

**Preserving and studying scientific heritage at the University of Lisbon:
Recent developments and perspectives**

*Marta C. Lourenço**

Resumen

La preservación y el estudio del patrimonio científico implican muchos desafíos. En la Universidad de Lisboa hemos estado atendiendo estos desafíos en estrecha colaboración con colegas de Europa y Brasil. En este artículo describo recientes trabajos en este frente, con foco en la formación sobre la cultura material y apoyando a otras instituciones en la preservación de su patrimonio científico. También discutiré el "giro material" en la historia de la ciencia, que ha sido una inspiración para Lisboa.

Palabras claves: patrimonio científico - la cultura material de la ciencia - historia de la ciencia - colecciones científicas

Abstract

The preservation and study of scientific heritage involves many challenges. At the University of Lisbon we have been addressing these challenges in close collaboration with partners from Europe and Brazil. In this paper I describe recent work on this front, with a focus on material culture training and supporting other institutions in the preservation of their scientific heritage. I will also discuss the 'material turn' in the history of science, which has been an inspiration for Lisbon.

Key words: scientific heritage - material culture of science - history of science - scientific collections

Fecha de recepción: 07/08/2013

Fecha de aceptación: 17/11/2013

Introduction

The sustainable preservation of scientific heritage is one of the greatest cultural challenges of contemporary societies. It involves a broad spectrum of agents, from museums to universities, secondary schools to academic hospitals, historians of science, archivists, among many others. The material evidence of scientific research, teaching and innovation is dispersed and may be vulnerable. It assumes a wide range of shapes and formats, from collections (e.g. herbaria, scientific and medical instruments, fossils, minerals, DNA and seed banks, models, drawings, documents, books) to buildings (e.g. astronomical observatories, chemistry and physics laboratories, anatomical theatres), botanical gardens and parks.

Although many countries include the preservation of scientific heritage in their cultural heritage legislation,¹ in practice this heritage is twice an orphan. First, it is an orphan in its own institutions –universities, schools, research institutes– because these often lack the vocation, dedicated funds, qualified staff or internal mechanisms for its preservation. Preservation tends to be left to the arbitrariness and good will of heritage-concerned individuals. Secondly, it is an orphan in regards to culture institutions –e.g. culture ministries, cultural divisions in municipalities– who tend to be sympathetic but feel the preservation of scientific heritage is someone else’s responsibility.²

In the past three decades, an increased sense that a lot has already been lost, combined with other social, cultural and scientific factors have resulted in a growing awareness towards the importance of scientific heritage in contemporary societies. Perhaps one of the most significant factors was the ‘material turn’ in the history of science and technology.³ Scientific objects and collections have always interested historians, but material culture only recently gained its proper space in the history of science, technology and medicine, with special issues,⁴ bibliographies,⁵ dictionaries and

¹ And at least one country –Brazil– explicitly includes the preservation of the heritage of science and technology in its Constitution. See M. GRANATO, “Scientific heritage in Brazil”, *Studies in History and Philosophy of Science*, 2013, DOI 10.1016/j.shpsa.2013.07.008.

² See an overview of the problems of scientific heritage in contemporary societies, see M.C. LOURENÇO, “O património invisível: História, organização e preservação do património científico em Portugal”, *Museologia.pt*, 4, 2010, pp. 106-121 and M. C. LOURENÇO & L. WILSON, “Scientific heritage: Reflections on its nature and new approaches to preservation, study and access”, *Studies in History and Philosophy of Science*, 2013, DOI 10.1016/j.shpsa.2013.07.011.

³ L. TAUB, “Reengaging with instruments”, *Isis*, 102, 2011, pp. 689–696.

⁴ For example the special volume of *Osiris* (núm. 9, 1994), edited by Albert Van Helden and Thomas L. Hankins, the Focus Sections of volumes 96 (2005) and 102 (2011) of *Isis* and special volumes 38 (2007)

encyclopaedias,⁶ and multiple articles and books proposing new approaches.⁷ Moreover, international organisations created in the early 2000s, such as the International Committee ICOM for University Museums and Collections (UMAC)⁸ and Universeum, the European University Heritage Network,⁹ have considerably contributed to an integrated approach to university heritage, particularly scientific university heritage.

