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*Royal cabinets of physics in Portugal and Brazil:  
An exploratory study*

**Abstract**

Little is known about the history of cabinets of natural philosophy, later known as cabinets of physics, in Portugal. Scientific instruments assembled by the Portuguese royal family for purposes of teaching, study and entertainment were thought to have been lost. A recent ‘discovery’ of a significant number of ‘lost’ royal instruments from the sixteenth to nineteenth centuries has prompted research into the organization, use and dispersal of royal cabinets of physics in Portugal and Brazil. In this paper, I will present this research, focusing on the discussion of the methods and challenges. I will also discuss some preliminary results.

**Introduction**

In the late summer of 1991, Fernando Bragança Gil (1927–1999), former director of the Museum of Science of the University of Lisbon, received a phone call from a teacher in one of Lisbon’s secondary schools. The teacher explained that the school had several scientific instruments from the former royal Palace of Ajuda (Lisbon) and asked for help in their study and preservation. Initially, Bragança Gil was sceptical. He knew that there had been royal cabinets of physics, but these were all lost and there were no known records of instruments having been transferred to schools. However, after some insistence, he went to the school. He could not believe what he saw. In the physics laboratory, surrounded by current and indistinct physics equipment, were some of the most incredible scientific instruments ever seen in Portugal, among which were a 1573 Flemish quadrant, an Elias Allen circles of proportion (c. 1630) and a Butterfield equatorial sec-

tor (fragment, c. 1690) (ill. I–III). In the world of scientific instruments, this ‘discovery’ was equivalent to finding a new Raphael or a new Rembrandt in grandmother’s attic. Given their importance, combined with the need to be preserved, studied and made accessible, Bragança Gil proposed the transfer of the instruments to the Museum of Science on a permanent loan basis. This was accepted by the school. Eventually, a total of 70 scientific instruments would be transferred to the Museum between 1991 and 2003 – the majority with confirmed ‘royal’ provenance. It is the second largest existing group of instruments from the ‘lost’ Portuguese royal cabinets of physics, after the Palace of Ajuda itself<sup>1</sup>. The instruments have been catalogued, restored, displayed and are being studied. They have triggered the broadest historical research into cabinets of physics that has ever been conducted in Portugal.

Until now, a total of 215 instruments with documented ‘royal’ provenance have been identified in palaces and museums in Portugal and Brazil. The oldest are the Flemish quadrant mentioned above and a 1575 brass celestial globe by Christopher Schissler, a German instrument maker who probably made instruments for Tycho Brahe (Keil & Zäh 2007). The most recent is an 1893 Edison phonograph. There are telescopes, octants, vacuum pumps, globes, armillary spheres, microscopes, slide rules and didactic animated planetary devices, among many others. All but two instruments (Seruya & Pereira 2005, Gessner 2010) remain unstudied. The majority have had limited public display and remain inaccessible to the scientific community. However, their historical importance, singularity and rarity are remarkable. They raise questions that remain unanswered: How could such rare instruments have remained ‘hidden’ for so long? When and for which purposes were they acquired? What were the contexts of their acquisition, use and circulation? Did their roles change through time? What is their significance today?

An exploratory project aiming at answering some of these questions was formally initiated in 2010. It involves 20 historians of science, museum professionals and other experts, at least three countries (Portugal, Brazil, and France) and a time span of over 300 years. Among the expected outcomes are a publication and an exhibition reuniting all ‘lost’ instruments. In this paper, I will briefly present the project, particularly its methodology and main challenges, as well as some preliminary results.

## Methods, sources and challenges

Scientific instruments from the royal cabinets are at the centre of this research. They are our primary sources. Collections-based history of science involves specific methodologies that often pose many challenges. Although there has been a considerable growth in interest in scientific instruments as primary sources during recent years, mainstream history of science uses mainly documental sources. Historians are trained in reading texts and they often lack the ‘grammar’ of objects (Corn 1996, Lourenço 2002). In a project that brings together such a diverse team – ‘mainstream’ historians, instrument-based historians, museum professionals, and so on – perhaps the most important challenge is to

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<sup>1</sup> At the time of the ‘discovery’, Bragança Gil did not know that there were scientific instruments at the Palace of Ajuda.

overcome different ‘cultures’, backgrounds and perceptions of objects in order to maintain the material culture focus. There is a permanent tendency to give more value and credibility to documents – documents hold the ‘ultimate word’, the ‘ultimate proof’ – and position instruments at a secondary level, as mere illustrations of a narrative derived solely from archival sources. This tension between objects and documents is beneficial to the research, but one needs to be constantly reminded of bringing the former to centre stage.

Initially, the universe of royal instruments to be studied was limited to those at the Museum of Science. However, it was necessary to find out if there were more royal instruments elsewhere, particularly at the eight former royal palaces in Portugal. These were nationalized in 1910, when Portugal became a republic and the last King, Manuel II (1889–1932), was forced to exile in London. All palaces but two were transformed into museums in the mid-twentieth century<sup>2</sup>.

Thus, the research methodology involved two stages. First, a preliminary survey of the palaces and other relevant museums in Portugal and Brazil was done in order to identify more ‘lost’ or ‘forgotten’ scientific instruments. The survey immediately posed a major practical challenge, namely: how do we define a ‘scientific instrument’? As Taub (2009) and others (e.g. Turner 1993, Bud *et al.* 1998) have explained, no single comprehensive definition exists. The term is used loosely both in museums and by historians. A telescope is considered a scientific instrument, but so is a teaching model of the atom, a long-case clock or a telephone. Moreover, the term ‘scientific instrument’ is often used anachronistically since it only became in use during the nineteenth century (Taub 2009) (ill. IV–VI).

Portugal’s former royal palaces are abundant with artefacts of science and technology. They once had kitchens, workshops and pharmacies with different types of balances, glassware, measure standards, meters, among many utensils and tools; they also had decorative clocks, barometers, thermometers, telephones, and telegraphs. At an early stage of the survey we realized that a working definition of ‘scientific instrument’ was needed to circumscribe the scope of the research. Ultimately, a simple and intuitive definition was chosen: in the context of this study, ‘scientific instrument’ is restricted to artefacts aimed at conducting scientific experiments in a context of teaching, study or entertainment<sup>3</sup>. This excludes mere clocks, ‘decorative’ barometers and thermometers, telephones, and so on. Eventually the scope also came to include mathematical games and scientific toys, as well as artistic representations of scientific instruments<sup>4</sup>. Although difficult to apply in a considerable number of practical cases, this definition has enabled us to successfully conduct the survey of royal scientific instruments, both in Portugal and Brazil (table 1). The total number of instruments may grow as research evolves.

