The historical instruments from Valongo Observatory, Federal University of Rio de Janeiro

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Abstract

Valongo Observatory is part of the Federal University of Rio de Janeiro, Brazil. It was founded in 1881 with the primary mission of being used for the practical lessons given at Rio de Janeiro Polytechnic School. It has a collection of around 300 objects used in the teaching and research, including scientific instruments, apparatus and accessories. In this paper we discuss the collection formation, drawing on data about its objects, which were used in practical lessons for the disciplines relating to astronomy, geodesy and topography given at the observatory till the 1950s, and the practical lessons and research conducted as part of the undergraduate course in astronomy after 1958.

Introduction

Brazil's first universities date back to the early 20th century, but there is some debate about which higher education institution came first. Some argue that the first was Escola Universitária Livre de Manáos, established in the heart of the Amazon region in 1909, later the University of Manáus;[1] others argue that it was the University of Paraná,[2] founded in the south of the country in 1912.[3] Still others cite the University of São Paulo, founded in the 1930s, arguing that this was the country's first real university in the full sense of the word.

Officially speaking, Brazil's first university was founded by federal decree in 1920. It first went by the name of the University of Rio de Janeiro, changing to University of Brazil in the 1930s, and finally to Federal University of Rio de Janeiro in the 1960s. Initially, the university merely assembled three schools that already existed in Rio: the Escola Politécnica do Rio de Janeiro (Rio de Janeiro Polytechnic School), the School of Medicine of Rio de Janeiro and the Faculty of Law.

When it was integrated in the University, the Polytechnic School had an astronomical observatory, which continued to exist until today. In this paper, we present and analyze the history of the astronomical observatory's collection of scientific instruments, equipment and accessories, manufactured in the nineteenth and twentieth centuries and used in astronomy, geodesy and topography practical lessons.

Fig. 1 - Astronomical Observatory of the Polytechnic School of Rio de Janeiro on Santo Antonio hill. Photo: unknown. Valongo Observatory Collection, 1921

The astronomical observatory was founded in 1881 with the main mission of supporting teaching of astronomy and geodesy to students of the Polytechnic. It stood on Santo Antonio hill (fig. 1) until the 1920s, when it was transferred to Chácara do Valongo (Valongo estate), on Conceição hill, both in the center of Rio de Janeiro, Brazil. In the course of time, the observatory was named as Valongo Observatory.

The Valongo collection is a typical historical university education and research collection. Its objects were from a public university and were stored and gathered, intentionally or not, as the outcome of the dynamics involved in the development and dissemination of knowledge that took

[1] UFAM. Histórico da UFAM, ufam.edu.br/instituicao/instituicao.htm (accessed May 31, 2012).
[2] In 1920 it lost its status of university and was broken down into isolated faculties until 1946, when it was again reintegrated, and in 1951, when it became a public institution and started providing free education.
[3] UFPR. Histórico, www.ufpr.br/portalufpr/historico-2/ (accessed July 26, 2012).

place inside the observatory; it therefore involves methods, processes and knowledge that are representative of the education and research practices of that institution. The collection comprises some 300 objects and covers the areas of astronomy, geodesy, topography, chemistry and photography. It contains telescopes, pendulums, blink comparator and measuring device, chronographs, and many accessories, such as objective lenses, eyepieces and filters.

The collection can be divided into two groups based on how the instruments were used. One group consists of objects manufactured in the late nineteenth and early twentieth century. They were mostly imported from Europe, with a few notable exceptions of objects produced in Brazil, such as the equatorial telescope manufactured by José Hermida Pazos. The other group consists of objects produced since the 1950s. Most were manufactured by Carl Zeiss and acquired through an agreement between Brazil, the German Democratic Republic and the People's Republic of Hungary (BRASIL 1969), which became known as the MEC-Ministry of Education and Culture/Eastern Europe Agreement.