Since 2007, the National Museum of Natural History and Science of the University of Lisbon has been addressing the ‘material turn’ in the history of science, in close collaboration with the Centre for the History of Science of the University of Lisbon (CIUHCT-UL)¹⁰ at local level, and partners in Europe and South America. In this short note, I will describe recent developments in two simultaneous fronts: a) increasing the use of collections for research and teaching and b) promoting the preservation of scientific heritage.

The National Museum of Natural History and Science

Like so many universities in Europe and the world, the University of Lisbon has a diverse heritage of science, technology and medicine, still largely unorganised and until recently little known from the scientific community and the general public.¹¹ It has one museum –the National Museum of Natural History and Science (MUHNAC)– whose

and 40 (2009) of *Studies in History and Philosophy of Science*, edited respectively by Adam Mosley and Liba Taub, among others.

⁵ E.g. G. L'E. TURNER & D. J. BRYDEN, *A Classified Bibliography on the History of Scientific Instruments*, Oxford, SIC, 1997.

⁶ E.g. R. BUD & J. D. WARNER, *Instruments of science: An historical encyclopaedia*, London, Science Museum, 1998.

⁷ E.g. D. BAIRD, *Thing knowledge. A philosophy of scientific instruments*, Berkeley, University of California Press, 2004; M.C. LOURENÇO & A. CARNEIRO (eds), *Spaces, Collections and Archives in the History of Science: The Laboratorio Chimico Ouverture*, Lisbon, Museum of Science of the University of Lisbon, 2009; P. HEERING & R. WITTJE (eds), *Learning by doing: Experiments and instruments in the history of science teaching*, Stuttgart, Franz Steiner Verlag, 2011; L. LÓPEZ-OCÓN, S. ARAGON & M. PEDRAZUELA, *Aulas con memoria: Ciencia, educación y patrimonio en los institutos históricos de Madrid (1837-1936)*, Madrid, CEIMES/CSIC/Comunidad de Madrid, 2012, among many others.

⁸ See UMAC's website and the journal *UMACJ* at <http://publicus.culture.hu-berlin.de/umac/>, accessed 16 June 2013.

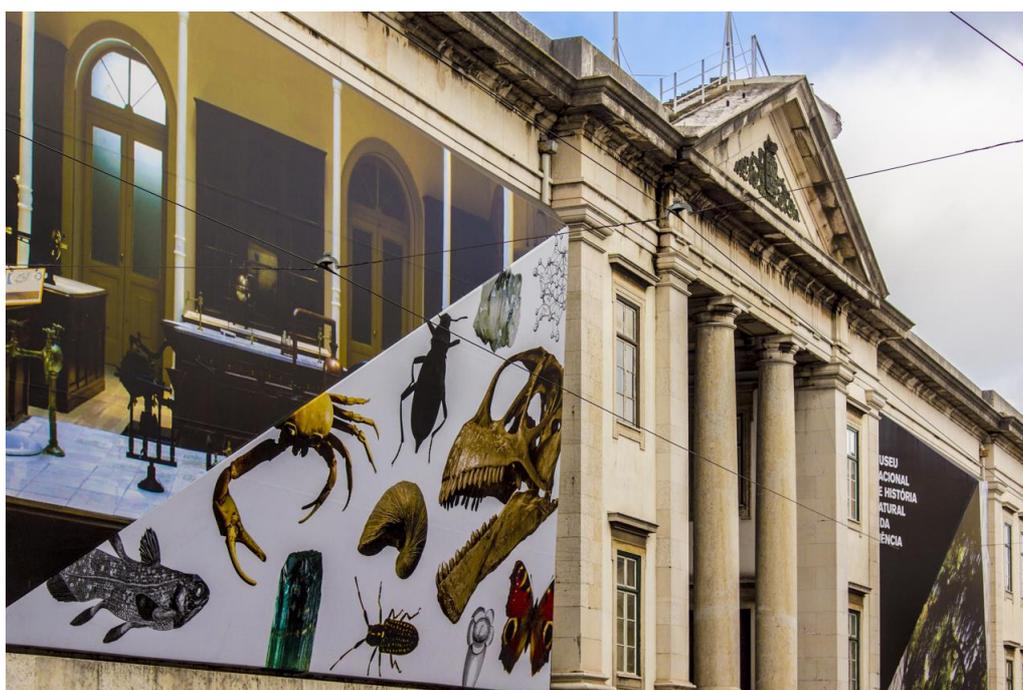
⁹ See *Universeum*'s website at <http://universeum.it/>, accessed 16 June 2013.