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<sup>2</sup> Palaces of Ajuda (Lisbon), Queluz, Sintra-Vila, Sintra-Pena, Mafra, Vila Viçosa, Necessidades (Lisbon) and Belém (Lisbon). All but the Palaces of Necessidades and Belém are open to the public.

<sup>3</sup> This working definition has already been used in other research projects involving the Museum of Science (e.g. Granato *et al.*, in press).

<sup>4</sup> E.g. paintings depicting royal family members with armillary spheres and globes, sculptures, and frescos with scientific representations.

Table 1. Number of instruments with confirmed royal provenance under study per institution. The total number is 215 (August 2011)

<b>Institution</b>	<b>Location</b>	<b>Status/Observations</b>	<b>Number of Instruments</b>
Palace of Ajuda (18 <sup>th</sup> and 19 <sup>th</sup> century)	Portugal (Lisbon)	The Palace is today a museum.	78
Palace of Belém (16 <sup>th</sup> century)	Portugal (Lisbon)	The Palace is today the official residence of the President of the Republic.	0
Palace of Queluz (18 <sup>th</sup> century)	Portugal	The Palace is today a museum.	8
Palace of Sintra-Vila (15 <sup>th</sup> century)	Portugal	The Palace is today a museum.	1
Palace of Sintra-Pena (19 <sup>th</sup> century)	Portugal	The Palace is today a museum.	11
Palace of Mafra (17 <sup>th</sup> century)	Portugal	The Palace is today a museum.	12 <sup>1</sup>
Palace of Necessidades (18 <sup>th</sup> century)	Portugal (Lisbon)	The Palace is today the Ministry of Foreign Affairs.	0
Palace of Vila Viçosa (15 <sup>th</sup> century)	Portugal	The Palace is today a museum.	19
Museum of Science, University of Lisbon (1985)	Portugal (Lisbon)	Instruments transferred from the Palace of Ajuda to a secondary school in the 1950s and to the Museum in the 1990s.	65
Former National Museum of Science and Technology (1976)	Portugal (Coimbra)	Instruments transferred from the Palace of Ajuda in the early 1970s. Presently the Museum is undergoing an extinction process.	12 <sup>1</sup>
Cabinet of Physics, Science Museum of the University of Coimbra (18 <sup>th</sup> century)	Portugal (Coimbra)	Possibly, instruments transferred from the Palace of Ajuda to the College of the Nobles (Lisbon) in 1766 and from there to Coimbra in 1773.	2
Geographical Society of Lisbon (1875)	Portugal (Lisbon)	The two Coronelli globes enter the Geographical Society in 1878. They were acquired for the Royal Library of the Palace of Ribeira (Lisbon), by King João V.	2

Institution	Location	Status/Observations	Number of Instruments
National Museum (1818)	Brazil (Rio de Janeiro)	The Museum has a sundial with an inscription for Emperor Pedro II (1825–1891).	1
National Historical Museum (1922)	Brazil (Rio de Janeiro)	The Museum holds the most significant heritage of the Brazilian Imperial family.	4

The second stage of the research, presently under development, is to study these instruments individually, as well as the history of the cabinets they belonged to. Whenever possible, existing instruments will be assigned to their original cabinets. This is also a challenge due to a number of reasons. First, the instruments are dispersed among more than 10 institutions in two countries. Secondly, the instruments are considerably heterogeneous, both in type and time frame. There are ‘ornamental’ instruments, probably acquired for prestige or decoration; there are teaching instruments, similar to those commonly found in university cabinets. In terms of disciplines, the instruments cover physics, chemistry, mathematics, astronomy, as well as technological and industrial models. There are also *in situ* instruments, such as meridians, sundials and possibly astronomical towers. Moreover, it is often difficult to distinguish which of these instruments belonged to royal cabinets *sensu stricto* and which belonged to royal-sponsored cabinets outside the palaces, say in colleges, religious orders or universities. Thirdly, the research requires the use of different sources: the instruments themselves, for which a specific study record was developed (appendix), documental and bibliographic sources, as well as iconography. Finally, the majority of the instruments are scarcely documented, which resulted in the need to conduct significant and time-consuming preliminary surveys of thousands of documents in national archives in Lisbon, Rio de Janeiro, and Paris (ill. VIII–IX).

## Cabinets of Natural Philosophy and royal collecting

During the Renaissance, globes, armillary spheres, astrolabes and clocks were displayed in libraries and *Wunderkammer*, amidst works of art, antiquities and natural history specimens. However, it was only in the late seventeenth and particularly during the eighteenth century that mathematical, astronomical and physics instruments were regularly and purposefully assembled in collections for learning about the natural world. These collections were designated cabinets of natural philosophy or cabinets of physics. Early examples are the Cabinet of the *Accademia del Cimento* (1657), the Royal Society (1662) and, in universities, the Cabinets of Leiden (1675), Utrecht (1706) and Padua (1739), among others (Lourenço 2005). There is an extensive international bibliography on the role cabinets played in teaching, research and the dissemination of science (e.g. Taton 1969, Novelli 2000) and many case-studies (e.g. Brenni 1995, Clercq 1992,

Pantalony *et al.* 2005). The cabinet of physics has a singular place in the history of collections and history of science. In its teaching version, the cabinet of physics still exists essentially unaltered in schools and universities around the world (Lourenço 2005). Unlike cabinets of natural history, the internal logic of the cabinet of physics was not one of learning through accumulation. Instruments were acquired to be used and, once they became obsolete, they were replaced by more accurate ones. A cabinet of physics is a mirror of scientific innovation at a given moment, particularly when the owner is wealthy.

