]

[a]Corning Museum of Glass, One Museum Way, Corning, NY 14830, USA
[b]Rijksmuseum Boerhaave, Lange St. Agnietenstraat 10,
2301 EG Leiden, The Netherlands
[c]Mathematisch-Physikalischer Salon, Staatliche Kunstsammlungen Dresden,
Zwinger, 01067 Dresden, Germany
[d]Huygens ING (Royal Netherlands Academy of Arts and Sciences – KNAW)
P.O. Box 10855, 1001 EW Amsterdam, The Netherlands

tiemencocquyt@rijksmuseumboerhaave.nl

Keywords: *simple microscope, Antoni van Leeuwenhoek, Johannes Hudde, Prince Rupert's drops*

Abstract

The single-lens ("simple") microscopes made and used by Antoni van Leeuwenhoek in the years 1672 – 1721 have acquired iconic status in the history of 17th-century science for their role in fundamental microbiological discoveries. Yet surprisingly little is known with certainty about the composition and construction of the key component of the ten or so surviving instruments of this type: the tiny glass lenses mounted between thin metal plates, with a free aperture of only 1 mm or less. Were they ground, as Leeuwenhoek himself claimed, flame-worked, or produced by some other method? A combination of approaches – empirical trials with master glassworkers, innovative** material analysis, and a re-

examination of contemporary archival sources – leads us to question traditional accounts of these lenses. In particular, we look closely at the work of the Amsterdam regent Johannes Hudde (1628-1704), whose introduction in the 1660s of flame-worked, solid globular lenses, rather than the ground glasses of lenticular shape common until then, strikingly re-oriented Dutch microscopic activity. In what technological context did Hudde's lenses emerge? How did the optical properties of his lenses differ from those of his predecessors? Did his lenses arise from practical experience, from developments in theoretical optics, or in a way that might be situated outside the optical tradition? While addressing these topics in the context of 17th-century glass technology, some points become clearer, new questions emerge, but the meaning of a contemporary "Dutch joke" remains unresolved.

Short biography and research interests

Marv Bolt investigates 17th-century refracting telescopes and other optical devices, the role of glass in scientific instruments, and connections between art, science, and the humanities.

Tiemen Cocquyt is curator of natural sciences at the Rijksmuseum Boerhaave. His research interests include the history of optical instruments and cabinets of experimental philosophy.

Michael Korey studies mathematical, optical, and philosophical instruments in their cultural contexts, especially in relation to early-modern princely courts.

Huib Zuidervaart studies physics, astronomy, and history of science. His main field of research is the history of physics and astronomy in early modern Europe, with a focus on the history of scientific instruments and collections.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

MAKING HERITAGE: THE JOURNEY OF A NAIRNE ELECTRICAL MACHINE

Rupert Cole

Science Museum, Exhibition Road, London SW7 2DD, UK.

rupert.cole@sciencemuseum.ac.uk

Keywords: ***Edward Nairne, museums, electrical machines, Faraday***

Abstract

Edward Nairne was a maker of electrical machines. His patented design of 1782 was his most successful: portable, easy-to-use and aimed at both medical and philosophical markets for electrical machines. This paper traces the historical journey of one of these machines in the London Science Museum's collections, as it moved from Michael Faraday's possession at the Royal Institution to the Science Museum, with short excursions to exhibitions at Hastings, Brighton and Vienna. It charts how this object's use, status and meanings have shifted over the last 250 years according to changes in electrical science, ownership, historiography and museology. The paper will explore these shifts in the context of the emergence of scientific heritage, examining the role of the instrument maker in the transition of this electrical machine from apparatus to museum artefact. It will include a look forward to how the machine will be displayed in the Science Museum's forthcoming permanent gallery London: Science City.

Short biography and research interests

Rupert Cole is an Assistant Curator at the Science Museum, London. He is broadly interested in the public and material cultures of science in the 19th and 20th centuries. His doctoral work was on the Royal Institution and the promotion of science in the postwar period in Britain.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Museum of Physics as an agent of development for the University Museums of Modena

Elena Corradini

Department of Engineering Enzo Ferrari, via Vivarelli 10, Modena 41125, Italy

elena.corradini@unimore.it.

Museum of Physics, Cabinet of metrology, museum development, information technologies

Abstract

Particular attention was recently paid to the collections of the ancient Museum of Physics, located since the beginning of the 20th century in the first floor of the University Palace and transferred in small portions to the Civic Museum of Modena, where some instruments are still exhibited. For this reason, the University of Modena has been able to develop a special project for the new installation of some of the university's scientific museums, including the Museum of Physics and the Cabinet of Metrology - Metric Workshop, in a large building erected on five floors between the nineteenth and twentieth centuries, originally to house the university's scientific laboratories directly connected with the Sant Agostino Hospital. The ample structure hosting the laboratories, abandoned after the 1960s as a result of their transfer to the university campus, has recently been renovated with funding from the Fondazione Cassa di Risparmio. The renovation will provide for the university museums hosted in this area as well as reception areas for the public, laboratory rooms for students, conferences, and projects, archives and library spaces, all to be provided with modern information technologies. In addition, the University Museums in the Sant Agostino complex will be connected with the Polo per l'Immagine (Image Centre) that

the City of Modena is planning for the repurposing of the spaces of the eighteenth-century former hospital.

Biography

Elena Corradina is Professor of Museology, member of the Collegium Doctoral School of Human Sciences and Director of Museums Polo of the University of Modena and Reggio Emilia, Rector delegate at the CRUI, and Rector's delegate for the University Museums Network, board member of ICOM-UMAC and Coordinator of the Italian University Museums Network. Her main research interests are history of collections and museums; organization of museums with specific attention to conservation, documentation, and valorization of the cultural heritage.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium

Leiden/Haarlem, 3-7 September 2018

Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Public science lectures in a city without a university: London c.1690-1730

J. Desborough

Science Museum, Exhibition Road, London, SW7 2DD

Jane.Desborough@sciencemuseum.ac.uk

Keywords: London, Public science

Abstract

Public science lectures began to be held in London in the 1690s and flourished in the first decades of the eighteenth century. This was despite there being no university in London until 1826.

London was home to a successful mercantile community, a network of instrument makers, the Royal Court, and Parliament. This combination of people located in the same place at the same time brought about a unique situation that was not shared by other English towns in this period. This paper will consider the range of factors that came together to make London the centre for public science lectures in England at this time.

Integrated into the city though London's residents were, they were not isolated from the rest of the country and did not necessarily spend their entire year in the city. On the one hand this raises the question as to the extent to which London's public lectures were free from university control and whether this enabled wider access to them. Newspaper adverts provide evidence of different target audiences for example. On the other hand, it also

raises the question as to whether the universities of Oxford and Cambridge exerted an influence on lectures at a distance through their members. It is significant that many lecturers had some level of connection with Oxford or Cambridge. This paper will address both of these questions.

Short biography and research interests

Jane Desborough is Curator of Scientific Instruments at the Science Museum and co-curator of the permanent gallery *London: Science City 1550-1800*. She has worked in a curatorial capacity in museums since 2008 and has a specialist interest in early modern history of science, she completed her PhD in 2016 with a thesis entitled *The Changing Face of Time: the making of the modern clock & watch dial 1550-1770* at the University of Leeds.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

(Please complete all sections shown in **RED**.)

Cooperative Neighbours: On Using Nearby Venues to FacilitateOobservations at the Royal Observatory, Greenwich

L.E. Devoy

Royal Museums Greenwich, Park Row, Greenwich, London, SE10 9NF, UK

ldevoy@rmg.co.uk

Keywords: altazimuth telescope, observatory, George Biddell Airy, Greenwich

Abstract

In August 2015 during renovation work, a cubical stone block was found on the parapet on the south face of the Queen Mary Wing of the Old Royal Naval College, Greenwich. By standing next to the marker and observing the direct line of sight, it becomes apparent that the block is aligned with the Royal Observatory. Subsequent investigations have revealed that the block was used as an azimuth marker for the altazimuth telescope, designed in 1857 by the seventh Astronomer Royal, George Biddell Airy. A review of observatory photographs from the period revealed that a hole had been pierced through the wall between Flamsteed House and the eastern Summer House to give a clear sight of the mark from the telescope. According to official records, the marker performed exceptionally well and remained in use from its installation in 1880 until the construction of new computing rooms at the Observatory obscured the view in November 1888. Local church spires were subsequently used as azimuth markers. This discovery has therefore shed light on a little-known aspect of the Observatory's work which reveals how the site was not

just an isolated location within Greenwich Park but was dependent upon the institutional support and architecture of its neighbours.

Short biography and research interests

Louise Devoy is Curator of the Royal Observatory, Greenwich. Since joining the Museum in 2013, she has contributed to the redisplay of several galleries including the recent reinterpretation of the domestic spaces occupied by the Astronomers Royal and their families in a project known as Observatory Life (2016). She is currently working on the development of the exhibition Moonstruck, due to open in July 2019.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

High-Tech Instruments for Determining the Shape of the Earth: Examples from European Meridian Arc Measurement and Triangulation in the Kingdom of Saxony from 1862-1890

Wolfram Dolz

Mathematisch-Physikalischer Salon,Staatliche Kunstsammlungen Dresden, Zwinger, Dresden, 01324, Germany

wolfram.dolz@skd.museum

Keywords: ***Meridian Arc Measurement, Universal Instrument, Triangulation, Saxony***

Abstract

To determine the size and exact shape of the Earth, astronomers and geodesists have always needed the most accurate surveying instruments of their respective epochs. In antiquity, Eratosthenes of Cyrene estimated the circumference of the Earth using only a simple instrument such as a gnomon. With the principle of modern triangulation, published by Snellius in 1617, a breakthrough in measurement of the Earth was achieved. This method was simultaneously associated with the need to make accurate maps of a country. Surveying instruments for triangulation developed from the quadrant of Picard, the first seconds-theodolite of Ramsden, the repeating circle of Borda, to the universal instruments of the 19th century created by various French, English and German makers. The largest meridian arc measurement at the beginning of the 19th century was carried out by Struve and Tenner. They used a universal instrument of Reichenbach and Ertel for triangulation, one of the best instruments of the time. Inspired by the great work of Struve, in 1861 the

Prussian General Baeyer proposed the measurement of an arc across Central Europe with the participation of several countries. The Kingdom of Saxony also used this international project for its own land surveying campaign. Under the direction of August Nagel, the trigonometric network was created from 1862 to 1890 with a universal instrument by Repsold as the basis for accurate mapping. To convince the public and the authorities of the benefits of the European meridian arc measurement for a national survey, Nagel in 1876 wrote a memorandum. He explained that the proposed detailed measurement of Saxony would be based on the compression of the triangular networks used for the meridian arc measurement. In fact, the data and measurements obtained served until the Second World War as the basis for the accurate mapping of Saxony at the scale of 1: 25,000. The initiators of the degree measurement were concerned with the further development of geodesy as a science; their efforts led to the foundation of the International Organization for the Earth Measurement.The paper will explain the instruments used in the European meridian arc measurement in Saxony. These apparatus document instrument making in the new era of the industrial revolution and the service of such instruments in large state projects.

Short biography and research interests

Wolfram Dolz is senior curator of the collection of globes and surveying instruments at the Mathematisch-Physikalischer Salon of the Staatliche Kunstsammlungen Dresden. An engineering graduate from the Technical University of Dresden, where he also studied cartography, Dolz has published widely in the fields of the history of cartography and geodesy. He is a member of several commissions of the Deutsche Gesellschaft für Kartographie and, since 2010, Vice-President of the International Coronelli Society for Study of Globes.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

The Abstract Submission Form

A Valuable Archive of Failed Inventions: The Museum of the Admiralty Compass Observatory

Richard Dunn

Royal Museums Greenwich, Park Row, Greenwich, London SE10 9NF, UK

rdunn@rmg.co.uk

Keywords: ***magnetic compass, failed instruments, museums***

Abstract

Established in the 1840s, the Museum of the Admiralty Compass Observatory (ACO) gathered together compasses and other instruments examined and developed by the ACO, as well as experimental and prototype instruments from elsewhere, held as an archive of invention in the field of magnetic instrumentation. The Museum therefore became – and, indeed, had been created as – a repository of ideas against which claims of originality and efficacy might be tested. Looking at some examples of failed instruments that were deployed in this way, this talk offer one way in which the preservation of failures can prove practical and instructive.

Short biography and research interests

Richard Dunn is Senior Curator for the History of Science at Royal Museums Greenwich. His publications include *The Telescope: A Short History* (2009), *Finding Longitude* (2014, with Rebekah Higgitt) and *Navigational Instruments* (2016).

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

THE RECONSTRUCTION AND REBUILDING OF VAN MARUM'S "ONGEMEEN GROOTE ELECTRIZEER-MACHINE" AND SOME EXPERIMENTAL RESULTS

Wolfgang Engels

HistEx GmbH, Oldenburg, Marie-Curie-Str. 1, 26129 Oldenburg

engels@histex.de

Keywords: ***Van Marum, electrical machine, replica, alterations of construction***

Abstract

Following a suggestion of Martinus van Marum (1750-1837) the Teylers Tweede Genootschap of the Teylers Stichting commissioned John Cuthbertson (1743–1821) to build a large electrical generator. The two-disk frictional machine was completed in 1784 and to this day is displayed at Teylers Museum in Haarlem along with an impressive ensemble of conductors and one battery of Leyden jars, a remnant of the original four.

HistEx made a working replica of this instrument. While the very delicate original instrument was suggested for scientific use only, some inevitable modern adaptions and changes needed to be implemented regarding the requirements of demonstration- and safety issues in public. In addition, no jars have been produced and due to space limitations of the exhibition room a down-scaling to 90% was required. In this respect the generator does not represent a perfect replication but nevertheless, a close-to-the-original re-enactment was possible.

During experimentation 270mm sparks could be observed and valuable insights into special difficulties arising from this very big instrument could be gained. I will present that some findings are corresponding nicely to the historical sources of the original machine. Furthermore I show some new results but also questions which turned up during the process of making and testing the replica.

Since the opening of the Lorentz Lab at Teylers Museum (Haarlem) in spring 2017 the replicated machine is in use with slightly reduced performance for daily public demonstrations.

Short biography and research interests

Wolfgang Engels is Chief executive officer of HistEx GmbH, Oldenburg. Hetook studies in engineering, physics, and history of science (TU of Hannover and U of Oldenburg). He is a research associate at physics department (physics education and history of physics and philosophy of science, University of Oldenburg). His main research fields are: history and instruments of science, reenactment of historical experiments, construction and engineering.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

MARC-AUGUSTE PICTET'S CABINET AND THE RISE OF EXPERIMENTAL PHYSICS IN GENEVA AT THE END OF THE 18TH CENTURY

Stéphane Fischer

Musée d'histoire des sciences de Genève, 128 rue de Lausanne, CH-1202 Geneva

Stephane.fischer@ville-ge.ch

Keywords: ***Geneva*, *Experimental physics, public demonstrations, "Syllabus", Marc-Auguste Pictet***

Abstract

At the end of the 18th century, the Genevan physicist and astronomer Marc-Auguste Pictet (1752-1825), former assistant and student of the famous naturalist Horace-Bénédict de Saussure (1740-1799), began in Geneva a series of courses in experimental physics, which became very popular. Intended for a wide and wealthy audience, both female and male, these courses were divided into thirty lessons. They covered the entire field of contemporary physics and included numerous demonstrations with instruments that came mainly from Pictet's personal cabinet. The first courses took place at the *Société des Arts de Geneva*, a cultural society founded in 1776 by Saussure and a local watchmaker, which aimed to contribute to the progress of industry, crafts and science in Geneva. The society had taken many initiatives to familiarize its members with technical and scientific discoveries and to improve local skills. After 1818, the courses moved to the "Musée académique" (the first public Museum of the city). Women accounted for almost half of the auditors. Pictet's interest in pedagogy is evinced by the fact that his lessons were

accompanied by a “Syllabus”, a practical textbook relating more than 500 instruments to demonstrate physical phenomena, following the tradition of 18th-century physics books.

Pictet was also a renowned physicist who, throughout his career, acquired a great variety of instruments to conduct research on heat, geodesy, and meteorology. In 1796, he was one of the founders and the editors of the *Bibliothèque Britannique*, a journal of scientific and technical knowledge diffusion, which published French translations of the best English scientific articles.

Pictet’s physics instruments are one of the founding collections of the Academic Museum of Geneva (the first public Museum of the city), created in 1818. One hundred instruments still exist and are now preserved at the Museum of the History of Science in Geneva.

A major effort is underway to analyse this collection, with the aim of establishing a “catalogue raisonné”, restoring some of the instruments, and making replicas of others.

