Scientific Instrument Commission

ICHST 2017 | 25th INTERNATIONAL CONGRESS OF HISTORY OF SCIENCE AND TECHNOLOGY

IUHPST/DHST | SBHC

Science, Technology and Medicine between the Global and the Local

Rio de Janeiro, Brazil, from 23 to 29 July 2017

XXV INTERNATIONAL CONGRESS OF HISTORY OF SCIENCE AND TECHNOLOGY

XXXVI Symposium of the Scientific Instrument Commission

26-28 July 2017
Rio de Janeiro, Brazil

- Scientific Instruments Between the Local and the Global -



Photos: Jaime Acioli (MAST collections)

BOOK OF ABSTRACTS

July, 2017

MUSEU DE ASTRONOMIA E CIÊNCIAS AFINS

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA, INOVAÇÕES E COMUNICAÇÕES

BRASIL GOVERNO FEDERAL

Programme

Sunday 23 July 2017
Praia Vermelha Campus
ICHST 2017 Registration

Monday 24 July 2017
Praia Vermelha Campus

Morning	ICHST 2017
Afternoon	ICHST 2017

Tuesday 25 July 2017
Praia Vermelha Campus

Morning	ICHST 2017
Afternoon	ICHST 2017

Wednesday 26 July 2017
Praia Vermelha Campus, Room 13

Morning	ICHST 2017
13.30	**Opening Session** Silke Ackermann, SIC President Marcus Granato, LOC Chair
	Session 1: Global disciplines and global networks **Chair: Silke Ackermann, University of Oxford, UK**
13.45	**Measuring professions and mathematical instruments in early Modern Europe** Antoni Malet, Universitat Pompeu Fabra, Barcelona, Spain
14.00	**Studying and exhibiting instruments of global infrastructures for environmental monitoring and surveillance** Soraya Boudia, University of Paris Descartes-CERMES3, Paris, France Sébastien Soubiran, Jardin des Sciences, University of Strasbourg, France
14.15	**Discipline building with material culture: Instruments and the history of science in late 20th century Britain** Samuel Alberti, National Museums Scotland, Edinburgh, UK
14.30	**Debate**
15.00	**Coffee-break**

	Session 2: Global instruments and global technologies **Chair: Rich Kremmer, Dartmouth University, USA**
15.30	**Early forms of telescopes, in theory and in practice** Marvin Bolt, Corning Museum of Glass, New York, USA Michael Korey, Staatliche Kunstsammlungen Dresden, Germany
15.45	**The *Theatrum Astronomicum* of the University of Leiden according to the 1637 Astronomical records of Georg Marggrafe** Oscar T. Matsuura, MAST, Brazil
16.00	**Networks of a new microworld: Production, trade and ownership of microscopes in the early Dutch Republic** Huib J. Zuidervaart, Huygens ING (Royal Netherlands Academy of Arts and Sciences - KNAW), Amsterdam, The Netherlands
16.15	**The machine that goes 'bing': nineteenth-century uses of telephone instruments in medicine, mining and the military** Michael Kay, University of Leeds, UK
16.30	**Debate**

Thursday 27 July 2017
MAST – Museum of Astronomy and Related Sciences

	Session 3: Instruments and politics **Chair: Samuel Alberti, National Museums Scotland, UK**
9.00	**A device to unveil military secrets: the C.I.S.E. Cockcroft-Walton accelerator** Leonardo Gariboldi, University of Milan, Italy
9.15	**Instruments of development: German teaching apparatus and practices at IIT Madras** Roland Wittje, IIT Madras, Chennai, India
9.30	**Did the presence of scientific instruments affect the destiny and workload of liberated Africans? Science and freedom: new evidence about foreign engineers in 19TH century Brazil - Minas Gerais** Télio Cravo, Universidade Estadual de Campinas, Brazil
9.45	**From the global to the local: technology transfer from low Earth orbit to Alabama** Emily Margolis, Johns Hopkins University, USA
10.00	**Debate**
10.30	**Visit - MAST exhibitions, collections, archives, laboratories**
12.30	**Lunch break**

	Session 4: Local instruments, global knowledge **Chair: Roland Wittje, IIT Madras, India**
14.00	**The scientific instruments as tools for the transmission of knowledge: the case of a 15TH century treatise on the operation of the Musarṭan astrolabe** Pouyan Shahidi Marnani, Indiana University, Bloomington, USA
14.15	**The operation of scientific instruments and machines: the use of audiovisuals in exibitions** Adriana Mortara Almeida; L. Foronda; O.S. Junior; J. Q. Novo; G. B. Piedade; M. G. Almeida; D. Soquettia; D. Bandeira, Instituto Butantan - Brazil
14.30	**Electromagnetic devices in early 19TH century Padua** Sofia Talas & Fanny Marcon, Museum of the History of Physics, University of Padua, Italy
14.45	**Debate**
	Session 5: Heritage of science and technology **Chair: Sofia Talas, University of Padua, Italy**
15.15	**Science and technology heritage in Portuguese and Brazilian Museums: first results of a new comparison** Marcus Granato, Victor Abalada & Luisa Maldonado, MAST, Brazil
15.30	**Managing and preserving scientific and technological heritage in Cuba: an urgent and ardous task** Claudia Felipe Torres & Lubia Diaz Bernal, University of Havana, Cuba
15.45	**Cultural heritage of science and technology in Brazilian universities: an introduction to the museums and collections of the Federal University of Rio de Janeiro** Ethel R. Handfas, Universidade Federal do Estado do Rio de Janeiro, Brazil
16.00	**Research institutes in Pernambuco (Brazil): disposal and preservation of science and technology heritage** Emanuela Sousa Ribeiro, Universidade Federal de Pernambuco, Brazil
16.30	**Debate**
17.00	**Coffee break**
	Session 6: Instruments and the development of ideas in science and technology **Chair: Michael Korey, Staatliche Kunstsammlungen Dresden, Germany**
17.30	**The role of instruments in the evolution of timekeeping** Taha Yasin Arslan, Istanbul Medeniyet University, Turkey
17.45	**Revamping the solar system: Planetaria, Copernican armillary spheres, and the idea of 'discovery' in astronomy** Pedro M. P. Raposo, Adler Planetarium, Chicago, USA

18.00	**Quantum mechanics and industrial research: the corroboration of the Casimir Effect** Ad Maas, Museum Boerhaave, Leiden, The Netherlands Beto Pimentel, Universidade Federal do Rio de Janeiro, Brazil
18.15	**Debate**

