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“Greenwich on the river Tagus”: Reflections on the scientific, cultural and historical significance of Ajuda, the Astronomical Observatory of Lisbon

Introduction

The University of Lisbon is currently reflecting on how the *Observatório Astronómico de Lisboa* [the Astronomical Observatory of Lisbon], located at the Tapada da Ajuda and which we will here simply designate by Ajuda Observatory, can be preserved for the future. The reflection encompasses pondering if a museological function can contribute to the preservation goal and, consequently, which museological approach delivers the best and most sustainable contribution¹. Gradually, as almost all nineteenth century

¹ As part of this process, during the past three years a research project was developed into the architectural features and history of the Observatory, including adjacent buildings and grounds, as well as the criteria for its musealization. The preliminary results of this research were presented at the UNIVERSEUM Annual Meeting, at the Museum of Science, University of Lisbon, 6–8 July 2007. Some delegates (Thomas Bremer (Halle-Wittenberg), Steven de Clercq (Utrecht), Reet Mägi (Dorpat/Tartu), Panu Nykänen (Helsinki), Sébastien Soubiran (Strasbourg), Sofia Talas (Padova), Bjørn Vidar Johansen (Oslo)) with particular interest or competence in the history and/or the musealization of astronomy were invited by Rui Agostinho, Director of the Observatory, and Pedro Marques de Abreu, from the Faculty of Architecture, Technical University

observatories in Europe ceased to be used for precise astronomical observations due to a variety of reasons, many were turned into offices for research and teaching activities no longer directly connected with instruments on site, thus losing their original structure, character and function. Some were altogether abandoned or turned into a museum (e.g. the Observatories of Greenwich and Marseille).

Ajuda, one of the two nineteenth century observatories owned by the University of Lisbon, stands out as a unique outstanding example of an observatory that has remained almost entirely unaltered: it has maintained the original setting up of a nineteenth-century research laboratory, with the instrumentation *in situ* and in working condition almost ready to resume its activity. Moreover, the site of the Observatory – including the library – remains in use by astronomers. This exceptional situation offers the context to move one step beyond the evident choice of converting Ajuda into a traditional museum of astronomy. This choice would not only disturb its authenticity and thus quality, but would also be a missed opportunity. In this paper, we argue that the principal element in musealization should be to bring the authentic spaces to life and to regard the *ensemble* as starting point. This implies a step further in scale from *object* to *space*, allowing a story-telling approach to astronomy, as well as to science as part of society and to the ways the ensemble reflects the intellectual, sociological, political and cultural environment, both nationally and internationally. This amounts to an ambitious and challenging concept, requiring a new museological perspective, as well as an interdisciplinary team. It is also a delicate process as it by definition demands that the space remains as it is: undisturbed, *in situ*.

Ajuda: the Historical Context²

In the years leading to the construction of the Astronomical Observatory of Lisbon, 1861–1867, the astronomical world was engaged in a fierce discussion on the topic of parallax and the underlying broader question of the dimensions and structure of the observable universe. This question was subject to exciting developments ever since the first announcement of reliable parallax results in 1838, enticing astronomers to carry out further observations and measurements. The determination of the parallax of the star Groombridge 1830 became a subject of controversy, especially during the period 1846–1850 when Hervé Faye from Paris and Friedrich Georg Wilhelm von Struve from the Pulkovo Observatory (Russia) advanced incongruous results. In 1850, the idea of carrying out observations in Lisbon to solve this problem was advanced and, in 1855, the geodesist Filipe Folque proposed that a brand new observatory should be erected in Lisbon. Struve's first appointment (1813) had been in Dorpat (now Tartu, Estonia), where he had a major role in improving Dorpat's Observatory and the acquisition of instruments. Its famous 24 cm Fraunhofer refractor had arrived in Dorpat in 1824 and was installed in the new rotating dome in 1825. Struve had advised architect Carl Ludwig Engel regarding the design of the Observatory of Helsinki (1834) and had played a key

of Lisbon, for a workshop aimed at discussing ways Ajuda can be used as a museum, whilst maintaining its character and outstanding monumental qualities.

² See also Agostinho *et al.*, this volume.

role in the construction and scientific equipment of the Pulkovo Observatory (1839) in St Petersburg, which he directed since 1839.