Short biography and research interests

Stéphane Fischer is assistant curator at the Musée d’histoire des sciences of Geneva which hosts a collection of scientific instruments that belonged to some former major Geneva’s scholars like Saussure, De la Rive, Colladon or Pictet. Besides his work in preservation and conservation, he also promotes the collection through publications, demonstrations and replication.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium

Leiden/Haarlem, 3-7 September 2018

Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Research technologies and user-driven innovation

Christian Forstner

Goethe-Universität Frankfurt am Main, Gräfstr. 78, Frankfurt/Main, 60486, Germany

forstner@em.uni-frankfurt.de

Keywords: *stereomicroscopes, innovation, 19C, 20C*

Abstract

This talk presents my new project, where I analyze research technologies in the meaning of Terry Shinn as a special type of innovation. Research technologies as *generic devices* are embedded, dis-embedded, and re-embedded into different contexts. The development of a research technology takes place in an *interstitial* arena, between the academia, industry and state, or between the traditional disciplines. Therefore, research technologies circulate as dynamic carriers of knowledge between different social domains, which are directly involved in the process. However the knowledge linked to these technologies is not static but rather dynamic, changing along the circulation process. New approaches in the history of innovation have revealed the importance of the user or consumer in the course of the innovation process. A closer look shows that user-driven innovation is crucial for the development of research technologies. A good example is the Greenough type stereomicroscope. Its development goes back to Horatio S. Greenough's invention of a dissecting microscope for biological purposes. The evolution from a simple binocular to a stereomicroscope is a good example for a research-technology-driven innovation. The

above-mentioned Greenough-type and especially the Abbe-type microscope united multiple development lines, which led to the gradual development of new instruments with multiple applications in the fields of biology, medicine (surgical microscopes), mineralogy and criminology.

Short biography and research interests

Christian Forstner graduated in Physics at Regensburg University and completed his PhD in History of Science with a 2017 dissertation on David Bohm's and Richard Feynman's approaches to quantum mechanics. He finished his Habilitation at Jena University in 2017 with an analysis in the history of nuclear energy. Currently he is a researcher at the collaborative research center 1095 at the Goethe University Frankfurt, focusing on the history of solid-state physics.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium

Leiden/Haarlem, 3-7 September 2018

Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

The Isfahan Qibla Finder: Its Use in Teaching the History of Islamic Science

Robert H. van Gent

Department of Mathematics, Utrecht University, PO Box 80010, 3508 TA Utrecht, The Netherlands

r.h.vangent@uu.nl

Keywords: ***qibla, Islam, geography, map projection, history of science education***

Abstract

The qibla finder is an instrument that can be used for determining the correct compass direction (*qibla*) to Mecca. A small number of sophisticated qibla finders made in Isfahan in the 17th century have recently been the focus of several detailed papers and books. Of special interest is the origin of the mathematical principles on which the Isfahan instrument is based as it uses a refined map projection that was not known to Western cartographers until the early 20th century. The use of the instrument in workshops on the history of Islamic science will be discussed.

Short biography and research interests

Robert H. van Gent was curator of astronomy at Museum Boerhaave (Leiden) from 1989 to 1999. He now works as a senior scientific researcher for the Department of Mathematics at Utrecht University. His research interests are the history of astronomy, astrology, calendars, celestial cartography and navigation. In 2006 he published with TASCHEN a facsimile edition of the *Harmonia Macrocosmica* (1660) of Andreas Cellarius.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

The Abstract Submission Form

Medieval compilation culture and early western astrolabes: questioning ‚Chaucerian' astrolabes

S. Gessner[a], J. Rogers[b]

[a]CIUHCT, Faculdade de Ciências, Edif. C4, Piso 3, Gabinete 15, Campo Grande, Lisbon, 1749-016, Portugal

[b]Mount Allison University, 62 York St, Sackville NB, E4L 1E4, Canada

samuel.gessner@gmail.com

Keywords: ***early western astrolabes, compilation culture, individual features, contextual gestures***

Abstract

Each early astrolabe is unique. They differ from each other not only by the various stars on the rete or various latitudes on their plates. Beyond such ‚core functions' they often exhibit variant additional functionalities for the calendar, different ways of counting hours, distance measurement or other types of reckoning. In providing detailed descriptions, recent scholarship also points to further idiosyncratic features of some early western astrolabes: e.g., animal-shaped elements on the rete, heraldic references or the use of letters instead of numerals to label the hour scale (Strano & Bennett 2014, Eagleton 2007). The uniqueness of astrolabes appears in material terms, too: size, materials and skill used in their making, degree of completeness or patchiness. How can historians deal with the individuality of these instruments? Keeping the various ‚dimensions of use' of early instruments in mind (Gessner 2014, Borelli 2008) this talk gets new inspiration from

medievalists' understanding of compilation culture shaping textual knowledge transmission. It proposes to view early western astrolabes as ‚compilations' and examines how such a perspective affects the way we question surviving instruments.

Short biography and research interests

Samuel Gessner has been focusing on the plurality of mathematical cultures and the role of mathematical instruments, using preserved historical instruments as primary sources. He has published essays like "Heavenly networks: Celestial maps and globes in circulation between artisans, mathematicians, and noblemen in Renaissance Europe", *Nuncius*, 30(1), 2015, 75-95. In 2017, he was a co-organiser of the Oberwolfach Seminar on *Mathematical Instruments Between Material Artifacts and Ideal Machines*.

Janine Rogers is Professor of Medieval and Sixteenth-Century Literature in the Department of English Literature at Mount Allison University. She specializes in interdisciplinary approaches to literature, especially in the fields of literature and science, and in late medieval English literature and book culture. She is the author of *Eagle* (Reaktion Press, 2014) and *Unified Fields: Science and Literary Form* (McGill-Queen's University Press, 2014).

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

PRECISION TIMEPIECES FOR ASTRONOMY: PATTERNS OF COLLABORATION BETWEEN ASTRONOMERS AND CLOCKMAKERS IN THE 19TH CENTURY

Sibylle Gluch

Independent Scholar, Käthe-Kollwitz-Ufer 29, Dresden, 01307, Germany

sibyllegluch@web.de

Keywords: ***Astronomy, horology, cooperation, 19th century***

Abstract

Within the context of the history of scientific instruments, timepieces are usually neglected - somehow they do not seem to fit. This attitude, however, was not held by 19th century astronomers, who paid as much attention to their clocks as they did to their astronomical instruments, which in some cases were even supplied by the same makers. Astronomers published going rates of their timepieces and thus fostered the development of precision standards. In many cases they had clear ideas regarding the appearance and functional details of their clocks so that these could be comfortably used for astronomical purposes. Yet how realistic were those astronomers' ideas? How deep were the technical understandings on the astronomers' side? And how did clockmakers react to such special wishes of their clients?

The paper will approach these questions by analyzing the correspondence of the astronomers Johann Caspar Horner (1774-1834) and Heinrich Christian Schumacher (1780-1850). Their communications with clockmakers span half a century and include a

wide variety of makers, covering several social strata of the clockmaker's profession, from the humble Johann Wilhelm Gottlob Buzengeiger (1778-1836) in Tübingen and the ambitious expatriate Joseph Thaddäus Winnerl in Paris to the internationally renowned firm of Breguet, also in Paris. Their letters deal with one maker's first venture into precision horology as well as with a specialist's concern with the refinement of an already exceptional product. By looking at the astronomers' and the clockmakers' sides, the paper will examine the mutual relationship between the two parties. It appears that outstanding technical ability on the side of the maker could lead to mutual cooperation, a collaboration that superseded social boundaries between "craftsmen" and "scholars."

Short biography and research interests

Dr Sibylle Gluch has a PhD in German studies. From 2013 to 2015 she was the curator of an exhibition entitled 'Einfach – Vollkommen. Sachsens Weg in die internationale Uhrenwelt` at the Mathematisch-Physikalischer Salon in Dresden. From 2015 to 2017 she was engaged in a research project on the beginning of German precision horology, which was funded by the Gerda-Henkel-Stiftung. She is about to embark on a new research project concerning the development of precision standards for astronomically used timepieces in the 18th century.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Instruments of Baltic German Explorers in the First Half of 19th Century

Feliks Gornischeff

Estonian Maritime Museum, Pikk 70, Tallinn, 10133, Estonia

feliks@meremuuseum.ee

Keywords: ***Baltic Germans, Adam Johann von Krusenstern, exploration, navigational instruments, astronomical instruments, circumnavigation***

Abstract

This paper examines the scientific instruments used by the Baltic German explorers during their voyages around the world in the first half of the 19th century. Concentrating on the first Russian circumnavigation in 1803-1806, it will especially consider the scientific instruments used by Adam Johann von Krusenstern (1770-1846). Besides economic interests, this expedition also had strong scientific objectives.

Since Russian instrument making was not acequately developed for his purposes, Krusenstern had to look towards Europe to acquire high-quality instruments. This presentation will look at his purchasing process and will show examples of navigational and astronomical instruments that the expedition used. Troughton and Dollond are examples of instrument makers who supplied the expedition.

During his voyage, Krusenstern conducted astronomical and scientific observations linked to oceans, climate, magnetic fields etc., and compared his data to information previously gathered about this region. He evaluated the use of different instruments in various

conditions. These results, in turn, helped him chart the Pacific Ocean more accurately than ever before. This voyage played a big part in the improvement of navigational techniques and yielded important information about the Pacific for future navigators and scientists. Krusenstern was a mentor for other Russian explorers; he provided guidelines to other navigators sailing in the Pacific. In 1824, he published an atlas of the Pacific.

Short biography and research interests

Feliks Gornischeff works as a researcher in the Estonian Maritime Museum. As manager of the navigational instruments collection, he became interested in navigational techniques. Currently he is writing an article on the navigational instruments in the collections of the museum and is responsible for the “Age of Sail and Baltic German Explorers” in the new permanent exhibition of the Estonian Maritime Museum.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Inga Elmqvist Söderlund 1967–2017: Introduction to the session

K. Grandin

Center for History of Science, Box 50005, Stockholm, SE-104 05, Sweden

karl.grandin@kva.se

Keywords: ***Inga Elmqvist Söderlund, keyword2, keyword3, keyword4***

Abstract

This talk will give an overview of Inga Elmqvist Söderlund's career and an outline of her biography. The talk is intended to serve as an introduction to the special session.

Short biography and research interests

Karl Grandin holds a MSc in engineering physics and a PhD in history of science and ideas from Uppsala University. His research has mainly dealt with the history of modern physics. He was many years a colleague to, and worked closely with, Inga Elmqvist Söderlund.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

The Abstract Submission Form

HOW GLOBES AND MAPS CONTROLLED THE EXPLORATION OF AMERICA

H. Gropp
Universität Heidelberg, Germany

d12@ix.urz.uni-heidelberg.de

Keywords: ***Maps, Globes, America, Exploration***

Abstract

The title page of Francis Bacon's "Novum organum" of 1620 shows a clear allusion to the power of world exploration by means of navigation. A ship passes the Strait of Gibraltar, the frontier between the Mediterranean Sea and the Ocean Sea, later called Atlantic Ocean. This new ocean, vast and unknown, represents the new scientific challenges whereas the Mediterranean Sea was more or less known and could be, if necessary, in many cases be sailed by cabotaggio, i.e. going along its coasts.

Earlier than the English and the Dutch, it was mainly the Portuguese and also the Spanish who travelled and explored these new oceans. In fact, such a frontispiece was already used in a Spanish book of 1606 "Regimiento de Navigacion". Navigation is the key word which governs and controls the explorations, and in Latin we can read "Multi pertransibunt et augebitur scientia".

Whereas Bacon used these metaphors in order to describe his new attitude of commanding nature for economic and political purposes, in this talk it will be investigated how real world exploration controlled by instrumental opened the small sea to the vast ocean prepared by mathematical and astronomical methods. In particular, the maps and the globes stored new knowledge and also served as instruments to

govern and control further exploration. This will be discussed using the case of the exploration of America by Portuguese, Spanish, French, English, and Dutch. Only by exploring and surveying the seas, the lands and also the skies it became possible to know, to control and to govern or to command, and the instruments were maps and globes. However, the focus will be on the early years at the end of the 15th and in the beginning of the 16th century.

Short biography and research interests

The author is a mathematician and a historian of science, mainly of mathematics and astronomy. His main fields of research are combinatorics and graph theory within mathematics as well as the history of combinatorics, history of calendars and similar mathematical-astronomical objects, but also other aspects of mathematics. Recently this focus has shifted to the history of cartography, in particular during the early modern period.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

ALL ELECTRIC HOUSING: THE USE OF MODEL HOMES TO INTRODUCE ELECTRICITY INTO THE DOMESTIC SETTING IN EARLY 20TH CENTURY BRITAIN

Ms Jan Hicks[a]

[a]Archives Manager, Museum of Science and Industry, Liverpool Road, Manchester M3 4FP, United Kingdom

Jan.Hicks@msimanchester.org.uk

Keywords: electricity; housing; convenience; women

Abstract

The paper looks at how model homes were used as marketing tools to influence consumer uptake of electricity in early 20th century Britain, and the way in which women were increasingly seen as the human conduit for getting electricity into the home. It poses a question of whether "the empire of man over things" and humanity's efforts to command nature by learning to harness electricity have resulted in things having empire over man. Drawing on the Museum of Science and Industry's exceptional and integrated object and archive collections around domestic electrification, four examples of model homes are discussed: a model home displayed at the Manchester Electricity Exhibition, a month-long exhibition of electrical engineering technology delivered by the National Electrical Manufacturers' Association in 1908; an all-electric house built as part of Manchester Corporation's council housing programme in 1923; a model all-electric house at the British Electrical Development Association's "Electricity in Service" stand for the 1924 British Empire Exhibition; and the Electrical Association for Women's All-Electric House of 1935, a model show home filled with all the modern conveniences of the period. The selection of these examples stems from research for the exhibition *Electricity: The spark of life*, which

has been a collaboration between Wellcome Collection, Teylers Museum and the Museum of Science and Industry.

Short biography and research interests

Jan Hicks is the archives manager at the Museum of Science and Industry, Manchester. As lead curator for the Manchester iteration of the exhibition *Electricity: The spark of life*, Jan has interviewed film maker Bill Morrison about his practice for the Science Museum Group Journal. She has also presented a paper on the EDA's three-film promotional campaign of 1935 for a Material Cultures of Energy workshop on energy films at the British Film Institute, London.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

Astrolabe workshops in Pakistan

J.P.Hogendijk

Mathematics Department, Utrecht University, P.O.Box 80.010, 3508 TA Utrecht, Netherlands

J.P.Hogendijk@uu.nl

Keywords: *astrolabe, teaching, workshop*

Abstract

ASTROLABE WORKSHOPS IN PAKISTAN

Together with two students, the author conducted a three-day program on astrolabe workshops in Lahore, Pakistan, and again in Karachi, Pakistan, in February-March 2018.

I will summarize the events and then discuss the reasons why the audiences were interested in the astrolabe. These include educational purposes (also in madrasa teaching), scientific and artistic reasons, and interest in the national heritage. Clearly, the epoch of the astrolabe has not (quite!) come to an end.

Short biography and research interests

Jan P. Hogendijk is professor in the history of mathematics in the Department of Mathematics at the University of Utrecht, Netherlands. His research interests include the history of the mathematical sciences in medieval Islamic civilization. Together with students he has often travelled to the Middle East to present workshops on historical subjects. For his cv and publications see www.jphogendijk.nl

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

CROSS-FERTILISATION BETWEEN MUSICAL AND SCIENTIFIC INSTRUMENT MAKERS IN 19TH-CENTURY PARIS.

A. Houssay[a], D. Pantalony[b]

[a] Laboratoire du Musée de la musique, Cité de la musique-Philharmonie de Paris, 221, avenue Jean Jaurès, Paris, 75019, France.

[b]Canada Science and Technology Museum, 2380 Lancaster Rd., Ottawa, Ontario, K1G 5A3, Canada

ahoussay@cite-musique.fr

dpantalony@ingeniumcanada.org

Keywords: ***music, acoustics, materials, precision***

Abstract

The Teylers Museum has one of the more extensive and complete collections of nineteenth-century acoustical scientific instruments in Europe. Many of them come from the Parisian makers Rudolph Koenig and Albert Marloye. The instruments carry with them a deep history of cross-fertilisation between the musical and precision instrument trades.

Taking advantage of the proximity of the Teylers collection to the conference proceedings, we will be co-presenting on this topic based on evidence offered from close examination of acoustical and musical instrument collections. The Telyers collection demonstrates how questions and preoccupations in music and musical instruments shaped scientific/precision instrument making and the study of acoustics through skills, materials, tools, and original studies related to making high-quality musical instruments. Collections of musical instruments, such as at the Musée de la Musique, show how scientific

questions, practices based on visual techniques, and material know-how (e.g. Chaldni, Savart and Helmholtz) transformed the empirical view of musical instrument functioning in general. François-Joseph Fétis writes how the famed violin maker Jean-Baptiste Vuillaume, for example tried to apply new acoustical discoveries to his workshop practices. His apprentice Koenig came to exemplify this complex joining of forces, especially through his contributions to the analysis of musical sound and the standardisation of pitch, both examples of the "Empire of Man over Things" through the acoustical workshop. A coherent body of acoustical instruments emerges from workshop apprenticeship, social networks, scientific findings, commercial factors, and professional practice to become increasingly part of an independent subject taught as "acoustics" in university laboratories.

Short biography and research interests

Trained in music, acoustics and musicology, **Anne Houssay** attended the Newark School of Violin Making in England in the 1970s. After establishing her own workshop in Lyon, she joined the Musée de la Musique, project as a specialist of bowed instruments. Her research interests are in the history of technology - musical instrument making, string making, wooden crafts, theories of sound and acoustics, PhD in preparation.