Friday 28 July 2017
Praia Vermelha Campus, Room 13

	Session 7: Instruments, developers and users **Chair: Marta C. Lourenço, University of Lisbon, Portugal**
9.00	**Linking past and future: Henrique Morize (1860-1930) and the National Observatory, Brazil** Maria Lúcia N. M. Loureiro & Ana Beatriz S. Cascardo, MAST, Brazil
9.15	**The 'personal' equations of American astronomer Joel Stebbins** Dana A. Freiburger, University of Wisconsin-Madison, USA
9.30	**The research of recent material culture of science in the Museu de Astronomia e Ciências Afins: the objects from Centro Brasileiro de Pesquisas Físicas** Janaina Furtado, MAST, Brazil
9.45	**Challenges and opportunities in the study of recent heritage of Science and Technology: two examples of astronomical instrumentation** Tânia Dominici, MAST, Brazil
10.00	**Debate**
10.30	**Coffee break**
10.45	**SIC Annual General Meeting**
12.30	**Group photo**
13.00	**Lunch break**
	Session 8: Singular instruments, multiple lives **Chair: Pedro Raposo, Adler Planetarium, USA**
15.30	**From working world to the museum world: the museum of topography history and cartographic engineering Keuffel & Esser Thoeodolite's trajectory (Pernambuco - Brazil)** Bruno Melo de Araújo, Federal University of Pernambuco, Brazil
15.45	**The three lives of the EAI 8800 Calculator: from nuclear fear to the museum** Cyrille Foasso, Musée des Arts et Métiers, Paris, France

16.00	**Dissemination and influence of the Zeiss Optical Planetarium in the Republic of China (1923-1949)** Nan Zhang, Shanghai Jiao Tong University, China
16.15	**Debate**
16.40	**Closing session**
	Richard Kremmer, incoming SIC President Sofia Talas, incoming SIC Secretary
17.00	**Coffee break**

Saturday 29 July 2017
Praia Vermelha Campus

Morning	ICHST 2017
Afternoon	ICHST 2017

Session 1: Global disciplines and global networks (Wednesday 26 July, 13:45)

MEASURING PROFESSIONS AND MATHEMATICAL INSTRUMENTS IN EARLY MODERN EUROPE

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Keywords: mathematical instruments, professions, early modern, Europe

Abstract

Mathematical changes in practical geometry, including specialization and the proliferation of mathematical instruments, were deeply related to changes in social structure and, in particular, to the sixteenth-century emergence of professions specializing in the measure of specific goods. Measuring professions not only became part and parcel of the fabric of life in early modern Europe but very often were also embodiments of political authority. Some attention has been paid to the increase in mathematical literacy in early modern Europe, but not much attention has been paid to the politics and the sociology of measuring. The paper focusses on one or two case-studies that reveal the ways in which bylaws and ordonnances by royal and local authorities regulated the practice of measuring, including the measuring instruments and their standardization. The paper shows how the profesional measurers themselves, backed by political authority, participated in the coercive apparatus of the state and town; and how the standards and measuring instruments were earmarked and kept in symbolically relevant buildings. It aims to show that social conventions, mathematical instruments, and social and political authority shaped conceptual change in mathematics.

[1] Full Professor in History of Science, Universitat Pompeu Fabra (Barcelona). Marie Curie Senior Fellow (Max-Planck Institut for History of Science, 2013-2015). Fellow, International Academy of History of Science. My main research interests include early modern mathematics, optics, and mathematical instruments.

STUDYING AND EXHIBITING INSTRUMENTS OF GLOBAL INFRASTRUCTURES FOR ENVIRONMENTAL MONITORING AND SURVEILLANCE

Soraya Boudia[a,2], **Sébastien Soubiran**[b,3]

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Keywords: monitoring, global scientific infractructures, exhibition, public engagement

Abstract

Scientific instruments studies often focus on the history of a specific instrument or a number of instruments that are part of an experimental setting. This objet-based approach produced precise and useful research on instrument makers, instruments' circulation and trade, different users and 'life cycles' from makers to users, and the related knowledge they generated.
If this approach is indeed heuristically very rich, its utility is less obvious to study global research infrastructures in charge of collecting environmental data beyond national scale. These infrastructures are characterized by both the use of a large number of instruments dispersed through distant locations, and different type of instruments to process the data. These infrastructures emerged in European observatories during the first half of the nineteenth century as a result of networks for geomagnetism and meteorological observations. New technical exploratory technics like seismometers, sonar and radar, expanded the capacity and range of observations on a worldwide scale. These observation and research networks spread during the second half of the twentieth century for technical and political reasons. On the one hand, technological developments, such as computers and satellites, gave access to data collecting and processing at a previously unknown scale. On

[2] Soraya Boudia is historian of science and technology, professor in the University of Paris Descartes. She conducted several researchs on history of radioactivity, on scientific heritage and environmental and technological risks. She has co-edited, with Nathalie Jas, Toxicants, Health and Regulations Since 1945 (2013), Powerless Science? Science and Politics in a Toxic World (2014).

[3] Sébastien Soubiran, is deputy director of the Jardin des sciences a cultural department of the university of Strasbourg in charge of the preservation and valorisation of scientific heritage. He is currently working on the renovation of the museum of zoology at the University of Strasbourg into a natural history museum with a STS perspective.

the other hand, during the cold war, the entire Earth became a battlefield equipped with international measure systems of radioactivity or seismology used mainly for monitoring the Soviet enemy.

In this paper, we will first present a state of the art of research in history of science and technology on global scientific infrastructures for environmental monitoring and surveillance. Secondly, based on the renovation process of the zoological and seismological museum initiated in Strasbourg, we would like to explore how these studies can be used in a museum exhibition setting in order to address environmental issues and develop public engagement with science and research.

DISCIPLINE BUILDING WITH MATERIAL CULTURE: INSTRUMENTS AND THE HISTORY OF SCIENCE IN LATER 20TH CENTURY BRITAIN

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Keywords: collections; history of science; Royal Scottish Museum; Edinburgh

Abstract

History and philosophy of science expanded significantly in 1960s Britain as it did elsewhere, concurrent with professional developments within the museum sector that changed the pattern of acquisition and display of instruments in science collections. Interrogating the relationship between these two mini-industries helps us to understand the role of material culture in the construction of expertise.

Building on existing studies of the relationship between collections in Oxford, Cambridge and London and the history of science teaching programmes that followed them (Bennett 1997; Fox 2006; Morris 2010; Taub and Willmoth 2006), this paper explores connections between other collections and new centres for HPS elsewhere in Britain. Focussing on the instrument collection of the Royal Scottish Museum in Edinburgh (a predecessor of the National Museums Scotland), it asks how collections were used – or not – in teaching and research by new generations of historians and curators. What role did scientific instruments play in the development of history of science in an era of unprecedented higher education expansion? How was historical expertise manifested in exhibitions and displays? And how did developments within one locality (Edinburgh) reflect the global relationship between museums and universities? Fifty years later, the Rio Congress will be a fitting place to reflect on these connections as the Scientific Instrument Symposium and the International Congress of History of Science and Technology meet together.

[4] Dr. Samuel Alberti is Keeper of Science and Technology at National Museums Scotland and Honorary Professor at the University of Stirling; previously he was Director of Museums and Archives at the Royal College of Surgeons of England (which includes the Hunterian Museum) and held a museum-academic joint appointment in Manchester. His research focusses on the history of STM collections in Britain since 1800.