The artifacts bear marks acquired throughout their existence, imbuing them with values that surpass those derived from mere materiality. When explored, these marks reveal practices, representations, knowledge and techniques used in teaching and research at the observatory. The artifacts are evidence of the influences on the formation of the group's identity. They bridge between the past and the present of astronomy teaching in Brazil. This knowledge made it possible to build up the history of the objects and the trajectory by which the collection was formed, while also contributing to better understanding a part of history of astronomy teaching at the observatory and therefore in Rio de Janeiro, which was little known.

Once they were brought together in the collection as testimonies, these objects became documents bearing knowledge that could be used to build up this trajectory. To obtain the final results, it was necessary to find out and understand how they were used, the scientific practices and ideas of the day, as well as their broader contexts.

Methodology

The research into the marks on the objects from the Valongo Observatory collection was guided by the "cultural biography of things" (KOPYTOFF 2008; ALBERTI 2005) and by Jim Bennett's proposal for using a prosopographical approach in the study of collections, namely when the goal is to study them as a whole, creating a biography of the whole rather than that of the individual objects (BENNETT 2005). Emphasis was put not only on their individual trajectories, but also on the information about social, economic, scientific and political changes and relationships that the institution went through; relationships and changes that thereby influenced the formation of the collection.

Prosopography, or collective biography, is a research method that investigates the common ground in a group's past by collectively studying their lives (STONE 1971, 46). One of its advantages is that lack of data about the individuals from a given group does not prevent working on the group as a whole. Despite being limited, data can, once gathered, be collated and interrelated using systematic criteria such as pre-set questions, show meanings that reveal patterns influencing historical processes (VERBOVEN, CARLIER & DUMOLYN 2007, 36).

Coincidences between the particularities of the collection and the potential uses of the proposed approach indicated that this method would be adequate to study the collection of science and technology objects from Valongo Observatory. Despite shortage of data about the majority of objects, they have points in common, such as provenance, areas of knowledge involved, and use, enabling comparative perspectives and qualitative interpretations needed to interrelate limited data on the

individual components. By doing this, it was possible to gain clarification about acquisitions, uses and losses of objects from the collection, piecing together a far more wide-ranging set of information.

Data collecting was guided by the prosopographic method, similar to that of an individual biography: drawing up questions, whose answers should, after being analyzed, bring to light common features of the individual elements in the group, forming patterns of relationships. These data are often scarce, varied and open to discussion, but when analyzed in the light of the questions, demonstrate the common features and courses taken by the members of the group, providing more comprehensive knowledge about them collectively.

The questions relate to the objects' functions and contexts, which are essential for understanding how the collection was formed and for building up a table of data capable of yielding knowledge on the way the collection and the institution were formed and developed. As such, the questions used were: When was the object manufactured? Who manufactured it? What was the object's function? What kind of object is it? What research and practical lessons was the object used in? What function(s) did the object have in the research or practical lessons? Was it used for technical purposes? For educational purposes? How long was it used? What scientific areas and disciplines was it used for? How was it involved in the course curricula?

Answers were obtained from information in the literature for the conceptual, theoretical basis for the work, and from archival sources related to the context in which the objects were acquired and used in teaching astronomy in Rio de Janeiro. Documents consulted were of administrative, institutional and educational nature, including minutes, reports, letters, regulations, scientific articles, photographs, and the programs and curriculums for the disciplines. They were researched in the national archives, the Museum of the Polytechnic School, the library of Valongo Observatory, the historical records from the Polytechnic School, the municipal archives, the heritage department of UFRJ, and electronic files, resulting in about one thousand documents containing information of relevance to the research, from an initial set of thousands of documents related to the Polytechnic School and the observatory.

Another important source was the markings on the objects themselves. Often, these were crucial in identifying certain objects, a common difficulty when working with this type of collection. Inscriptions involving dates, manufacturers' names, stamps, and engraved plaques were essential for identifying and understanding the importance of certain objects in the collection, such as the '1910' stamped on the T. Cooke & Sons equatorial telescope, the '1880' embossed on the Pazos equatorial telescope, or the stamp of the Scientific Commission for Exploration, which visited Ceará between 1859 and 1861, on a spirit level.

