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WORK IN PROGRESS

Cândido Baptista de Oliveira and the "Forgotten Memoir": The First Plan of a National Astronomical Observatory After Brazilian Independence (1822-1831)

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Abstract: On February 1, 1828, the newspaper *Diario Fluminense* published in full the Plan for the establishment of an astronomical observatory in the city of Rio de Janeiro. The document was written by the Brazilian mathematician Cândido Baptista de Oliveira and substantiated the approval of the law determining the creation of the future Imperial Astronomical Observatory of Rio de Janeiro (IORJ). This paper discusses the influences embedded within Oliveira's project, by analyzing the appropriation of different scientific traditions gained during his training as a mathematician at the Observatory of the University of Coimbra and during his studies at French scientific institutions, such as the Polytechnic School and Paris Observatory. I argue that this project had a nationalistic ideal, imbued with the notions of progress and modernity, both effects of the ongoing circulation of people and scientific knowledge during the beginning of the nineteenth century.

Keywords: history of astronomy; Brazilian empire; Candido Baptista de Oliveira; imperial observatory; Rio de Janeiro

Introduction

On September 7, 1822, Brazil became an independent nation. Brazilian historiography often remarks that the independence process developed a pendular swing between two different types of political projects, the liberal—with federalist and liberal implications—and the conservative —with centralist leanings. This pendulum shaped conflicts that involved, on the one hand, the consolidation of the State and, on the other hand, the integrity of the territory. From this scenario emerged a national project based on a Constitutional Monarchy, guided by D. Pedro I, the son of the Portuguese King D. João VI. [1]

During this first phase of the Brazilian empire (1822-1831),[2] modernization and progress acquired a particular sense. The local elites kept most of their colonial privileges, including the right to maintain the plantation and the slave trade as the pillars of the economic system.[3] Consequently, economic development and progress were fully concentrated in the hands of plantation owners and powerful merchants.[4] Not unrelated, political and economic power continuity meant that the education of future elites was restricted to the members of that same class. Young men of good birth and fortune studied and trained at European universities and scientific institutions, during the colonial period; they did the same in the first decades of the empire. Maria Costa investigated the circulation of these youths with funding from the Ministry of War and the Ministry of the Empire, between 1822 and 1831. Costa estimates that 73.6% of the pensions—scholarships or commissions—were concentrated in areas related to the military sciences, such as mathematics, military engineering, naval studies, metallurgy, and others. The author indicates that most were destined for Paris, arguing that the Empire had

[1] Wilma Peres Costa, "Do Domínio à Nação: Os Impasses da Fiscalidade no Processo de Independência," in *Brasil: Formação do Estado e da Nação*, ed. István Jancsó, 143-93 (São Paulo: Hucitec, 2003), 153.

[2] The independence was not peaceful, lasting a couple of years. Right after the declaration, several states started uprisings against the new crown. This posed a great threat to the territorial integrity and the empire's priority then was to retain these territories. Between 1822 and 1831, the first Emperor, D. Pedro I, struggled to settle the uprisings and following tensions between the state administration and political representatives in Congress. With little success, he spent several years trying to set a balance between the central government policies and the states. After his father's death, in 1826, he decided to return to Portugal and fight for his daughter's claim to the Portuguese crown. On April 7, 1831, he abdicated the Brazilian throne and let Regents administer the nation since his son, the future emperor, was just a toddler. See: José Murilo de Carvalho, *A Construção da Ordem, A Elite Política Imperial: Teatro de Sombras, a Política Imperial* (Rio de Janeiro: Civilização Brasileira, 2008), 37.

[3] The Brazilian Empire, a constitutional monarchy with an economy fueled by a slavocracy, became one "political island" surrounded by abolitionist republics like Argentine, Uruguay and Bolivia, which were previously part of the Spanish American colonial territories. See Sérgio Buarque de Holanda, *Capítulos de História do Império* (São Paulo: Companhia das Letras, 2010), 38. See also João Paulo Garrido Pimenta, *Estado e Nação no Fim dos Impérios Ibéricos no Prata: 1808-1828* (São Paulo: Hucitec, FAPESP, 2006).

[4] Carvalho, *A Construção da Ordem*, 39.

a special interest in French military and scientific culture.[5] Contrary to other new nations in Latin America, Brazil had no university in the early nineteenth century. Since the arrival of the Portuguese court in 1808, Rio de Janeiro hosted the Royal Academy of the Coast Guards (1808) and the Royal Military Academy (1810). After independence, other learning and scientific institutions were created in the following decades, such as the Colleges of Medicine and Law (1830s), focusing on the education of the elite classes.[6] Even in this scenario, Brazilian scholars joined the University of Coimbra or other institutions whenever possible. After independence, several of them returned to contribute with their knowledge and training to the making of the young nation.[7] The Brazilian Empire aspired to create institutions that embodied its own national identity.

In this paper, I will consider the trajectory of the mathematician Cândido Baptista de Oliveira and his plan for the establishment of an astronomical observatory in Rio de Janeiro, published in 1828. Oliveira's plan was used to convince the Congress and the Senate to approve the decree creating the observatory. I aim to analyze the plan and to explain Oliveira's interest to embed this institution within the progress of the Empire, given that the observatory could contribute to the reformation and expansion of the educational system and the development of existing scientific institutions. Some questions need to be asked to understand Oliveira's role in setting up the basis for the establishment of an astronomical observatory in Rio de Janeiro: Which scientific astronomical traditions did Oliveira draw upon for his observatory project? And, in addition, how was Oliveira's project of an astronomical observatory connected to the nation-state building of the Brazilian Empire during the first half of the nineteenth century?