Session 2: Global instruments and global technologies (Wednesday 26 July, 15:30)

EARLY FORMS OF TELESCOPES, IN THEORY AND IN PRACTICE

Marvin Bolt[a,5], **Michael Korey**[b, 6]

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Keywords: telescope, material culture, representation, Kepler

Abstract

Archive-based scholarship has revealed much about the emergence of the telescope in 1608, its dissemination, and its evolution. Investigation of actual instruments, however, provides an important and necessary source of information, and a check on speculation. Inspired and informed by the work of Rolf Riekher, Rolf Willach, M. Eugene Rudd, and Duane Jaecks, we have, over the past decade, located and identified over 1000 refracting telescopes made before 1750. Our recent discovery and investigation – in two German museums – of the only two known surviving early Keplerian telescopes (each having a positive objective and a positive ocular lens) provides material evidence relating to archival discussions and to previous interpretations of telescopic representations. We shall see, for example, how those representations range from a crude illustration merely suggesting a generic telescope to one accurately depicting a specific instrument, with others in between whose significance remains to be investigated.

[5] Marvin Bolt investigates 17th-century refracting telescopes, the role of glass in scientific instruments, and connections between art, science, and the humanities.

[6] Michael Korey studies mathematical, optical, and philosophical instruments in their cultural contexts, especially in relation to early-modern princely courts. He leads the project 'Deus ex machina,' which examines Renaissance planetary automata in detail.

THE *THEATRUM ASTRONOMICUM* OF THE UNIVERSITY OF LEIDEN ACCORDING TO THE 1637 ASTRONOMICAL RECORDS OF GEORG MARGGRAFE

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Keywords: astronomical instruments, astronomical practice, Leiden Observatory, Georg Marggrafe

Abstract

In order to characterize the observational practice and instrumentation of an astronomical observatory of the time, and to estimate the instrumental and observational performance based on positional and timing measurements of the observations, 29 out of 119 Marggrafe's documents stored in Erfgoed Leiden en Omstreken (ELO) were set apart for a detailed analysis. The documents bring the records of the astronomical observations made between January 13 and November 6, 1637 at the Observatory of the University of Leiden, just before Marggrafe's travel to Brazil. Our analysis began with the transcription and translation of the Latin manuscripts written by Marggrafe's own hands, and went through the statistical analysis of the observational data. Cross-referencing the obtained results with subsidiary information highlighted the innovative and reformist character of the Observatory at the time, revealed the mainstream astronomical issues and the peculiar trajectory of Marggrafe's astronomical training, particularly in practical astronomy obtained in Leiden in only 14 months as a self-taught observer and instrument maker. As part of the historical boom of Astronomy between the empirical and the kinematic approach of Tycho Brahe and Kepler, respectively, and the dynamic one by Newton, and considering the shortage of detailed information about the observatories of the time, this study hopes to offer a modest but valuable contribution to the history of astronomical instrumentation of the first half of the 17th century, and also to complement a previous work of the author with Huib Zuidervaart presented in SIC2012 on the Marggrafe's Observatory in Dutch Brazil.

[7] Oscar Toshiaki Matsuura is B. A. in Philosophy, B. Sc. in Physics, M. Sc. in Solar Physics and Ph. D. in Cometary Astrophysics. He is a retired Associate Professor from the Institute of Astronomy of USP and now he is a voluntary staff member of MAST and of the Postgraduate Program on History of Sciences of UFRJ.

NETWORKS OF A NEW MICROWORLD: THE PRODUCTION, TRADE AND OWNERSHIP OF MICROSCOPES IN THE EARLY DUTCH REPUBLIC

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Keywords: Microscopes, 17th – 18th centuries, Scientific instrument makers, Dutch Republic

Abstract

In the seventeenth century a new kind of scientific instrument emerged: the 'philosophical instrument'. They were not devices to measure, but what they revealed gave food for thought. The microscope was one of these philosophical instruments that provided insight into a new, previously unknown, microworld. Although the microscope was developed from the telescope in the late 1610s, it only came to fruition in the late 1650s. The instrument became even more successful after the development of the single lens microscope around 1660.
The major Dutch researcher Antony van Leeuwenhoek (1632-1723) and many other early microscopists made their own microscopes, which were never sold to the public. However, the sensational discoveries of several of these microscopists in the 1670s created a public demand for such microscopes, which in turn generated the emergence of professional microscope makers. In this new market Dutch, French, German and English instrument makers tried to get their share. In this paper, I will be examining how this professional production and trade of microscopes evolved in the early Dutch Republic, and how the ownership network of these instruments and their makers functioned to bring a locally developed product to a wider audience.

[8] Dr. Huib J. 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.

THE MACHINE THAT GOES 'BING': NINETEENTH-CENTURY USES OF TELEPHONE INSTRUMENTS IN MEDICINE, MINING AND THE MILITARY

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Keywords: telephony, electricity, users, medicine

Abstract

When Alexander Graham Bell demonstrated his new telephone instrument in Britain for the first time in 1877 he admitted that it was then in an "embryo state": he did not know what form it ultimately might take, or the uses to which it might be put. Indeed, the journey of telephony from inception to ubiquity was not rapid or straightforward, and it was not immediately obvious what telephone instruments might be used for. This supposedly global technology – marketed early on as an invention for conversation which anyone could use with ease – had a wide variety of different local applications.

This paper focuses on the reception of telephone instruments, in particular Bell's electromagnetic telephone, and the users who innovated with them in three areas: the medical profession, the mining community, and the British Army. In each case this paper will demonstrate how the basic property of telephone instruments, that of producing noise upon the detection of small currents, was put to different uses – and not necessarily for transmission of speech.

The use of telephone instruments for non-conversational purposes such as scientific and medical research has not been much addressed by existing histories of telephony. However, the importance of users, as well as producers, in the development of technologies has been demonstrated by Oudshoorn and Pinch (2003), amongst others; this paper expands upon their approach by exploring how the uses of telephony in late Victorian Britain depended on, and reveal new insights into, the people and communities who engaged with these new instruments.

[9] Michael Kay is a postdoctoral researcher at the University of Leeds with research interests in the social and cultural history of nineteenth-century telecommunications and late nineteenth- and early twentieth-century domestic electrical technologies of lighting and power. He received his PhD in the history of British telephony in 2014.