Once data had been collected, they were analyzed in a table (appendix) to build up a scenario that gave a view of the interconnections between them. In the table, data were assembled about intrinsic and extrinsic aspects of the objects: the former being information inherent to the objects themselves, their intended uses and how they were actually used in teaching and research activities at the observatory; and the latter being information on the reference sources for the data presented. The columns' headers were based on the questions mentioned above in order to group together the responses meaningfully. At the end of the table, a column was added for references consulted.

Once the information was inserted into the table, data analysis was undertaken to interrelate the topics and the objects. This produced results which, when combined with the information about the institution and the contexts the objects were part of, enabled the reconstruction of the trajectory of the collection in time. The analysis helped shed light not only on the acquisition and use of the objects from the collection cited in the documents, but also on those which were not mentioned in the sources consulted. Similarities between the objects, especially their type, function and use, yielded knowledge,

albeit circumstantial, about why the objects on which little or no data were found were present in the collection.

This approach made it possible to find out more than just a few pieces of information about the objects. As the collection formation became more visible, it became clear how the contexts of the objects influenced its trajectory, whether in the way they were used or their ultimate destination, individually or as a group; contexts which, more often than not, were determined by the history of the institution itself. Finding out this information did more than merely fill in complementary data for narratives to be used in communication between spectator and object; it drew a picture that translated the way the collection had been formed and helped identify turning points in the trajectories of these material cultural assets, namely: a) the starting point in 1874 when the Polytechnic School was established, whenceforth the first objects were acquired, even before the observatory had been founded; b) the founding of the observatory linked to the Polytechnic School, on July 5, 1881; c) the transfer of the observatory from Santo Antonio hill to the Valongo estate (on Conceição hill), between 1924 and 1926; d) the period when the observatory fell into disuse, between 1936 and 1957; e) the creation of the undergraduate course in astronomy in 1958; f) the acquisition of a set of instruments through an agreement between the Brazilian Ministry of Education and Culture and two countries from eastern Europe in the 1970s; g) the change in attitude towards the instruments marked by the rise of institutional memory preservation projects, as of 1996; and h) the formation of the collection, based on activities undertaken in partnership with Museu de Astronomia e Ciências Afins (MAST).

The history of each individual object from Valongo Observatory cannot be reconstituted. However, the dynamics surrounding their presence in or absence from the collection help us to understand turning points in the formation of the collection, correlations between objects and the event they were involved in, as exemplified below.[4]

Fig. 2 - Pazos equatorial telescope, manufactured in 1880. Photo: Maria Alice C. de Oliveira, 2010

The trajectory of the formation of the collections at Santo Antonio Hill

On the acquisition of the instruments

The formation of the set of instruments that formed the initial core of the observatory's collection of S&T objects dates back to a period prior to its foundation. This is confirmed in a document sent in 1880 to the Ministry of the Empire (Ministério do Império) by the acting director of the Polytechnic School, Ignacio da Cunha Galvão, containing a request and a budget to purchase a telescope. The document contained notification for the purchase of a telescope that had been examined by Manuel Pereira dos Reis, at the price of seven hundred and fifty réis. Interestingly, a simple receipt from July 24th 1880 documents the purchase of an astronomical telescope for seven hundred and sixty réis. The coincidence between the date of this purchase and the date stamped on the telescope manufactured by Jose Hermida Pazos awakened the suspicion that the telescope in question was the Pazos telescope (fig. 2), one of the main artifacts in the collection because of its originality and use in the observatory.

[4] OLIVEIRA, M. A. CIOCCA DE. 2011. *A Trajetória da formação da Coleção de Objetos de C&T do Observatório do Valongo.* Dissertation (Masters) – Programa de Pós-Graduação em Museologia e Patrimônio, UNIRIO/MAST, Rio de Janeiro. Supervisor: Marcus Granato.

In 1906, a receipt from Charles Raynsford confirms the purchase of a prism and the repair of a spirit level for the coudé-mounted meridian telescope, [5] casting light on the acquisition process for the Julius Wanschaff coudé-mounted telescope. Likewise, a letter and an invoice from 1907 elucidate on the acquisition of an astronomical theodolite by Paul Gautier[6] and a Peyer Farvager chronograph[7].