¹⁰ See <http://ciuhct.com/>, accessed 7 August 2013.

¹¹ See M.C. LOURENÇO & M.J. NETO (coord.), *O Património da Universidade de Lisboa: Ciência e Arte, Lisboa*, Universidade de Lisboa/Tinta da China, 2011. A survey of the heritage of the University of Lisbon can be seen at <http://memoria.ul.pt/index.php/Categoria:Colec%C3%A7%C3%B5es>, accessed 16 June 2013. This publication and survey was done before the University of Lisbon merged with the Technical University of Lisbon in 2012.

origins date back to the royal scientific cabinets of the Palace of Ajuda (Lisbon), in the 1770s. The MUHNAC congregates ideal conditions for the development of an integrated and interdisciplinary approach to scientific heritage in the context of the history of science (fig. 1). It occupies 5 ha in the centre of Lisbon. The complex was built in the nineteenth century to support teaching and research in the sciences. Despite a major fire in 1978, it survived intact in its main architectural and historical characteristics. It includes a main building (1857), a Botanical Garden (1878), an Astronomical Observatory (1898) and a Chemistry Laboratory (1890s). It also includes older buildings and structures, documenting a history of teaching that dates back to the early seventeenth century. In 2012, the Museum integrated the Astronomical Observatory of Lisbon (1873), located in the west of the city.

Figura 1
Main entrance to the MUHNAC, University of Lisbon



Fuente: Photo J. Perico, MUNHAC Archives.

The collections, encompassing c. 800,000 scientific instruments, books and natural history specimens, have never been dispersed.¹² They do not result from disparate and

¹² A significant part of the zoology and geology collections were destroyed in a fire that devastated the main building in 1978. See L. PÓVOAS, C.L. LOPES, I. MELO, A.I. CORREIA, M.J. ALVES, H. CARDOSO & A.M.G. de CARVALHO, “O Museu Nacional de História Natural”, M.C. LOURENÇO & M.J. NETO (coord.), *O Património...cit.*, pp. 20-36.

random incorporations and are thus considerably consistent. Moreover, the constitution, function and use of buildings and collections are extensively documented through a comprehensive historical archive covering over 300 years and including c. 300,000 manuscripts, teaching manuals, expedition and field notes, images, drawings, among others. It is this coherence and comprehensiveness, combined with the availability of multiple sources and contexts – buildings, documents, iconography and collections – that makes the Museum particularly suited to meaningful collections-based research, teaching and interpretation in a wide range of scientific disciplines, from museology to the history of science and science education, biology, ecology, biodiversity studies, sociology, anthropology, science communication, museum studies and exhibition development, among others. In this text, I will focus exclusively on the history of science.

Increasing collections-based history of science in Lisbon

The ‘material turn’ poses challenges both to museums and to historians. These challenges are structural and more difficult to overcome for museums.¹³ Historians are naturally interested in objects and collections. They are frequent visitors to museums and use artefacts and specimens to illustrate books, papers and teaching materials. They recognise the importance of material culture and visual culture.