Session 3: Instruments and politics (Thursday 27 July, 9:00)

A DEVICE TO UNVEIL MILITARY SECRETS: THE C. I. S. E. COCKCROFT-WALTON ACCELERATOR

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Keywords: Cockcroft-Walton accelerator, nuclear physics, cross-section measurement, Cold War

Abstract

Nuclear research in the first decade after WWII is an interesting case study for the relationship between the local and the global. The strong connection between nuclear physics and the new nuclear weapons meant that many scientific and technological results were classified as military secrets. In 1946, a new centre of nuclear research was established in Milan (Italy): the C.I.S.E. (Centre for Information Studies and Experiments). Founded as a private centre to produce nuclear electric power, the C.I.S.E. soon started theoretical and experimental research to develop new devices to measure nuclear cross-sections of the interactions between thermal neutrons and the nuclei of elements used as fuel or as building materials for a nuclear reactor. Their first results on U-235, obtained with an ionization chamber, were published in 1950, shortly following similar partial results by several other European and Indian physicists. New researches were made with a 400 kV, 3kVA Cockcroft-Walton accelerator, built in 1951, used with a time-of-flight spectrograph. In 1954, C.I.S.E. published the measurements of total cross-sections in "an energy range, whose cross-section has not been made known until now". It was time to unveil some secrets. One year later, following Eisenhower's proposal for "open skies", the "Atoms for Peace" Geneva conference decided to share nuclear knowledge for peaceful use. Since July 2016, the C.I.S.E. Cockcroft-Walton accelerator is on permanent exhibition at the National Museum of Science and Technology in Milan and is now being studied in a project to safeguard and reconstruct C.I.S.E. history.

[10] Leonardo Gariboldi is a researcher in history of physics and physics education. His main research topics concern the Italian polar expeditions, the devices used to study cosmic rays, and the C.I.S.E. centre of nuclear research. He is a member of the Scientific Council of the European Society for the History of Science.

INSTRUMENTS OF DEVELOPMENT: GERMAN TEACHING APPARATUS AND PRACTICES AT IIT MADRAS

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Keywords: teaching Instruments, cold War, IIT Madras

Abstract

The Indian Institute of Technology (IIT) Madras was founded in 1959 with the assistance of the Federal Republic of (West) Germany in the midst of the Cold War and an evolving development discourse. As part of the agreement, a number of German experts joined IIT Madras as professors for the initial years to set up laboratories and engineering curricula, and to supervise students and research scholars. A first generation of Indian faculty in return received their training in Germany. German ideas and practices of engineering education are manifested and have materialised in laboratory setups and large amounts of German scientific instruments.

How did the German professors think Indian engineers should be trained? And how did these ideas and practices of engineering education transform in the Indian, or we might rather say in the Madras environment? While Indian IIT-graduates have become a successful brand within the international corporate world, the curriculum has gradually moved away from a focus on the laboratory, and towards computation and theory. In my presentation, I will trace the first generation of these German instruments at the physics department of IIT Madras and place them within the concepts and traditions of science and engineering education. I will discuss how these instruments were actually used and how practices changed in the decades after the foundation of IIT Madras.

[11] Roland Wittje is associate professor in history of science and technology at the Indian Institute of Technology Madras and chair of the Universeum working Group on Recent Scientific Heritage. Publications include *The Age of Electroacoustics* (2016) and *Learning by Doing: Instruments and Experiments in the History of Science Teaching* (With Peter Heering, 2012).

DID THE PRESENCE OF THE SCIENTIFIC INSTRUMENTS AFFECT THE DESTINY AND WORKLOAD OF THE LIBERATED AFRICANS? SCIENCE AND FREEDOM: NEW EVIDENCE ABOUT FOREIGN ENGINEERS IN 19TH CENTURY BRAZIL – MINAS GERAIS

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Keywords: liberated Africans, juridic condition, engineers, scientific instruments

Abstract

Liberated Africans, Slaves, and free coloured people worked on heavy manual activities during the construction of road and bridges in nineteenth-century Brazil. This presence produced direct effects on the organization of laborers and the behavior of province engineers. In the 1850s, foreign engineers working in Minas Gerais province requested scientific instruments from Vienna and Paris. After that, the engineers also requested the Brazilian government to provide them with liberated Africans to work on the transport and dismantling of scientific instruments. The results demonstrate that province engineers intervened in the destiny of liberated Africans. During the decades known as the "illegal slave trade era", liberated Africans formed a special legal category present in Brazil, Cuba, and the British Caribbean. The literature has focused on the implementation of mixed commissions and the fine line between slavery and freedom in the nineteenth-century Atlantic world. In Brazilian historiography, recent work also suggested that liberated Africans were assigned to the building and maintaining of road infrastructure. This paper presents preliminary results of ongoing research to demonstrate how different juridic conditions lead to an explicitly unequal treatment. Main sources used were documents related to the construction of road infrastructure, collected and treated in a database that comprises 22,000 documents for the period of 1840-1889. Moreover, this research has also explored the registration of liberated Africans. The registration offers valuable information. Documents contain name, age, nação (nation), place of employment and the name of the responsible entity (e.g. engineers, private individual, Jardim botânico). These records are important for the study of the illegal servitude and show that legally binding labor contracts were imposed without the consent of the Africans involved.

[12] Ph.D. student at UNICAMP. Master in Social History – by Universidade de São Paulo. Main research areas of interest: i) History of Engineering; ii) scientific instruments; iii) labourers. The development of current research relies on the assistance of scientific scholarship granted by São Paulo Research Foudantion (nº 2014/06264-2).

FROM THE GLOBAL TO THE LOCAL: TECHNOLOGY TRANSFER FROM LOW EARTH ORBIT TO ALABAMA

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Keywords: spaceflight, technology transfer, pedagogy

Abstract

Since 1982, the United States Space Camp in Huntsville, Alabama, has welcomed over half a million children, adults, and families to play astronaut for a week. Participants 'train' for space missions through a mixture of classroom lessons and hands-on experience with instrumentation found on the flight deck of the Space Shuttle, modules of the International Space Station, and in the Mission Control center. The history of U.S. Space Camp reveals a unique episode of technology transfer from the global to the local, in which instruments for conducting experiments in low earth orbit and for navigating in space were adapted for pedagogical and entertainment purposes at a camp in the American South.
Through archival research and interviews with participants and program managers, I describe the U.S. Space Camp experience and contextualize it, with its dual agenda of inspiring patriotism and interest in careers in science and engineering, as a product of the Cold War. This research continues the tradition of historical scholarship on teaching laboratories, while engaging with the current discourse on science and leisure in America. Attending to the interactions between U.S. Space Camp participants and the instrumentation allows for a methodological intervention in the discipline of space history, namely the introduction of actors (children and families) omitted from traditional narratives about spaceflight and society.

[13] Emily Margolis is a doctoral student in the Department of History of Science and Technology at the Johns Hopkins University. Her research interests include space history, urban history, gender studies, and material culture. Emily's dissertation examines the intersection of science and leisure in the Cold War through the study of vacations to space sites. She will pursue a curatorial career upon graduation.