David Pantalony is Curator of Physical Sciences and Medicine at the Canada Science and Technology Museum. He was recently lead curator for the Science and Medicine Gallery at the renewed museum in Ottawa. In collaboration with historians of musical instruments, he is looking at new ways to explore this topic through an exhibit combining scientific and musical instruments.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

STAGING A DEMONSTRATION: THE NATURAL PHILOSOPHY LECTURE RE-IMAGINED AT LONDON'S SCIENCE MUSEUM

Matthew Howles

Science Museum, Exhibition Road, London, SW7 2DD, United Kingdom

matthew.howles@sciencemuseum.ac.uk

Keywords: ***Experimenting, Demonstrating, Learning, Entertainment***

Abstract

The historical phenomenon of the natural philosophy demonstration will be given prominence at a new permanent gallery opening in 2019 at London's Science Museum. Provisionally titled *London: Science City 1600-1800*, the gallery will explore how London's practical, commercial and imperial ambitions transformed the city into a leading centre of scientific craftsmanship, knowledge and innovation.

One of the gallery's main objectives is to broaden the general public's understanding of the diversity of people and places engaged with "science" in historic London. To that end, the gallery's design will include four *mise-en-scènes* or "staged" spaces, each populated with original scientific instruments to evoke a different environment of scientific activity – from instrument-making in the workshop to trigonometrical surveying in the field. The perspectives of curators, gallery designers, interpretation strategists and audience researchers have all shaped the development of these scenarios.

This paper addresses the approaches taken to realise two of the *mise-en-scènes*: an air-pump experiment at the Royal Society by Francis Hauksbee, and a public demonstration

on optics by Stephen Demainbray. Exploring and contrasting the social makeup and dynamic of these meetings, the experiences they offered, the purposes they served and the locations in which they occurred, these two *mise-en-scènes* will enrich visitors' understanding of natural philosophy lectures and experiments in London.

Short biography and research interests

Matthew Howles is an Assistant Curator at London's Science Museum, working on the forthcoming gallery *London: Science City, 1600-1800*. Within this role he is particularly interested in the fine and applied arts with reference to historic London and science, including views and maps, portraits, and depictions of scientific phenomena ranging from experiments to balloon flights. He previously worked at the V&A researching Victorian architectural and decorative art designs.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

(Please complete all sections shown in **RED**.)

"To Demonstrate Nature's How and Why, to Pleasure and Good Use, is What we Aim for and Always Try"

J.W.HUISMAN

Rijksuniversiteit Groningen, Oude Kijk in't Jatstraat 7a, 9712EA Groningen, the Netherlands

j.w.huisman@rug.nl

Keywords: ***Physics societies, inventors***

Abstract

The Groningen Physics Society was established at the beginning of the 19th century, rather late, compared with other Dutch learned societies, although (the then student in Groningen) Martinus van Marum, amongst others, had tried to start such a society thirty years earlier.

In 1801, several Groningen University students founded the "Natuur- en Scheikundig Gezelschap". By merging in 1810 with another physics society of the city, the "Natuur- en Scheikundig Genootschap" was born. Its members mostly repeated experiments that had been published by others and organized lectures about all kinds of phenomena. In order to perform these experiments, equipment was bought, mostly concerning static electricity and chemistry. In the 1860s, the focus changed from performing experiments to giving lectures. The instruments were partly donated to the University and the H.B.S. (a newly formed type of secondary school, with an emphasis on science rather than Latin and Greek); the remainder was auctioned.

Due to the number of members who were professors, the Physics Society's affiliation with the University of Groningen was obvious. One of the frequent speakers was Sybrandus Stratingh, known for his electro-magnetic carriage. His research also led to a kind of internal combustion engine, which will be presented during the SIC Symposium. Another member of this learned society was the head of the City's gymnasium. Although a classicist, he conducted remarkable research circa 1900 in the field of physics, together with Haga, professor of physics at the University. One of his inventions was an interference microscope, which will also be discussed.

The Society still exists today. It has a broad membership, regular meetings and awards prizes for remarkable research as well as grants for exhibitions.

Short biography and research interests

Jan Waling Huisman is the collections and stores manager/curator of scientific instruments at the Museum of the University of Groningen. His interests are physics, engineering and education. After almost 30 years on the job and involvement in at least 50 exhibitions, he still learns every day. His current research project is about the history of the Physics Laboratory at the University of Groningen.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Sound Figure Experiments – An examination of their changes over 80 years

J. Janka

Europa-Universitaet Flensburg, Auf dem Campus 1, 24943 Flensburg, Germany

Jasmin.janka@uni-flensburg.de

Keywords: ***Replication Method, Acoustic, Changing Experiments over time***

Abstract

Metal plates, sand and a violin bow: These are the only things you need for experiments on sound figures. This simple arrangement had a great potential for physicists in the first half of the 19th century. Although such experiments were related to acoustical research at first, scientists used it in different fields of physics to visualize waves through solids and liquids. Analyzing changes in the handling and resulting interpretations can provide us with an understanding of the development of wave theory; this can be described as evolving from a static view, like the harmonic motion of the pendulum, to a dynamic view of moving waves.

I tried to analyze the differences by looking not through the eyes but also through the 'hands' of some physicists who worked with sound figures. I used the replication method to compare several 19th-century experiments. One of the main questions was to explorre whether the different results described by the protagonists derived from their hands-on practices, their interpretations or their personal backgrounds.

In my talk I will discss some of the results concerning the material and theoretical requirements of the 19th-century scientists who worked with sound figures.

Short biography and research interests

Jasmin Janka has completed her PhD at the Europa-Universität Flensburg. She worked there in the group of Peter Heering, who brought the replication method from Oldenburg to Flensburg. Her research interests are the history of 19th-century physics and the evolution or the development of experimental apparatus over their usage time. She also investigates epistemological processes in sciences of the past.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

ART AND SCIENCE IN THE PRINTING OF MAPS AND ARCHITECTURAL DRAWINGS IN BLUEPRINTING AND RELATED PROCESSES OF PHOTO REPRODUCTION.

M. E. Jardim[a,b]

[a]Centre for the Philosophy of Sciences of the University of Lisbon (CFCUL).
[b]Centre for Structural Chemistry(CQE).
University of Lisbon, Faculty of Sciences, Campo Grande, C4.3.24, 1749-016 Lisbon, Portugal

mejardim@fc.ul.pt

Keywords: ***Blueprinting, maps, architectural drawings, 19th-early 20th century***

Abstract

Blueprinting was one of the first reprographic processes used by cartographers and engineers to quickly and inexpensively reproduce maps, charts and drawings without the use of engravers and printers (Murray, 2009). Blueprinting is based on the process of the cyanotype invented by the astronomer John William Herschel (1792-1871), described in his communication "*On the action of the rays of the solar spectrum on vegetable colors and on some new photographic processes*", presented to the Royal Society of London in 1842.

The reprographic method of blueprinting maps and drawings was done as follows: the original map/drawing was drawn on a translucent medium which allowed the light to pass through the paper impregnated with a mixture of ferric ammonium citrate and potassium ferricyanide. After exposure to light the surface sensitized with the iron salts became intense blue due to the reduction of iron (III) to iron (II), forming the inorganic complex

commonly called Prussian blue, insoluble, in areas not obscured by lines in the original document. Special machines were invented around 1895 to automatically produce full document printing (exposure to light, development, washing and drying). Blueprinting and similar photo reproduction processes (Duchochois,1892) were used extensively between 1870 and the 2nd World War.

In this study the various photo reproduction processes and instruments will be discussed with an emphasis on the analysis of maps and architectural drawings in Portuguese collections.

Short biography and research interests

Maria Estela Jardim is former Associate Professor of Chemistry, currently a member of the CFCUL and associate member of the CQE, University of Lisbon. Her main research interests are: History of scientific photography in the 19th-early 20th century, non-destructive analytical techniques of historical photographs and scientific cinema. She is the co-author of the book "100 Anos de Fotografia Científica em Portugal (1839-1939): Imagens e Instrumentos" published in 2014 by edições 70.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

DIGITISING THE CONNOISSEURIAL EYE

Stephen Johnston

Museum of the History of Science, University of Oxford, Broad Street, Oxford, OX1 3AZ, UK

stephen.johnston@mhs.ox.ac.uk

Keywords: ***Mathematical instruments, attribution, engraving, interdisciplinary research***

Abstract

Unlike the history of art, with its long and sometimes fraught tradition of connoisseurship, the history of scientific instruments has rarely concentrated on issues of authenticity and attribution. Judgements on such matters are nevertheless acutely important to the trade, as well as to museums and collectors, particularly at the moment of acquisition.

This paper introduces a new interdisciplinary research project especially relevant to mathematical instruments. Working with pattern recognition experts and information engineers, as well as psychologists and practising engravers, it will create a new platform for attribution studies. Building on the work of scholars such as Gerard Turner and Koenraad van Cleempoel, the focus is on developing a digital toolset for analysing the forms of engraved numbers and letters.

The project will assemble a large dataset of detailed images of character forms along with quantitative techniques to compare the geometry of inscriptions. The aim is to ensure that

conclusions demonstrably emerge from a secure foundation of fully accessible evidence, controlled by robust statistics.

By bringing a new tool into the broad mainstream of instrument studies the ambition is to open up fresh questions on the authorship of mathematical instruments and the organisation of their production. Recognising the extraordinary skills of engravers will also reanimate the connoisseurial eye for the next generation of instrument scholars.

Rather than just outlining the project, the paper will build a conversation with colleagues on the project's research questions. It also seeks expressions of interest from collections which could contribute to the dataset.

Short biography and research interests

Stephen Johnston is Head of Research, Teaching and Collections at MHS Oxford. His research focuses on mathematical arts and sciences in Renaissance and early-modern Europe, and he has published on topics such as geometry, architecture, astronomy and astrology, and particularly their material culture.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

MATHEMATICAL INSTRUMENTS GET PERSONAL: TOOLS, INVENTIONS AND TOYS

Peggy Aldrich Kidwell

National Museum of American History, Smithsonian Institution, MRC671, P.O. Box 37012, Washington, DC, 20013-7012 USA

kidwellp@si.edu

Keywords: ***mathematical instruments, computers, United States***

Abstract

It is tempting to assume that mathematical instruments are put to use in the practice of mathematics, mathematics teaching, and the development of related sciences like astronomy. Although this occasionally occurs, these objects also have a wide range of practical uses – in surveying, finance, administration, and navigation, to name only a few areas. Similarly, users of mathematical instruments include not only mathematicians and the mathematically inclined but also many other people. This paper explores the changing role of mathematical instruments in American society, emphasizing instruments that users have in some sense considered to be their stuff. The objects include personal tools like slates, slide rules, and personal computers; inventions that served as symbols of the imagination of individual inventors; and entertaining educational toys and video games. When appropriate, it describes interactions between the objects and contemporary mathematics and mathematics education. Some of the materials described are to go on

display in 2019 at a small exhibit at the Smithsonian's National Museum of American History.

Short biography and research interests

Historian of science Peggy Aldrich Kidwell is Curator of Mathematics at the Smithsonian Institution's National Museum of American History. Her research interests include slide rules, calculating machines, mathematical teaching apparatus, and mathematical games.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

ON THE WAY TO A NEW COLLECTION OF SCIENTIFIC INSTRUMENTS AT ETH ZURICH

W. Kolbmann

ETH Library, Rämistrasse 101, Zürich, 8092, Switzerland

wibke.kolbmann@library.ethz.ch

Keywords: ***Collection foundation, collection management concept, acquisition criteria***

Abstract

In 2016 the executive board oft ETH Zurich adopted a new policy for building, accessioning and deaccessioning collections. Since then, numerous requests for the acquisition of scientific instruments and equipment as well as teaching aids have been received by ETH Library, collections, and archives staff. These are usually large collections from the departments of the university itself, for example the Machine lab, the Department of Physics, the Institute of Electronics or the Institute of Geodesy. The departments and institutes point out that they have preserved the objects because ~~they~~ of their scientific, technical, and historical value. However, these units lack competence for qualified collections and inventory management and the capacity for documenting and exploring the context to the objects. With the establishment of a central collection of scientific instruments and teaching aids, which will be affiliated to the ETH Library, the gap in the operational management of the collection could be closed and resources should be provided to preserve these cultural assets and to ensure the sustainable development of

the collection. This paper will give an introduction to the process of establishing a new collection, the proposed collections management concept, and the internal university cooperation plan for maintaining and managing the collection, as well as the acquisition criteria.

Short biography and research interests

Wibke Kolbmann is curator of Object Collections at ETH Library of the Swiss Federal Institute of Technology Zurich since 2015. She studied archaeology, history and Egyptology. Later, she earned her master of library and information science. Her work focuses on promoting the use of scientific university collections for the purpose of research and teaching, offering consulting on collection management. She recently applied for the founding of a new collection of scientific instruments at ETH Zurich.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

The Abstract Submission Form

BRINGING THE HEAVENS TO EARTH:
PRINCES, PLANETS, AND PROGNOSTICATION

Michael Korey

Mathematisch-Physikalischer Salon, Staatliche Kunstsammlungen Dresden,
Zwinger, 01067 Dresden, Germany

michael.korey@skd.museum

Keywords: *geomancy, planetary theory, prognostication*

Abstract

Classical geomancy is by design a quite earthly means of divination: rows of dots are marked out on the ground with a staff (or with a pen on paper), counted up according to their parity, ordered into a tableau, and then used to answer a question at hand – be it the whereabouts of a lost item, the prospects for a forthcoming journey, or the veracity of a witness. Elector August of Saxony (1532-1586), well known for his cultivation and use of mathematical instruments, was an avid practitioner of this art, as evidenced by abundant surviving manuscripts in his own hand. Until recently, a number of these divinatory manuscripts have resisted analysis. This paper deciphers these, thereby revealing an unexpected celestial connection, a mathematically innovative prince at work, and a tantalizing possible use for the great astronomical clock he commissioned.

Short biography and research interests

Michael Korey studies mathematical, optical, and philosophical instruments in their cultural contexts, especially in relation to early-modern princely courts.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium

Leiden/Haarlem, 3-7 September 2018

Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

'PURE' DRINKING WATER IN ANTEBELLUM BOSTON? INSTRUMENTS, LEAD PIPES AND PULIC HEALTH

Richard L. Kremer

Dartmouth College, Department of History, Hanover, NH 03755, USA

richard.kremer@dartmouth.edu

Keywords: ***lead pipes, drinking water, Boston water system, Augustus Hayes***

Abstract

The 'lead pipe movement' began in Boston in the 1840s, as Harvard chemist Eben Horsford urged city officials to use lead for their new urban water system. By 1900, fully 85% of the largest American cities delivered fresh water to their inhabitants through lead service pipes. And by 1900, many public health officials began warning about the adverse health and 'eugenics' effects of lead poisoning. Two other industrial chemists, Augustus A. Hayes and Samuel Luther Dana, studied the corrosive action of water on metal pipes and mounted a (failed) public campaign against lead pipes. This paper will investigate the role of instruments in the debate, including standard apparatus for chemical analysis, new tools developed to measure "water quality," and statistical tools designed to assess the "safety" of humans consuming small amounts of lead over long periods of time. Measuring "safety," I will argue, would require many more components than brass, glass, and calibrated scales.

Short biography and research interests

Richard L. Kremer is associate professor of history at Dartmouth College, where he curates the King Collection of Historic Scientific Instruments. He studies brass and paper astronomical instruments from the late medieval period and mathematical and philosophical instruments from the 19th century. He is currently President of the Scientific Instrument Commission.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium

Leiden/Haarlem, 3-7 September 2018

Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

The Astronomical Observatory as a Scientific Instrument

Janet Laidla

University of Tartu, Lossi 25, Tartu, 51003, Estonia

janet.laidla@ut.ee

Keywords: ***astronomy, architecture, exhibit***

Abstract

We can claim with little controversy that Tycho Brahe's observatory Uraniborg was a scientific instrument in itself but did the rise of telescope as the main astronomer's tool change this? The aim of the present paper is to look at the architecture of 18.-19. century observatories to see what requirements were set for new observatory buildings and to understand how the building itself might be described as a scientific instrument. The idea for the paper arose from discussions between historians of science and historians of architecture who have claimed that the architect J. W. Krause had no say in the building of the Tartu observatory in the beginning of the 19th century. Is this really true?

Although the different kinds of requirements for observatories have been listed and discussed in existing literature and the concept of the astronomical observatory as a scientific instrument also has been used before, my proposed survey will serve as a reminder that it is not enough to secure and preserve the historical instruments. The observatory building has value as both a historical building and a scientific instrument and should thus be preserved, if at all possible, and preferably be opened for visitors.

Therefore, the paper seeks to be included in the special session celebrating Inga's life and work as it was prepared with the Stockholm observatory in mind.

Additionally, inspired by the concept of observatory as a scientific instrument, the curators decided to design a hands-on exhibit that will be introduced via a short video as the last part of the presentation.

Short biography and research interests

Janet Laidla works at the University of Tartu Museum and at the University of Tartu Institute of History and Archaeology. She has a PhD in history with interest in early modern historiography, history of culture and history of science. Her area of research is the history of knowledge in early modern and modern periods.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

ERRORS, FALSE MISTAKES, MISINTERPRETATIONS: DO THEY MAKE SENSE?

P. Lauginie

Groupe d'Histoire et de Diffusion des Sciences d'Orsay (GHDSO).Université Paris-Sud, France

pierre.lauginie@u-psud.fr

Keywords: ***Errors, misinterpretations, anachronisms***

Abstract

In this paper, I will focus on some 'errors' – sometimes widely considered as such, or on the contrary hidden in the depth of data – in historical experiments reports. Real errors or misinterpretations by following scientists or historians? I will explore and discuss three examples:

(i) *Cavendish*'s 'weighing of the Earth' with the torsion balance in 1798: a miscalculation lies obviously in the reported data for the Earth's density. It was sometimes corrected by following authors or historians, contradicting Cavendish and implying that measurements were not so good as the author claimed. Without denying the formal error, the discussion will finally prove Cavendish fundamentally right. In this respect, detailed examination of the text and of the experimental process, and some elementary statistics are necessary.

