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*Edited by  
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## Introduction - *Fernando B. Figueiredo*

The birth of a small Portuguese community of historians of science can be traced back to the 1930s, with the creation of the *Grupo Português de História das Ciências* (Portuguese Group of History of Science), encouraged by Aldo Mieli (1879-1950). Mieli was the leading promoter of the *Académie Internationale d'Histoire des Sciences* and visited Portugal in the early 1930s (Simões *et al.*, 2008; Fitas *et al.*, 2008, p. 213-233). This group became responsible for the publication of the first Portuguese journal in the history of science, entitled *Petrus Nonius* (1937-1951). The truth is that in Portugal the study of science in its historical and philosophical dimensions has just recently started to take firmer steps, supported by interdisciplinary working groups linking various departments, research centres, and universities.<sup>1</sup> Much remains to be studied. Some areas in the history of science are still in an embryonic stage – it is the case for the Portuguese history of astronomy.

The specific historical studies on astronomical science are very scarce since they are generally embedded in larger projects. Until very recently, Portuguese history of astronomy has been considered as a subsidiary field of the history of marine navigation and of mathematics. Nevertheless, among physical and mathematical sciences, astronomy is the most studied discipline over time in the country.

In fact, although Portugal and astronomy are mentioned together, the association will most likely resonate with maritime discoveries, scientific navigation and the use of astronomy to expand, map, and maintain a maritime empire. The Portuguese expertise in astronomy and related fields, if acknowledged at all, will certainly be associated with the Early Modern Period, and probably with an ensuing decline that immersed the country into a long-standing era of backwardness. A particular tradition of Portuguese scholarship on the relations between navigation, mathematical sciences and Portugal's seafaring ventures might well have contributed to reinforce this picture. Seeking to emphasise a purported national vitality in the pioneering maritime deeds of the Portuguese, it fostered a focus on the subject as a

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<sup>1</sup> Some statistics regarding the production on the Portuguese history of science during the period 2000-2004 can be seen in (Tavares & Leitão, 2006).

claim of priority for the sake of national pride, and implicitly as consolation for the country's subsequent diversion from the main roads of modernity.

Once it embraced the celebratory and nationalistic overtones of the political agenda of the Salazar regime, the Portuguese Group of History of Science produced much of its work on this issue. It emphasized a golden period of Portuguese science associated with the maritime discoveries and geographical expansion. From June 23 to December 2 1940, Lisbon hosted the great exhibition of the “Mundo Português” (Portuguese World) (Commemorating the date of the foundation of the Portuguese State (1140) and the Restoration of Independence (1640) was also a way to legitimise and celebrate the Salazar regime of Estado Novo. The Commemorations led to several colloquia on the history and identity of the country, which focused on the glorious time of the Discoveries. They corroborated the image of Portugal as the head of a majestic empire founded on a long legacy of great glories: a country that gave new worlds to the World (Comissão Executiva dos Centenários, 1940).

A wave of recent works has been setting the scene for a more balanced representation of the Portuguese contributions to the cultural encounters and the profound geographical and scientific reconfigurations that shaped the Early Modern world. Portuguese scholars, navigators, brokers, and other historical actors are now being studied, mainly regarding the wider circuits and networks through which their actions had an impact in the affairs of their day. While this approach undermines national-biased claims, it also leads to better recognise the importance of figures such as the mathematician Pedro Nunes in the mathematical sciences of the period. The theoretical discussion around issues such as the existence of an “Iberian science” also contributes to shed new light on the complex interactions between geographical boundaries, the emergence of seaborne empires, and the circulation of mathematical and natural knowledge.

Our argument in this thematic issue of the *Cahiers François Viète* is that bringing this period under a perspective similarly focused on circulation, networking, and exchange will not only allow to overcome somewhat parochial dichotomies such as backwardness/progressiveness, success/failure, and recognition/obscurity, but will also contribute to further our understanding of the wider networks and circuits of modern astronomy. As far as Portugal is concerned, there is, in fact, plenty of material to explore this line of research. This issue comprises six articles by the most respected researchers in the field, examining the Portuguese history of astronomy from the Discoveries to the 20th century.

The first article of the volume is devoted to the Portuguese astronomical navigation in the Age of Discoveries. António Costa Canas

starts with a summary of the main contributions by the Portuguese to astronomical navigation, giving a brief description of the main bibliography published on this subject. While the leading experts are probably aware of it, it is not the case for a broader audience. Then, Costa Canas tries to answer the following question: when did astronomical navigation start? Even though at the beginning, Portuguese sailors did not use astronomical methods developed primarily in the Mediterranean Sea, they did later in oceanic voyages. Sailors could stay for long periods of time in the open ocean, out of sight of land. They needed new methods to sail ships safely. The Portuguese adapted techniques, instruments, and calculation processes to increase the accuracy of positions obtained on high seas. The author analyses the evolution of the Portuguese celestial navigation, focusing his attention on the methods for determining latitude and longitude of the ship at sea. Regarding latitude, the Portuguese sailors made use of the Polaris or the Sun. As regards longitude, although a satisfactory solution only became available in the 18th century, the same sailors used a method that made use of the conjunctions and oppositions of the Moon. That method was employed in Magellan's voyage (1519-1522), the first voyage around the world in human history. All this is explained and placed in the context of the nautical techniques of the 15th and 16th centuries when the Portuguese had proven themselves as navigation experts.