For historians, the challenge consists mainly on considering material sources on an equal basis with documental sources. This requires a shift in historiographical approach: from objects as illustrations of historical interpretation to objects as primary sources of historical analysis. In other words, objects from the start, not at the end, of historical narratives. This is not always possible for many reasons, but historians are trained to carefully evaluate sources before and as research progresses. In any case, it cannot be done without adequate training. Material sources require a different grammar and different methods from the use of documental sources.¹⁴ Complementary training of

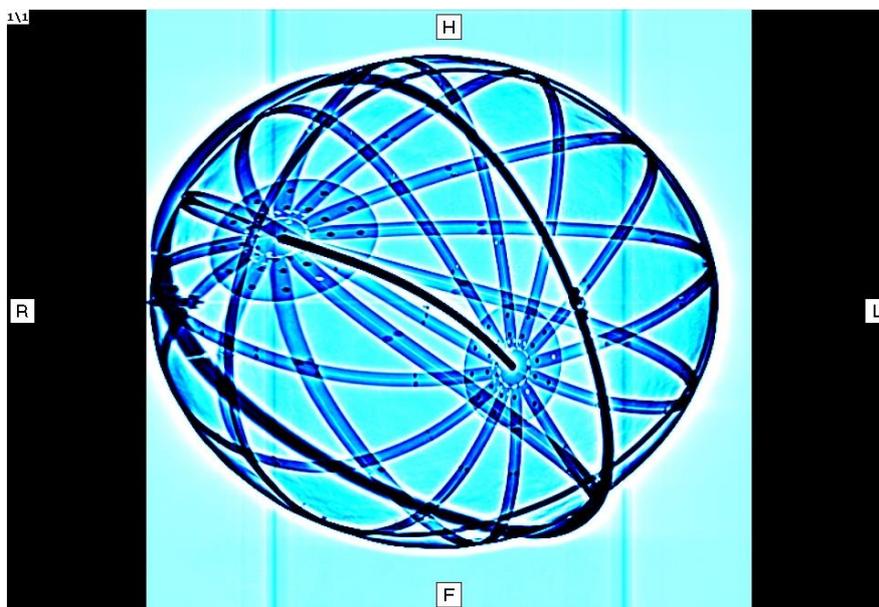
¹³ M. C. LOURENÇO & S. GESSNER, “Documenting collections: Cornerstones for more history of science in museums”, *Science & Education*, 2012, DOI 10.1007/s11191-012-9568-z.

¹⁴ S. LUBAR & W.D. KINGERY, *History from things. Essays on material culture*, Washington DC, Smithsonian Institution Press, 1993; M. C. LOURENÇO & S. GESSNER, “Documenting...” cit.

young historians in the material culture of science is paramount for a meaningful increase in collections-based research.

The MUHNAC has been paying considerable attention to training. In 2008, a 40-hour course on ‘Museums, Collections and History of Science’ was included in the Masters of History and Philosophy of Science of the University of Lisbon. The course aims at preparing students to use museums and collections as easily as they use archives. It provides them with the necessary conceptual framework of material culture and related literature, as well as the standard method for artefact analysis (the so-called Winterthur method).¹⁵ The course, which has a strong practical component, is based at the MUHNAC and students use its collections and archives. It is the only Masters in the History of Science in Portugal offering formal material culture training, and one of the few in Europe. Condensed versions of this course have also been offered in Brazil.¹⁶ At the MUHNAC, young historians are also trained in a more practical context, through research projects. Over the years, it has been possible to have a considerable number of scholarships that have contributed to the national critical mass of material culture trained historians.

Figura 2
The ‘skeleton’ of a sixteenth-century metal globe



Fuente: by Christoph Schissler (National Palace of Sintra, Inv. No. 3457), obtained by CT-scan during a research into royal collections of scientific instruments in Portugal (Courtesy Portuguese Institute of Oncology, Lisbon).

¹⁵ E.M. FLEMING, “Artifact study: A proposed model”, *Winterthur Portfolio*, 9, 1974, pp. 153-173.

¹⁶ Pos-graduate course in Museology, MAST/Unirio.