European aristocracy has assembled collections at least since the late Middle Ages (Mauriès 2002, Impey & MacGregor 2001). Kings and princes liked cabinets of natural philosophy because they offered social prestige and satisfied their curiosity, superstition, love of learning and the appreciation of beauty and fine craftsmanship. They also saw wealth and power in scientific development. On the other hand, natural philosophers needed patrons and instrument-makers needed buyers. An intense circuit of knowledge and instrument trade flourished around eighteenth-nineteenth century cabinets of physics. Studying these cabinets provides insights about the scientific development and personalities, innovation trends, political and commercial relations and social taste.

Among the most important Renaissance royal cabinets of natural philosophy are the well-known Francesco I de' Medici's collection at the Palazzo Vecchio in Florence, Rudolph II's cabinet in Prague, and Elector Augustus' Cabinet in Dresden. In 1750s London, George III assembled what is today one of the most comprehensive and consistent eighteenth-century royal cabinets (Morton & Wess 1993). These collections are well-studied and the surviving items have been catalogued and made accessible for both historians and the general public in palaces and museums across Europe.

## Cabinets of Physics in Portugal

One of the things that impress foreign visitors of Portuguese museums is the relative absence of scientific instruments. A question I am continuously asked is: 'Where is Portuguese scientific heritage? Where are the navigation instruments of early Portuguese travels to Asia and South America?' It is a question I do not know the answer to. Certainly, many of those instruments are now lost in the depths of the oceans. Also, there are instruments from the Portuguese 'discoveries' in museums in Brazil, North America and Europe, including a couple of Portuguese nautical astrolabes at the Maritime Museum in Lisbon. However, it is true that scientific and technological heritage is under-represented in Portuguese museums. Moreover, contrary to many countries elsewhere in Europe, Portugal did not develop museums of science and technology in the mid-nineteenth to twentieth centuries (Lourenço 2010).

Although inaccessible to the average tourist or museum visitor, Portugal has important collections of scientific instruments and edified scientific heritage such as astronomical and meteorological observatories and chemistry laboratories dating from the eighteenth to the twentieth centuries<sup>5</sup>. Although more research needs to be done,

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<sup>5</sup> I would highlight, among others, two 'treasures' of Portuguese scientific heritage: i) the eighteenth century Cabinet of Physics of the University of Coimbra, preserved until today in its original

scientific instruments in Portugal seem to have had very long periods of ordinary use for teaching and research (Lourenço 2010). This, combined with political isolation and lack of funds during most of the twentieth century, partly justifies the lack of museums (instruments were in use) and partly explains the preservation of scientific heritage. In fact, the example mentioned earlier of the royal instruments given by the Palace of Ajuda to the secondary school in Lisbon is an illustrative example of these dynamics of long use. In 1957, the instruments were transferred because at the Palace they were considered obsolete and useless material and at the school they were considered to have some use for teaching (although some were more than 400 years old!)<sup>6</sup>.

It is not only in museums, however, that scientific instruments are under-represented. Portuguese eighteenth and nineteenth century cabinets of physics – and perhaps earlier ones, as recent research seems to suggest (Leitão 2001, 2008) – have received little attention from historians. Portugal has no tradition in the history of collections and the attention of historians has mainly focused on collections of natural history (e.g. Simon 1983, Brigola 2003). General studies of the history of Portugal (e.g. Serrão 1996) and recent biographies of the royal family (e.g. Silva 2006, Monteiro 2008) offer only scarce references to collections. The foremost studies on eighteenth century cabinets of physics in Portugal were those by Carvalho (1959, 1978, 1982, 1985, 1993). These works are important for their systematic review of primary sources, but were done from the perspective of the history of ideas, provided limited international context and only one is a collection study (Carvalho 1978). No study addressed royal cabinets, whose contents and history have long been ignored. Since no significant instruments were found until recently, Portuguese historiography seems to have taken for granted that the royal cabinets were dispersed and lost due to a chequered history of wars, fires and earthquakes.

However, scientific instruments are known to have been gathered at the Portuguese royal palaces for the instruction of princes and the entertainment of the court at least since the early 1700s, when the abundance of gold from Brazil allowed for acquisitions from the best instrument makers in Europe<sup>7</sup>. During this research, we have identified five consistent royal cabinets, two in the eighteenth century and three in the nineteenth century: King João V's Cabinet and Astronomical Observatory (1720s–1750), Prince José's Cabinet (1770s–1780s), Princes Pedro and Luiz's Cabinet (1840s), Princes Carlos and Afonso's Cabinet (1860s–70s), and Princes Manuel and Luis Filipe's Cabinet (1890s). Moreover, a cabinet was transferred to Brazil with the court when the capital of the Empire moved from Lisbon to Rio de Janeiro following the French occupation in 1807.

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furniture and open to the public at the Science Museum of the University of Coimbra (cf. <http://www.museudaciencia.org/> accessed 21 August 2011) and ii) the three magnificent chemistry laboratories of the universities of Coimbra, Lisbon and Porto, respectively from the eighteenth, nineteenth and early twentieth century (only the two former are restored and open to the public).

<sup>6</sup> Letters by Manuel Zagalo, Correspondence 1956, 1957, Historical Archives of the National Palace of Ajuda (AHPNA).

<sup>7</sup> Brazil was 'discovered' in 1500 by a Portuguese navigator, Pedro Álvares Cabral (1468–1520), and it remained a Portuguese colony until 1821.



## **Eighteenth century royal cabinets: King João V and Prince José Cabinets**

João V (1689–1750) was a king of broad sensitivity towards the arts, the sciences and the humanities, combined with an immense wealth that derived mostly from the extraction and commerce of Brazilian minerals. He supported the publication of many books, created the Royal Academy of History (1720) and provided the College of Santo Antão – the most important astronomy and natural philosophy teaching institution in Lisbon – with books, equipment and teachers (Leitão & Martins 2008, Tirapicos 2010). He is known to have assembled a magnificent library in the Palace of Ribeira, in Lisbon, together with an Astronomical Observatory. The latter was organized by Giovanni Battista Carbone, a Jesuit professor at Santo Antão (Carvalho 1985, Silva 2006)<sup>8</sup>. The Palace – destroyed by the fire following the 1755 earthquake – had globes, telescopes, quadrants, sextants and a remarkable map collection (Carvalho 1985, Schwarcz 2002). Of these, only two Coronelli globes seem to have survived. They were acquired in 1723, possibly from Johannes Theodorus Schalbruch, professor at the University of Amsterdam who died in that same year (Seruya & Pereira 2005). After 1755, the globes were transferred to the nearby Military Arsenal and, in 1878, to the Geographical Society in Lisbon. They were restored and are accessible to the public.