Bruno Almeida's paper is dedicated to the astronomical work of one of the most important figures in Portuguese history of science, the mathematician Pedro Nunes (1502-1578). Professionally, Nunes was a university professor and a Cosmographer (appointed in 1529), a practice that combined different scientific disciplines such as geography, mathematics and, of course, astronomy. Nunes' contributions to science are multiple and span from pure mathematics to mechanics, astronomy, algebra and navigation. In his paper, Almeida stresses that Nunes' astronomical activity was highly motivated by practical needs motivated by his professional activity as a cosmographer. He suggests that the texts that Nunes wrote about astronomy can be organized in three main categories: translations of earlier texts, commentaries to those texts and original research.

It has been common, in Portuguese historiography, to consider the period after Pedro Nunes's death and the beginning King José's reign (1714-1777), in 1750, as a period of inertia/slowdown, if not stagnation, for Portuguese science, i.e. mathematics and astronomy. Two main factors were invoked to explain that phenomenon. One was the existence of a powerful Inquisition, and the other was the control of the Jesuits over Portuguese education. However, in the past few years, this image started to change due to the work of an emergent class of historians of science who have been

studying the role played by the Jesuits in the teaching of science during the 17th and 18th centuries (Carolino & Ziller, 2005; Leitão, 2007; Leitão & Azevedo Martins, 2008; Martins, 1997; Saraiva & Jami, 2008; Saraiva, 2000; Saraiva, 2001). For example, Luis Tirapicos has been working in that field of research in the last couple of years.

Luis Tirapicos focuses his paper on the first half of the 18th century when the court of King João V (1689-1750) counted one of the most active networkers of the period, Giovanni Battista Carbone (1694-1750). This Italian Jesuit priest and mathematician became a central figure in the practice of astronomy during that period. Carbone, who came to Portugal on the invitation of the King with his fellow Jesuit Domenico Capassi (1694-1736), played a pivotal role in promoting astronomy and the internationalisation of observation work. Tirapicos argues that the discovery of large deposits of Brazilian gold and the dispute with Spain over the limits of the Iberian-American colonies were the driving forces for the development and patronage of astronomy by the King. As he points out: “there was a mutual relationship between Brazilian gold and astronomy. Astronomy was sponsored and paid for by American gold. In other words: state-sponsored science implied science to serve the State.” As the King’s assistant and consultant, Carbone became an active agent in the diffusion of astronomical data and knowledge, using commanding networks, diplomatic channels and the web of the Society of Jesus.

After D. João V’s death, a radical transformation promoted by his son King José (1714-1777) occurred in the Portuguese society. Towards the end of the century, the Marquis de Pombal (1699-1782) – the all-powerful minister of the new King – encouraged the reformation of Coimbra University (1772). Thanks to this initiative, mathematics, astronomy, the Enlightenment and the concept of national/university observatory became the axes of a thorough search for international institutional standards.

My paper explores the scientific activity of the Royal Astronomical Observatory of the University of Coimbra, created in the context of the teaching reforms carried out by Pombal at Coimbra University. The reform meant for the University to not only be a teaching centre but also to produce knowledge in order to fulfil the technical and scientific needs of the country. First, I will start with a brief contextualization of the scientific panorama of the country in the first half of the 18th century, namely in the fields of mathematics and correlated sciences. Then I will focus on the scientific work carried out at the Observatory, compared with the practice of the most famous observatories in Europe. I will then explore how the astronomical work of its first director – Monteiro da Rocha (1734-1819) – which spanned from theoretical to practical astronomy, was in tune with

the major astronomical problems of that time (e.g. the tricky problem of the determination of longitude at sea). Finally, my paper will examine the creation and activity of several academic institutions (e.g. the Royal Academy of Sciences of Lisbon, the Royal Academy of Navy, the Academy of Fortification, Artillery and Design and the Royal Maritime, Military and Geographic Society), that were created during the reign of D. Maria (1734-1816). These institutions reinforced the institutionalisation of modern science and its practice in the country, which had begun with the former reformist policies of Minister Pombal.

The creation of these new institutions revealed that the training, professionalisation and scientific specialisation of mathematicians, astronomers, engineers, botanists, chemists, and mineralogists was a reality in Portugal in the years that followed the reform of the University. In fact, in less than forty years, Portugal had undergone a paramount transformation in its educational and scientific paradigm. There are several examples to confirm this, such as the 1780 expeditions to Brazil in order to delimit the frontiers of the country after the Treaty of Santo Ildefonso (1777), in which several astronomers all doctorates in Mathematics, participated. These events contrasted with the expeditions that took place after the Treaty of Madrid (1750), which were mostly composed of foreign astronomers, mainly Jesuits.