(ii) *Léon Foucault*'s speed of light measurement in 1862: "in round numbers, [of] 298 millions m/s" (instead of 308 millions from Astronomy). However, from his complete tables of data, a noticeably higher value seems more likely. Was Foucault biased under the strong pressure of Le Verrier who "was overbearing and expected Foucault to find a

smaller value”? The point, previously discussed by Abbé Moigno, will be re-examined in the light of Foucault’s full set of data.

(iii) A further question drawn from the seventeenth century: was propagation of light ‘instantaneous’ or did it require time? *Galileo* tried his famous two-lanterns experiment. *Descartes* discussed the point from the observation of lunar eclipses. Strangely, from both texts, it appears that – speaking in modern terms – a velocity greater than roughly 100 km/s was considered as an instantaneous propagation. Wrong conclusion? For us, certainly. But was it also for them and in their own time?

Short biography and research interests

Pierre Lauginie, former lecturer and researcher in Physics, has developed an experimental approach to history of science teaching based on adaptations of historical experiments. Present interests are on history of instruments and measurement, and popularization of science.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Looking at the Skies for 175 Years:
The 162-mm Plossl Refractor and the 400-mm Gautier Refractor of National Observatory of Athens

Lazos Panagiotis[a], Tsimpidas Dimitrios[b]

[a]National University of Athens, Faculty of Primary Education, 13A Navarinou Str., Athens, 10680, Greece
[b]National Observatory of Athens, Nymphon Hill, Thiseio, 11810, Athens, Greece

taklazos@gmail.com
dtsimpidas@noa.gr

Keywords: ***National Observatory of Athens, Jules Schmidt, Map of the moon, Plossl***

Abstract

The National Observatory of Athens was founded in 1842, only 12 years after the establishment of the Greek state. Baron G. Sinas, a rich Greek from Vienna, was convinced by George Vouris (professor of astronomy at the University of Athens) to assume the cost for the construction of an Observatory in Athens. The Hill of the Nymphs was selected as the site for the building. Architect Theophil Hansen designed the building.

The observatory was not initially founded for studying the heavens but for practical reasons, such as time measurement and finding the exact latitude of Athens for accurate cartography. Nevertheless, two telescopes of the observatory were used quite intensively for astronomical observations until 1940. The first is the 162-mm Plossl refractor. It is one of the earliest instruments of the observatory and, until 1901, was its largest telescope. It is also the telescope through which Jules Schmidt, over a period of many years, conducted

observations that led to the drawing of his famous topographical map of the Moon. This map, published in 1876 by the Prussian Academy of Sciences, contains 30,000 calderas, 2000 of which were depicted for the first time. It was so famous in its era that it was mentioned by Jules Verne.

The second telescope is the 400mm Doridis' refractor, the largest telescope in Greece until 1959. Dimitrios Doridis was a little known Greek. Part of his legacy was used to purchase this telescope carrying his name since 1902. The mechanical parts of the telescope were built by the Gautier Company in France; the manufacture of the lens is attributed to the Henry Brothers. It has been used extensively for planetary, stellar and solar observations.

Currently, the Doridis refractor serves as the main observation telescope of the Thiseio Visitor Centre of the National Observatory of Athens.

Short biography and research interests

Panagiotis Lazos is a physics teacher in secondary education. He obtained his BSc degree in Physics from the University of Athens. He has also a BSc in photography and a MSc in History and Philosophy of Science and currently is a PhD student. His main research interest is the recording of 19th-century collections of scientific instruments in Greek educational institutions and how they were used in the educational process.

Dimitrios Tsimpidas is a public outreach and science communication officer for the National Observatory of Athens, regularly operating the Doridis and Newall historical telescopes located on the Hill of Pnyx and Penteli Mountain, respectively.

He obtained his BSc degree in Physics from the University of Athens. He also holds a MSc in Astronomy and Space Physics from the University of Uppsala and a BA in drama and theater studies from Piraeus Drama School. His main interests are the physics of the planetary magnetospheres and the origin of planetary systems.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

THE DEVELOPMENT OF KNOWLEDGE NETWORKS BETWEEN FRANCE AND SWEDEN AT THE TIME OF THE FOUNDATION OF THE UPPSALA AND STOCKHOLM OBSERVATORIES

J. Davoigneau[a], F. Le Guet Tully[b]

[a]Heritage Directorate, French Ministry of Culture, 182 rue Saint-Honoré, Paris, 75001, France
[b]Astronome honoraire, 19 Quai de la Seine, Paris, 75019, France

jean.davoigneau@culture.gouv.fr

Keywords: ***knowledge networks, observatories,***

Abstract

Published in 1989 on the 250th anniversary of the foundation of the Swedish Academy of Sciences, *Science in Sweden* contains a chapter by Ulf Sinnerstad, former Professor of Astronomy at Stockholm observatory, entitled "Astronomy and the First Observatory". Sinnerstad recalls how the position of astronomy, clearly "insignificant" in Sweden in the late 17th century, became an important issue in the 18th. His paper highlights the gradual emergence of knowledge networks between Swedish and European scholars. We aim at studying in more depth the development of scholarly relationships between Sweden and France since the beginning of the 18th century. An initial, provisional list of scholars known to have played a role in these networks includes Cassini, Celsius, Delambre, Delisle, Melanderhjelm, Outhier, Roemer, and Wargentin. We are searching for archival documents that are related to these networds and especially to the astronomical and

geodetic instruments that Swedish scholars ordered for their observatories and scientific expeditions.

Short biography and research interests

Jean Davoigneau, a historian with a scientific background, works for the *Mission Inventaire général du patrimoine culturel* at the French Ministry of Culture where he is the specialist in scientific and technical heritage. He is involved in several international collaborations within the *Convention France-UNESCO* and is a member of the *Heritage Council* at the Paris Observatory.

Françoise Le Guet Tully is an honorary astronomer. Her research projects concern the history of astronomical instruments and institutional observatories. She is also involved in astronomical heritage issues.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

Horizontal Voltaic pile and the chemical theory of galvanic elements

L. Leppik

[a]University of Tartu Museum, Lossi 25, Tartu 51003, Estonia

lea.leppik@ut.ee

Keywords: ***G. F. Parrot, Voltaic pile, galvanic elements***

Abstract

In 1796, the Livonian Public Welfare and Economic Society was established in Riga and Tartu. Georg Friedrich Parrot (1767-1852, professor of physics of the University of Tartu 1802-1826) became its first secretary. The aim of the society was to spread economically useful science-based knowledge and to contribute to the development of factories and manufacturing companies. Among the 60 improvement proposals initiated by Parrot, there were 18 original inventions (water filtration, fire extinguisher, rational stove, air purification in hospitals, disinfection using beer vinegar, and many others).

Among other useful improvements Parrot together with David Hieronymus Grindel (1776-1836, professor for pharmacy and chemistry at the University of Tartu in 1804-14) in early 1801 constructed the horizontal Voltaic pile. At that time, it was far from clear how and why the Voltaic pile produces energy—Volta himself proposed the contact theory, i.e., explaining the phenomenon with the contact of two metals. In 1802, Parrot was among the first to give the correct explanation: it is a chemical process (metal reacts with an electrolyte). This was one of the greatest scientific discoveries of Parrot, but sadly found no acknowledgement. In my presentation I will open some reasons why this theory was neglected. The destiny of practical inventions was better: it was the horizontal Voltaic pile

constructed by Parrot that was used by Moritz Hermann von Jacobi in the first electric engine that powered a boat on the Neva River in 1839.

Short biography and research interests

Lea Leppik, PhD, is research director of the University of Tartu Museum. She has dealt with the history of the University of Tartu, history of astronomy and the biographies of scientists.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

THE OBSERVATORY MUSEUM IN STOCKHOLM – WORK AND ACTIVITIES BETWEEN 2005 TO 2013 AS SEEN FROM AN ASTRONOMY GUIDE

Michael Lindberg

The Stockholm Observatory museum, Sweden
The Royal Swedish Academy of Sciences, Box 50005, SE-104 05, STOCKHOLM, Sweden

michaellindberg73@gmail.com

Keywords: ***Stockholm old Observatory***

Abstract

This paper introduces the observatory museum in Stockholm, describing the work and activities provided there during the last decade when it was open to the public. It focuses on the period when the observatory building was only acting as a museum and received visitors regularly. A few temporary exhibitions will be discussed, along with some of the more permanent instruments which were on display. One of the attractions was to observe the night sky in the historical cupola with a Zeiss refractor from 1910. This experience, very popular among visitors and school children, especially on cloud-free nights, will also be mentioned. Important stakeholders for the program, such as the House of Science in Stockholm and the observatory museum's former curator, Inga Elmqvist Söderlund, will also be considered.

Michael Lindberg earned a M.Sc. with a major in physics in 2013 at Stockholm University. Between 2005 to 2013 he worked as an astronomy guide at the observatory museum in Stockholm under Curator Inga Elmqvist Söderlund. He has also been working at Nasdaq since 2007 but retains a deep interest in history of science, especially historical instruments.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

C AT THE BELFRY

F. Lo Bue[a], S. Mélin3[a], C. Semay[b], F. Michel[c]

[a]Service Sciences et Techniques au Carré, Université de Mons, Place du Parc 20, 7000 Mons, Belgium
[b]Service de Physique Nucléaire et Subnucléaire, Université de Mons, Place du Parc 20, 7000 Mons, Belgium
[c]Retired professor of the Université de Mons

Francesco.lobue@umons.ac.be

Keywords: ***popular science, demonstration experiments and apparatus,***

Abstract

In 1849, Hippolyte Fizeau determined the speed of light in a famous experiment. The idea was to measure the time taken for a pulse of light to travel between an intense light source and a mirror about 8 km away. A rotating cogwheel with 720 notches, which could be rotated at a variable speed, was used to chop the light beam and determine the flight time. In 2017, physicists and technicians of the University of Mons in Belgium reproduced the experiment with modern devices to allow members of the public to measure the speed of light themselves. The light source used was a low power laser, and the cogwheel was replaced by an electrically driven chopper, but the general spirit of Fizeau's experiment was preserved. The exhibition was organised in the belfry of Mons, a baroque-style building classified as a UNESCO World Heritage site. The solutions found for the main problems encountered are presented to help colleagues intending to reproduce the experiment.

Short biography and research interests

Francesco Lo Bue is a physicist anddirector of the Scientific Dissemination Department of University of Mons.

Soizic Mélin is a physicist who works in the didactics of physics and the diffusion of sciences at University of Mons.

Claude Semay is a professor at the Department of Physics, University of Mons. His research interests are quark physics and quantum mechanics.

Francis Michel is a retired professor of the University of Mons. His research interests were devoted to nuclear collisions.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

TRACKING MATHEMATICAL INSTRUMENTS FOR OVERSEAS IBERIAN TERRITORIES IN LATE EIGHTEENTH CENTURY

I. Malaquias[a]

[a]Departamento de Física, CIDTFF*, Universidade de Aveiro, Aveiro, 3810-193, Portugal

imalaquias@ua.pt

Keywords: ***mathematical instruments, Iberian Courts, overseas territories, eighteenth century***

Abstract

Scientific development in the second half of the eighteenth century owed much to the improvement and progressively greater production of instruments for making the best and most accurate measurements. Mathematical instruments, which at that time also included the astronomy, navigation and geodesy, benefited from the new technologies of glass production and metalworking as well as from refinements driven by the interest in globalizing missions that developed throughout the century (e.g., observations of transits of Mercury and Venus, cartographic expeditions, and travels of geographic and scientific exploration). The Portuguese and Spanish courts, the pioneers of globalization in the 15th and 16th centuries, sought to expand their worldwide positions and promoted interest in a more scientific knowledge of their overseas territories. In this presentation I will present examine some mathematical instruments, mainly originated in Britain, that were acquired

for and accompanied some Portuguese and Spanish expeditions in the last two decades of the eighteenth century.

Short biography and research interests

Isabel Malaquias is currently Associate Professor at the University of Aveiro, Physics Department and researcher at CIDTFF. Her main research interests are history of science, history of instruments and physics education. Recently, she co-edited *For the Love of Science - The Correspondence of J. H. de Magellan (1722-1790)* (2017), and authored *International networks of production and distribution of scientific instruments in the eighteenth century Europe* (2017), and *An eighteenth century travelling theodolite* (2016).

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

The Abstract Submission Form

M. De La Hire, "Horloges à Sable pour les voyages en mer"

M. MORFOULI

Observatory of Paris, 61 Avenue Denfert Rochereau, Paris, 75014, France

Meropi.morfouli@obspm.fr

Keywords: ***Horology, Sandglass, Navigation, Longitudes***

Abstract

Philippe De la Hire was a French astronomer, mathematician, and physicist mostly known for his astronomical and architectural work. What I propose here is to highlight a less known aspect of his work concerning mathematical, technical solutions and propositions to the art of horology for scientific use. In order to underline the importance of his work in time measurement we will focus on an invention made by De la Hire in 1684 and proposed at the Académie Royale des Sciences as a solution for the longitude problem and other difficulties in navigation. In the same period that Christian Huygens constructed, proposed and tested his highly elaborated clocks in the sea for navigational purposes, Philippe De la Hire, proposed a rather peculiar sandglass for the same purposes. What I propose here is a contextualised presentation of De la Hire's "Horloges à sable pour les voyages en mer" as the author himself calls them.

Short biography and research interests

Her principal research interests lie in the field of Philosophy and History of Sciences and particularly in the notion of time in Physics and Astronomy. She's currently investigating in her Post Doc Research the relation of causality between precision in time measurement and the mathematization of natural phenomena in the works of 17th-century Natural Philosophy scholars.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

The Abstract Submission Form

Versailles: Water, Savants and Levelling in 17th-Century France

M.J. Morizet

34 bis avenue de Paris, Versailles, 78000, France

morizetb@club-internet.fr

Keywords: *Water , Levels, Progress in instruments*

Abstract

Louis XIV wanted basins and fountains in the gardens of the Chateau de Versailles. Since this chateau was built on marshy grounds, the problem of water supply and drainage immediately became apparent.

Leveling is an art as old as civilizations. Feeding water to fields, cities or the Gardens of Babylon requires good leveling before carrying out often considerable labor of moving massive amounts of earth. For millennia, leveling techniques did not change, but the invention of the telescope in 1608 and its application to instruments by l'Abbé Picard (circa 1660) made a profound modification of leveling instruments, a modification that continued with the addition of the spirit level of Melchizedech Thevenot, writer, cartographer and librarian to the king.

Scientists and instruments makers in Paris showed great creativity in the development of practical and universal levels. Famous scientists like the astronomer l'Abbé Picard, the Dutch astronomer, mathematician and physicist Christian Huygens and the Danish astronomer Ole Roemer were among those involved with the project. The latter two actually invented a type of level. Makers like Michael Butterfield and Louis Chapotot

realized the ideas of the scientists by constructing instruments to accomplish these mathematical and technical parameters. They managed to develop refined instruments that yielding the most accurate results.

The adventure of creating water as decoration thus became possible in Versailles thanks to these instruments that combined the ideas of scientists and the techniques of craftsmen. Unfortunately, except for Thevenot’s brilliant invention of the bubble level, still in use, little remains of this era.

Short biography and research interests

A former professional geologist, M.J. Morizet has long been interested in scientific instruments and their manufacturers in France. He helped curate the exhibition "Science and Curiosities at the Court of Versailles" (2010) and the exhibition "André Le Nôtre en Perspectives" (2013).

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

THE MECHANICS' INSTITUTES OF GREAT BRITAIN: THE PIONEERING EXAMPLE OF THE SOCIETY FOR THE ENCOURAGEMENT OF THE USEFUL ARTS IN SCOTLAND

A.D. Morrison-Low

Research Associate, National Museums Scotland, Chambers Street, Edinburgh, EH1 1JF, United Kingdom

a.morrison-low@nms.ac.uk

Keywords: *Society, patronage, invention, instruments*

Abstract

The Royal Scottish Society of Arts was founded in 1821 as 'The Society for the Encouragement of the Useful Arts in Scotland' and was incorporated by Royal Charter in 1841. It was concerned with the fields that we would now describe as science, technology, engineering and manufacture, but which were then known as the useful arts, as opposed to the fine arts. Drawing its inspiration from the London-based Society of Arts, its founder David Brewster saw it as a means of supporting and rewarding Scottish inventions through aristocratic patronage. During its early years, it provided a forum for the discussion of scientific matters, including the development of scientific instruments, some of which can be identified from its *Proceedings*.

The Royal Scottish Society of Arts, still based in Scotland's capital city Edinburgh, is now on the brink of celebrating its bicentenary, and has managed to adapt itself over the past

two centuries to changing audiences. This paper will explore some of its earliest events, resulting in improvements by Scots to scientific instruments of the day.

