

# Historical Telescopes and Astronomy Outreach

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**Abstract.** The Night-Sky Observation Program (POC, acronym in Portuguese for *Programa de Observação do Céu*) is the most traditional education activity run by the Museum of Astronomy and Related Sciences (MAST), located in Rio de Janeiro, Brazil. The activity starts with a brief talk about the astronomical objects available for visibility and is followed by the sky observation with MAST's telescopes, one of them being over a century old. A study conducted in 2015 pointed out that its participants perceive the historical value of the old refractor and declare that the activity brings them feelings of wonderment. These perceptions and declarations have motivated us to conduct a new study to identify and exchange experiences with institutions worldwide that also use historically valuable telescopes in their night-sky observation activities with the public. With the goal of gathering information from these institutions and making it into a guide, an online survey with open and close-ended questions was launched in late 2017. Nearly eighty institutions from all continents answered our questionnaire. The data collected are vast and rich and not only tell about the passion of those mediating such activities, but also the history of astronomy itself.

**Keywords.** public observatories; historical telescopes; history of astronomy; astronomy outreach

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## 1. Introduction

The Museum of Astronomy and Related Sciences (MAST) in Rio de Janeiro is an institution under the Brazilian Ministry of Science and Technology, leading research in the fields of History of Science, Museum Studies, Astronomy Heritage and Education in Sciences in non-formal settings. MAST was originally the home of the National Observatory (ON), one of the oldest Brazilian scientific institutions. Today, MAST occupies the historic buildings and antique telescope domes previously safeguarded by ON.

The exhibitions and activities organized by MAST represent a dialogue between Astronomy, History and Philosophy. The essence of the activities offered is the interaction between visitors and society. These activities take place on weekdays and weekends. During the week, MAST is mostly visited by school students. During the weekends, the activities aim at the general public.

MAST's most popular activity occurs every Wednesday and Saturday nights, when the telescopes are made available for the public to gaze at the sky. This activity named as "Night-Sky Observation Program", or simply POC (acronym in Portuguese for *Programa de Observação do Céu*) has the goal of offering observations of astronomical objects to the wide public, and has an annual participation of 2400 people. It is conducted by a team of mediators<sup>†</sup> (undergraduates and professionals from various areas) who present a

<sup>†</sup> Mediators are the people who are responsible for welcoming the participants and carrying out the activities. They allow the participants to learn more about the themes presented and

30-minute talk called “The Sky of the Month” that is followed by the observation with the 21-cm refractor called “Luneta-21”, a century-old instrument, and other amateur telescopes.

Luneta-21 has a delightful story: it was installed within a dome built to host a larger refractor, the refractor of the Brazilian emperor, D. Pedro II (Costa 2009). Its daffy installation was motivated by the visit of the Belgian king Albert I and the queen Elizabeth to Rio de Janeiro, in 1920. The queen wanted to visit the new ON’s facilities, which were in the process of moving from Castelo Hill (downtown) to São Januário Hill (district of São Cristóvão). Luneta-21 was dissembled from its original dome downtown so that the king and the queen could enjoy the new facilities in full operation. It was provisionally assembled in the emperor’s refractor dome. The king and the queen never visited ON, and Luneta-21 has been provisionally installed in the same place for 98 years.

It was used to observe Venus (1959–1961), Jupiter (1958–1959), Saturn (1959–1963), the occultation of stars by the Moon and Saturn (1960s), as well as to determinate the right ascension and diameter of Uranus (1959). It has been used for public observations of the sky without interruption since the establishment of the Museum in 1985.

Activities in museums that use historically valuable instruments, such as POC, although very popular deserve reflection, because operating heritage instruments is a constant source of debate and strain, both inside and outside the museum profession. The purpose of the museum is the preservation of material evidence (Mann 1989). On the one hand, working exhibits in science museums, as it is the case of Luneta-21, greatly increase the educational value of the object. On the other hand, it compromises the originality and evidential value of the artefact.

The education value of Luneta-21 was studied by Costa (2009) and Bassallo (2016). The latter showed that 61% of the visitors who take part in POC preferred the observational experience with the century-old refractor. When interviewed, participants mentioned the historical value of the Luneta-21 and declared that the refractor brought feelings of wonderment. The fact that the Luneta-21 was also used to conduct astronomical research in the past made some people feel “like real observers, scientists, astronomers” (Spinelli *et al.* 2018).

These considerations have encouraged us to conduct a new study to identify world-wide institutions that also use historically valuable telescopes in their public observations of the sky. The ultimate goal is to exchange experiences and discuss the uses of such instruments with educational purposes. Our intent is also to gather information from these places and make it into a guide, which will provoke interest in the history of astronomy, and help make these institutions more popular. Here we describe how the survey was conducted, its results, and offer insights on areas for future educational activities and research with such instruments.