Session 4: Local instruments, global knowledge (Thursday 27 July, 14:00)

SCIENTIFIC INSTRUMENTS AS A TOOL FOR THE TRANSMISSION OF KNOWLEDGE: THE CASE OF A 15TH CENTURY TREATISE ON THE OPERATION OF THE MUSARṬAN ASTROLABE

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Keywords: transmission of knowledge; astrolabe; musarṭan; Tabriz

Abstract

In the 9th or 10th century C.E. scholars in the Islamic world made an innovation in astronomical instrumentation by combining the standard northern and southern astrolabes to create a class of astrolabes known to the modern literature as "mixed astrolabes". The *Musarṭan* (= crab shaped) astrolabe is one of the more well-known astrolabes of this kind in the medieval Islamic world.

In addition to the standard, medieval literature of astrolabe-making which reveals the geometric-astronomical structure of the *Musarṭan* astrolabe, a group of treatises were written, specifically, on its operation. *Mukhtaṣar dar maʿrifat-i usṭurlāb-i Musarṭan wa Muqawwas* (compendious [treatise] on the knowledge of the *Musarṭan* and the *Muqawwas* astrolabes) is a treatise of this kind, written in Persian by a certain Pīr Muḥammad, known as Ḥakīm-i Tabrīzī (14th–15th century C.E., Tabriz). This recently rediscovered text is chronologically the latest known text written on the use of the *Musarṭan* astrolabe. However, what makes this work distinct from its peer texts, that half a dozen of them are extant today, is the isolation of its author from them. This isolation is not only suggested by Tabrīzī who claims to have discovered how to work with an instrument that was unknown in his time and place, but is also attested to by the contents of his treatise.

In the present research, based on my critical edition of Tabrīzī's text, I first demonstrate the disconnection of Tabrīzī from the literature of the *Musarṭan* astrolabe. To do so, I

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contrast the terminology that he uses to describe this astrolabe, the definitions that he provides for them, and his approach to the complications of the instrument's operation with what can be found in the preceding literature—especially the two earliest, extant works on this instrument by Abū Saʿīd al-Sijzī (ca. 945–ca. 1020 C.E.). Moreover, based on Tabrīzī's text as well as the other pieces of literature on the mixed astrolabes—especially the work of Abū Naṣr Aḥmad b. Zarīr (12th century C.E.)—I investigate the possibility of existence of an oral tradition on the *Musarṭan* astrolabe as an auxiliary source for Tabrīzī. I then show how in isolation from the textual tradition of the mixed astrolabes, Tabrīzī succeeded in writing a "user's manual" for the *Musarṭan* astrolabe mainly by learning from a specimen of this very instrument in his possession. Tabrīzī's then 450 year old *Musarṭan* astrolabe becomes the main vehicle for the transmission of this instrument's operation.

THE OPERATION OF SCIENTIFIC INSTRUMENTS AND MACHINES: THE USE OF AUDIOVISUALS IN EXHIBITIONS

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Keywords: machine operation, audiovisual, Butantan Institute, history of science

Abstract

The Butantan Institute Historical Museum displays scientific instruments, furniture, glassware and other objects from the twentieth century that are part of the history of research, production and knowledge dissemination of Butantan. Many instruments like the optical microscope, precision scale, calculator, egg candle, typewriter and telephone are examples of instruments whose functions are still performed by more complex and accurate devices. The presentation of these objects, contextualized by small scenarios, texts and photographs, arouses great visitor attention. However, the understanding of their operation is only possible through an educator's explanation to the visitors. Still, several processes have so far been explained only theoretically, since due to preservation issues the educators cannot handle the associated objects. A research project on the operation of Butantan historical collection of instruments is being developed in order to give subsidies to the creation of short films that show the machines working as in their original context. The films will be available in the Historical Museum exhibition and on social networks, facilitating the operational understanding of these machines to visitors and generating interest for the visit of those who do not know the museum. The films will have subtitles and audio description for people with visual and hearing impairments. The museum educators can use the films in various ways in the educational activities, increasing the public understanding of science and health histories. We will present the research results and the films, proposing a discussion on the role of audiovisuals in history-of-science exhibitions.

[15] Adriana Mortara Almeida is a historian, has a PhD in Communication and Information Sciences (USP) and has attained a Post-doctorate degree in Museology (UNICAMP). Currently she is ICOM-Brazil vice-chair and director of the History Museum of Butantan Institute. She has published several articles about Museum Education, Audience Studies, Museum Evaluation and History of Science.

ELECTROMAGNETIC DEVICES IN EARLY 19TH CENTURY PADUA

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Keywords: history of electromagnetism, motors, restoration

Abstract

In the 1830s, Salvatore Dal Negro, professor of experimental physics at the University of Padua, developed a series of electromagnetic devices, such as the "dynamo-magnetometer", an instrument meant to measure the force exerted by electromagnets, and the "electromagnetic ram", a peculiar model of electrical motor. These instruments long lay disassembled in the storerooms of the Museum of the History of Physics of the University of Padua, and they have only recently been studied, restored and reassembled for the first time.
The present paper will describe these newly restored devices and contextualize them within the developments of electricity in the early nineteenth century.

[16] 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.

[17] Fanny Marcon is a PhD student in «Epistémologie, histoire des sciences et des techniques» at University Paris Diderot-Paris 7. From 2009, she has been collaborating with the Museum of the History of Physics of the University of Padua. Her research focuses on the history of scientific instruments and museology.

Session 5: Heritage of science and technology (Thursday 27 July, 15:15)

SCIENCE AND TECHNOLOGY HERITAGE IN PORTUGUESE AND BRAZILIAN MUSEUMS: FIRST RESULTS OF A NEW COMPARISON

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Keywords: scientific instruments, restoration, Bamberg, MAST

Abstract

The ignorance that still surrounds the topic of science and technology (S&T) heritage means much of this heritage is yet to be tracked down and many items that could be presented as such might have already been modernized or discarded. After a Brazilian survey that built a panorama of the current state of this heritage in that country, the same process is being used for Portugal, so as to provide a basis for national comparisons. The initial results of this ongoing research are here presented, aiming to offer the first thorough comparison between the current state of S&T heritage in both countries, concentrating on heritage preserved on museums, since information has been easier to retrieve and is more complete for these institutions. The sets and collections of interest to the study are composed of objects related to the exact and earth sciences produced until the 1960s. With an older scientific tradition, objects that go back at least to the XIIIth century can be tracked down in Portugal, whereas, in Brazil, objects dating further back than the XIXth century are scarce. Nonetheless, in both nations most located objects derive from the XIXth and XXth centuries. This paper intends to present a deeper analysis of S&T heritage in both countries, employing categories that range from the quantity of preserved artifacts to their level of preservation, thus providing better understanding of the role these objects played in the making of science and of how they now are seen, appreciated and studied in these different national contexts.

[18] D.Sc. degree in Materials Science, Head of the Museology Department at MAST, Professor of Conservation at the Post-Graduate Program on Museology and Heritage (UNIRIO/MAST). His main research interests lie in conservation of scientific instruments, science and technology heritage and history of collections.