After the devastating earthquake, the royal family moved its permanent residence to a provisional wooden construction in Ajuda (a predecessor of the present Palace of Ajuda). It was there that a major investment in scientific collections was done during the 1760s and 1770s: a museum of natural history, a botanical garden, a chemistry laboratory, a library, a drawing and engraving course and later a cabinet of physics were assembled (Brigola 2003). Physicists, mathematicians and naturalists were called from across Europe to administrate these collections and, in some cases, provide and monitor public access.

The Ajuda Cabinet of Physics is thought to have been organized for the education of José, Prince of Brazil (1761–1788) and his younger brother João (1767–1826)<sup>9</sup>. Michele Franzini (1740s–1810), a mathematician from Venice was their professor and main organiser of the Cabinet. Acquisitions were made all over Europe, mostly through diplomatic agents (Carvalho 1982, Tirapicos 2010)<sup>10</sup>. A few descriptions of the Cabinet exist in the literature. The English aristocrat William Thomas Beckford (1760–1844) mentions the Cabinet, particularly instruments from English makers Ramsden and Dollond, in a conversation he had in 1787 with Prince José (Beckford 1901). However, the most comprehensive description of the Cabinet was made by Marc-Marie de Bombelles, Marquis of Bombelles (1744–1822) and ambassador of France in Lisbon, in his journal:

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<sup>8</sup> João V also sponsored the construction of the magnificent eighteenth century baroque Library of the University of Coimbra.

<sup>9</sup> It was João who eventually would become King – João VI – due to the premature death of José.

<sup>10</sup> One of the most significant acquisitions of scientific instruments seems to have been made in 1781 at the auction of the collections of Charles Alexandre, Duke of Lorraine (1712–1780). The Portuguese royal family, through *John Hyacinth de Magellan (1722–1790)* acquired “16 boxes of scientific instruments which were dispatched to Lisbon” (Carvalho 1982: 83–84). This requires more research because no inventory has yet been found and Lisbon does not appear in the official destination list (Rasquin 2002).



Nous désirions depuis longtemps voir l'intérieur des appartements du Prince du Brésil [Prince José]. M. Franzini, son maître de mathématique, d'histoire, de géographie, est vénitien; ci-devant médecin, aujourd'hui rusé courtisan, il s'est acquis le plus grand crédit sur l'esprit de l'héritier présomptif de la couronne [...]. Nous sommes rendus à une heure après midi au palais d'Ajuda. Nous y avons trouvé des gens du prince qui nous ont fait voire son cabinet de physique. Les machines moins nombreuses qu'à Coimbra<sup>11</sup> y sont également bien rangées et faites avec le plus grand soin. Au dessus de ce cabinet est une salle dont la vue sur le Tage rend l'habitation fort agréable, à l'exception de petits passages, elle est remplie de reliefs de fortifications et des représentations également en relief des procédés relatifs à tous les arts et métiers. Les modèles de fortifications sont tous venus de Turin. [...] Le prince a dans un autre cabinet tous les modèles des instruments d'artillerie, plus loin on voit encadrée la suite des uniformes de toutes les principales puissances de l'Europe. [...] Après avoir vu tous ces objets, on nous a menés dans une salle basse où sont déposées, en attendant un emplacement plus convenable, toutes les parties des reliefs propres à montrer au prince dans leurs détails et sur une très grande échelle diverses parties de l'art hydraulique comme canaux, écluses de toutes formes, ponts avec les portes de flots, retenues d'eaux, écluses de chasse, etc... Ces modèles sont également venus de Turin et ne souffriraient aucune comparaison avec ceux qui se voient aux Ponts et Chaussées de Paris [...]. Tels que sont les reliefs du prince du Brésil, ils serviront cependant à lui donner des idées justes des travaux qu'il faudrait exécuter dans le pays qu'il gouvernera un jour. Les Portugais devraient être reconnaissants de ce que M. Franzini tourne vers les choses utiles les goûts du prince destiné à porter leur couronne. A quelque distance du palais et dans une situation agréable est le cabinet d'histoire naturelle de Son Altesse Royale [...] (M. de Bombelles, cited in Brigola 2003: 100).

Bombelles' description suggests a wide range of instruments, models and teaching artefacts covering the areas of hydraulics, physics, mathematics, and military strategy, ballistics, construction and *etiquette*, among others. It also suggests a wide view over the river Tagus, although the Cabinet's precise location remains to be determined. Although Prince José had long been dead and his brother João (future King João VI) was already 40, this was likely to be approximately the same Cabinet that the French saw in Ajuda when they occupied Portugal in 1807. But when they arrived, the Palace was empty and the royal family was already on its way to Brazil.

In 29 November 1807, when the Napoleonic forces commanded by General Jean-Andoche Junot were about to enter Lisbon, the royal family and court escaped to Rio de Janeiro with the help of the British Navy. It was a massive transfer of over 15 thousand people, the most important royal archives and treasures, the Royal Mint, and many collections. The court remained in Brazil from March 1808 until 1821, when King João VI returned to Portugal. In other words, for 13 years the capital of the Portuguese Empire was effectively Rio de Janeiro and not Lisbon. A substantial amount of literature exists on this topic, both in Portuguese and Brazilian historiographies (e.g. Lima 2006, Norton 2008). The point I want to address here is the role and fate of the Ajuda Cabinet of Physics during this period of political, military and social unrest.