Thanks to its latitude, Lisbon was considered the ideal location for measurements, not only to solve the above-mentioned dispute, but also to observe other stars considered suitable for parallax determinations by astronomers. Moreover, Wilhelm Struve considered the Lisbon skies to be suitable for observations of nebulae. The astronomer foresaw Lisbon as the peer of Pulkovo in sidereal astronomy. Since Lisbon had no decent observatory, the construction of a brand new and up-to-date observatory provided a timely and welcome challenge for an ambitious scientific community seeking recognition in the European arena. It was also an opportunity for Portugal to rise to a side-by-side position with the most developed nations of Europe³ King D. Pedro V was an enthusiastic supporter of scientific endeavour and he personally contributed to the observatory by donating part of his private hunting grounds – the Tapada da Ajuda – overlooking the river Tagus, just like Greenwich is overlooking the Thames. Ajuda and Greenwich are responsible, up to present-day, for the official timekeeping of Portugal and the UK, respectively.

Certainly, Ajuda cannot be regarded as an isolated episode: it was the result of many influences and subsequently served as example for many more, all over the world. Ajuda was inspired by Pulkovo; but Pulkovo was already the result of many influences: from Dorpat and Helsinki, but it surely embodied influences from Munich, Göttingen and Königsberg as well. Arguably, Göttingen's building was the first materialisation of the 'central block-plus-side-wings' model. However, this was in itself a development of features already present in earlier observatories, such as those in Uppsala, Stockholm, Richmond, Radcliffe and Copenhagen. Struve had acquired enormous fame – mainly due to his activities in Dorpat and Pulkovo – and he was invited across Europe to advise on design and instrumentation of new observatories. Moreover, Struve's book *Description de l'Observatoire astronomique central de Poulkova*, published in 1845, was a reference for many observatories in the nineteenth century. This led in various cases, both in Europe (Lisbon, Oslo, Nice) and in the US – Barnard at Oxford (Mississippi), Harvard at Cambridge (Massachusetts), Hopkins (Massachusetts) and Georgetown College (Kentucky) – to observatories based on the architecture and design of the Dorpat/Pulkovo, which consisted in a main cupola at the heart of the building with two almost symmetrical wings for meridian measurements at each side. However, Pulkova/Dorpat's influence went considerably beyond mere architecture, determining choices such as sites on hills, the disposition of the buildings and the communication between the various places, the solid foundations of the instruments, the thermal isolation, large refractors, the best instrument makers, the best architects ... and also the very rich library.

The Observatory at Ajuda is probably the most striking example of Struve's influence. The floor plan is an almost exact, well-documented copy of Pulkovo⁴. Ajuda provides an outstanding example of a complex and fascinating story, inserted in a magnifi-

³ P. Raposo, *Down-to-Earth Solutions for Celestial Purposes: Remarks on the Life and Works of the Astronomer/Instrument Maker Campos Rodrigues (1836–1919)*, p. 203–207 [in:] *Who needs Scientific Instruments? Conference on scientific instruments and their users*; 2–22 October 2005, Leiden, Museum Boerhaave, 2006.

⁴ P.M. Abreu, *pers. comm.* July 2007, P. Abreu, *The Lisbon Astronomic Observatory – Elements for the history of its architecture* [in:] *Proceedings, XV National Meeting of Astronomy and Astrophysics, Lisbon, 27–29 July 2005*, ed.: J. Afonso, N. Santos, A. Moutinho, R. Agostinho, Editora: Scientific World, Inc, 2006.

cent European adventure. Lisbon's Observatory could never have emerged by itself – it needed Russia, France, and a combination of astronomical debates, industrial development, roads and railways, political ambitions, and money, among other factors.

Ajuda – present situation

The Observatory at Tapada da Ajuda comprises the observatory itself as main building, a small botanical garden, two large buildings currently used for offices – originally they housed the astronomers, technical staff and their families, and workshops – and also a few smaller buildings for particular measurements and for instrument correction. Until today, Ajuda remains a university research centre, where astronomical research programmes continue to be carried out. Ajuda has thus kept its original function.

The main observatory building, its architecture, its internal structure and layout and the function of the spaces have remained almost entirely untouched and in their original state, maintaining the original touch and atmosphere of the place. Such an excellent preservation of the original structure is very rare, at least among European astronomical observatories. Furthermore, its precise geographical alignments turn the observatory into a sort of 3D compass rose and tool of geographical orientation. The observatory is operational in its basic functional aspects, such as rotating the main dome and opening the observing slits, thus providing the visitor a 'live' feeling of an astronomical building of its time.