However, not only historians need training in artefact analysis and material sources. For reasons too complex to discuss here, for the past four decades the central role of collections and research in museums has been declining¹⁷ and museum professionals themselves often need extra training. Moreover, museology and museum studies courses do not typically prepare professionals for the specificities of scientific collections. Finally, as I will explain below, scientific heritage is too dispersed, too abundant and too complex for its preservation to be left only to museum professionals – scientists, professors and technicians in each university, school, research laboratory, need awareness and basic training. As a result, the MUHNAC has developed intensive courses¹⁸ on material culture, scientific collections conservation, inventory and study aimed at professionals from a multitude of backgrounds and institutions, including museums.

Training forces us to focus. Literature on the material culture of science and scientific heritage does not abound and, over the years, the MUHNAC has developed materials, particularly at the level of methods, criteria and guidelines. These include new approaches to collections' biographies and artefact analysis,¹⁹ scientific collections survey tools that are being used in Portugal and Brazil,²⁰ an inventory and conservation manual for scientific instruments,²¹ and a classification table for scientific collections.²² Presently, MUHNAC's researchers are addressing the issue of university collections' evaluation, in other words what parameters determine value and significance of a given university collection.²³ Some of these materials are closely connected with MUHNAC's Scientific Heritage Programme, described below.

¹⁷ See e.g. R.G.W. ANDERSON, "To thrive or to survive? The state and status of research in museums", *Museum Management and Curatorship*, 20, 2005, pp. 297-311.

¹⁸ Duration can be two days or one week.

¹⁹ Based on Igor Kopytoff and E. McClung Fleming respectively, see LOURENÇO & GESSNER, op. cit.

²⁰ Still unpublished, but the record fields can be seen at the survey of collections of the University of Lisbon, see note 10.

²¹ Internal document distributed among institutions that participate in the MUHNAC Scientific Heritage Programme, see below.

²² C. TEIXEIRA, *Património Cultural da Universidade de Lisboa: Levantamento e contributo para a sua valorização*, unpublished Masters in Museology, New University of Lisbon, 2012; M. C. LOURENÇO & L. WILSON, "Scientific heritage..." cit.

²³ M.C. LOURENÇO, C. TEIXEIRA & L. F. LOPES, "Tools for evaluating collections: Assessing the Natural History Collections of the Museums of the University of Lisbon", unpublished paper presented at the *XIV UNIVERSEUM Network Meeting*, 7 June 2013, University of Valencia. See also the recently released *Qualitätskriterien für wissenschaftliche Universitäts-sammlungen* [Quality criteria for scientific university collections], June 2013, Coordination Center for University Collections in Germany, <http://wissenschaftliche-sammlungen.de/de/>, accessed 4 August 2013.

In short, for the past years, the MUHNAC has been using their collections, archives and buildings to stimulate a new centrality of collections in the heart of the historian community and the museum community. Outcomes have included increased post-graduate teaching, research and professional training, as well as a number of methodological and conceptual documents for research and preservation of scientific collections. This has been done in close articulation with several research units, universities and museums in Portugal, Europe and Brazil.

The Lisbon Scientific Heritage Programme: Fundamental Concepts, Partnerships and Networks

Scientific heritage is a more complex concept than, say, archaeological heritage or natural heritage. We are operating empirically, often intuitively, and adapting standards as we move along. Much more research needs to be done on the fundamentals.²⁴ Moreover, the preservation of scientific heritage is a research but also a political endeavor. If scientific heritage does not emerge as an autonomous entity in present-day's crowded, fragmented and multi-complex cultural heritage landscape it is difficult, if not impossible, to establish preservation policies at national or local level. The heritage of science deserves an international movement similar to the ones that led to other global UNESCO preservation conventions, such as the biodiversity convention in 2000 or the intangible heritage convention of 2003. Raising awareness among the museum community and the scientific community is paramount.

At the MUHNAC, we use the following definition of scientific heritage: “scientific heritage is the shared collective legacy of the scientific community, in other words what the scientific community as a whole perceives as its identity, worth being passed on to the next generation of scientists and to the general public as well. It includes *what* we know about life, nature and the universe, but also *how* we know it. Its media are both material and immaterial. It encompasses artefacts and specimens, but also laboratories, observatories, landscapes, gardens, collections, *savoir faire*s, research and teaching practices and ethics, documents and books”.²⁵ This definition has allowed us to

²⁴ M. C. LOURENÇO & L. WILSON, “Scientific heritage...” cit.