Apparently, Prince João had given orders for the Physics Cabinet and the Library of the Palace of Ajuda to be also packed and transported to Rio. This intention is possibly related to the education of Prince Pedro (1798–1834), heir to the throne, who was then nine years old. However, this did not happen. In the haste and confusion of the departure, dozens of boxes with books and scientific instruments remained forgotten at the port (Carvalho 1982, Pinheiro 2001; Schwarcz 2002). Since the Cabinet remained

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<sup>11</sup> The Coimbra Cabinet, as mentioned before, was transferred from the Lisbon College of the Nobles in 1773. At the time, it had c. 550 "machines", as Bombelles designated the instruments.

in Lisbon, it was seen and documented by the French. In July 1808, the French consul Tibère Blanc made an individual list of the Cabinet's instruments (Daget & Saldanha 1989)<sup>12</sup>. At this point, we do not know if the French took some of these instruments to Paris, as they did with several natural history specimens from Ajuda (Hamy 1908, Daget & Saldanha 1989). Meanwhile in Rio, when Prince João realised the Library and Cabinet had been forgotten in Lisbon, he asked that these were dispatched to Rio as soon as possible, which the French apparently allowed. Given their number, the books travelled in three separate journeys (January 1810, March and September 1811) (Schwarcz 2002), but the instruments had already arrived in Rio in June 1810; their total number remains unknown. Due to the lack of a proper space at the Palace, Prince João ordered that they were stored at the nearby Hospital of the Third Order of Carmo<sup>13</sup>. Naturally, some instruments were damaged during the travel across the Atlantic. These were repaired by José Gaspar Marques (1775–1843), an artificer who had received training at the Ramsden London workshop in the 1790s (Reis 2006).

In Rio, the history of the Physics Cabinet coincides with the history of the Royal Library at least until early 1812<sup>14</sup>. After that, no references to the instruments seem to appear in documental and bibliographic sources. During his stay in Rio, Prince João created a large number of scientific and teaching institutions<sup>15</sup> and the Cabinet was possibly dispersed before 1821. As for surviving instruments, the research is ongoing. As in Portugal, the history of scientific collections in Brazil remains to be done and although Brazilian scientific heritage is also significant, most of it remains outside museums and access is difficult.

## **Nineteenth century royal cabinets: The education of three generations of princes in Lisbon**

Little is known about the royal cabinets of physics organized in nineteenth century Lisbon. There are records of at least three, but research into their history is still at an early stage.

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<sup>12</sup> *Etat des instrumens de physique experimentale, Modeles de Fortifications et des Arts et Métiers, qui se trouvent placés dans les six sales de la Galerie en face du Jardin Botanique, sous l'administration de Tibère Blanc*, 28 Juillet 1808. Carton AJ/15/600, Archives Nationales de France, Paris. Blanc lists more than 250 instruments.

<sup>13</sup> Decrees by Prince João, 27 June and 29 October 1810, Rio de Janeiro National Archives. The historical archives of the Third Order of Carmo, presently at the Municipal Archives of Rio, also mentions the scientific instruments and the adaptation works required to their accommodation (OC.AD Ordem Terceira, book 1214, fl. 227–250).

<sup>14</sup> The Ajuda Library remained in Rio after the independence of Brazil. It became the core collection of the National Library of Rio, the largest in South America.

<sup>15</sup> Prince João considerably stimulated the scientific and technological development of Brazil, through the creation of several institutions: the Royal Mint (1808), the Naval Academy (1810), the Military Academy (1810), the Royal Museum (1808), the School of Surgery (1813), the Royal Botanical Garden (1819), the Royal School of Sciences and Arts (1816), among many others (Lopes 1997). It is possible that the scientific instruments from Lisbon were canalised to one or more of these institutions.

As mentioned before, D. João returned from Brazil in 1821. His son Pedro became King Pedro IV of Portugal and Emperor Pedro I of Brazil. Portugal initiated a period of political and social unrest, including civil war between 1828 and 1834. It was not until the 1850s, and two generations later, that we have records of cabinets of physics at the royal palaces<sup>16</sup>. presumably for the education of Prince Pedro, later King Pedro V (1837–1861), and Prince Luiz (1838–1889), later King Luiz I due to the premature death of his older brother. In their youth, spent between the Palaces of Ajuda and Necessidades, Pedro and Luiz demonstrated considerable interest in the sciences. In 1854, the two princes undertook a grand tour of Europe and visited exhibitions and museums in England, Belgium, the Netherlands, Germany, Austria, France, Italy and Switzerland (Mónica 2000). In adulthood, both became avid art and natural history collectors<sup>17</sup> and sponsored several scientific institutions, such as the creation of the Astronomical Observatory of Ajuda, the Meteorological Observatory and the Lisbon Polytechnic School. During this period, the fluidity between scientific instruments for teaching, scientific instruments as royal gifts and scientific instruments as collectibles became more accentuated and the borders between them are difficult to perceive.

As had been the tradition of the Portuguese royal family, the two last generations of princes also learned at home. The sons of King Luiz I, Princes Carlos (1863–1908) and Afonso (1865–1920), were educated at the Palace of Ajuda during the 1860s–1870s. They had instruments of physics in their study cabinets, among which globes, armillary spheres, electrostatic machines and geometric models (Guedes 2004). The very last heir to the throne, Prince Luiz Filipe (1887–1908), complemented his home education with lessons at the Military College in Lisbon. He was assassinated at 21, two years before the end of the monarchy in Portugal.

In October 1910, the new Republican government sealed the Palaces and conducted systematic and detailed inventories aimed at dividing what was State property and what were personal objects of the House of Bragança<sup>18</sup>. In the case of Ajuda, the inventory took more than 15 years to be completed. Hundreds of scientific instruments were listed in the inventories of Ajuda and Necessidades, the two most important palaces at the time. Many instruments were considered private property and were sent to Manuel II, the last king exiled in London. Some were possibly sold at auctions across Europe, but some may have returned to Portugal in the 1940s<sup>19</sup>. As for the instruments that remained

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<sup>16</sup> Namely an inventory of a Cabinet of Physics at the Palace of Ajuda, dated 1854 and recently discovered, lists over 320 scientific instruments (*Relação dos objectos existentes nas salas do Antigo Gabinete de Physica do Real Palácio d'Ajuda*, 14 June 1854. ANTT, Casa Real, Box 4663). This Cabinet could have been partly used in the education of Pedro and Luiz and partly remnants of the 'old' cabinet that existed in Ajuda in the early nineteenth century, listed by Tibère Blanc.

<sup>17</sup> Pedro V would eventually organize a natural history museum at the Palace of Necessidades, mostly assembling his collections of birds and shells. He also went to the *Muséum* in Paris and was given specimens by the French as compensation for their 'confiscation' of Ajuda natural history collections in 1808 (Daget & Saldanha 1989).

<sup>18</sup> *Inventário Judicial do Palácio da Ajuda* (15 vols.) e *Inventário Judicial do Palácio das Necessidades* (7 vols), AHPNA.