MANAGING AND PRESERVING SCIENTIFIC AND TECHNOLOGICAL HERITAGE IN CUBA: AN URGENT AND ARDUOUS TASK

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Keywords: technological heritage, legal protection, management policies

Abstract

Cuba holds a dispersed but significant heritage of scientific instruments preserved in scientific and educational institutions, such as the University of Havana, the Seminar of San Carlos and San Ambrosio, the Cuban Academy of Sciences, historical pharmacies, among others. With a clear predominance of nineteenth and twentieth-century scientific instruments, these collections are a tangible expression of the evolution of science in Cuba, the Caribbean and Latin America, and they reflect the diversity of scientific and philosophical influences experienced in our country, placed in an intense cultural and commercial cross point. They also demonstrate the deep relation between the developing of science and the emergency of the spirit of independency in our country.
However, in spite of such relevance, Cuban scientific and technological heritage is not granted a clear legal protection. It is only lightly mentioned in Cuban regulations concerning cultural heritage and there are no specific recommendations about its protection. Moreover, the management strategies developed in the institutions where these collections are preserved reveal the absence of a specifically designed approach and a heterogeneity of inventory and diffusion policies. It is probably the most fragile expression of cultural heritage in Cuba due to its little recognition both in the cultural sector and the scientific community.As a result of recent research, a methodology specifically focused on scientific and technological heritage has been developed in order to provide institutions with a useful tool to identify, evaluate, preserve and promote their collections. This paper will present and discuss this new methodological approach and analyze the limitations in the preservation and management of this type of heritage. Some of the most important Cuban collections of scientific instruments will also be identified.

[19] Claudia Felipe Torres is Head of the University Cultural Heritage Unit at the University of Havana since 2010. She is an associate professor at the Faculty of Arts and Letters at the University of Havana and holds a PhD at the University of Granada. President of the International Council of Monuments and Sites (ICOMOS) Cuban Committee. Her main research interests are University Cultural Heritage and Latin American Modern Architecture.

CULTURAL HERITAGE OF SCIENCE AND TECHNOLOGY IN BRAZILIAN UNIVERSITIES: AN INTRODUCTION TO THE MUSEUMS AND COLLECTIONS OF THE FEDERAL UNIVERSITY OF RIO DE JANEIRO

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Keywords: university heritage, science and technology, museums, UFRJ

Abstract

This paper presents preliminary results of a PhD in Museology and Heritage (Universidade Federal do Estado do Rio de Janeiro - UNIRIO/Museu de Astronomia e Ciências Afins - MAST) about scientific and technological heritage in Brazilian universities. The research was prompted by concerns about the vulnerability and fate of objects used in the production of science and technology knowledge. Field work was undertaken at the Universidade Federal do Rio de Janeiro (UFRJ) aiming at examining why and how objects once used in research and teaching are disposed of, or instead, preserved and musealized. Issues such as the political, social and scientific contexts for constructing or dismantling laboratories, decision-making about obsolescence and preservation of science and technology objects; and the conditions under which musealized collections are kept, used and made accessible were analysed. The research draws on primary and secondary sources, including oral interviews with professors, researchers, lab technicians and museum professionals.

[20] Ethel Rosemberg Handfas is an economist, with a M.Sc. in Museology and Heritage from the Federal University of the State of Rio de Janeiro / Museum of Astronomy and Related Sciences (UNIRIO / MAST). She is currently a PhD student in Museology and Heritage at UNIRIO / MAST, under the theme "University heritage in Brazil: the science and technology heritage of the Universidade Federal do Rio de Janeiro".

RESEARCH INSTITUTES IN PERNAMBUCO (BRAZIL): DISPOSAL AND PRESERVATION OF SCIENCE AND TECHNOLOGY HERITAGE

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Keywords: Research institutes, Applied Research, Scientific Instruments, Pernambuco

Abstract

This paper presents and discusses the results of surveys conducted in seven research institutes of science and technology in the State of Pernambuco, Brazil (Instituto de Pesquisas Agronômicas, Instituto de Pesos e Medidas do Estado de Pernambuco, Instituto de Tecnologia de Pernambuco, Superintendência de Desenvolvimento do Nordeste, 4º Distrito do Departamento Nacional de Produção Mineral, 3º Distrito de Meteorologia do Instituto Nacional de Meteorologia e Coordenação Estadual de Pernambuco do Departamento Nacional de Obras Contra a Seca). The survey aimed at identifying scientific instruments and associated documentation that could be considered science and technology heritage.

The research institutions were created by the regional or federal government between the 1930s and 1960s and their researchers played an important role in academia, especially in the higher education of Natural History, Engineering, Agronomy and Geology. The paper concludes that, despite significant activity in these Pernambuco research institutes, they did not deliberately preserve scientific instruments associated with science and technology activities during this period. Only administrative and scientific documents were partly preserved. The absence of scientific instruments encourages reflection on the motivation of their disposal, given that although most institutions surveyed had some kind of preservation mechanism or policy, scientific instruments were systematically excluded.

[21] Doctor in History. Professor at the Department of Anthropology and Museum Studies, and at the Public Management Master's Program, at the Federal University of Pernambuco. Member of the research group Preservation of Cultural Collections, at the Astronomy and Related Sciences Museum, and leader of the research group Museology, Science and Information, from the Federal University of Pernambuco. Main research topics: Heritage Management, Science and Technology Heritage, Museological Documentation.

Session 6: Instruments and the development of ideas in science and technology (Thursday 27 July, 17:30)

THE ROLE OF INSTRUMENTS IN THE EVOLUTION OF TIMEKEEPING

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Keywords: timekeeping, *ʿilm al-mīqāt*, astronomical instruments, Mamluk astronomy, Ottoman astronomy, Islamic World.

Abstract

Timekeeping was an important knowledge field (*ʿilm*) for Muslims for centuries, because it dealt with the essential problems of Islamic life, such as finding the qibla (the direction of Mecca), determining the times of the five daily prayers, and correctly predicting the beginning of Ramadhan (the month for fasting) and two eids (religious holidays). In early Islam, timekeeping was initially a practice giving approximate solutions only based on naked-eye observations, without any instruments or calculations. After the reception of astronomy in the Islamic World in the 9th century, timekeeping found its place as a branch of astronomy. For more than a thousand years, Muslims continued the tradition of timekeeping from Transoxiana to Andalusia. However, some centres of knowledge were keener on improving timekeeping than others. Mamluk Egypt and Syria in the 13th-15th centuries, and Ottoman Turkey in 16th-20th centuries were epicentres of the development and evolution of timekeeping. Observational and computational instruments had the most obvious and effective role in this evolution. From a simple gnomon to sophisticated mechanical clocks, instruments gradually changed the approach to timekeeping. This presentation introduces the journey of timekeeping from its roots in Baghdad to its golden age in Mamluk Egypt and Syria, up to its maturity and adaptation to modern sciences in Ottoman Turkey within the context of instrumentation.

[22] Taha Yasin Arslan works in the Department of the History of Science Istanbul Medeniyet University in Istanbul, Turkey. He obtained in 2015 his Ph.D. on timekeeping in the Islamic World. He works on Mamluk and Ottoman-era manuscripts and astronomical instruments. He also makes replicas of the instruments and writes manuals for non-professional audiences.