²⁵ M. C. LOURENÇO & L. WILSON, “Scientific heritage...” cit.

establish the scope and methodology of our theoretical and practical work. On the one hand, it assumes an all-encompassing approach – from objects to archives, sites and buildings. On the other hand, it also assumes, albeit indirectly, that scientific heritage should be preferably preserved *in situ*, in the institutions where it is generated. This can be controversial not only because traditionally museums are the institutions that preserve cultural heritage but also because, some argue, universities, schools and hospitals are not prepared to preserve collections and heritage. However, if properly done, the advantages are evident, as Jardine argues in a recent paper: potential increase in heritage- and collection-based teaching and research, engagement with wider communities, involvement of students, enhancement of institutional identity and work experience, respect for contexts and practices, among others.²⁶

Our experience in Lisbon indicates that this decentralised preservation approach is possible if a few conditions are met: i) political will and engagement at the highest level of the heritage-generator institution (rector, dean, director, president); ii) the existence of simple preservation tools that the institution can use; iii) close partnership and constant evaluation; and iv) a few heritage-concerned individuals at the institution.²⁷ Although simple, these conditions are demanding and often months of preparation are needed before preservation work can even begin.

In 2007, the MUHNAC initiated a national programme to sustain this all-encompassing *in situ* preservation of Portuguese scientific heritage. Initially, the Programme was informal and resulted from frequent demands for help. Typically, individual teachers, scientists and researchers asked the Museum for assistance in the preservation of orphaned or endangered collections. More often than not, the Museum was called at the last minute before an emergency (i.e. a laboratory about to be moved or dismantled, an attic to be emptied). On many occasions, little could be done resulting in frustration and disappointment, combined with a sense that a bit of time and few resources could have made all the difference. This has impelled the Museum to proactively identify which tools institutions needed to preserve the scientific heritage they generate, at least at a minimal level. It soon became clear that institutions needed

²⁶ See N. JARDINE, “Reflections on the preservation of recent scientific heritage in dispersed university collections”, *Studies in History and Philosophy of Science*, 2013, DOI 10.1016/j.shpsa.2013.07.009.

²⁷ When one of these conditions are not met and the heritage is abandoned or in danger, the Museum has accepted joint management or even transfer of the collections to its storages, on a long-term loan basis.

three types of tools: i) basic definitions,²⁸ ii) selection criteria,²⁹ and iii) guidelines for preservation and use.³⁰

Based on these ‘grass-roots’ needs, the Museum compiled available information and literature, prepared training courses and basic materials. The Programme became more formal and solid. Today, it covers more than 20 heritage-generating institutions (e.g. the Lisbon Academy of Sciences; Passos Manuel, Camões, Oeiras and Santarém Secondary Schools; the National Train Museum; the Hygiene and Tropical Medicine Institute; Saint Joseph, Saint Marta Hospitals; the Doroteias College; the National Agronomy Station; the Military College, among others). More recently, the Programme has focused on institutions from the University of Lisbon (e.g. Faculty of Medicine, *Instituto Superior Técnico*, Câmara Pestana Bacteriological Institute, Astronomical Observatory of Lisbon).³¹ In terms of disciplines, the Programme covers preservation of heritage from all sciences – from medicine and health to the so-called exact sciences, biological and geological sciences and mathematics. At its core lies the idea that scientific heritage and collections are an integral part of the distributed research, teaching and science communication infrastructure of Portugal.

²⁸ The identification of the needs of the institutions was done informally, through ongoing dialogue and reflection, during 2007. It has been refined over the years with the experience the Museum has obtained. In terms of basic definitions, most institutions wanted to know: What is scientific heritage? How does it relate to what we do and what we are? What are collections? What is a scientific instrument? What is an inventory? What training is required to inventory?