<sup>19</sup> When he died in 1932, Manuel II donated a significant part of his collections to Portugal with the explicit purpose of creating a Museum dedicated to the House of Bragança. This Museum is today the Palace of Vila Viçosa, around 200 km east of Lisbon.

in Portugal, they had one of three destinations during the twentieth century: some were considered ‘useful’ and were sent to education institutions (schools, museums of science, etc.); some were distributed through the palaces for decoration when these were muzealised (such as the 1575 Schissler globe, in 1910 at the Library of the Palace of Necessidades and today at the Palace of Sintra-Vila); and some have remained in their original location (table 1).

## **Concluding remarks**

This research is still at its early stages and conclusions are obviously premature. It was initiated by the chance ‘discovery’ of a few stunning scientific instruments. At the moment, these are still beautiful instruments, for which research will provide historical depth and significance.

For years scientific instruments were not considered relevant for the history of science. In the early 1960s, Lindsay (1962: 238) stated that historians of the physical sciences “have never at any time relied upon collection[s] as a primary research source”. Since the 1990s, the situation began to change and today there is an increasing interest in the role collections of scientific instruments played in science. This research is framed by this interest, which provides important insights into the development of experimental inquiry, research and teaching practices and technical application and innovation. Given the wealth and power of the owners, royal collections of scientific instruments also bring new perspectives into local and global historical narratives, particularly social and political contexts and international relations.

Moreover, as the research into the history of royal cabinets of physics in Portugal and Brazil progresses, what initially was reported as dull and insipid is apparently vivid and dynamic. In the eighteenth century and early nineteenth century, royal cabinets of physics were at the centre of an intense scientific activity both in Lisbon and in Rio. They were used for teaching, astronomical observations, experiments and public lectures, and they possibly stimulated instrument making and trade in Portugal and Brazil. There is no doubt that this research will contribute to our understanding of the role instruments have played in teaching and disseminating science in both countries. Most importantly, it is hoped that it will also establish a firm base for further collections-based history of science and ultimately contribute to the preservation, accessibility and the promotion of Portuguese and Brazilian scientific heritage.

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## Bibliography

- Beckford W., 1901, *A Corte da Rainha D. Maria I. Correspondência de William Beckford*, Livraria Editora Tavares Cardoso & Irmão, Lisboa.
- Brenni P., 1995, *Gli strumenti di fisica dell'Istituto Tecnico Toscano. Ottica*, Istituto e Museo di Storia della Scienza, Firenze.
- Brigola J.C.P., 2003, *Coleções, gabinetes e museus em Portugal no século XVIII*, Fundação Calouste Gulbenkian/Fundação para a Ciência e Tecnologia, Lisboa.
- Bud R., Warner D.J., Johnston S., 1998, Introduction [in:] eds. R. Bud, D.J. Warner, *Instruments of science: An historical encyclopedia*, Science Museum, London and National Museum of American History, Smithsonian Institution in association with Garland, New York, p. ix–xi.
- Carvalho R., 1959, *História da Fundação do Colégio Real dos Nobres de Lisboa*, Atlântida-Livraria Editora, Coimbra.
- Carvalho R., 1978, *História do Gabinete de Física da Universidade de Coimbra*, Biblioteca Geral, Universidade de Coimbra.
- Carvalho R., 1982, *A Física Experimental em Portugal no séc. XVIII*, Biblioteca Breve, Instituto de Cultura e Língua Portuguesa, Lisboa.
- Carvalho R., 1985, *A Astronomia em Portugal no séc. XVIII*, Biblioteca Breve, Instituto de Cultura e Língua Portuguesa, Lisboa.
- Carvalho R., 1993, *O Material didáctico dos séculos XVIII e XIX do Museu Maynense da Academia das Ciências de Lisboa*. Academia das Ciências de Lisboa.
- Clercq P. de, 1992, Le Cabinet de physique du Musée Boerhaave de Leyde [in:] ed. D. Ferriot, *Muséologie technique – séminaire de recherche 1990–1991*, Centre d'Histoire des Techniques, Musée National des Techniques, Paris, p. 61–64.
- Corn J.J., 1996, Object lessons/Object myths? What historians of technology learn from things [in:] ed. W.D. Kingery, *Learning from things. Method and theory of material culture studies*, Smithsonian Institution Press, Washington DC, p. 35–54.
- Daget J., Saldanha L., 1989, *Histoires Naturelles Franco-Portugaises du XIXe siècle*. Instituto Nacional de Investigação das Pescas, Lisboa.
- Gessner S., 2010, The Vopelius-Schissler connection: transmission of knowledge for the design of celestial globes in the 16th century, “SIS Bulletin, Journal of the Scientific Instrument Society”, No. 104, p. 32–42.
- Granato M., Lourenço M.C., dos Santos C.P., Brasil Z.F., de Sousa R.F., in press. Thesaurus de acervos científicos como instrumentos de preservação do património científico: Um projecto de cooperação