The Napoleonic Invasions and the consequent departure of the Court to Brazil, on 29 November, 1807, (only returning in 1821) as well as the civil war (which only lead to political, social stability and peace in 1834) made the first decades of the nineteenth century very difficult for Portuguese science and its institutions.

By the mid-nineteenth century, Portuguese authorities engaged in an ambitious institutional project aimed at fostering the measurement of stellar parallax and further developing stellar astronomy, in close collaboration with no other than the Observatory of Pulkovo, the leading observatory at the time. Thus was born the Observatory of Lisbon (1861-1867), which would later become a major centre of expertise for the constitution of an imperial network of colonial observatories. The Astronomical Observatory of Lisbon (AOL) was founded in 1857 to collaborate with the Russian observatory of Pulkovo in the development of stellar astronomy, especially in the measurement of stellar parallax. However, this project did not materialise, and the observatory was readjusted to a more traditional observatory devoted to timekeeping. From the 1880s onwards, the AOL secured its status as a national timekeeper. In the last quarter of the 19th century, several attempts to introduce astrophysics in Portugal led to exchanges of observation work (namely in solar photography), as well as sur-

veys and discussions on instrumentation and the institutional settings in which to foster this discipline. Although the scientific outcome of such efforts was overall meager, they reveal not only local setbacks but also the complex interplay between institutions, professional identities and international networks in the rise of the “new astronomy”.

Vitor Bonifácio’s paper is devoted to the efforts of the astronomer Francisco Costa Lobo (1864-1945) to initiate a Portuguese astrophysical research at the Coimbra Observatory in the first decades of the 20th century. The extensive travelling of Francisco Costa Lobo (1864-1945) in the first half of the 20th century – which was instrumental to the systematic programme of spectral-heliography that began in Coimbra in the 1920s – constitute more than a token of local effort to keep abreast of the international status quo. They offer a perspective on the international circuits of early-twentieth-century astrophysics and their routes, actors, and procedures, according to perceptions and aspirations. These elements allow us to draw a picture of this scientific *milieu* more nuanced than that provided by the historical narratives emanating from this very *milieu*. Even though Portugal’s involvement with astrophysics in the early stages of the discipline still leaves the impression of a generally unaccomplished venture, the persistence of positional astronomy in the Observatory of Lisbon and the younger observatory of the University of Porto (established in the 1940s) – usually connected to international programmes and research agendas – hints at the importance of the “old” astronomy throughout the 20th century, an aspect often overshadowed by the history of astrophysics itself.

Pedro Raposo’s paper entitled “Meteorology, Timekeeping and ‘Scientific Occupation’: Colonial Observatories in the Third Portuguese Empire”, presents an overview of colonial observatories in the Third Portuguese Empire (1825-1957), and the attempts that were made to steer an imperial network of observation devoted not to astronomy but to meteorology. Raposo explores the creation and activity of the Luanda Observatory (later João Capelo Observatory) in 1879 and the attempt to upgrade it in the 1920s, the inauguration of the Campos Rodrigues Observatory in Lourenço Marques (now Maputo) in 1908, and the constitution of the National Meteorological Service of Portugal in 1946. These episodes are set in their political context and approached through the aspirations of imperial resurgence that underlay the Third Portuguese Empire.

During the 20th century, the professional astronomical activity was mainly supported by the universities and their observatories, mainly, Porto, Coimbra and Lisbon. However, until the end of the 1970s, it was very hard to find publications by Portuguese astronomers in international peer-

reviewed journals. This quasi-non-existence of astronomical publications is a consequence of the reduced number of astronomers. Even if we do not have the real figures, we assume that there were no more than five to ten PhD researchers in astronomy and astrophysics in Portugal at the end of the 1970s. During the 1980s the situation started to change. Almost simultaneously – and curiously outside of the academic observatories – research groups in astronomy and astrophysics appeared in the Portuguese universities of Porto and Lisbon. These universities created under-graduation and graduation syllabi in order to train future astronomers and astrophysicists. The global strategy was to create a substantial amount of people able to rebuild Portuguese astronomy and astrophysics. The collaboration with the European Southern Observatory (ESO) was crucial, as with the ESA. Presently, Portugal has a very important and experienced research community of astronomers and astrophysicists involved in several international projects. Very recently, an SPA<sup>2</sup> study from 2013 showed interesting data concerning the impact of astronomy and astrophysics in Portuguese science, space science being the field with one of the highest rates.<sup>3</sup>

At the end of this brief introduction, we only can express our deepest hope that, by connecting the most recent research on the principal topics of Portuguese astronomy, our reader can get a clearer overview of the role and place of Portugal in the global endeavours of astronomical science. We hope this volume can provide a useful contribution in that direction and be a stimulus for new and contextualised research studies on Portuguese history of astronomy and correlated sciences.

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<sup>2</sup> The SPA (Portuguese Astronomical Society), was founded to contribute and to promote, in its broadest sense, the development of the Portuguese astronomy ([www.sp-astronomia.pt](http://www.sp-astronomia.pt)).

<sup>3</sup> [http://sp-astronomia.pt/comunicado\\_FCT2013](http://sp-astronomia.pt/comunicado_FCT2013)

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