## 2. Preservation versus use of historical instruments

When the matter is handling objects considered historically valuable artefacts, there are defenders and critics. Among the science museum professionals, two perspectives prevail. They both reflect the different ethical conceptions on the practices of these museum institutions. According to Mann (1989), these perspectives can be defined as “conservative” and “working views”. In our case, the museum object that calls for this debate is Luneta-21.

they make the participants’ experience meaningful. There are many names for this agent in the literature: educator, explainer, monitor, presenter, guide, among others. However, throughout this paper, we will always use the word “mediator”.

In the conservative view, maintaining the originality of objects is understood as the primary objective of museums, and conservation attitudes must always prevail. Supporters of this conservative perspective will argue that it is wrong to compromise objects through manipulation. However, the working view perspective states that the best way to preserve an object is to use it regularly. This working view also considers that witnessing a museum object in operation is important for its understanding and contemplation.

For Mann (1989), the handling of original objects can be understood and even defended because a replica does not replace the original. It is a problem, though, that even if not verbalized by the defenders of the working view, often times the handling is more important than the conservation of material evidence. The author concludes that, to deal with handling matters, science museums must rehearse a new ethic, more appropriate for its type, in which it is accepted that “the destruction of one form of evidence so that another ‘more important’ form of evidence can be revealed to the public, by the sectioning and operation of artefacts” (op cit, Mann 1989, p. 383).

Understanding that “museum object” is a concept built in a socially and culturally determined classificatory process called “musealisation”, more than two decades later, Brulon (2015, p. 26) recognized in Brazil a new “way in which museums and the scientists who work in these institutions think about these classifications”. The author attributes this changing process of classification to the advent of contemporary art and the ecomuseums, that were “responsible for shaking the structures of the systems of meaning making in which museum objects are commonly inserted” (op cit., Brulon 2015, p. 26). Thus, not only in science museums, but in museums of various types, contemporary discussions among museum professionals have influenced the use of museum objects.

Museum objects are heritage materials. Therefore, it is important to point out that the concept of heritage itself has changed over time. While the original concept of the term goes back to a set of tangible assets related to the formation of national identities, today, the concept is expanded to encompass intangible assets. In this process, the way of seeing heritage material, monuments or museum objects has also changed.

### 3. Methodology: survey of public observatories

We conducted a survey to

- (a) learn the perspectives of museum institutions world-wide on the use of historically valuable telescopes for public observations, and
- (b) create a guide to public observatories.

We invited members of the International Astronomical Union to take part in the survey. We also disseminated the survey to potential institutions in the beginning of September, 2017. We accepted responses to the survey until the end of November, 2017. An e-mail of contact (historicaltelescopes@mast.br) was provided for inquiries.

The survey instrument comprised of four main blocks of questions: (1) institution’s and respondent’s identification; (2) information about the activity promoted with the historical telescope and the personnel that undertake the activity; (3) information on the historical telescope; (4) identification of concepts and perspectives of participants in relation to the use of museum objects.

The first two blocks were mostly comprised of close-ended questions or short strings that aimed at searching activities similar to POC and gathering information necessary to create the guide to public observatories. The third block aimed to collect information on the historical telescope itself, such as the period it was manufactured, the research it has conducted, and if the telescope is considered a cultural heritage or as a museum object, as well as if it has undergone maintenance.

The fourth block aimed at deepening the understanding of concepts involved in our survey that depends on the perspective of the respondent. For instance, it was important to understand the meaning of the historical value of instruments according to the respondent's point of view; if the use of an historically valuable telescope contributes to the activity and if it inhibits its preservation. For that end, we used the Likert scale. Such a scale consists of comparable statements that are built using the theory from museum studies, that measures the same constructor. The Likert scale also allows survey respondents to indicate to what extent they agree with or endorse each statement made on the survey, that are all summed up.

#### 4. Results

The analysis of our survey is still on-going. Out of the 74 answers received, 70 institutions confirmed to be carrying out public observation of the sky with instruments considered of historical value. The majority of these institutions are university departments (32), with predominance in the United States (24). As for the professionals who carry out these actions, survey respondents identified them as graduate students (43) and trained professionals from various fields predominate (42). In terms of field of knowledge, the majority of the institutions (67) have professionals or undergraduates from Science, Technology, Engineering and Mathematics (STEM) who take care of the observations. Figs. 1, 2, 3 and 4 summarise these results.