- luso-brasileira. Proceedings of the VI Meeting of Museums of Portuguese Speaking Countries, ICOM-Portugal, Lisbon, September 2011.
- Guedes C.C., 2004, *A educação dos príncipes no Palácio da Ajuda*, Ministério da Cultura/IPPAR e Palácio Nacional da Ajuda, Lisboa.
- Hamy Le D'E-T., 1908, *La Mission de Geoffroy Saint Hilaire en Espagne et en Portugal (1808)*, *Histoire et documents*, in *Nouvelles Archives du Muséum*, t. X, Paris.
- Impey O., MacGregor A., 2001, *The Origins of Museums. The Cabinet of Curiosities in Sixteenth- and Seventeenth-Century Europe*, 2<sup>nd</sup> edition, House of Stratus, London.
- Keil H., Zäh H., 2004, *Tycho Brahes Aufenthalte in Augsburg (1569–1570 und 1575)*, “Beiträge zur Astronomiegeschichte”, 7, p. 45–98.
- Leitão H., 2001, Galileo’s Telescopic Observations in Portugal [in:] eds. J. Montesinos, C. Solís, *Largo Campo di Filosofare. Eurosymposium Galileo 2001*, Fundación Canaria Orotava de la Historia de la Ciencia, La Orotava, p. 903–913.
- Leitão H., Martins L.A. (coord.), 2008, *Sphaera Mundi: A Ciência na “Aula da Esfera”*. *Manuscritos Científicos do Colégio de Santo Antão nas coleções da BNP*, Biblioteca Nacional de Portugal, Lisboa.
- Lima O., 2006, *D. João VI no Brasil*, Topbooks, Rio de Janeiro, 4<sup>th</sup> edition.
- Lopes M.M., 1997, *O Brasil descobre a pesquisa científica*, Hucitec, São Paulo.
- Lourenço M.C., 2002, *Working with words or with objects? The contribution of university museums*. Meeting, “Do Collections Matter to Instrument Studies?” British Society for the History of Science and the Scientific Instrument Commission of the IUHPS/DHS, 29–30 June, Museum of the History of Science, Oxford.
- Lourenço M.C., 2005, *Between two worlds: The distinct nature and contemporary significance of university museums and collections in Europe*, PhD dissertation, Conservatoire National des Arts et Métiers (Paris).
- Lourenço M.C., 2010, *O património invisível: História, organização e preservação do património científico em Portugal*, “Museologia.pt”, 4, p. 106–121.
- Mauriès P., 2002, *Cabinets of Curiosities*, Thames & Hudson, London.
- Mónica M.F. (org.), 2000, *Correspondência entre D. Pedro V e Seu Tio, o Príncipe Alberto*, ICS/Quetzal Editores, Lisboa.
- Monteiro N.G., 2008, *D. José na sombra de Pombal*, Série Reis de Portugal, Temas e Debates, Lisboa.
- Morton A.Q., Wess J.A., 1993, *Public and private science. The King George III Collection*, Oxford University Press/Science Museum, Oxford.
- Norton L., 2008, *A corte de Portugal no Brasil*, Companhia Editora Nacional, São Paulo, 3<sup>rd</sup> edition.
- Novelli I. (ed.), 2000, *La curiosità e l’ingegno. Collezionismo scientifico e método sperimentale a Padova nel Settecento*, Università degli Studi di Padova.
- Pantalony D., Kremer R.L., Manasek F.J., 2005, *Study, Measure, Experiment. Stories of Scientific Instruments at Dartmouth College*, Terra Nova Press, Norwich, Vermont.
- Pinheiro A.V., 2001, Da Real Biblioteca à Biblioteca Nacional [in:] P. Pereira org., *Brasiliana da Biblioteca Nacional. Guia das Fontes sobre o Brasil*, Fundação Biblioteca Nacional, Rio de Janeiro, p. 241–250.
- Reis A.E., 2006, *Gaspar José Marques e a máquina a vapor – sua introdução em Portugal e no Brasil*, Edições Culturais da Marinha, Lisboa.
- Schwarz L.M., 2002, *A longa viagem da biblioteca dos reis*, Companhia das Letras, São Paulo.
- Seruya A.I., Pereira M., 2005, *Globos Coronelli. Sociedade de Geografia*, IPCR, Lisboa.
- Serrão J.V., 1996, *O despotismo iluminado (1750–1807)*, *História de Portugal*, vol. VI (5<sup>a</sup> edição), Verbo, Lisboa.
- Silva M.B.N., 2006, *D. João V*. Círculo de Leitores, Lisboa.
- Simon W.J., 1983, *Scientific expeditions in the Portuguese overseas territories (1783–1808) and the role of Lisbon in the intellectual-scientific community of the late eighteenth century*, Instituto de Investigação Científica Tropical, Lisboa.



- Taton R., 1969, *Enseignement et diffusion des sciences en France au XIIIe siècle*, Hermann (republished 1986), Paris.
- Taub L., 2009, *On scientific instruments*, "Studies in History and Philosophy of Science", 40, p. 337–343.
- Tirapicos L., 2010, *O Telescópio Astronómico em Portugal no Século XVIII*, Master thesis in History and Philosophy of Science, University of Lisbon.
- Turner A. J., 1993, *Interpreting the history of scientific instruments* [in:] eds. R.G.W. Anderson, J.A. Bennett, W.F. Ryan, *Making instruments count: Essays on historical scientific instruments presented to Gerard L'Estrange Turner*, Variorum, Aldershot, p. 17–26.