²⁹ In this respect, institutions wanted to know: What is the value of the heritage we generate? What is important to preserve and what is not? How can we select? What institutional mechanisms can we implement to avoid arbitrary trashing of relevant equipment and documentation? How to document what has to be trashed due to space or other constraints?

³⁰ In terms of long-term preservation and use, some of the questions asked by the institutions were: Once we select what is to be preserved, what do we do? Where do we keep it? How? Who should be given access and under which conditions? How can we display our scientific heritage? How do we give it increased visibility? Who pays for it?

³¹ M.C. LOURENÇO & M.J. NETO (coord.), *O Património...cit.*; C. TEIXEIRA, *Património Cultural...* cit. In 2013, the University of Lisbon merged with the Technical University of Lisbon, becoming the largest university on Portugal.

Figure 3
The MUHNAC team cleaning teaching wall charts during a conservation session at the Hygiene and Tropical Disease Institute (IHMT), 2013, Lisbon



Fuente: photo by the author.

The Programme has been recently described in its general lines.³² It comprises four stages. Stage I involves a series of visits to the heritage-generating institution (university, school, polytechnic, institute, hospital). Stage II involves basic training of staff from the given institution, typically at the MUHNAC. Stage III encompasses the design of a tailor-made strategic plan for the preservation of scientific heritage for the institution, in close articulation with its needs, aims, constraints and resources. Finally, Stage IV involves the implementation of the strategic plan, which the Museum monitors closely, through further training, the engagement of students and volunteers, assistance with potential funding sources and the provision of exhibition space at the MUHNAC for increased visibility. A brief checklist of the Programme's four stages is presented in Appendix 1.

³² M. C. LOURENÇO & L. WILSON, "Scientific heritage..." cit.

Although only impacting at national Portuguese level, the Programme involves considerable preparatory work that has been done in international networks. Perhaps the most important partner in this respect is the Museum of Astronomy in Rio de Janeiro (MAST). The MAST and MUHNAC have coordinated concepts and methodologies for their national surveys of scientific heritage at collection-level in Brazil and Portugal, respectively.³³ The MAST also has a similar scientific heritage programme, though more limited given the size of Brazil. In 2006, both museums have assembled a network of 14 Brazilian and Portuguese institutions to develop a thesaurus of scientific instruments in Portuguese; this tool has just been released and is paramount for the identification and documentation of scientific heritage.³⁴ Translation to Spanish is already being considered.

Moreover, work with the University of Cambridge within the European network UNIVERSEUM has been fruitful in terms of concepts, criteria and requirements associated with the preservation of post-WWII heritage of science.³⁵ Finally, recent work done at the Humboldt University in Berlin has been inspiring for the development of strategic planning.³⁶ It is clear that the path towards the sustainable preservation of scientific heritage is complex, requiring multiple simultaneous fronts and innovative ideas. However, a lot is happening at the moment worldwide, and collaborative networks at national and international level are more than ever essential.

Concluding remarks

The world of cultural heritage has endured considerable changes in the past decades. History has changed too, albeit less.

Traditionally, objects have been cared for by museums and curators; manuscripts have been cared for by archives and archivists; books by librarians; buildings and monuments by preservation architects; photographs and drawings could be found in museums, but also in libraries and archives. Together, museums, libraries and archives

³³ At the moment, the scope of the Brazilian survey excludes collections of medicine and natural history.

³⁴ The Thesaurus can be explored at <http://thesaurusonline.museum.ul.pt/>, accessed 4 August 2013.

³⁵ Universeum has a Working Group for issues related to the preservation of recent scientific heritage, see http://universeum.it/working_groups.html, accessed 4 August 2013.

³⁶ Particularly at the Helmholtz Centre for Technical Culture, see <http://www.kulturtechnik.hu-berlin.de/>, accessed 5 August 2013.

were responsible for the preservation of the majority of the cultural heritage of the world.