Part of the trajectory of another instrument in the collection, the T. Cooke & Sons equatorial telescope (fig. 3), was also explained by the proximity of date in some documents to the date (1910) stamped on the object itself, elucidating the process by which it was ordered, purchased, received and installed.

Fig. 3 - T. Cooke & Sons Equatorial Telescope. Photo: unknown (Valongo Observatory Collection)

A document from 1907 containing a request for information from the manufacturer T. Cooke & Sons was the record that marked the beginning of the trajectory of this object in the observatory. Later, in the official government newssheet, *Diário Oficial*, and in reports by the board of the Polytechnic School of Rio de Janeiro in 1908, further data were found about: the approval of funds for the purchase of a telescope of the same type between 1908 and 1910; the construction of a tower for installing a telescope; and still 1910, the arrival and installation of a T. Cooke & Sons equatorial telescope at the observatory.

On the use of instruments in practical lessons

Students' attendance and the subjects taught in practical lessons at the observatory between 1896 and 1934 were revealed in five record books. These contained notes about the days of the lessons and the subjects given, signed by the assistant and the professor. The analysis of the information yielded insights into the instruments from the collection, and also on the use of similar instruments, as can be seen in the quotations from the books for the periods 1914–1916[8] and 1917–1918[9]: "The measurement of the zenith distance and determination of the time on the chronometer were investigated", signed by the professor Amoroso Costa, on August 20, 1914; "Readings will be made of the micrometers of the Gauthier theodolite, and angles will be measured", signed by the assistant Orozimbo Lincoln Nascimento on August 26, 1914; "The use of maps of the sky was taught and the equator was drawn", signed by the assistant Orozimbo Lincoln Nascimento on May 23, 1917.

In this period, invoices and reports provide information about instruments and classroom activities, namely subjects given and classroom dynamics. These data elucidate on the use of certain instruments from the collection and enrich our knowledge about their trajectories, such as the P. Gautier theodolite, the T. Cooke & Sons equatorial telescope, the coudé-mounted telescope by Julius Wanschaff, and the Peyer Farvager chronograph and pendulum.

The trajectory of the formation of the collection in Valongo Estate

Transfer of the observatory to Valongo Estate

Between 1924 and 1926, the observatory was transferred to Valongo estate due to improvements planned for Santo Antonio hill. Instruments had to be dismounted, boxed and transported by vehicle or

[5] Invoice from Casa Raynsford. Rio de Janeiro, December 18, 1906, for one hundred and eighty-five réis, referring to the repair of a spirit level and purchase of a prism (AN- IJ^2 187).
[6] Handwritten request for five contos and six hundred réis for the purchase of a meridian telescope and a P. Gautier theodolite; and a letter dated January 26, 1907, from the Polytechnic authorizing the purchase.
[7] Invoice from Casa Raynsford dated December 20, 1907, for four hundred and fifty-seven réis (AN- IJ^2 183).
[8] Register of students' attendance in practical astronomy classes at the astronomical observatory of the Polytechnic School on Santo Antonio hill. Rio de Janeiro, 1914-1916. (UFRJ / Valongo Observatory / Library)
[9] Register of students' attendance in practical astronomy classes at the astronomical observatory of the Polytechnic School on Santo Antonio hill. Rio de Janeiro, 1917-1918 (UFRJ / Valongo Observatory / Library).

on the head of people from one hill to the other, a distance of approximately one kilometer. Among the objects moved were the large equatorial telescopes by Hermida Pazos and T. Cooke & Sons.[10]

After 1926, the Astronomical Observatory of the Polytechnic School functioned at Valongo. Practical lessons were given there by the assistant professor of astronomy, Orozimbo Nascimento until his death in 1936. Lessons continued, albeit sporadically, by Dr Allyrio H. Mattos, professor of the discipline until 1954, when he retired.