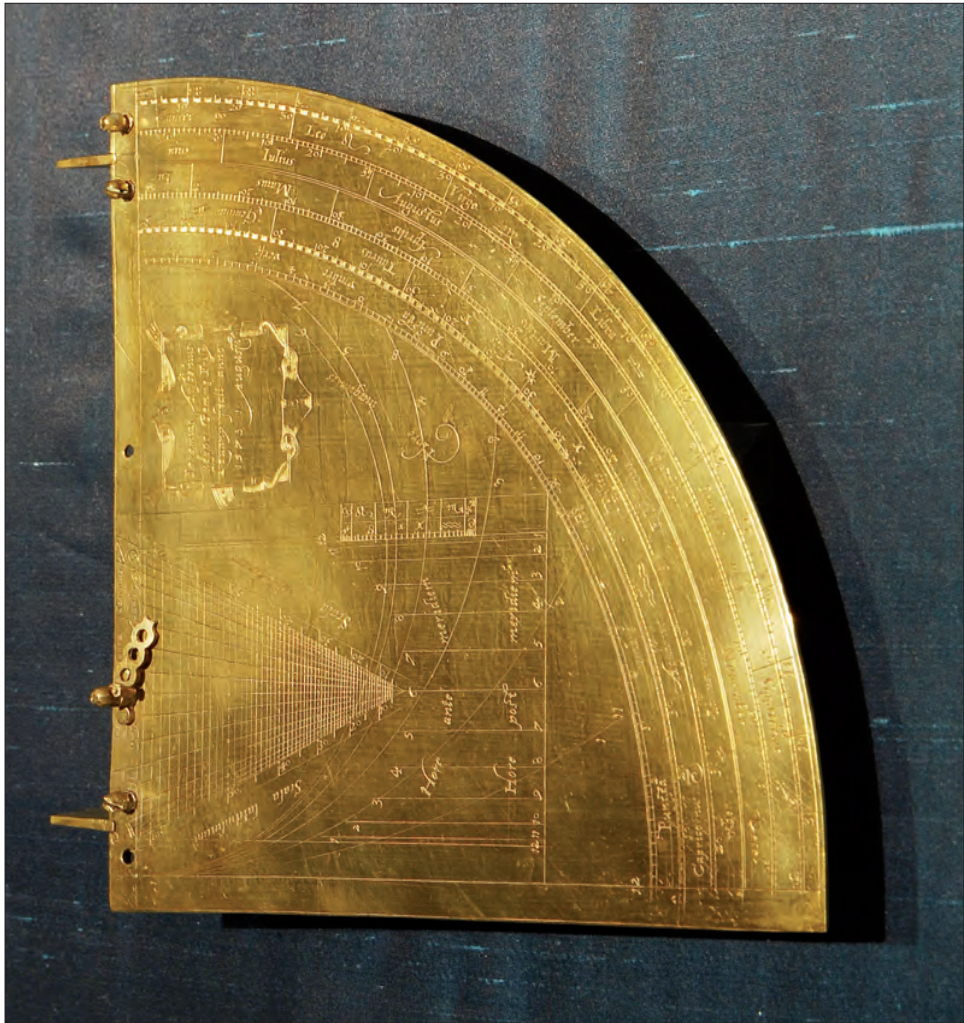
## STRESZCZENIE

### *Królewskie gabinety fizyki w Portugalii i Brazylii: wstępne badania*

Nie wiemy zbyt wiele o historii portugalskich gabinetów filozofii naturalnej, później znanych jako gabinety fizyki. Dotychczas uważano, że instrumenty naukowe zgromadzone przez portugalską rodzinę królewską w celach naukowych, dydaktycznych oraz z zamiarem dostarczenia rozrywki, zaginęły na przestrzeni wieków. Ostatnie „odkrycie” znacznej ilości „zaginionych” instrumentów, pochodzących od XV do XIX wieku, skłania do przeprowadzenia badań nad organizacją, funkcjonowaniem, a następnie rozproszeniem gabinetów fizyki w Portugalii i Brazylii. W artykule omówiono podjęte badania, skupiając się przede wszystkim na przedstawieniu zastosowanych metod i problemów badawczych. W końcowej części zaprezentowano wstępne wyniki tychże badań.



Marta C. Lourenço



Ill. I. Quadrant, Ieremias Arscenius, Louvain 1573 (Museum of Science of the University of Lisbon, Inv. No. MCUL 1162). Photo J. Sotomayor



Ill. II. Circles of proportion, Elias Allen, London, c. 1630 (Museum of Science of the University of Lisbon, Inv. No. MCUL 501). Photo J. Sotomayor





III. III. Equatorial sector (fragment), Michael Butterfield, Paris, c. 1670 (Museum of Science of the University of Lisbon, Inv. No. MCUL 1163). Photo J. Sotomayor



Ill. IV. The Palace of Vila Viçosa. Photo R. Barbosa



III. V. Research team members during the survey of the palaces; here, a telescope at the Palace of Sintra-Pena, December 2010. Photo C. Pires





III. VI. Gardens of the Palace of Belém, Lisbon. Photo G. Pereira

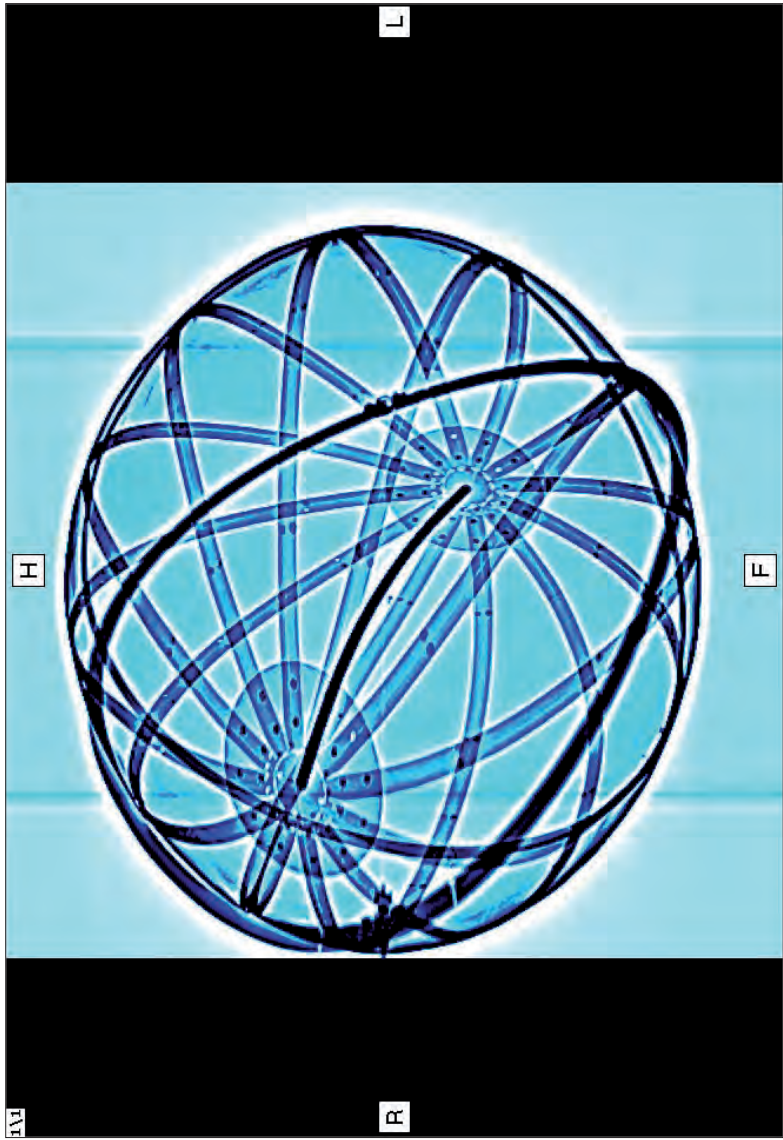


III. VII. Two globes and an armillary sphere at the Library of the Palace of Mafra. Photo G. Pereira





III. VIII. The 1575 Schissler globe, from the Palace of Simtra-Vila is submitted to a CT-scan at the Portuguese Institute of Oncology in Lisbon for study, March 2009, Photo M.C. Lourenço



III. IX. The internal structure of the Schissler globe, image obtained through the CT-scan, March 2009