The collection of astronomical instruments is also outstanding. Ajuda was equipped with high quality instruments bought from the best European instrument makers of that time⁵. Most of them – not only the large ones but also smaller instruments and instruments related to data analysis or laboratory work, etc. – have not been removed from their original location. Moreover, most of the technical changes that were made on the larger instruments did not imply major modifications on the instruments' shape and mechanical working.

Finally, like Pulkovo, an excellent and comprehensive library was considered essential for a first-class observatory. The collecting of books, periodicals, ephemerides, atlases, etc., for the library was initiated even before the first stone was laid, reflecting state-of-the-art astronomical knowledge of the second half of the nineteenth century. From its very beginning, the library also collected on the history of astronomy. Today, with ca. 13,500 volumes and thousands of offprints, the library holds one of the richest book collections in its field in Portugal.

In short, Ajuda distinguishes itself from most observatories around the world due to its complete and undisturbed *ensemble*; one of those extremely rare authentic places that has escaped 'modernisation', being stripped and refurbished and that has maintained its original structure and atmosphere. It remains a beautiful example of an almost completely equipped nineteenth century astronomical observatory, a 4-dimensional 'sleeping beauty', potentially a reference collection for nineteenth century European astronomical observatories.

⁵ This is different from the observatories of Paris, London or Strasbourg, which bought mainly instruments from their own country; although the German instruments were dominant at that time.

Ajuda – what kind of museum?

The Astronomical Observatory of Lisbon undoubtedly deserves recognition as a national monument of scientific heritage, together with the best possible care (including sufficient funding and staffing). Ajuda is also one of few remaining ‘complete’ observatories used today for astronomical research. The observatory was born as a research laboratory and it appears essential to preserve this mission for at least three main reasons. First, it is a way of keeping the building ‘alive’ and close to its original mission. So far, this has not caused serious damage to any of the monumental aspects nor to the original instrumentation. Second, an authentic observatory provides the ideal environment to train the current and future generation of astronomers to understand, accept and respect the historical heritage associated with their discipline. Finally, it helps bridging together past and future, heritage and science in the making. In fact, this combination materialises in the different public outreach and educational programmes provided today by the observatory: guided tours, special star observation events through original telescopes and a weekly TV-programme addressing scientific matters.

Turning Ajuda into a museum will inevitably introduce a tension between the authenticity of the architectonic complex and public demands. An additional tension follows from different expectations of the visiting groups: schools, the culturally and scientifically interested individuals and tourists. These points should be carefully addressed as they are likely to have a major impact on what visitors experience as the ‘public quality of a museum’.

Expectations and demands from the individual visitor can be split into ‘services’ and ‘content’. Services include a clear presentation on the web of up-to-date information about access, opening hours, prices, clear road signs, parking, a welcoming reception and basic facilities for rest and refreshments. Content is about the quality of the presentation and interpretation of the observatory, its functions and instrumentation and its authenticity. Turning Ajuda into a museum implies that it should become a place of interest for visitors, a place where they feel welcome and where their inquisitiveness is triggered.

As the role of museums is not to teach, but to offer visitors an experience enabling their curiosity to be stimulated and to contribute to a basic form of understanding, the crucial question is: how can the musealization of Ajuda be done? More precisely, how to turn Ajuda into a museum that invites the public to explore the multi-layered processes that make up Ajuda’s biography and, at the same time, provides the best guarantee for a durable preservation of its qualities? This implies that ways should be found to let the entire ensemble reveal the manifold of stories that lay hidden in the building, its architecture, its instrumentation, the history of its use, etc. Musealization should not be seen as a goal in itself, but as a means to explore and convey the multifaceted biography of Ajuda, thus contributing to its valorisation and to the keeping of the complex for next generations.

The clearest, and most fundamental way to approach this question is to ask whether Ajuda is going to house a museum on astronomy, or whether the Ajuda-ensemble itself will be presented. Not merely as an astronomical observatory where one can learn about the stars and the universe, but (in addition to that) as a place telling about the different layers of stories related to the broader intellectual, cultural and sociological history re-

lated to the establishment and use of Ajuda in the broadest sense. There are many more questions related to Ajuda as well, like the role it played within 19th century European astronomy; and closer at home, its role at the local level, within the scientific, social, political, economical and cultural history of Portugal.