Short biography and research interests

Alison Morrison-Low was formerly Curator of Historic Scientific Instruments at National Museums Scotland and is now a Research Associate. She continues to work in this area, as well as in the history of photography.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

AN EMBODIMENT OF CULTURAL SYNTHESIS : THE ASTROLABE DESIGNED BY LĀLAH BULHOMAL LĀHORĪ AND CREATED BY USTĀD PĪR BAKHSH LĀHORĪ

MUBASHIR UL-HAQ ABBASI

mubashirpakistan1@gmail.com" PAKISTAN

Keywords:*19th century Astrolabe, Lahore, Cultural synthesis*

Abstract

Astrolabe production in Mughal India in the sixteenth and seventeenth centuries was largely dominated by the Allāhdād family of Lahore. After the decline of the Mughal empire, astrolabe production appears to have ceased, as no instrument bearing a date in eighteenth century is known to exist. But towards the middle of the nineteenth century, there was a sudden revival at Lahore, largely due to the initiative of Lālah Bulhomal Lāhorī who was well-versed in the production of Islamic as well as Sanskrit instruments. Together with his associates, he made Lahore once again a vibrant centre of production of astronomical instruments. There exist today some 45 instruments of diverse types, with inscriptions in Arabic/Persian, Sanskrit, or English, produced by this group of instrument makers.

An outstanding specimen amongst these is a massive astrolabe now preserved in the Lahore Museum. It was designed by Bulhomal (a Hindu) and fabricated by Pīr Bakhsh (a Muslim) at the request of Maulvī Ghulām Muḥammad Khān (a Muslim of the Sunni sect). Moreover, it is dated in three calendars belonging to three cultural traditions:

Vikrama Saṃvat 1897, Hijrī 1257 and Anno Domini 1841. Thus it embodies a cultural synthesis. Behind its solid metal craft, it carries a subtle message: harmony and respect among the various factions, irrespective of religious divisions. After introducing the cultural context in which the astrolabe was produced, the paper will provide a detailed technical description of the astrolabe.

Short biography and research interests

Assistant Professor Mubashir Ul-Haq Abbasi, Institute of Space Technology, Islamabad, Pakistan is an electrical engineer by profession. He has written eight books on astronomy in Urdu language to introduce the subject to the public. He has established a Radio Astronomy Lab and an observatory. He designs astrolabes and sundials. Presently he is compiling a catalogue of ancient astronomical instruments extant in the museums in Pakistan.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

THE COLLECTION OF HISTORICAL SCIENTIFIC INSTRUMENTS AT THE ITALIAN NATIONAL INSTITUTE OF HEALTH: BETWEEN SCIENCE AND ART

F. Napolitani, M.A. Falcone, R. Ferrara
on behalf of the
"Working Group for the Promotion of the ISS Historical Scientific Instruments"

Istituto Superiore di Sanità, Viale Regina Elena 299, Rome, 00161, Italy

federica.napolitani@iss.it

Keywords: ***Scientific instruments, history of science, museums, art***

Abstract

The Istituto Superiore di Sanità (ISS) is the Italian National Institute for research on public health and biomedicine. It holds an extensive collection of scientific instruments of historical interest dating back from the years of its foundation (1934), which also includes material from the beginning of the twentieth century. Scientific instruments are at the core of scientific and technologic development. In the past, many were invented and designed by the scientists themselves and were built in-house by local laboratory technicians, workers and manufacturers, as it happened at ISS. Instruments no longer in use became important for their historical significance and artistic appeal. This poster will present the ISS collection which consists of about 800 scientific and measuring instruments, original laboratory equipment, apparatus for experiments and demonstrations and other artefacts.

This collection helps us trace the history of research at ISS. It also documents the work of illustrious researchers such as the Nobel Prize winners Daniel Bovet (Laboratory of Therapeutical Chemistry) and Ernst Boris Chain (International Research Centre for Microbiological Chemistry). A selection of instruments from this valuable collection is on permanent display at the ISS Museum, where an interactive exhibition allows visitors to learn more about each instrument and experience how they were used in their original settings.

A project is now underway to complete the inventory of this collection with the aim of opening this significant cultural heritage to the scientific community worldwide, through a dedicated website which will soon be freely available online.

Short biography and research interests

The authors work at the Italian National Institute of Health in the Scientific Knowledge and Communication Service. They have many years of experience in librarianship, information science and journal publishing. They are part of a Working Group whose goal is studying, cataloguing and promoting the collection of scientific instruments held by the Institute. They have participated in many international conferences in their areas of interest and have authored a number of research papers.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

JOHANNES ANTON LINDEN († 1619), GOLDSMITH AND INSTRUMENT MAKER OF HEILBRONN

Günther Oestmann

Institute for Philosophy, History of Literature, Science and Technology,
TU Berlin, Straße des 17. Juni 135, 10623 Berlin

Gandersheimer Str. 20, 28215 Bremen

oestmann@nord-com.net

Keywords: *16th century, Astrolabes, Sundials, Compendia*

Abstract

Little is known about the life of Johannes Anton Linden († 1619) but some fine instruments made by him are extant. Moreover, he prepared a German translation of Johannes Stoeffler's 1513 *Treatise on the Astrolabe* (*Elucidatio fabricae ususque astrolabii*) which was beautifully copied by Endres Schwepler, a copper hammer smith of Heilbronn. Linden's text is one of a small number of vernacular translations of Stoeffler's book on the construction and use of the astrolabe written in the 16th century (there are two French translations as well as a second German translation which originated in Switzerland). Although Linden mastered Latin, he had obviously no academic background. Therefore it is of interest to consider how he coped with Stoeffler's highly specialized scientific prose. The paper will examine the available biographical sources, Linden's translation, as well as his extant astrolabes, sundials and astronomical compendia.

Short biography and research interests

Günther Oestmann (b. 1959) trained as a clock- and watchmaker and in 2013 was awarded the ‘Prix Gaïa’ of the Musée international d’horlogerie in La Chaux-de-Fonds. In 2017 he was appointed extraordinary professor for history of science at the Technical University Berlin. His fields of research include history of scientific instruments and clocks, history of astronomy and mathematical geography, as well as maritime history. He is currently working on geniture collections of Early Modern Europe.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

The Movement of Frozen Water

T.E. Phillipson

National Museums Scotland, Chambers Street, Edinburgh, EH1 1JF, United Kingdom

t.phillipson@nms.ac.uk

Keywords: ***glaciers; pitch; surveying; demonstrations***

Abstract

J.D. Forbes (1809 –1868) was an Edinburgh physicist and Professor of Natural Philosophy with diverse interests ranging from optics and heat to topics that are now considered geophysical. Among these interests was the question of how glaciers move. Instruments and documents which relate to Forbes' research came into the National Museums' collections from both the University of Edinburgh and Forbes' family. Notably they include a manuscript and printed map surveyed by Forbes of the Mer de Glace at Chamonix and a theodolite he used for glacial observations, which are now united in the museum collections.

Forbes was part of a wider community discussing this glacially slow motion. Was the very solid-seeming ice flowing like a liquid? The behaviour of pitch, which can be shattered with a hammer or left to flow slowly by itself, was referred to by several researchers to illustrate this possible mechanism for the motion of glaciers. This property of pitch led to a number of very long-term experiments and demonstrations including Lord Kelvin's pitch glacier and experiments where pitch drips slowly out of a funnel. In 1902 an unknown staff

member in the museum workshop placed lumps of pitch into a funnel and left it (mostly) to its own devices, in what is now the oldest-known pitch-drop demonstration in the world. For over a century, the seemingly-solid lumps of pitch have flowed downwards through the narrow tube.

This paper will look at Forbes' glacier research within its wider context, specifically the instruments used and results achieved with them.

Short biography and research interests

Tacye Phillipson is Senior Curator of Science at National Museums Scotland. She was lead curator for the Enquire gallery which looks at how scientists have sought to answer questions and the many different aspects of science.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

A Survey of Sundials in Rio de Janeiro

R. A. Pimentel Jr.

Universidade Federal do Rio de Janeiro, rua J. J. Seabra s/nº, Rio de Janeiro, 22470-130, Brazil

beto@if.ufrj.br

Keywords: ***Astronomy, History of Astronomy, Sundials, Time keeping***

Abstract

This work presents a survey of the public sundials within the metropolitan region of Rio de Janeiro, Brazil.

Short biography and research interests

Beto Pimentel has been a physics teacher in the laboratory school of the Universidade Federal do Rio de Janeiro for the last 21 years. He works with instrumentation and non-conventional and creative approaches to teaching Science, and has a Ph. D. in the history of optics, in which field he has done a number of works related mainly to the history of interferometry in the nineteenth century.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

Cylinder dials in Ottoman Turkey: The 'Asâ-yı Musa (The Staff of Moses)

Gaye Danışan Polat

Department of the History of Science, Faculty of Letters, Istanbul University, Turkey

gayedanisan@gmail.com

Keywords: *'Asâ-yı Musa, cylinder dials, Ottoman Empire, Turkey*

Abstract

The present paper will introduce an astronomical instrument called the *'Asâ-yı Musa* (the Staff of Moses), based on two Ottoman manuscripts. The first one is an anonymous treatise, the *Risâle-i tersim-i alât-ı hey'et* (A treatise on the drawing of astronomical instruments, 1647), and includes the descriptions and sketches of various sundials. The manuscript is kept at the Kandilli Observatory collection in Istanbul. The second is the *Mecmû'a-i resâil-i nâdire fi el-'ulûm el-felekiyye* (A rare collection of treatises on the science of spheres). It bears the seal of Mustafa Sıdkı (d.1769), and the date 15 Ramadan 1153 H (1740 CE). It is available through the Princeton University digital library. The examination of these two manuscripts shows that *'Asâ-yı Musa* could be a portable cylinder dial. This hypothesis is supported by the fact that the Ottoman muwaqqit Ahmed Ziya Akbulut (1869-1938) uses the following names for cylinder dials: *Üstüvânî, 'Asâ-yı Musa,* and *Batlamyus kuburu* (Ptolemeos's cylinder). The examination of the above-mentioned manuscripts aims to trace the historiography of cylinder dials in Ottoman Turkey.

Short biography and research interests

Gaye Danışan Polat is a graduate from the Department of Astronomy and Space Sciences, Istanbul University. She completed her master thesis (*Observatories and Astronomical Observations in Turkey, 1575-1997*) in 2009, and her PhD thesis (*Ottoman Nautical Astronomy and Astronomical Instruments in the 16th century*) in 2016. She currently pursues her research on the history of portable astronomical instruments. Her current Postdoc research project is titled as *Ottoman portable astronomical instruments and their field of application: a comparative study for the 16th century* at the Museum of the History of Science, Oxford. Her second research project, entitled *Paper Instruments in the History of Ottoman astronomy*, is funded by an SIS grant.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

To command the mind?: Building and buying material mathematical models

Anne Por

Rijksmuseum Boerhaave Leiden

annepor@rijksmuseumboerhaave.nl

Keywords: Mathematical models; visuality/sensibility; models as instruments; learning by modeling

Abstract

Tools and instruments enable us to control nature. Certain man-made objects, however, appear to be instrumental in controlling our own thought processes instead. Material mathematical models allow us to literally make sense of abstract mathematical objects. Strikingly, by making and looking at mathematical models, insight is gained in a science that is empathically syllogistic. The assumption that exposure to sensory material develops abstract thought underlied the mystically inspired reform movements that shaped our modern education. In 1877, professors Felix Klein and Alexander Brill held their first 'mathematical seminar' at the Munich Technische Hochschule. Students each studied a certain mathematical surface and designed the corresponding model as part of their assignment. Later, many of these models became commercially available through the publishers Ludwig Brill and Martin Schilling. In 2015, Rijksmuseum Boerhaave acquired almost one hundred mathematical models from Leiden University's Mathematical Institute. Most of these models was bought from Brill and Schilling, as was the majority of models in

most collections. However, about twenty models are substantially more intriguing, since they appear to be DIYed, possibly by students. One is even a gift from a student to a professor. I will raise questions about how these models were used in practice and will point out some difficulties in researching such matters in hope of giving rise to a fruitful discussion.

Short biography and research interests

Anne Por studied Art History and is currently a master student History and Philosophy of Science.

She takes special interest in the history of data visualization, diagrammatic reasoning, didactic-pedagogic materials and parapsychological studies, or generally, the history of human endeavours to make literal sense of ideas and measurements.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

ENGINEERING THE HARP: THE ERARD LONDON FIRM 1800-1830

Panagiotis Poulopoulos

Deutsches Museum, Museumsinsel 1, Munich 80538, Germany

p.poulopoulos@deutsches-museum.de

Keywords: ***Musical Instrument Trade, Regency London, Production, Marketing***

Abstract

The early nineteenth century witnessed a great boom in the market of technology-driven luxury products. A wide variety of 'state-of-the-art' objects, ranging from scientific devices, to mechanised furniture and automata, to complex musical instruments, were available not just for the few professionals and connoisseurs, but also for thousands of amateurs among the middle classes. These objects, usually demonstrating technical expertise, skilled craftsmanship and visual elegance, resulted mainly from the fruitful collaboration and transfer of technologies between different crafts.

One example of this process is the harp, an instrument which around 1800 became as popular as the piano in Europe. Due to the addition of a pedal mechanism for shortening the strings, the harp was radically transformed into a powerful sounding machine and consequently a symbol of status. The development of the harp reached a peak in the competitive and stimulating environment of Regency London with the introduction in 1811 of the patent double-action harp by Sébastien Erard (1752-1831). As the leading harp inventor and manufacturer, Erard applied various innovative methods in

the engineering of the harp, paving the way for the gradual industrialisation of the instrument.

This paper will focus on the manufacture and marketing of the harp between 1800 and 1830, aiming to identify connections and influences from related crafts, especially those involved in the trade of scientific instruments. By presenting the case of Erard, the paper will discuss workshop practices (for example, Heinrich Johannes Kessels, who would become a prominent maker of chronometers and observatory regulators worked for Erard from 1814-22), highlighting aspects of standardisation (for example, screws used in the scientific instrument trade found their way into Erard's harps), serial production and trademarking, as evidenced in surviving instruments and archives of the firm.

Short biography and research interests

Panagiotis Poulopoulos is currently a post-doctoral fellow in the Research Institute for the History of Science and Technology at the Deutsches Museum, Munich. He has a BA in Museum Conservation (TEI Athens), a Masters in Musical Instrument Research and a PhD in Organology (both University of Edinburgh). His latest projects focus on aspects of musical instrument manufacture in the 19th century and on issues of authenticity. Since 2016 he has been Advisory Board Member of ICOM-CIMCIM.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

The Abstract Submission Form

Hermann von Helmholtz's Instruments of Acoustics Research

Katharina Preller

Deutsches Museum, Museumsinsel 1, Munich, 80538, Germany

k.preller@deutsches-museum.de

Keywords: ***Acoustics, Helmholtz, Musical Instruments, Steinway & Sons***

Abstract

Recent approaches to organology – the study of musical instruments – have pointed out the common features and practices of scientific and musical instruments. For his groundbreaking theory "On the Sensations of Tone", Hermann von Helmholtz made equal use of these two types of artifacts. In doing so the boundary between "ordinary" musical instruments and measuring tools becomes blurred. Resonators, double sirens or the newly-developed apparatus for the synthesis of sound enabled Helmholtz and his readers to examine controversial phenomena such as combination tones as well as the "tone color" (Klangfarbe) of musical instruments or the human voice. Helmholtz had gained a broad knowledge about music by engaging himself in issues of tuning systems as well as playing and building instruments. It is therefore no surprise that he chose a representative of both disciplines - the acoustician and trained violin-maker Rudolph Koenig - to build his devices for the most part.

The new 19th-century knowledge about acoustics also provided musical instrument making with a scientific fundation. On this basis, for example, Steinway & Sons made some

significant developments towards the modern piano. They claimed to have learned so much from Helmholtz's theory that they expressed their gratitude by giving him three pianos, successively, as presents. The first of these is now located at Deutsches Museum in Munich. It is equipped with an early version of the so-called duplex scale, which is closely linked to Helmholtz's acoustical findings. This innovatiion adds certain overtones to the piano's upper notes and was developed by means of Helmholtz's resonators.

Short biography and research interests

Katharina Preller is a Ph.D. candidate in musicology at LMU Munich and member of Dr. Rebecca Wolf's research group "The Materiality of Musical Instruments" at the Deutsches Museum. Her dissertation examines the impact of acoustics research on musical instrument making from the late eighteenth century to around 1900.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

FRAMING THE DEVICE: PHOTOGRAPHY AND SCIENTIFIC INSTRUMENTS

Pedro M. P. Raposo

Adler Planetarium, 1300 South Lake Shore Drive, 60605 Chicago, IL, USA

praposo@adlerplanetarium.org

Keywords: *Photography, Adler Planetarium, Roderick and Marjorie Webster, curatorial work, photographic archives*

Abstract

The Adler Planetarium has recently catalogued a wealth of photographs produced from the 1960s through the 1980s by the well-known curators and benefactors Marjorie Webster (1915-2011) and Roderick Webster (1915-1997). The Webster Photographs, as they are known in the Adler community, cover a wide array of scientific instruments in collections all over the world, as well as several exhibitions, scholarly meetings, and cultural events. This paper is a first attempt to situate the Webster Photographs in a broader picture of the historical relation between scientific instruments and photographic practice. I will begin by addressing the role of photography in designing, trading, using, and refiguring scientific instruments. Then I will analyse how photography was incorporated into the practices of collecting, curating, documenting, and publicly displaying the material culture of science. Finally, I will provide an overview of the Webster Photographs, and discuss the relevance of this photographic collection to Adler staff, to the SIC community, and to the museum and research communities at large.