Few records or information were found between 1936 and 1957. However, a comparison of an inventory from 1920[11] with a list of instruments from 1957 showed that the number of instruments had considerably diminished. Although no documental evidence was found, the general abandonment of the observatory in the 1940s and 50s after the death of the assistant is the most likely reason.

The astronomy course at Valongo Observatory

On November 29, 1957, approval was given by the Council of the National Faculty of Philosophy (FNFi) of the University of Brazil[12] for the undergraduate program in astronomy.[13] Classes began in 1958 and the observatory at the Valongo hill, then part of the National School of Engineering, became the course's practical lessons headquarter, making its facilities and equipment available to professors and students alike.[14]

During this stage of the observatory's history, the use of instruments yielded academic and scientific output, with some being featured in the observatory's publications. In 1960, Valongo Observatory published the first issue of the *Astronomy Course Bulletin* (*Boletim do Curso de Astronomia*), a series of five issues published between 1960 and 1966, with the aim of giving "knowledge about the educational works and providing results of astronomical observations made by professors and students of the Astronomy Course", in the words of Luis Eduardo da Silva Machado, professor and director of the observatory (MACHADO 1960).

At Valongo, one of the main innovations was the creation of a small functional photographic laboratory. This was aimed at developing astronomical photographs made in the research and teaching of photography techniques by Professor Guilherme Wenning, from the Military Institute of Engineering. This information explains the presence of objects related to photography in the collection.

Between the 1970s and the 90s, the astronomy course underwent reforms designed to update astronomy teaching. These reforms also introduced different requirements for instruments, leading to modernizations and fluctuations in the number of instruments in the set.

Initially, revised curricula highlighted photographic techniques applied to astronomical observations and reductions through the use of computers, driving the replacement of the existing equipment with new equipment that was more suited to the new technologies (CAMPOS 1995, 4).

In the 1970s, the set of instruments was considerably enlarged when it received equipment resulting from the MEC/Eastern Europe agreement (BRASIL 1969). It received and installed a coudé-mounted

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[10] Statement of services rendered on Santo Antonio hill for removal work and the temporary installation of the observatory and the respective funds obtained for this purpose, between 1924–1926 (UFRJ/Valongo Observatory/Library), p. 24.

[11] This document, considered a precious part of the historical collection, is a manuscript listing the fixed and movable assets, separated by category of materials. It is divided into three parts: the first with the assets purchased until 1920, the second with items purchased in 1921, and the third with photographs of some of these assets (UFRJ/Valongo Observatory/Library).

[12] In 1920 the Polytechnic School of Rio de Janeiro, the National Faculty of Law and the National School of Medicine, composed the University of Rio de Janeiro, which was later renamed the University of Brazil and, later, the Federal University of Rio de Janeiro. The astronomical observatory of the Polytechnic School, later known at Valongo Observatory, was part of this entity.

[13] Minutes of an extraordinary meeting held on November 29, 1957, at the National Faculty of Philosophy – FNFi (Faculdade Nacional de Filosofia) (UFRJ/PROED/Arquivo).

[14] Minutes of the meeting of the Council of the National Faculty of Philosophy (FNFi) of the University of Brasil held on April 8th 1959, p. 4f. (UFRJ/Museu da EscolaPolitécnica).

refractor telescope, which was important for researching the sun; four portable telescopes for use in teaching and in university research projects;[15] a planet camera; a GII fast photometer with accessories; a SP-II model spectra projector with accessories; a blink comparator; achromatic lens; an Ascorecord coordinate measuring device (coordinatograph) for use in the reductions and interpretations of data resulting from astrographical observations.

This equipment and accessories such as plate brackets and chassis are today part of the collection. When in use, they assisted the astronomy course lessons, as well as research conducted at Valongo Observatory, and also in outreach activities, such as observations aimed at the general public. Special emphasis should be given to studies related to the field of astrometry developed between 1980 and 1990 together with the astrometric telescope at the Capricorn Observatory in Campinas,[16] the coordinatograph and the comparator of astrographic plates, which formed a set of instruments whose coordinated use yielded, published academic and scientific papers.