The second of these two fundamentally different approaches, where the entire ensemble itself is the exhibit, appears to us as the best option. This is partly as the first option – where the observatory would house a museum – would gradually lead to degradation (too many examples can be named), but more importantly, because the ensemble of Ajuda offers a unique possibility for a story-teller museographical approach in a broader context. And as such it would be a unique case in Europe.

This choice implies a farewell to traditional museography, characterised by exhibition halls furnished with showcases with objects that have been displaced from their contexts. There is no need for contextual displacement as in Ajuda actual science was done and everything has remained in its original setting. Furnishing Ajuda with showcases would be a missed chance, and a shame, as it would definitely turn Ajuda into yet another museum of astronomy, where the visitor glances at beautiful, shiny, and well-polished objects. Such a conventional approach would be a lost opportunity as it does not meet the quality standards worthy of Ajuda.

Entering Ajuda is entering a time machine, one of those rare and almost ‘sacred’ experiences of entering an authentic and undisturbed space of science. Therefore, the museographical approach of Ajuda should be structured around this rare and precious ‘wow-moment’ of immediately knowing that the space is genuine, that everything is on the right place and in its original context. However, the experience of a ‘wow-moment’ is not sufficient to satisfy the curiosity of the visitor. Ways must be found to allow and stimulate the visitor to satisfy his inquisitiveness, again, without disturbing the original patina of the space.

This challenge offers the possibility of developing a museography of authentic spaces and to explore the possibilities of wider interpretations of the concept ‘museum’ in being a place that stores memories. The challenge is to leave the place ‘untouched’, ‘as it is’, and to develop ways to convey the message in different, non-destructive ways.

Museography of authentic spaces

The fact that everything is *in situ* makes the essential difference between the museography of authentic spaces and of traditional museums. In the latter, the collection is composed of objects that were once selected and taken out of their context before they were brought into the museum. A selection from this selection is subsequently put on display.

In authentic spaces however, virtually everything remains *in situ* and hence in context, telling part of the story of the space. The visitor of authentic spaces is confronted with such an overwhelming amount of spatially dispersed visual information, covering a span of time, that he does not know where to look and what he should see. The museography of authentic spaces has by consequence to cope with the interpretation and the presentation of spatiotemporal dispersed information.

Interpretation of spatiotemporal dispersed information, ‘telescoping analysis’

The challenge lies in bringing order in the abundance of information and in linking this to one of the processes that makes up the biography of the space (landscape, building, etc.). It is therefore important to identify the process-lines that make up that biography. The biography can be read, in combination with other archival material, from the numerous traces that can be found in the space, in the building, in its architecture, its layout and in its equipment and furniture. These stories are all about processes, the process of ambition, of decision-making, building, financing, research, competition, of success and failure, etc.

A closer look at such biographies reveals that we can distinguish a stratigraphy of several layers, each with its own characteristics and internal logic and often related in a hierarchical way. This is not only true for the space, but also for the process of decision-making, for its purpose, function and use.

In this paper we introduce the concept of ‘telescoping analysis’ as a useful tool in identifying process-lines and the way they inter-relate. ‘Telescoping analysis’ as instrument for distinguishing and describing the subsequent strata, or layers of the history of an object (landscape, building, tool, etc.) in relation to its establishment, function and use. This approach is essential for the development of an integrated and well-structured story-telling, including web-based visual narratives.

The concept of ‘telescoping analysis’ is inspired by both the concept of stratigraphy, Nicolas Steno’s geological law of superposition based on a chronological order, and by the architectural concept of ‘Shearing layers’⁶ that addresses buildings as a set of components evolving in different timescales, each layer with a decreasing longevity or life-span.

The scheme below illustrates the concept of ‘telescoping analysis’. The left column, modified after Brand⁷, ranks elements from the evolution of a building and how that building adapts to changing requirements over periods of time. The column to the right adds the human factor and essentially accounts for the process of decision-making, function, use and the interaction with the environment.

Telescoping analysis
stratigraphy of layers of meaning

related to building

- Location, size
- Construction
- Architecture
- Interior layout
- Infrastructure, wires
- Instruments, furniture

related to function

- Ambition
- Decision
- Status
- Function
- Use
- Equipment

⁶ http://en.wikipedia.org/wiki/Shearing_layers.

⁷ S. Brand, *How Buildings Learn: what happens after they're built*, New York, Viking, 1994.