Our open-ended questions reveal that a considerable group of respondents identified that the participants express feelings of wonderment when observing through historical telescopes. We have also found sentences compatible with the working view proposed by Mann (1989). Here we show some examples:

*“Although we try to avoid it, sometimes we look at the same target through the Great Equatorial Telescope as we do through the small modern telescopes and we have had comments on how looking through the historic instrument has a different feel. Many visitors are fascinated by its historic origins. . .”*

*“It elicits ‘wow’ moments from all who see and/or use the telescope”.*

*“All our visitors admired the possibility of observing the universe through the Telescope”*

*“There is a psychological impact to looking through the same piece of glass as famous people of the past, an instrument from before things like the civil war, the wild west, or the immigration of many visitor’s families. It’s also hard to envision a replica actually reproducing some of the effects of 19th century glass. . .”*

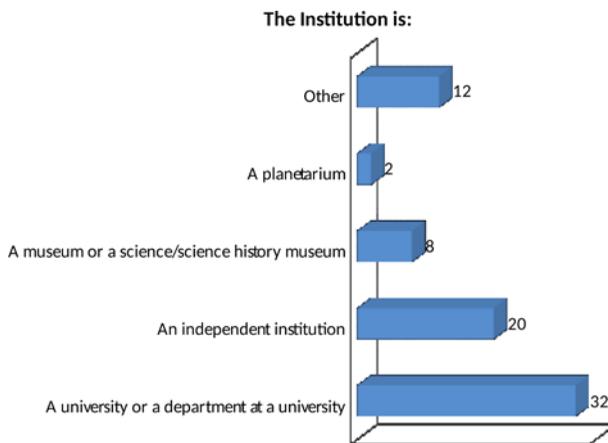
*“Even if the telescope cannot be used as a tool of discovery anymore, we think it is marvelous for people to delight their eyes by looking at celestial objects using the telescope. . .”*

#### 5. Perspectives

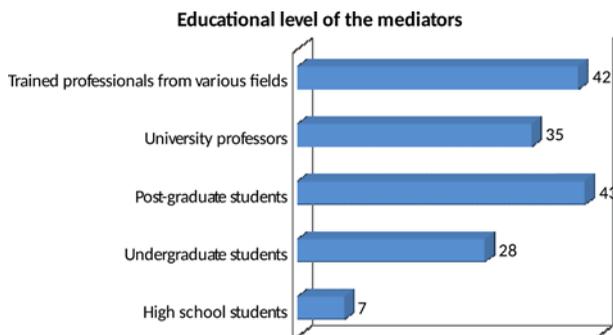
The analysis of our survey is still on-going. As a next step, we will contact institutions that use historical telescopes and are science museums. The guide to public observatories is also being organized and will be published in 2019.



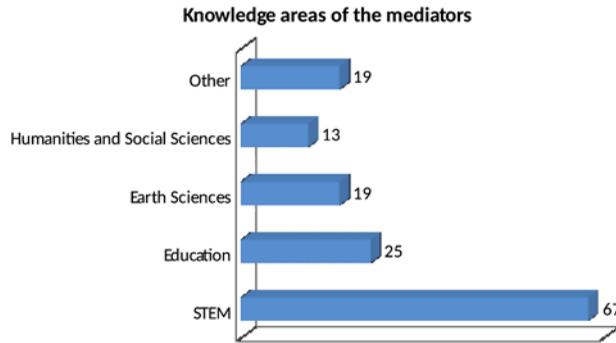
**Figure 1.** Type of institutions: 43% are university departments, 27% independent institutions and 11% science museums. We have also found that 3% are planetaria and 16% are other types of institutions.



**Figure 2.** Distribution of institutions that use historically valuable telescopes for public observations. The number within the blue box corresponds to the number of public observatories in the country, except for Europe. In this case, it is represented the total number of observatories in Austria, Croatia, Denmark, England, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Spain, North Ireland, Ukraine and the Vatican.



**Figure 3.** Education level of mediators. Trained professionals and graduate students are typically the education level of the mediators.



**Figure 4.** Field of knowledge of the mediators employed for observational activities.

## 6. Discussion

ARETXAGA: I noticed that some of the telescopes in your list are still being used for research. Do you include in your survey what research activities are still being performed with these historical telescopes?

SPINELLI: We did not include an item in the online survey related to current research undertaken with the historical telescopes. However, since there are blank spaces for comments, quite often the respondents provide such information when this is the case. Therefore, we have this information for some institutions

HEARNSHAW: We have at least 4 historical 19th-century refractors in New Zealand (one 6-inch from 1864, one 18-inch from 1897 and two 9-inch refractors). Can we add these to your list?

SPINELLI: Yes. We are still processing the data collected from the survey, we have already identified institutions that are missing in our list. We will invite these institutions to take part of the survey and they will have some extra time to reply the survey.

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