In the course, they were used in fundamental science and research,[17] including projects on astrometry, photometry of asteroids and comets, and to obtain precise positions of celestial objects on photographic plates. They were also used in reducing data from the astrographic plates obtained by the observatory's astronomers at the European Southern Observatory (ESO, La Silla), in the Chilean Andes, and the Estación de Altura El Leoncito, astronomical observatory of the University of San Juan, in the Argentine Andes (MACHADO 1984, 3). They were also used in community outreach projects, when the telescopes were mounted specially for astronomical observations of events such as eclipses and passages of comets. When Halley's Comet passed in 1986, the event was observed by the visiting public using portable telescopes, including four Zeiss/Jena portable telescopes and the Zeiss/Jena astronomical telescope, which was placed on Sugar Loaf for the public to observe the phenomenon.

New trajectories

Since the 1990s, with new technological innovations, a lot of the equipment used at the observatory has been replaced. It has partly been put aside and safeguarded by people who valued it in some way, and partly has remained untouched, perhaps because of its size, which made it hard to dispose of.

In the late 1990s, concern about the preservation of elements relating to the institution's memory awakened an interest in recovering these objects.

Thus, in 1996, a survey was carried out in order to find out which objects still existed and could be considered historical, highlighting the need to adopt measures for their restoration and preservation. As a result, between 1997 and 2005 a project for the preservation of the astronomical memory of Valongo Observatory was developed in three phases, involving the restoration of a few instruments and domes and the preparation of specific areas to exhibit the restored instruments. Based on the results, two new projects have begun in 2007 and 2008, involving the recuperation of another exhibition area. Also in 2008, an agreement was signed between Valongo Observatory and MAST for the restoration, identification, documentation and organization of the objects.

[15] Report of the activities of Valongo Observatory in 1973 (typewritten) (UFRJ/Valongo Observatory/Library).
[16] Due to a lack of appropriate atmospheric conditions and terrain, this equipment could not be installed at Valongo. It was sent to Campinas, Brazil, where a building was built to receive it in Pico das Cabras, a region that has been considered favorable for the installation, which was made via an agreement between UFRJ, the Campinas local authority, UNICAMP and PUCC, establishing a program of technical and scientific cooperation, especially in astrometric surveys.
[17] Document n. 58/87 dated June 11, 1987, from the Board of Valongo Observatory to the Dean of UFRJ (UFRJ/Valongo Observatory/Library).

As a result of these initiatives, a set of documents that represent the memory of the institution and part of the history of the teaching of astronomy in Brazil, especially Rio de Janeiro, has been preserved, also an integral part of the university's heritage and the country's science and technology heritage. This set of objects includes the collection of S&T objects from Valongo Observatory.

Concluding remarks

In this study, the use of prosopography proved valuable for building up the trajectory of a set of objects that today constitute a university collection. The large quantity of documents consulted yielded information that cast light on the different stages the objects went through on their course from being useful to being obsolete and abandoned, and finally to being acknowledged as evidence of the working life of the observatory, vestiges of a past that deserves to be reconstituted.

As the trajectory of the objects was pieced together, each object or group of objects from the collection was explained in such a way that confirmed its role in the activities undertaken at the observatory. While the collection's trajectory was being built up, it was interesting to understand that the most important thing was not to confirm what was said in documents about an object in the collection, but to realize that the information characterized it as a real item from that collection, not only for its use, but mainly because it was important in constructing the institution's identity and was instrumental in the development of Brazilian science and technology.

The knowledge about the ways and contexts objects were used showed how important this collection is as a historical legacy to a university's teaching and research work. Data gathered from the artifacts were used to build up part of a history that was previously unknown and also provided contributions that could serve as bridges between the collection and its observers.

In the scope of museology, efforts that led to the formation of the collection provide a glimpse of its future transformation from a 'collection' to a museum collection, when the information obtained about the objects can be used to construct narratives about the teaching of astronomy in exhibitions open to the public, and in activities such as university outreach projects.