The application of this concept to historic complexes like Ajuda offers a four-dimension dynamical model for the analysis and description of the different processes that concur to its biography. Such approach enables the achievement of important goals: on the one hand, it makes Ajuda accessible for the two major target groups – cultural inclined (individual) visitors and school groups. On the other hand, it respects and reinforces the qualities of Ajuda, simultaneously allowing the presentation of contemporary astronomical research.

Presentation of spatiotemporal dispersed information

The traditional audio tour, in combination with a leaflet is definitely a familiar and useful first step in introducing visitors to a complex like Ajuda. However, the main shortcoming of audio tours is their limitation to the presentation of pre-programmed and hence by definition ‘one-dimensional’ stories. Although the growing experience of hand-held devices is promising and generally well received by the visitor, they only marginally exploit the potentials of the rapidly growing digitized world, whilst the new media allow an integrated, and therefore multi-dimensional presentation and visualization of spatiotemporal dispersed objects and digitized information, in combination with a dynamic, personalized navigation through digitized information, with the possibility to study and interpret interrelationships and to access further information through deep linking.

A challenging museographical approach that allows an in-depth interpretation of spaces like Ajuda can therefore be the development of a portal for a dynamic visual narrative, to be experienced by visitors, both online and hand-held. Its aim will be to provide a combination of a real fruition of an authentic space of science with an online-experience designed to allow visitors to draw relationships and comparisons, and to further explore the history of all aspects that have been relevant in the establishment and biography of Ajuda. This approach can only rely on further research into the history of Ajuda, especially regarding the twentieth century, which is less documented than the initial period.

Concluding remarks

Turning Ajuda into a museum offers a real challenge for our community, but at the same time a real opportunity to conceive a new generation of university museums. This is not a challenge for Ajuda alone – there is work already done with the *Laboratorio Chimico* at the University of Lisbon – but a joint challenge for the university and the city. University museums are in a privileged position as they are part of the university, and therefore embedded in an environment with a tradition of research and experimentation, and they also share an easy access to a wide range of facilities and on-site expertise. Moreover, although in this specific case access is not easy and needs to be rethought, Ajuda integrates the most important pole of museums in Lisbon – the Belém-Ajuda pole. This pole comprises the National Museum of Archaeology, the National Museum of Ethnology, the Jerónimos, the Torre de Belém, the Tropical Botanical Garden and the National Palace of Ajuda. The latter – which is indeed very close to the Observatory to the West – includes the oldest botanical garden in Portugal, constructed in the eighteenth

century for the education of the Portuguese royal family. The Royal Botanical Garden of Ajuda is today open to the public.

Ajuda can therefore be part of a larger ‘ensemble’ and be used as a bridge between the university and the Lisbon museums. Turning Ajuda into a museum would benefit both the university and the city. For the university, Ajuda offers a location for the promotion of the public understanding of astronomy and related subjects and, above all, a unique opportunity for its identity marketing. Visitors (including school classes) will not only be interested in modern astronomy, but will be attracted by the quality of the site, the view and the diverse aspects of the ensemble. As for the city, Ajuda can be an interesting place to visit for tourists and culturally interested visitors, as it offers a wide variety of attractions, ranging from the view on the river Tagus, the vegetation and the architecture of the building to the possibility of understanding how astronomy was made, or how the official time was established and transmitted. It would thus enhance both the touristic and the cultural offer of the area.

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STRESZCZENIE

„Greenwich nad rzeką Tagus”: refleksje nad naukowym, kulturowym i historycznym znaczeniem Ajudy, Astronomicznym Obserwatorium Lizbony

Artykuł opisuje przypadek Obserwatorium Astronomicznego w Lizbonie, nazywanego popularnie Ajuda, oraz możliwości zaadaptowania go jako muzeum. Zważywszy, że budynek, wnętrza i instrumenty pozostają na swoich miejscach – podobnie jak biblioteka – nienaruszone, Ajuda pozostaje najlepiej zachowanym obserwatorium z końca XIX wieku w Europie i jako takie nabiera wielkiego międzynarodowego znaczenia. Zachowanie i przekształcenie Ajudy w muzeum może iść w parze pod warunkiem pełnego respektowania autentyczności jego przestrzeni. To wymaga nowego muzeologicznego ujęcia, biorącego całość jako punkt wyjścia do narracji pokazującej nie tylko proces badań astronomicznych, lecz także sytuującej Ajudę w szerszym ówczesnym intelektualnym, kulturowym i socjologicznym kontekście.