Short biography and research interests

Pedro M. P. Raposo is a curator at the Adler Planetarium in Chicago, where he oversees a world-class collection of astronomical instruments, prints, and rare books. He curated the award-winning exhibition ‘What is a Planet?’ (Adler Planetarium, 2016-2018) and is currently working with the Adler team on a new exhibition about public engagement with the night sky. His current research interests include the history of visual and mechanical representations of the solar system, tridimensional thinking in astronomical imagery, and the history of optical planetaria.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Patrick Copland's Apparatus: "*generally considered as superior to any in Britain*"

John S. Reid

Department of Physics, Meston Building, King's College, University of Aberdeen, AB24 2UE, Scotland

j.s.reid@abdn.ac.uk

Keywords: ***University collection, 18th century, public classes, Patrick Copland***

Abstract

Patrick Copland was a Professor at the University of Marischal College, Aberdeen from 1775 to 1822. His passion for the applications of Natural Philosophy took him in several directions. Teaching by demonstration was one and he raised his hobby of 'making things' to the standards of a skilful professional instrument maker. Over the years he expanded his apparatus by various means to cover the full range of natural philosophy teaching. Among his achievements he raised enough money by public subscription to build a well-endowed astronomical observatory. He was also passionate about the public engagement of science, as it's now called, and in providing mechanics and artisans with an insight into the science behind the innovations of the day. Well before any comparable courses existed in England, from 1785 Copland set up and gave a biennial evening course of 70 lectures for mechanics and other interested members of the public. His demonstration instruments were a key feature of that course. This talk discusses the background to Copland's work and will examine aspects of his instrument collection including the inventories of his collection and the provenance of his bought-in instruments. It will also

comment on the reaction of contemporaries to his instruments and his teaching, and the sequel after his death.

Short biography and research interests

John S. Reid is a retired Head of Physics who has been for many years Honorary Curator of the ‘Natural Philosophy Collection of Scientific Instruments’ possessed by the University of Aberdeen. He has taught a wide range of physics subjects and published papers on theoretical, computational and practical physics as well as the history of physics. He is currently cataloguing his University’s scientific instrument collection.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium

Leiden/Haarlem, 3-7 September 2018

Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

THE MUSSCHENBROEK AIR PUMP OF LANDGRAVE CARL OF KASSEL

F. RIESS[a], K. GAULKE[b], W. ENGELS[c]

[a]CvO University, PO Box 2503, Oldenburg, D-26111, Germany
[b]Astronomisch-Physikalisches Kabinett, An der Karlsaue 20 a, D-34121 Kassel, Germany
[c]HistEx GmbH, Marie-Curie-Straße 1, Oldenburg, D-26129, Germany

falk.riess@uni-oldenburg.de

Keywords: Air pump, van Musschenbroek, replica, experiments

Abstract

In 1685, Landgrave Carl of Hesse-Kassel bought an air pump from the Musschenbroek workshop in Leiden. He was an admirer of the sciences and collected numerous scientific instruments for his collection at the Collegium Carolinum in Kassel. The pump is one of the earliest surviving products from the Musschenbroek workshop as well as being a particularly early pump with an inclined cylinder. To enable the production of a working replica of the pump for demonstration purposes in the Astronomisch-Physikalisches Kabinett in Kassel we took the opportunity to examine the air pump closely and to compare it with other pumps from the same period. The similarities and several differences which we uncovered among contemporary pumping devices, as well as some special features of the Kassel pump, revealed information about its "biography." Several additions and modifications have convinced us that the pump originally was delivered without the extant table. We have concluded that it was modified later in order to facilitate compression experiments, in that a structure was added to press the vacuum chamber

onto its plate; in fact, for physical reasons, a much more stable construction is required for the investigation of compression phenomena. Doubts about the common explanation for the inclination of the cylinder arose from the re-enactment of working with the pump. Suspected reasons for special construction details will be exemplified. While the talk will give some answers based on new material findings, much room remains for further investigation.

Short biography and research interests

F.R.: Born in 1944, studies in physics, philosophy, and pedagogy (TU of Darmstadt). From 1974 to 2009 lecturer and professor for physics education and history of physics, University of Oldenburg. Main research fields: history of experimentation and experiments, historical instruments in physics, use of historical content in physics education and teaching. Consulting and collaboration for HistEx, Oldenburg.

K.G.: Chief curator, Astronomisch-Physikalisches Kabinett, Kassel, and head of the Kassel Planetarium Born in 1968, studied history and history of the natural sciences and technology at Stuttgart University. Main interests in research: history of early modern astronomy and physics.

W.E.: Born in 1956, studies in engineering, physics, and history of science (TU Hannover and University of Oldenburg). Research associate at physics department, University of Oldenburg. Main research fields: history and instruments of science, re-enactment of historical experiments, construction and engineering. CEO of HistEx GmbH, Oldenburg.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Seismographs on Show

Alexandra Rose

Science Museum, Exhibition Road, London, SW7 2DD, UK

alexandra.rose@sciencemuseum.ac.uk

Keywords: ***seismograph, seismology, working object, museum display***

Abstract

'The seismograph will certainly add materially to our present exciting display of working instruments, especially as its unique movements will be caused by natural forces and not by the ubiquitous push-button.'

R. W. Plenderleith, 1959

Displays of working objects are commonplace in science museums, but, as the above quote from a curator of the Royal Scottish Museum suggests, working seismographs promise something quite unusual. Not requiring major modifications in order to 'perform' on demand, they provide museum visitors with a genuine glimpse of distant earth movements.

Or do they?

This paper outlines some preliminary work on seismographs operating in public places. It particularly focusses on a horizontal pendulum instrument made by British seismologist John Johnson Shaw, which was exhibited in London's Science Museum from 1935 until

2008. Museum records reveal the tensions that existed between the seismograph's dual role both as a precision instrument and a public exhibit. These tensions were continually renegotiated throughout the instrument's lifetime as the Museum's expectation of its working instrument shifted, and the discipline of seismology underwent dramatic changes in scale, scope and methods.

While instrumental seismology may have improved understanding of earth's structure and movements, earthquakes remain deadly and resistant to prediction and control – meaning seismographs provide a peculiar perspective on the conference theme of 'Instruments and the "Empire of Man over Things"'.

Short biography and research interests

Alexandra Rose is Curator of Earth Sciences at the Science Museum, London, and lead curator of a forthcoming gallery, *London: Science City 1600-1800*. She has recently begun a PhD on the history of seismological instruments in the 19th and 20th centuries.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

ASHADHAR, THE TIBETAN PRIEST'S TIME-STICK: A COMEDY OF ERRORS IN NOMENCLATURE

Sreeramula Rajeswara Sarma

Independent Scholar, Höhenstrasse 28, 40227 Düsseldorf, Germany

SR@sarma.de

Keywords: ***Column Dial, Ashadar Stick, Time-Stick***

Abstract

In the horological exhibition held at Berlin in 1898, a professor of engineering exhibited a wooden column dial which, he claimed, "was purchased from a pilgrim on the road leading through the Himalayas to Benares". He added that the name of this column dial was "Ashadah, after the month of the same name—from middle of June to middle of July—during which the pilgrimages to Benares are chiefly commenced," and that it was about two thousand years old because the name of the solar month *Āśvina* was transcribed as *Arimana,* which — being the name of the Old-Persian evil spirit Ahriman — attests to the time when the influence of the Old Persian on Sanskrit was clearly noticeable.

There are several specimens in the museums in UK which are quite similar to the one exhibited in Berlin and these are now labelled as "Ashadar Sticks". Because the Berlin piece was said to have been purchased from a pilgrim coming through the Himalayas, it was thought that the pilgrim was a Tibetan priest. A noted historian of science even found slight Tibetan influence in the numerals carved on the instrument.

All this is sheer nonsense. The column dial has never been called *Āṣāḍha* in Sanskrit, nor is the hot summer month of this name the time when Indians or Tibetans undertook pilgrimages to Benares.

This paper aims to clear these misconceptions about this column dial and to discuss its exact nature and correct nomenclature.

Short biography and research interests

Sreeramula Rajeswara Sarma was formerly Professor of Sanskrit at Aligarh Muslim University in India. His research interests include Sanskrit texts on mathematics, astronomy and astronomical instruments. He has recently completed *A Descriptive Catalogue of Indian Astronomical Instruments* which is available online and which, in some 4300 pages, contains 600 entries, introductory essays on each category of instruments and long extracts from two important Sanskrit texts.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Fall of Aristotle or Rise of Archimedes? – How did optical instrument makers in London present objects and their workshops to buyers?

Joshua Scarlett

Science Museum, Exhibition Road, London, United Kingdom
University of York, York, United Kingdom

Jas611@york.ac.uk

Keywords: ***London, Telescopes, Micoscopes, Trade***

Abstract

Using the collections of late seventeenth century trade cards in the London Science Museum archives, this paper will explain how optical instrument makers in late 17th century London presented themselves, their instruments, their businesses and ultimately persuaded potential customers to buy these objects. Optical instrument makers including John Yarwell, his famous rival John Marshall, Thomas McIntosh and Edmund Culpepper, all used trade cards as part of their transactions within their workshops. This paper will argue that trade cards were dedicated marks of transaction, objects that also doubled as handbills, invoices, receipts, and souvenirs, at a time when shopping for luxury objects such as scientific instruments was becoming increasingly fashionable.

Unlike advertisements in newspapers and periodicals, trade cards also included visual depictions of the instruments for sale and the shop signs of their makers. A few of these early trade cards survive; long considered ephemeral print, they acted as objects

themselves. Intriguingly, the trade cards all used a similar shop sign: that of the ancient Greek mathematician Archimedes, who is depicted by each maker using a telescope as part of their shop sign. Building on earlier research by Bryden and Simms, this paper will ask the question: why was the ancient figure of Archimedes favoured at all? Does this fly in the face of adversity to the historiographical concepts of the Scientific Revolution and the fall of the ancient writers? Or was it all a simple case of one man's successful workshop being copied by his rivals?

Short biography and research interests

Joshua Scarlett is a Collaborative Doctoral student with the Science Museum, London and the University of York. His thesis is entitled 'Instruments and their Makers: a study of experiment, collaboration and identity in seventeenth century London' and uses the objects in the Science Museum collections to uncover the network in and around the early Royal Society. Joshua is a graduate of the University of St Andrews (MLitt, 2015) and University of Warwick (BA Hons, 2012).

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

Electric motors and lightning rods in colonial Calcutta

Simon Schaffer

Department of History and Philosophy of Science, University of Cambridge, Free School Lane, Cambridge CB2 3RH, England

sjs16@cam.ac.uk

Keywords: *electric motor, lightning rod, colonial science, battery, India, Faraday*

Abstract

William O'Shaughnessy, medical chemist and electrical experimenter, is well known for his involvement in the introduction of the electric telegraph to British India in the 1850s. In his initial period of residence in India during the decade following 1835, he was involved in a number of significant controversies and practical demonstrations in Calcutta about the working and efficiency of a range of electrical devices, notably types of novel electric motors, and the use of varying designs of lightning rods to defend military arsenals in time of storm. These instrument designs and the colonial debates that raged around them in part depended on different judgments about differences between how such devices worked in tropical and in European conditions. It was never clear whether seemingly authoritative trials in London were relevant to the conduct of electrical equipment and its practical deployment in Calcutta. Such disputes about electrical hardware reveal major issues involved in the making and use of scientific equipment as tools for practical and administrative control in nineteenth-century imperial networks.

Short biography and research interests

Simon Schaffer is Professor of History of Science at the University of Cambridge. He recently published on the use of astronomical instruments in the south Pacific (2016) and on the role of measurement standards in nineteenth century colonial sciences in Egypt and India (2017). He is co-editor of a forthcoming collection (2019) of papers on nineteenth century survey sciences.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Paper Dolls & Wonder Women of Astronomy

S.J. Schechner

Collection of Historical Scientific Instruments, Harvard University, Science Center 251c, 1 Oxford Street, Cambridge, MA 02138, USA

schechn@fas.harvard.edu

Keywords: *astronomy, gender, art, popular culture*

Abstract

Female figures holding, using, and posing alongside astronomical instruments appear in woodcuts and paintings, photographs, greeting cards, and advertisements. In some cases the woman represents an artistic interpretation of the muse of Astronomy or is a character in an allegory of sight. Sometimes she is a cultural stereotype of an astronomical observer; in other cases, the image shows a real observatory worker or astronomer. By means of a few chosen examples, this paper will selectively examine the iconography of women with astronomical instruments from the sixteenth through the twentieth centuries, exploring changing attitudes over time towards women as scientists.

Short biography and research interests

Sara J. Schechner is the David P. Wheatland Curator of the Collection of Historical Scientific Instruments, Harvard University and 2018 recipient of the LeRoy E. Doggett Prize for Historical Astronomy of the American Astronomical Society. She is the author of

Sundials and Time Finding Instruments: Hour Angle Dials (Adler Planetarium, in press). Recent research includes an analysis of a 17th century painting, *The Astronomers*, in the Palazzo Spada, Rome.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Sound Detection Instruments During the First World War (France and Italy)

Martina SCHIAVON

Archives Henri-Poincaré/Philosophie et Recherches sur les sciences et les technologies (UMR 7117 CNRS Université de Lorraine), 91 avenue de la Libération - BP 454. F-54001 NANCY Cedex, FRANCE

martina.schiavon@univ-lorraine.fr

Keywords: ***First World War, Sound detection, fonotelemetro, Cotton-Weiss***

Abstract

During the First World War, new engines and new ways to conduct war appeared. Crucial among these was the "special detection" of enemy batteries or the determination by sound of the position on a map of shooting artillery. Taking into account the filiation of instruments with pre-war geodetic work and actors, his talk will consider some instruments employed in the French and Italian frontlines, including the fluxmeter Emile Grassot employed in the French Cotton-Weiss detection and some chronographs or *fonotelemetro* as it was called in Italy.

My aim is to contextually reconstruct what I call the *faires* or the collective interaction of actors working on the ground in sound detection. Examining the "transfer" of a French instrument to the Italian front, I'll focus on the logic of the military use of a sound instrument: how it works on specific ground and with given personnel; how the data were used in a coordination service created to daily check the frontlines or in the description of a specific ground; the codevelopment between the study of an instrument and of the theory

of propagation of sound; and the uses of the instrument to correct maps and improve ground surveys.

Short biography and research interests

Martina Schiavon is Maître de conférences à l'Université de Lorraine (AHP-PRST). She is currently coordinating an ANR-project on the Bureau des longitudes (1795-1932). Her works include: *Itinéraires de la précision. Géodésiens, artilleurs, savants et fabricants d'instruments de précision en France, 1870-1930,* PUN-Edulor (2014); ''Phonotelemetry: sound-ranging techniques in World-War'', *Lettera Matematica International Edition, 27-41, 2015 ;* ''The Bureau des Longitudes: An Institutional Study'', in Dunn&Higgitt (Eds.) *Navigational Enterprises in Europe and Its Empires, 1730-1850,* Palgrave-MacMillan (2016).

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

By the power of steam or magic – steam engines and perpetual motion-machines at the court of Kassel

Bjoern Schirmeier

Museumslandschaft Hessen Kassel, Postfach 410 420, 34066 Kassel, Germany

nienesch@googlemail.com

Keywords: ***water works, steam engine, perpetual motion, physics teaching***

Abstract

Around 1700 Landgrave Carl of Hesse-Kassel showed a keen interest in steam pumps, steam engines and other means of providing power to machinery. Already housing four steam engines by 1721, Carl's capital was an important place on the Continent for experiments on these new types of engines. The landgrave invited not only Denis Papin to Kassel to construct a steam pump for water transportation, but also one of the most famous "inventors" of perpetual-motion machines in the early 1700s, Johann Ernst Elias Bessler, better known as "Orffyreus." Carl's support of Offyreus was grounded on his desire for new types of engines to provide power for water works in his parks as well as for the draining of mining shafts. The case of perpetual motion had not yet been closed, which may explain why eminent natural philosophers like Willem Jacob 's Gravesande travelled to Kassel to investigate Orffyreus' claim's to have created a perpetual-motion device. Gravesande's report to Isaac Newton as well as other surviving reports to, for example John Desaguliers, underscore the great international interest in developments in Kassel.

Although nothing of these engines seem to have survived, other objects show their impact on the teaching of physics at the Collegium Carolinum in Kassel, an attempt by Carl to found a very early version of a polytechnic school.

Short biography and research interests

Bjoern Schirmeier is a curator specializing in early-modern instrument history. He recently was part of a curatorial team that realized a large exhibition about Landgrave Carl of Hesse-Kassel named “Groß Gedacht! Groß Gemacht? – Landgraf Carl in Hessen und Europa.” The exhibition encompassed art history, political history and history of science, especially as Carl bought a large collection of scientific instruments, of which many have survived until today and were shown in this exhibition.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Talk of the town - a case study of the public experimentalist Peter Joseph Reuter in Braunschweig

Bernd Scholze

Otto-Beck-Strasse 13, 64625 Bensheim-Auerbach, Germany

scholze-b@t-online.de

Keywords: ***Experimentalist, Peter Joseph Reuter, local makers***

Abstract

Interest in experiencing physical experiments in the 18th-century society went well beyond the walls of the universities. The desire on the part of a broader urban population to encounter and engage with the new knowledge was often met by travelling experimentalists.

Using the example of Peter Joseph Reuter (active 1753 - 1767), I will show how his two-month stay in the Lower Saxon city of Braunschweig influenced the perception of physical instruments there.