Recently, the concept of cultural heritage has changed and expanded – it is now more integrated and contextual, more immaterial, more fragmented. Traditional preservation roles are more fluid and approaches have become increasingly complex and interdisciplinary. Familiar territories and boundaries have been diluted or no longer exist. One thing remains unchanged however: preserving cultural heritage continues to be about preserving and interpreting meaningful material and immaterial data for the public access of future generations.

In terms of scientific heritage, this means preserving and interpreting data about science, nature and the universe, in all their shapes and forms (words, things and bytes). The complexity of the preservation task requires the full commitment and active engagement of multiple actors and institutions in fruitful, effective and long-term partnerships. It also requires new tools and approaches, many of which have not been developed yet. For the interpretation task, historians are essential, and one wonders how it was possible that they have remained ‘divorced’ from museums for so long.

In recent decades, the history of science, technology and medicine has increasingly diversified its scope and approaches. It has become more interdisciplinary too. Topics that traditionally received little attention – controversies, contingencies, tacit knowledge, *microstoria*, women, traders, and lab technicians, among others – became increasingly central to science studies. Broader scopes led to a diversification of sources – notebooks, teaching manuscripts, laboratory logs, manuals, and instruments. The ‘material turn’ is part of this broader ‘social turn’ in the history of science, technology and medicine.

Artefacts, collections and scientific heritage can provide important insights into scientific practices as a social activity, namely the development of experimental inquiry; theoretical speculation; research and teaching practices; technical applications; and innovation, transfer, and interactions in the ‘trading zone’ between instrument makers, laboratory staff and scientists. As Golinski notes, from the study of instruments “we learn both that science is embodied in firmly material things and that it is nonetheless socially negotiated and historically variable”.³⁷ Increased use of collections as sources

³⁷ J. GOLINSKI, “Precision instruments and the demonstrative order of proof in Lavoisier’s chemistry”, *Osiris*, 9, 1994, pp. 30-47, quote from p. 47.

will thicken and enrich both local and global narratives in the history of science, technology and medicine. These, in turn, will gradually enrich our knowledge about collections and scientific heritage, projecting their stories into society and the future.

Acknowledgments

The author is grateful to the *Fundação para a Ciência e Tecnologia* (FCT, Portugal) and the *Conselho Nacional para o Desenvolvimento Científico e Tecnológico* (CNPq, Brazil) for funding research developed at the MUHNAC over the past decade.

Appendix 1

The MUHNAC Scientific Heritage Programme: A Checklist

Stage I

After a initial contact from the heritage-generator institution and a meeting with the institution administration, a set of field visits are planned to:

- evaluate the collections and associated documentation;
- identify available and engaged human resources (staff, teachers, scientists, technicians, students);
- identify potential storage and display areas;
- identify potential uses (research, teaching, outreach);
- compile information about museums, proto-museums and other heritage preservation structures that exist in the institution (archives, libraries);
- compile information about previous preservation initiatives;
- collect building plans, organograms, literature, photos, old catalogues and inventories;
- above all, raise awareness towards the importance of scientific heritage and associated documentation, convincing institutions that they can do better with the resources they already have and consolidate a partnership based on mutual trust.

Stage II

Basic training of the institution's available staff covering the following:

- scientific heritage cataloguing and documentation (archives, oral history, object photography, data and databases);
- material culture (artefacts and collections as sources);
- conservation and security issues (minimum storage requirements, environmental conditions, access control, insurance);

- legal issues (property, international treaties regarding endangered species, relevant legislation and guidelines regarding human remains, live specimens and typical hazards in scientific environments, such as chemical, radioactive, bacteriological, explosive materials, among others);
- restoration and display ethics.

Training sessions are variable in duration and they occur at the MUHNAC.

Stage III

This stage involves:

- design of a specific and step-by-step Strategic Plan for the Preservation of Scientific Heritage for the institution, including the provision of long-term policies, selection criteria and internal procedures (minimal requirements for preservation, institutional preservation mechanisms, regulations for display, teaching and research use);
- validation and approval of the Strategic Plan by the institution's top administration.

Stage IV

Implementation and evaluation of the Strategic Plan.