Scientific Instrument Commission

ICHST 2017 25th INTERNATIONAL CONGRESS OF HISTORY OF SCIENCE AND TECHNOLOGY

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Science, Technology and Medicine between the Global and the Local

Rio de Janeiro, Brazil, from 23 to 29 July 2017

REVAMPING THE SOLAR SYSTEM: PLANETARIA, COPERNICAN ARMILLARY SPHERES, AND THE IDEA OF 'DISCOVERY' IN ASTRONOMY

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Keywords: Astronomy, solar system, planetarium, Copernican armillary sphere

Abstract

The 'solar system' has long been a changeable entity, be it due to the addition of newly found objects, or, as a consequence of the latter, the reclassification of previously known bodies. Planetaria and Copernican armillary spheres had an important role in shaping public representations of the solar system. Their makers usually sought to convey the most up-to-date portrait of our planetary system. Moreover, older devices were often modified and expanded in the face of new additions to the roll of known planets, satellites and asteroids. This paper addresses the planetarium and the Copernican armillary sphere with regard to the idea of 'discovery' as a narrative staple in the teaching and the popularization of astronomy, particularly during the nineteenth century. A case in point is a Copernican armillary sphere in the collections of the Adler Planetarium sporting a mysterious 'Taurus' as the farthest planet in the solar system. This seemingly bizarre feature will be analysed in order to highlight the connections between this kind of artifact, the nineteenth-century discourses of discovery in astronomy, and the exploration of new market niches for educational instruments and scientific toys.

[23] Pedro M. P. Raposo, DPhil, is a curator at the Adler Planetarium, Chicago, US. His current research interests include the popularization of astronomy, celestial cartography, the history of modern planetaria, and the use of digital platforms to engage the public with historical collections and research.

MUSEU DE ASTRONOMIA E CIÊNCIAS AFINS

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA, INOVAÇÕES E COMUNICAÇÕES

BRASIL GOVERNO FEDERAL

QUANTUM MECHANICS AND INDUSTRIAL RESEARCH: THE CORROBORATION OF THE CASIMIR EFFECT

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Keywords: Casimir effect, Sparnaay, Sparnaay experiment, quantum mechanics

Abstract

In our paper we will discuss the instrument used for the first attempt at the verification of the Casimir Effect, an important quantum-mechanical phenomenon. The instrument, devised in 1958 by Dutch physical-chemist Hans Sparnaay, is intriguing in its simplicity of design. To enter the realm of quantum mechanics, experimental physicists usually have to deploy very sophisticated set-ups. Sparnaay's apparatus, however, was a down-to-earth, tabletop construction. It measured the force mutually exerted by two metal plates when placed at a very short distance. The magnitude of this force revealed the Casimir Effect. Another atypical feature of the experiment was that it was conducted in the research laboratory (NatLab) of the electrotechnical firm Philips. Hendrik Casimir was director of the NatLab and Sparnaay one of its researchers. Thus, we will also examine the relations between an apparently esoteric excursion in quantum mechanics and the commercial world of industrial research.

[24] Historian of Science, Ph. D. (2001); curator Museum Boerhaave (since 2003). Main research topics in History of science: scientific research in world war II; Dutch physics; Dutch scientific culture (1750-1940); Einstein; Newton and the Netherlands; History of energy

Session 7: Instruments, developers and users (Friday 28 July, 9:00)

LINKING PAST AND FUTURE: HENRIQUE MORIZE (1860-1930) AND THE NATIONAL OBSERVATORY

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Keywords: Henrique Morize, National Observatory (Rio de Janeiro, Brazil), Museu de Astronomia e Ciências Afins

Abstract

The administration of Henrique Morize in the National Observatory (Rio de Janeiro, Brazil) resulted in major and significant changes. During that period (1908-1929), the Observatory finally moved from the old building in Castelo Hill to the one it occupies today. Descriptions of the new facilities provide information about the existence of a museum where the first device models used in the Observatory would be on display. Morize headed the Observatory during the centenary of Brazilian Independence in 1922, and the centenary of the Observatory itself, in 1927. Morize wrote the history of the institution to celebrate this centenary. Despite delays caused by World War I, the Observatory equipment was modernized and expanded. This paper discusses the flow of instruments during his period, focusing on those purchased especially for the new facilities, those that were out of use due to lack of space in the old building and also historical instruments intentionally preserved. Some of these instruments survive today in the collections of the Museu de Astronomia e Ciências Afins (MAST).

[25] Maria Lucia de Niemeyer Matheus Loureiro holds a PhD in Information Science from the Universidade Federal do Rio de Janeiro (Brazil). She works at Museu de Astronomia e Ciências Afins on Museology. Her research interests are musealization as informational process and preservation strategies.

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THE 'PERSONAL' EQUATIONS OF AMERICAN ASTRONOMER JOEL STEBBINS

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Keywords: Astronomy, personal equation instrument, education

Abstract

In March 1901 Joel Stebbins, a graduate student in astronomy at the University of Wisconsin, sat down with the department's Personal Equation Machine from M. E. Kahler of Washington, D.C., and determined his personal equation value as 0.313 ± 0.0030 seconds based on 187 observations "taken perfectly naturally." As a new student studying in an observatory possessing an excellent array of instruments, this exercise could be seen as a logical and valuable step in learning how to operate a telescope where his personal equation numbers bespoke of heightened data accuracy.

Yet did these numbers speak to Stebbins in another way – perhaps as a warning of becoming too enmeshed in learning the 'old' astronomy with its emphasis on positional information where the personal equation held an important place? Did this Kahler Personal Equation Machine with its simple clockwork mechanism appear obsolete in a field where starlight itself was now revealing astonishing new details about the universe? Given that Stebbins left Wisconsin without a degree in June 1901 to study the 'new' astronomy of spectroscopy and photometry at Lick Observatory in California, a move encouraged by his supervisor and observatory director George Comstock, this suggests that more than one 'personal' equation may have been in play here.

My talk will look at this Personal Equation Machine and Stebbins' personal record of its use to consider how an 'old' machine might have compelled Stebbins to study the 'new' astronomy.

[26] I have broad interests in history of science and technology within the United States and Japan over the last 150 years - interests many times guided by an emphasis on the study of scientific instruments. I hold a M.Sc. from the University of Oxford in History of Science: Instruments, Museums, Science, Technology (1999), a M.A. from the University of Wisconsin-Madison in History of Science (2002), and have a History of Science Ph.D. dissertation in progress at the University of Wisconsin-Madison that explores the place of science in 19th-century American Catholic higher education.