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Annex

Table of interrelationships between objects from the collection of science and technology instruments from Valongo Observatory (example) – part A

Valongo Observatory record	*Data on the manufacturing of the object (name, manufacturer, place and date)*	*Use of object in teaching and research (practical lessons, projects and research activities)*	*Topic(s) related to its use*
Cooke telescope Valongo Observatory 2008/146	Equatorial telescope Manufacturer: T. Cooke & Sons Place of manufacture: London, UK Period: 20th century (1910) 300 mm diameter 5500 mm focal distance	Practical lessons Projects and research – international observation programs and astronomical research for photographic records Swiss Federal Observatory, Zurich, Royal Greenwich Observatory and Yale University Instrumental Techniques I - 1984	Description, assembly and handling; astronomical instruments; determining errors, time, azimuth; Observation – satellites and craters (Jupiter, Saturn and Moon) Astronomical photographs; visual, photographic, photometric, spectroscopic, thermoelectric and polarimetric observations Photographic records: solar photosphere, moon's surface, planets' surfaces, solar and lunar eclipses, micrometric observations of double stars and meridian astrometry, record of occulations of stars by the Moon and position of comets
Astrometry Valongo Observatory 8/149	Ascorecord coordinate measuring device (coordinatograph) Manufacturer: Carl Zeiss Place of manufacture: Jena, Germany Period: 20th century Dimensions: height: 0.95m diameter: 1.07m	Practical lessons Astrometric research Projects Astrometry II	Astronomical photography Photometry (astrographic plates)

Table of interrelationships between objects from the collection of science and technology instruments from Valongo Observatory (example) - part B

Valongo Observatory record	*Scientific output*	*Objects used in conjunction with / relation to this object*	*Place of use*	*Document(s) consulted about the objects in the collection or related to their use (**)*
Cooke telescope Valongo Observatory 2008/146	Studies into sunspots; Jupiter's satellites; occultations of stars by the Moon; Astrometric Photographs and photographic records of phenomena that took place in Rio de Janeiro – total and partial eclipses of the Sun and the Moon Observations of the transit of Mercury by the Sun Interpretative model of the progression of the shadow in a total eclipse of the Moon	Chronograph Photographic equipment and material Filar micrometer Tape chronograph	Polytechnic School Valongo Observatory	Date (1910) engraved on object; Letter dated Nov. 28, 1907 Handwritten letter dated July 23, 1908; Letter dated Jan. 22, 1909; letter dated Feb. 9, 1910. Polytechnic School reports – 1908, 1909, 1910.- *Diário Oficial* (government newssheet), of May 13, 1908, Jun. 9, 1908, Aug. 8, 1908, Jun. 1909; Oct. 1910, Aug. 1911. Statement of services – transfer – Jun. 30, 1926. Amoroso Costa Fund; Valongo Observatory bulletins – 1-6; *Contribuições do Observatório de Valongo* – series I to III. Class registers 1896-1934. Class registers Jan. 31, 1917, Feb. 2, 1917, May 23, 1917, Jul. 6, 1917. Inventory and lists from 1911, 1920, 1957 1957 list - CBPA Curriculum 1960 – *Boletim do Observatório de Valongo* n.1 Curriculum – 1963, 1968, 1975, 1984, 1994. Report on [activities] Sep. 19, 1962 *Contribuições do Observatório de Valongo* – Series I, II and III – 1966-1972 *Boletim do Observatório de Valongo* n.1-5 (1960-1966)
Astrometry Valongo Observatory 2008/149	Geoscience Year-book 1995 v.18 (CAMPOS)	Microdensito-meter for astronomical plates Blink comparator Graphic recorder for micro-densitometer Astrometric telescope	Valongo Observatory	Decree # 861 – Sep. 11, 1969 – Agreement between Brazilian Ministry of Education and Culture and East European countries Terms of responsibility -1971 Delhaye report – 1972 Valongo Observatory report - 1973 Curriculum – 1975, 1984, 1994 Letter from Valongo Observatory 1976 Astrometric telescope – 1984