As Reuter's public physical lectures could not cover his living expenses, the sale of instruments proved to be an important part of his income. A rare surviving catalogue published by him reveals both the instruments he sold and his demonstration programme. The range of instruments suggests all sort of customers, from chandeliers for the upper class to coach-lights for a coachman.

Reuter's presence in the city left lasting traces. In fact, it is possible to document a change in consciousness among his viewers and buyers, for after his arrival they not only wanted to witness the use of an instrument passively, but also to be informed about the fundamental physical principles underlying its use and the demonstrations they have seen. In particular, the local instrument maker Dieter Christoph Ehrhardt, employed part-time as a lecturer for glass grinding at the Collegio Carolino, felt the pressure; soon after Reuter arrived in town, he opened his workshop for people interested in instruments.

The paper describes an interplay between the experimentalist, who gave public demonstrations to earn his livelihood, and the urban society, which through these public experiments developed an appreciation for applied physics.

Short biography and research interests

Bernd Scholze has developed a passionate interest in the Magic Lantern over the past decade, searching for previously unknown primary sources, both written and instrumental. His main interest is the emerge of the magic lantern in the 17th century. He leads the German operation of a Stoke-on-Trent based pottery company.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

THE BIRTH OF 3-DIMENSIONAL MICROSCOPY: CONCEPTION AND DEVELOPMENT BETWEEN INSTITUTIONAL BOUNDARIES

Anna Simon-Stickley

a.sim.stick@gmail.com

Keywords: *3D, Microscopy*

Abstract

In 1892 a little known American zoologist, Horatio S Greenough, wrote to the head of the world's leading manufacturer of optical lenses, Dr. Ernst Abbe of Zeiss AG in Jena, Germany. Self-confidently Greenough proposed a detailed optical scheme for a microscope that would suit his needs and enable a 3-dimensional, upright vision when working with his specimens. He was lucky.vThe microscope was built and became the first commercially successful stereoscopic microscope, whose design is still employed today.

In this paper I will examine the correspondence between Greenough and the Zeiss directors and identify the historical prerequisites that stimulated the development of the stereoscopic binocular microscope. Why did Greenough, as an experimental embryologist, design this microscope? Why did Zeiss accept the plan? What technical, scientific and philosophical problems did the stereoscopic microscope solve? And finally, how could the institutional interactions between an instrument-making firm and a techno-scientific polymath be sociologically modelled in order to better understand the dynamics between

science and technology in 19th century Germany … and to draw conclusions for contemporary cooperation between these enterprises?

Short biography and research interests

After writing her bachelor thesis on how the anthopocene may overcome boundaries between art and science, Anna Simon-Stickley found herself more drawn to the History of Science than the History of Art. Combining the two, her special focus has been scientific imagery and instruments involved in expanding the realm of the visual.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

REVIVING TEYLERS' HISTORY WITH THE WORKING REPLICA OF VAN MARUM'S "ONGEMEEN GROOTE ELECTRIZEER-MACHINE" AND OTHER ELECTRICAL INSTRUMENTS

T.M. van der Spek

Teylers Museum, Spaarne 16, 2011 CH, Haarlem, The Netherlands

tvanderspek@teylersmuseum.nl

Keywords: ***working replica's, electricity, institutional history, public engagement, education***

Abstract

Teylers Museum recently opened its Lorentz Lab, where the history of the Museum as a research institute and laboratory is presented. A fully operative replica of Van Marum's ongemeen groote electrizeer-machine – the biggest friction machine ever – has been made for this lab, as well as many smaller working replicas of electrical instruments, mostly from the Teylers Museum's collection.

The Lorentz Lab is situated in the original Teylers' laboratory for physics and chemistry, a research facility initiated by Martinus van Marum in 1791 that ran until 1955. The new public experience is named after its most famous 20th century director, Nobel Prize winner and Einstein's mentor, Hendrik Anton Lorentz.

This paper describes the making of the Lorentz Lab and particularly the working replicas within it and gives an insight into the aims, issues, challenges, disappointments and

triumphs of using replicas to engage different audiences, in more active ways, with Teylers' scientific history.

Short biography and research interests

Trienke van der Spek is chief curator of the scientific collections and head of the science department at Teylers Museum, Haarlem. She is collections advisor at Nemo Science Museum of Amsterdam and previously worked at the Rijksmuseum Boerhaave in Leiden as curator and head of collections.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium

Leiden/Haarlem, 3-7 September 2018

Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

How Ideas Travelled Around 1800, as Exemplified by Atwood Machines

C. M. Splettsen

Goethe-University, Theodor-W.-Adorno-Platz 1, Frankfurt am Main, 60323, Germany

Convin.splettsen@gmx.de

Keywords: ***Atwood machines, material culture, travelling of ideas, 1800***

Abstract

This talk will focus on early Atwood machines. It will start with a machine made in Bavaria by Johan Anton Wisnpaintner in 1795, that I will carefully analyze. A comparison of designs and constructions of the earliest known Atwood machines by London and Italian makers will follow. The talk will also consider George Adams and his Atwood machine now in the Tylers Museum. From these early exemplars, I want to consider how ideas travelled around 1800. Did only the diagram published in 1784 by Atwood travel or were physical machines themselves also involved in traveling?

Short biography and research interests

Convin Splettsen is a bachelor student of history, ethnology and history of science at the University in Frankfurt. His research interests include astrolabes and material culture. At the moment he is working with Petra Schmidl on an article about astrolabe #0101 (King's inventory) and under the supervision of Fabian Link and Roland Färber is working on an article about "Hans Schrader and the classical archaeology at the Goethe-University".

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

SIC

From ‚Material Culture' to ‚Maker Cultures'

Klaus B Staubermann

ICOM Deutschland, In der Halde 1, Berlin, 14195, Germany

staubermann@icom-deutschland.de

Keywords: ***Scientific Instruments, The End, Or Not?***

Abstract

This pitch argues that we have seen, during the past decades, a very successful embedding of scientific instruments in the history of science. However, the history of science is a living and working discipline that itself changes over time. Themes that mattered one or two generations ago might not be relevant anymore to debates today. Most recently, we are observing a shift from what became called "material culture" to a more concise concept of a "maker culture". I argue that this recent approach resonates well with broader heritage bodies such as ICOM or UNESCO and thereby could prove useful for the future development of SIC both within academia and the heritage sector.

Short biography and research interests

Klaus Staubermann trained as a historian of science before becoming a scientific instrument curator and museum professional. Today, he is the CEO of ICOM, Germany. He is attending the SIC 2018 conference as part of research collaboration with the University of Gothenburg, Sweden, and in memory of the late Inga Elmqvist.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

Athanasius Kircher's *Organum Mathematicum*:
A Compendium for Combinatory Practical Knowledge

Giorgio Strano

Museo Galileo: Institute and Museum of the History of Science
Piazza dei Giudici 1, 50122 Firenze, Italy

g.strano@museogalileo.it

Keywords: *Atanasius Kircher, Mathematics, Art of Memory, Knowledge Control*

Abstract

The interests of Athanasius Kircher (1602-1680) included theology, philology, astronomy and astrology, natural history, geology, volcanology, acoustics, music, mathematics, Egyptology and Sinology, geography, steganography, and many others. Such an encyclopedic knowledge required mnemonic techniques in order to preserve the many acquired notions and to retrieve them when needed. The Jesuits might rely upon a long-lasting tradition in mnemonics, initiated by Matteo Ricci and his adoption of the "palace of the memory" technique, and reinforced by the notionism of the Jesuitical education. In Kircher's hand, the "art of the memory" merged with the typical religiously-grounded concept of a progress/evolution by hybridization and/or degeneration. Just as the many plants and animals inhabiting the world derived from the recombination of the few species which Noah saved from the universal flood, any field of knowledge is conceivable as the recombination of basic and essential notions. The *Organum mathematicum* represents the

most outstanding example of Kircher's idea. Only very few exemplars of the *Organum* have survived (at the Museo Galileo in Florence, the Národní Technické Muzeum in Prague, and the Bayerisches Nationalmuseum in München). Two of them are so close in resemblance that, very likely, they were made by the same craftsman. Both contain nine series of sticks, each one representing the basic data of a specific discipline. By recombining the sticks, the user of the *Organon* may perform, even without any specific knowledge, a wide array of operations in the fields of arithmetic, geometry, fortifications, chronology, time keeping, astronomy, astrology, steganography and music.

Short biography and research interests

Giorgio Strano is curator of the collections at the *Museo Galileo* of Florence. He is involved in the studies and popularization of the history of astronomy. He has published articles in international journals and has collaborated in the curating of exhibitions on the history of astronomy and science. He is general editor of the series *Scientific Instruments and Collections* (Brill, NL).

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

A 1573 Treatise by Olbrycht Strumienski: The First Polish Book on Hydro-Engineering

M.Taborska

Jagiellonian University Museum, 15, Jagiellonska str, Krakow, 30-559, Poland

malgorzata.taborska@uj.edu.pl

Keywords: ***technical literature, geodesy, hydroengineering, water works***

Abstract

Olbrycht Strumieński's *O sprawie, sypaniu, wymierzaniu i rybieniu stawów* [*About managing, building, measuring and stocking of fish ponds*], published in 1573, is the oldest Polish manual on hydro-engineering. In this original work, the author draws on his own experience to describe both tools and techniques for building and conserving ponds, dykes and waterways. The descriptions include many practical suggestions about measurement, engineering and technology used in hydro-engineering. In the following centuries, the treatise was repeatedly copied and republished, sometimes under other authors' names; it was even referenced in the 19th century. The development of the instruments described by Strumienski and his hydro-engineering techniques will be closely examined to see whether the later editions took technological progress into consideration. The described tools were used for leveling areas and for preparing water installations. The instruments used by Strumieński's instruments will be compared with leveling devices used in the next centuries in Poland.

Short biography and research interests

Dr Malgorzata Taborskais is a biologist and surveyor and since 2006 has been a curator at the Jagiellonian University Museum in Cracow. She supervises the collection of globes, clocks, sundials, watches as well as surveying, cartographical and meteorological instruments and biological laboratory equipment. She is interested in the history of science, especially of the natural sciences and geodesy.

Her research topics include Polish-language globes, history of geography at the Jagiellonian University, history of surveying in Poland, and history of biology in Poland.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

A FAILURE, AN ICON, OR BEYOND?

S. Talas

Museum of the History of Physics, University of Padua, via Marzolo 8, 35131 Padua, Italy

sofia.talas@unipd.it

Keywords: ***Cloud chamber, cosmic-ray researches, WWII aftermath***

Abstract

In the years 1936-1937, Bruno Rossi, one of the pioneers of cosmic-ray research, planned and had built the new building of Padua University Institute of Physics, fully equipped with cutting-edge scientific equipment. A short time later, in 1938, he was forced to leave Italy due to the fascist racial laws, then World War II almost totally stopped physics research in Padua.

This paper will focus on one of Rossi's instruments, a cloud chamber, that was only used after the war, when it was already quite obsolete. No significant scientific results were actually obtained with it.

We will discuss the way this instrument should be regarded today. Should we simply consider it as a failure or as an iconic object linked to Rossi's name? By further examining the situation of post-war Padua Institute of Physics, we will see that another possible view about this cloud chamber may emerge.

Short biography and research interests

Sofia Talas is curator of the Museum of the History of Physics at the University of Padua. Her main research interests are in the history of scientific instruments and the history of physics from the 18th to the 20th century.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

The Abstract Submission Form

Where did the hands go?

Jan Tapdrup

Hauchs Physiske Cabinet, Sorø Akademy, Søgade 17, Postbox 37, 4180 Sorø, Denmark

jan.tapdrup@gmail.com

Keywords: ***18C, Art, Science, Cabinets***

Abstract

The plates that accompany 18th-century books on experimental philosophy undoubtedly play an essential role in these imprints. First, visualisation facilitates the understanding of the experiments described. In fact, one could argue that images are essential for grasping of the subject matter. Second, books like Nollet's *L'Art des expériences* (1770) were intended to enable the reader to construct the instruments described. This would surely be impossible without the illustrations. Third, the plates have a powerful visual impact which must have been a great selling point for the books, thereby contributing to the proliferation of natural philosophy among wider audiences.

Some of the books like Nolle's *Leçons de physique expérimentale* (1743-64) present the instruments in a staged, quite theatrical manner. The instruments are presented as resting, for instance, on tables, pedestals and stools and are sometimes even accompanied by young damsels. Other books like Gravesande's *Physices elementa mathematica, experimentis confirmata* (1720-21) and *A Course of Experimental Philosophy* (1734) are more austere and technically oriented and the instruments are illustrated in a

decontextualised manner as if floating in mid-air absent all décor. One element we see in Nollet's books and in other works are severed hands pointing, showing, holding instruments or experiments. But they later disappear and definitely go out of fashion in the late 19th century. This paper traces the history of these hands. When did they first appear in such illustrations? What were their functions and where did the eventually go?

Short biography and research interests

Jan Tapdrup holds four university degrees one of which is an M.Sc. in History of Science: Instruments, Museums, Science and Technology. Tapdrup's most recent full-time job was as director of MUSE®UM/Museum Salling. He is currently working as a consultant for Hauch's Physiske Cabinet in Sorø, Denmark. His research interests include general history of instruments, science and technology, disciplinary change and development, as well as 18C studies.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium

Leiden/Haarlem, 3-7 September 2018

Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Recent Scientific Heritage: Reflections on Documenting and Displaing a He-Ne Laser

M. Teixeira

National Museum of Natural History and Science, University of Lisbon, Rua da Escola Politécnica 56, Lisboa, 1250-102, Portugal

miguelteixeira@outlook.pt

Keywords: ***Recent scientific heritage, material culture, exhibition***

Abstract

Recent scholarship has drawn attention to the challenges of preserving, studying and displaying recent heritage of science. In 2016, the Deutsches Museum in Munich accessioned a 1960-70s He-Ne laser that came from one of its workshops. The device was produced by Spectra Physics in the USA and was the first low-power He-Ne laser to be mass-produced using components originating from the manufacturer. I came across the laser during a recent Seminar on the Material Culture of Physics at the Deutsches Museum. Its provenance and history in the Museum workshop are largely unknown, although it is likely to have been used for precision alignment, instrument manufacturing or barcode scanning.

The laser has many of the challenging characteristics of recent heritage: delocalization, undocumented uses, lack of associated documentation, and physical opacity, among others. Moreover, the fact that this laser had a cycle of use in a museum workshop before

it was incorporated in the (same) museum collection, makes it a particularly interesting case. In this paper, I will use the Munich He-Ne laser as a point of departure to explore several issues of recent heritage of science in museums. I will particularly focus on possible public display narratives and approaches when documentation is lacking, and little is known about instruments' past cycles of use.

Short biography and research interests

Miguel Teixeira has background training in Geology. He is presently working toward a MSc in History and Philosophy of Science at the Faculty of Sciences, University of Lisbon. His project addresses a medical collection at the National Museum of Natural History and Science (University of Lisbon). His research interests include material culture, history of collections and scientific instruments.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

Arrival and Use of Electrical Instruments in Tartu Old Observatory

Kadri Tinn

University of Tartu Museum, Lossi 25, Tartu, 51003, Estonia

Kadri.Tinn@ut.ee

Keywords: ***astronomical instruments, electrical instruments, observatory***

Abstract

Electrical instruments have several uses in astronomy, whether it be during observations, such as in the case of electric clocks or chronographs; during the processing of photographic plates or other data gathered, such as for electrical microphotometers, or in communicating new discoveries.

The historical astronomy and mathematics collections of University of Tartu Museum contain several examples of instruments that possibly heralded the arrival of electricity in the day-to-day working of Tartu Old Observatory during its time as a scientific observatory. In this presentation first examples of these instruments are introduced, including a Hartmann type microphotometer designed and constructed locally by the observer Erich Schoenberg and the university mechanic B. Messer.

Short biography and research interests

Kadri Tinn is a curator of the astronomy and mathematics collection at University of Tartu Museum. Her research interests include the history of astronomy and the history of astronomical instruments.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Campbell-Stokes Sunshine Duration Recorder

L. Michael Trapasso

College Heights Weather Instrument Museum, Department of Geography and Geology
Western Kentucky University, Bowling Green, KY 42101 USA

michael.trapasso@wku.edu

Keywords: ***solar radiation, glass lens***

Abstract

It is an instrument with no moving parts. It records on paper without using ink. And it attracts the most attention from visitors to the College Heights Weather Instrument Museum. It is the Campbell – Stokes Sunshine Duration Recorder. Our younger visitors are drawn to the "crystal ball." Our adults wonder "what does that thing do?" In short, as the sun traverses the sky, the clear glass sphere acts as a lens to focus incoming solar radiation into a beam which can burn a trace across a paper data strip. The strip charts are specially treated to burn a trace without catching fire. In 1853, Campbell created the first design of this instrument, using a hollow glass sphere filled with water. It was placed in front of a semi-enclosed wooden box. By 1879, Campbell and Stokes created the design you see here and added the solid glass sphere. During its decades of use at the College Heights Weather Station (primarily a teaching laboratory) at Western Kentucky University, this device demonstrated to students the changes in length of day and timing of cloud obscuration. It was also involved in an observational study of the annular solar eclipse of 30 May 1984.