MUSEU DE ASTRONOMIA E CIÊNCIAS AFINS
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THE RESEARCH OF RECENT MATERIAL CULTURE OF SCIENCE IN THE MUSEU DE ASTRONOMIA E CIÊNCIAS AFINS: THE OBJECTS FROM CENTRO BRASILEIRO DE PESQUISAS FÍSICAS

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Keywords: material culture of science; big science; 20th Century, history, MAST

Abstract

In 2009-2010 the collection of scientific instruments of the Museu de Astronomia e Ciências Afins (MAST) received about 100 objects from the Centro Brasileiro de Pesquisas Físicas (CBPF, Brazilian Centre of Physical Research) that had been used in the scientific and academic laboratories of that institution. These objects were built in the 1950s through the 1970s by major scientific instruments makers such as General Electric, Hewlett-Packard, Leitz Wetzlar, Tektronix, among others. These objects became inseparably linked to politics once the CBPF researches were determined by the nuclear politics arising from the Cold War and the countless agreements between state government, the military and the scientists. It was the time known as Big Science, where "big" was associated with projects that required large-scale organization, complex laboratories, large groups of scientists, big machines, and, of course, big sums of money. But the big resources came with a price: the close relations between the development of scientific practices and knowledge and the state government, media and military. That said, in this presentation we will consider how to write the history of this collection and will discuss the promises and pitfalls of research on the recent material culture of science.

[27] Graduated in history from the State University of Rio de Janeiro-UERJ, master's and doctorate in Political History from the same university. He is currently a fellow researcher in the Museology Department at MAST. His main research interests lie in the field of history, with emphasis on General history and Brazil of the XIX and XX centuries, mainly in the following themes: political history, biography, museums and collections, historiography and theory and methodology of history.

CHALLENGES AND OPPORTUNITIES IN THE STUDY OF RECENT HERITAGE OF SCIENCE AND TECHNOLOGY: TWO EXAMPLES OF ASTRONOMICAL INSTRUMENTATION

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Keywords: recent heritage, astronomy, documentation, material culture

Abstract

The historical and documentary value of scientific objects of the end of nineteenth century and, in particular, those built from the twentieth century, began to be recognized only from the 1980s, in a process that is still seeking its consolidation and methodological adequacy. In this work, I discuss through two examples the complexity in the recognition, registration and protection of these objects. The first instrument is JET-X, the X-ray space telescope that has never been in orbit and whose construction was led by the UK. Since 2009, it is part of the collection of the Science Museum in London. The second one is the integral field spectrograph *Eucalyptus*, built in Brazil as a prototype for a larger instrument, the SOAR Integral Field Unit Spectrograph (SIFS). Since 2014, *Eucalyptus* is part of the collection of objects with historical value of the Brazilian National Laboratory of Astrophysics (LNA). That collection was identified from a partnership with the Museum of Astronomy and Related Sciences (MAST). Besides demonstrating the complexity of the identification, preservation and research of the recent heritage of S&T, I argue that the analysis of problems and challenges faced in the development of astronomical instrumentation in the recent decades, including through research about the projects that were not fully successful and their material heritage, can help to guide the scientific community in decisions on construction of the future instruments. Finally, it is highlighted the importance of providing public access to these objects.

[28] Researcher at Museu de Astronomia e Ciências Afins – MAST (Museum of Astronomy and Related Sciences, Rio de Janeiro, Brazil). She is a Physicist, with a Master and Doctorate degree in Astrophysics. Main interests of research are recent heritage of S&T, astronomical heritage, astronomical instrumentation and extragalactic astronomy.

Session 8: Singular instruments, multiple lives (Friday 287 July, 15:30)

FROM WORKING WORLD TO THE MUSEUM WORLD: THE MUSEUM OF TOPOGRAPHY HISTORY AND CARTOGRAPHIC ENGENEERING KEUFFEL & ESSER THEODOLITE'S TRAJECTORY (PERNAMBUCO- BRAZIL)

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Keywords: theodolite, museum, cartography, surveying, trajectory

Abstract

The globalized world loosens the politic-administrative boundaries, allowing the movement of people, ideas, technologies, objects and capital. This process simplifies making connections in global and local scales. Focusing on a Keuffel & Esser theodolite from Federal University of Pernambuco (UFPE) held at the Museum of topography history and cartographic engineering, we are going to analyse its trajectory to identify the knowledge intermediated by it.

K&E was a company founded in 1867 in the USA by German immigrants. By the year 1880, it had built its factory in Hoboken, New Jersey. In 1918, K&E acquired the control over Young & Sons and made it a department inside the company. The production at K&E ended in 1969.

The K&E theodolite chosen for our study was purchased by the Pernambuco State and experienced a diversity of locations and uses (Pernambuco's state work secretary, The Engineering School, The Museum of topography history and cartographic engineering). A careful view of its journey shows the object's circulation as a central actor in the knowledge production about the cartography and topography history in Pernambuco. From our analysis, we identified the object's potential to intermediate knowledge about the global-local dynamic of a scientific instrument, about scientific practices in educational institutions and about construction of an identity of a professional community.

[29] PhD student in Museology and Heritage at the Federal University of the State of Rio de Janeiro / Museum of Astronomy and Related Sciences (UNIRIO / MAST), Master in History from the Federal Rural University of Pernambuco. Graduated in History from UFRPE. Teacher at the Bachelor course of of Museology, UFPE. Currently develops doctoral research project "Between objects and institutions: Trajectory and constitution sets C & T objects of Engineering in Pernambuco."

THE THREE LIVES OF THE EAI 8800 CALCULATOR: FROM NUCLEAR FEAR TO THE MUSEUM

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Keywords: nuclear science, missile design, simulation, museum heritage

Abstract

The second half of the twentieth century has seen a major change in scientific instruments, viz., the quasi-disappearance of the analog in favor of the digital. However, in the 1960s, it was not obvious to scientists and engineers that this revolution would erase the ancient world. We will deal with the case of one archetypal scientific instrument, the EAI 8800 analog calculator and its 'hybridization' as the EAI 8900 with digital parts. We shall describe the "three lives" of that instrument. A child of the Atomic Age and of the Cold war, the EAI 8800 was first used in the 1960s for nuclear power simulation at the French Atomic Energy Commission. It then found employment by the designers of ballistic missiles until the beginning of the twenty-first century. The 'third life' of the object, namely its presence in the Collections of the *Musée des Arts et Métiers* in Paris, will lead us to discuss the question of what artifacts we should keep or discard, a key question for curators as our choices will forever shape our scientific and technological heritage.

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DISSEMINATION AND INFLUENCE OF THE ZEISS OPTICAL PLANETARIUM IN THE REPUBLIC OF CHINA (1923-1949)

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Abstract

The Zeiss optical planetarium was born in 1923 in Germany. Within the Popularization of Science Movement of China and the first worldwide boom of planetariums, the concept and image of the Zeiss planetarium was introduced into China. Through a study of Chinese popular texts in this period, the author will examine the process of the introduction of the Zeiss planetarium and will seek to explain why China did not construct a planetarium until the 1950s. The paper will also offer some more general ideas on the function and orientation of the planetarium.

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