Short biography and research interests

Dr. L. Michael Trapasso is Professor Emeritus in the Department of Geography and Geology at Western Kentucky University. During his tenure, he was the Director of the College Heights Weather Station. Upon his retirement, he converted the inventory of meteorological instruments into the College Heights Weather Instrument Museum, of which he is curator. He is also an author, public speaker, consultant, and photographer. He continues his interest in the history of weather instrumentation.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

's Gravesande on force, Torricelli's principle, rivers

Jip van Besouw

Vrije Universiteit Brussel, LW, Pleinlaan 2, Brussels, 1050, Belgium

Jip.van.Besouw@vub.be

Keywords: ***'s Gravesande, Torricelli's principle, vis viva, river flows***

Abstract

Dutch state river management emerged in the mid-eighteenth century and relied heavily on the expertise of natural philosophers from Leiden University. Of those, Willem Jacob 's Gravesande (1688-1742) was one of the most important. 's Gravesande is of best known for his experimental work on the *vis-viva* controversy that haunted eighteenth-century mechanics. In his mechanical work, 's Gravesande had argued that the *force* of a body was to be measured in terms of the square of its velocity. This paper will show that 's Gravesande's understanding of water was closely related to his work on the *vis-viva* controversy.

Recent studies have shown that the conceptualisation of force in terms of *vis-viva* was linked to a correct understanding of specific machines and scientific instruments. Specifically, in this conceptualisation force could easily be expressed in terms of the height over which a body was transported by a machine. As such, force had an obvious analogy to Torricelli's principle, which states that the square of the velocity of water flowing out of a hole in a reservoir is as the height of the water above the hole.

This paper will examine two of ’s Gravesande’s scientific instruments that made use of Torricelli principle to measure the quantities, heights, distances, and forces of water spouting out of a water reservoir under various circumstances. I will finish by briefly pointing out how these concepts helped to understand the dynamics of river flows.

Short biography and research interests

Jip van Besouw is a post-doctoral researcher at the Vrije Universiteit Brussel. He earned his PhD with a dissertation on Willem Jacob ’s Gravesande’s scientific methodology. His research focuses on the methods and practices of eighteenth-century physics and natural philosophy and has a particular focus on the use of scientific instruments.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

Making Astronomy Attractive for the Public: Stephen A. Ionides, Author of *One Day Telleth Another,* Sundial Maker and Dreamer

George N. Vlahakis

Hellenic Open University, Aristotelous 18, 26335 Patras, Greece
Institute for Historical Research/ National Hellenic Research, VassileosKonstantinou 48, 11635 Athens, Greece

gvlachakis@eap.gr

Keywords: *Astronomy, popularization, sundials*

Abstract

Sometimes history is not generous to scientists who perhaps do not deserve to remain in oblivion. There are social, political and scientific reasons for why someone who has worked with passion and devotion in his field has been forgotten by the later generations. In our paper we aim to consider these reasons in a theoretical framework and to support our arguments taking as case study Stephen A. Ionides (1880-1943), an engineer and amateur astronomer of Greek origin who lived and worked in the United States of America. His work of the popularization of astronomy during the early 20th century had a great impact, especially in the USA, as we may see from the relevant sources. Furthermore, Ionides was a cosmopolitan, belonging to a very wealthy family which flourished in 19th-century Britain. Among his scientific achievements are a detailed study of medieval astronomical instruments and sundials. The wider public learned him through his popular book, *Stars and Men*, co-authored with his daughter Margaret. Despite these

achievements, Ionides never became known in his homeland and he still remains a rather obscure figure in the history of popularization of astronomy and the history of astronomical instruments. We shall consider some reasons why this happened and shall attempt to put our arguments in a theoretical context.

Short biography and research interests

George N. Vlahakis is Assistant Professor of History of Science and Philosophy in the Hellenic Open University in Patras, Greece, and a Fellow Researcher in the Institute of Historical Research / National Hellenic Research Foundation. He was a visiting scholar at the Max Planck Institute for the History of Science in Berlin and currently is secretary of History of Physics Group of the European Physical Society and President of the Commission for Science and Literature of DHST/IUHPST.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium

Leiden/Haarlem, 3-7 September 2018

Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Early digital-computer usage in Amsterdam for the Dutch Delta Commission

T.R. Walstra

University of Amsterdam, Science Park 904, Amsterdam, 1098 XH, Netherlands

t.r.walstra@uva.nl

Keywords: ***Delta Commission, ARRA, ARMAC, Mathematisch Centrum***

Abstract

After the disastrous flooding in the southwest of the Netherlands in February 1953, the Dutch government installed a "Delta Commission" in order to do fundamental research to prevent future floods and use this research as norm to build flood defences in the Netherlands. The commission asked a number of scientific institutes like KNMI (Meteorological Institute), Rijkswaterstaat (Dutch infrastructure), Mathematisch Centrum (Mathematical Center) and the Waterloopkundig Laboratorium (Hydraulic Laboratory) to report on considerations concerning storm surges and tidal movements and the design of dikes and dams.

The Matthematisch Centrum (MC) in Amsterdam was asked to develop mathematical prediction models for high tides and the effect of wind upon water levels of the North Sea. Although large parts of this research were theoretical, the MC also used their early digital computers ARRA, ARMAC and X1 for this task, as can be deduced from surviving institute documents.

After a short historic background on the earliest Dutch computers, which were developed at the MC in the 1950's, I will describe how these computers were used at the MC during their first programming tasks. I will discuss the early work on ARRA and ARMAC and work for the Haringvliet sluices in the late 1950's on the X1 computer.

Short biography and research interests

Taco Walstra is curator of the Computermuseum of the University of Amsterdam, which is part of the Special Collections of the University. He teaches computer science at the Informatics Institute of the University of Amsterdam and is software developer for scientific research projects. He holds a degree from Utrecht University.

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Built for Breaking: The Polar Research Vessel POLARSTERN

Martin P.M. Weiss

German Maritime Museum, Hans-Scharoun-Platz 1, Bremerhaven, 27580, Germany

weiss@dsm.museum

Keywords: Environment, Cold War, Shipbuilding

Abstract

For many years, a sign on the bridge of the German icebreaking research vessel POLARSTERN warned: "You have to live with the Arctic, not against it". This phrase is symbolic of how even the most advanced technology reaches its limits – and humankind along with it – in the extreme environment of the Earth's poles. And yet, throughout the Cold War, it was generally accepted that whichever of the two superpowers controlled these areas would hold a decisive edge over its competitor. This was thought to be the case not only in strategic terms (the shortest path between Russia and America crosses the Arctic), but also in economic terms (both the Arctic and Antarctica were considered rich in natural resources). These assumptions proved a catalyst for engineering and science, as the technology through which one hoped to control and colonize these remote und inhospitable areas, as well as to generate knowledge about them, needed to be developed and refined. One such area was shipbuilding. Not only naval vessels and tanker ships were built to resist the ice, but also research vessels. For historians of scientific

instruments, these vessels are interesting not onlyl because of the devices they carry but also because the ships themselves can be considered scientific instruments.

This paper will focus on the example of POLARSTERN, reconstructing its history from its conception in the late 1970s through its refitting at the turn of the millennium. It will focus on how this particular vessel's icebreaking capabilities were optimized. Moreover, it will ask whether the POLARSTERN qualifies as "research-technology" in Terry Shinn's sense of the term (Shinn 2008) and what its history teaches us about the role of instrumentation in science in the 20th century. The paper will also present some ideas on how this history is to be incorporated into a new permanent exhibition at the German Maritime Museum and what this can convey about the history of scientific instruments.

Short biography and research interests

Martin P.M. Weiss completed his PhD on the history of Teylers Museum at the University of Leiden in 2013. After working at the European Commission in Brussels and the Deutsches Museum in Munich, he is currently preparing a book and an exhibition on the history of German research vessels as a postdoctoral researcher at the German Maritime Museum in Bremerhaven. He also teaches history of science at the University of Brunswick.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

Instrumental Culture at the Royal Geographical Society, London 1830-1850

J.A. Wess

Independent Scholar, London

jane.a.wess@gmail.com

Keywords: Citizen's science, nineteenth century, scientific societies, field science

Abstract

The Royal Geographical Society was founded in London in 1830, one of several scientific societies to appear within a few years. One of the original aims was to procure a collection of instruments for the perusal of prospective travellers. However, this aim was neglected. Instead the Society acquired instruments for loan to its expeditions from 1834. The first two expeditions were well-provided for in the manner of 'Humboldtian' science, but this practice faltered in the lean decade of the 1840s, when the Society became parsimonious, only contributing the basic position and height-measuring instruments.

A study of these early expeditions to various parts of the globe demonstrates that the instrumental rhetoric was more important than actual instrumental engagement. While some travellers were adroit in observing and recording, others were not. The end result was superficially similar in that the publications were in the form of travelogues with instrumental data and maps appended in some cases but not others.

In 1850 the Society produced the first list of its instruments, largely acquired through donations by two prominent travellers. From that time the instruments and their

whereabouts on expeditions were recorded on an annual basis. The talk argues that the prominence of instruments in the aims of the Society, the provision of instruments to travellers, and the belief in the value of instrumental observations, was not matched by consistent actions. However, the instrumental rhetoric was consistent in the promotion of the Society as scientific.

Short biography and research interests

Dr. Jane Wess has recently completed a PhD with Edinburgh University in collaboration with the Royal Geographical Society in London, studying the role of instruments in exploration. Having worked on eighteenth century instruments she is now equally interested in nineteenth century developments. Her current concern is the application of mathematics to topics including longitude, projections, isomaps, and the four-colour theory. Behind this is a belief that mathematics was not ‘unreasonably effective’ in this period.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

From Subjective to Objective Measurement: The Electrification of Sound Recording during World War I

Roland Wittje

Department of Humanities and Social Sciences, IIT Madras
Chennai 600 036, India

roland.wittje@gmail.com

Keywords: ***Sound measurement, World War I, microphone***

Abstract

World War I reconfigured acoustics as a scientific field. Acousticians turned from music as high culture to the complex sounds of the battlefield. Acoustic knowledge and technologies became important for the sound location of artillery and aircraft and the detection of U-boats. In the transition, sound measurement became increasingly electrified.

In my presentation I will discuss the meaning of "objective sound measurement" and how it relates to the development of microphones and recording apparatus. The Tucker hot wire microphone in combination with the Bull automated recording apparatus facilitated the transition from subjective to objective sound measurement, eliminating the human ear from the measurement process. Submarine warfare led to the development of resonant and non-resonant hydrophones for sound signaling and to locate enemy vessels. Radio tube amplifiers became available with small wireless radio transmitters and were used to amplify the faint acoustics signals from the sea. Nose generated by the microphones and the electric circuit, however, set limits to electric sound amplification. Neither the Tucker hot wire microphone nor the hydrophones were supposed to record "all sounds that were

out there” but were designed to be highly selective. Interestingly, the development of both objective sound measurement and the use of radio tube amplifiers for sound amplification show striking similarities in the methods that all the belligerents of World War I employed.

Short biography and research interests

Roland Wittje is Associate Professor of the History of Science and Technology at the Indian Institute of Technology Madras. His research interests include history of the physical sciences and engineering in the nineteenth and twentieth century, scientific instruments, university collections, scientific practice, and science and engineering education. His publications include *The Age of Electroacoustics* (MIT Press 2016).

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form
Public Science In 18th-Century Poland

E. Wyka

Institute for the History of Science Polish Academy of Sciences, Nowy Świat 72, Warsaw 00-001, Poland
Jagiellonian University Museum, Jagiellonska 15, Cracow, 31-007, Poland

ewawyka@gmail.com

Keywords: ***public lectures in Poland, 18th century science, Grodno's Dominicans, physics cabinet***

Abstract

Despite being on the periphery of developments in European science, eighteenth-century Poland gradually adopted modern scientific trends. Imported by teachers at schools run by the Jesuits or the Piarists Orders, the new achievements of experimental physics were popularized via public lectures and demonstrations. Such public lectures in Poland are first recorded in the 1750s. They were open to a broad audience and took place annually in the form of 'scientific disputes' illustrated by experiments and delivered by university students and their teachers. Around this time, travelling demonstrators also started to arrive in Poland.

Lectures and demonstrations for deputies, dignitaries and members of the Polish parliament were organized during the sessions of parliament. They took place both in large Polish cities, such as Poznan, Vilnius, and Warsaw, but also in smaller ones like Nowogrodek or Grodno.

In Grodno, in 1793, a series of lectures and physical demonstrations was prepared especially for King Stanislaw August and members of the Polish parliament who had come to Grodno for Parliamentary consultations. The series was put on by the Dominicans who ran a school in Grodno. A detailed description of these events was published in 1794 in the local press. Studying this press account allows us to assess the practical skills and scientific knowledge of the teachers and demonstrators as well as the equipment of the Dominican physics cabinet.

Short biography and research interests

The author's interests are the history of natural sciences in the 18th century, the reception and popularization of science in Poland, scientific instruments in the field of chemistry and physics, and manufacture of scientific instruments in Poland. Her recent book concerns the royal observatory and the physical cabinet of King Stanislaw August (reign of 1764-1795) in Warsaw. Currently, she is implementing a project funded by the National Science Centre Poland entitled "National inventory of historical scientific instruments".

rijksmuseum boerhaave

XXXVII Scientific Instrument Symposium

Leiden/Haarlem, 3-7 September 2018

Instruments and the 'Empire of Man over Things'

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

Hubert Engels and the Hydraulic Laboratory at the Technical University of Dresden

Joerg Zaun

TU Dresden, Office of Academic Heritage, Scientific and Art Collections, Zellescher Weg 17, 01069 Dresden, Germany

joerg.zaun@tu-dresden.de

Keywords: ***Hubert Engels, hydraulic laboratory, model experiments***

Abstract

Hubert Engels (1854-1945) assumed the chair in hydraulic engineering at the Technical University Dresden in 1890, where he started model experiments in river engineering. In 1898 his first laboratory for river engineering was established at the university and in 1913 he got a bigger and improved laboratory, which was in use for nearly 100 years. In 1914 Engels published a benchmark book about water engineering. The main focus of the presentation will be the establishment of these laboratories and the development of their measuring devices as well as Engels' considerations about the method of model experiments in hydraulic engineering.

Short biography and research interests

A historian of science and technology, Zaun from 2006 to 2015 was Curator for Academic Heritage at the TU Mining Academy in Freiberg and since 2016 has been Curator for Academic Heritage at the Technical University Dresden. His main research interests are in the development of scientific and technical collections.

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

rijksmuseum boerhaave

TEYLERS MUSEUM · OF · WONDER

The Abstract Submission Form

THE EMERGENCE OF THE PROFESSION OF 'PHILOSOPHICAL INSTRUMENT MAKER' IN THE 17TH-CENTURY DUTCH REPUBLIC

Huib J. Zuidervaart

Huygens ING (KNAW), Oudezijds Achterburgwal 185, 1012 DK Amsterdam, The Netherlands

huib.zuidervaart@huygens.knaw.nl

Keywords: ***Philosophical instruments, The Dutch Republic, Instrument makers***

Abstract

Before the 17th century 'mathematical instruments' were the only tools related to the "arts and sciences". These instruments were used for measurements or calculation in areas as commerce, surveying, drawing, navigation, astronomy, etc. But with the emergence of the telescope in 1608, a new kind of 'scientific' instrument came into being; A device that did not measure anything, but made things visible. The telescope revealed new phenomena, unseen and unknown before, such as mountains on the Moon, spots on the Sun and satellites around Jupiter. These discoveries challenged scholars to revise their ideas with respect to Cosmology and Natural Philosophy. For that reason the telescope – and similar instruments introduced at a later date, such as the microscope, baroscope, thermoscope, hygroscope, air pump and electrical machine – were called 'philosophical instruments'. These new instruments required not only a name to distinguish themselves from the earlier mathematical instruments, but also a new kind of producer. In my presentation I will focus on the emergence of this group of 'philosophical instrument makers' in the Dutch Republic,

which group, remarkably enough, did not emerge from the earlier group of mathematical instrument makers, but had a completely different origin.

Short biography and research interests

Huib Zuidervaart studied Physics, Astronomy and History of Science. His main field of research is the history of physics and astronomy in early modern Europe, with a focus on the history of scientific instruments and collections.

rijksmuseum
boerhaave

XXXVII Scientific Instrument Symposium
Leiden/Haarlem, 3-7 September 2018
Instruments and the 'Empire of Man over Things'

TEYLERS
MUSEUM · OF · WONDER

The Abstract Submission Form

INSTRUMENTS AND THE CIRCULATION OF KNOWLEDGE

L. Zwisler

Technical University of Denmark, Fysikvej Bygn.. 309, Kgs. Lyngby, 2800, Denmark

lazw@fysik.dtu.dk

Keywords: *Knowledge circulation, Engineering, Technoscience*

Abstract

Scientific instruments play an interesting role in knowledge circulation and studies of scientific instruments can bring interesting aspects to the study of knowledge. It is tempting to think of instruments as just the immutable mobiles of Latour, carrying unchangeable knowledge and 'translation without corruption'. But studying historical instruments through the prism of circulation of knowledge reveal more of the life and role of instruments. These studies show the varied forms of knowledge at play in scientific and engineering processes. Hence, I claim that it is valuable to study scientific instruments in their own right to allow these aspects to appear.

In the pitch I will present findings from studies of the creation, use and changes of instruments and look into what happens to knowledge in the process. These stories reach beyond the scientific communities and into the realm of industry and everyday-life.

Short biography and research interests

Laila Zwisler is the head of History of Technology at the Technical University of Denmark (DTU). Her research interests include technical academic heritage, technoscience history, engineering education history and history of technology. She teaches history of technology at DTU and is responsible for the technical heritage of DTU.