The "Forgotten Memoir" on the Historiography of Science

To help him draft his proposal for a new national Brazilian observatory, Oliveira searched for inspiration from available institutional models. The first place was the Observatory of the University of Coimbra (henceforth OUC). It is possible to identify the dialogue between

[5] Cf. Maria Cristiane da Costa, "Práticas de Pensões de Estudos no Império: Um Olhar Sobre os Pensionários Militares (1821-1831)" (master's thesis, Universidade Federal Fluminense, 2012), 38-9. See also Aviso do Ministro dos Negócios Estrangeiros, December, 12, 1825, AHI 300 03 16, Arquivo Histórico do Itamaraty.

[6] On the Colleges of Medicine see Isabela de Oliveira Dornelas, "A Criação das Faculdades de Medicina no Período Imperial Brasileiro," *Sillogés* 2, no. 2 (2019): 272-92, on 273.

[7] Several Brazilian historians of science have studied this emergency of scientific institutions during the first decades of the empire. Cf. Alda Heizer and Antonio Augusto Passos Videira, ed., *Ciência, Civilização e Império nos Trópicos* (Rio de Janeiro: Access, 2001); Silvia Figueirôa, ed., *Um Olhar Sobre o Passado: História das Ciências na América Latina* (Campinas: Ed. UNICAMP, 2000); Maria Amélia Mascarenhas Dantes, ed., *Espaços da Ciência no Brasil: 1800-1930* (Rio de Janeiro: Editora Fiocruz, 2001); Maria Margaret Lopes, "Aspectos da Institucionalização das Ciências Naturais no Brasil no Século XIX," *Quipu* 2, no. 12 (1999): 217-30.

the French and the Portuguese scientific traditions based on the bylaws and the programs of astronomy classes from the University of Coimbra. Furthermore, astronomers and students from the OUC were part of a network of circulation of ideas, theories, books, practices, and techniques. Astronomers in these two countries engaged in a common enterprise: improving the measurements of the relative positions of the moon, planets, and celestial bodies, as well as the determination of geographical locations based on extensive calculations of coordinates.

After his graduation, Oliveira had the opportunity to travel to Paris and study at the *Polytechnique*. The outcome of this research was his plan for the observatory, the first one to present the observatory as an institution aiming to create and sustain a technoscientific network in Brazil. However, it is crucial to note that Oliveira's plan is not mentioned in previous works about the history of astronomy in Brazil. In the Brazilian historiography of science, the major narratives seek to build a connection between the astronomical practices from colonial times to the creation of the astronomical observatory after independence. For instance, according to Abraão de Morais and Abraham Szulc and later Ronaldo Mourão, the institutionalization of astronomy in Brazil was a corollary to a long cumulative historical process of scientific practices and activities held since colonial times. They understood Brazilian scientific culture as inherited only from the Portuguese scientific world because of the colonial experience.[8]

Henrique Morize, director of the National Observatory between 1908 and 1929, highlights the importance of the founding decree of October 15, 1827, as the starting point for institutionalization. Morize, entrusted by the government to collect as much information as possible for a special publication to solemnize the centenary, is the author of the commemorative book of the National Observatory's 100 years.[9] He mentions Oliveira's plan but does not consider the project or the circumstances under which it was produced. Morize's book is considered a major source for the history of astronomy and the history of the astronomical observatory in Rio de Janeiro. Nonetheless, recent works still consider the decree of October 15, 1827—restating what Morize wrote—to be the starting point of this process. Antonio Augusto Passos Videira, for instance, does not mention or even detail Oliveira's plan, perhaps because the material was not attached to the decree.[10] Only recently, in 2022, José Campos published an article entitled "Candido Baptista de Oliveira: the idealizer of the Observatory of

[8] See, in particular, Abraão de Morais and Abraham Szulc, "A Astronomia no Brasil," in *As Ciências no Brasil*, ed. Fernando de Azevedo, 81-161 (São Paulo: Edições Melhoramentos, 1955); Ronaldo Rogério de Freitas Mourão, "A Astronomia no Brasil," in *História das Ciências no Brasil*, vol. 2, ed. Mário Ferri and Shozo Motoyama, 409-41 (São Paulo: EPU/EDUSP, 1979).

[9] The text remained in manuscript form until 1987, when it was published as a book. See: Nelson Werneck Sodré, "Morize e o Observatório Nacional," in Henrique Morize*, Observatório Astronômico: um Sé*culo de *História (1827-1927)* (Rio de Janeiro: Museu de Astronomia e Ciências Afins, 1987), 9-14.

[10] Antonio Augusto Passos Videira, *Os 175 Anos do Observatório Nacional* (Rio de Janeiro: Observatório Nacional, 2002); *História do Observatório Nacional–A Persistente Construção de uma Identidade Científica* (Rio de Janeiro: Observatório Nacional, 2007).

Rio de Janeiro," in the *Revista Brasileira de História da Ciência*, where he presents the memoir and the discussions that ensued in the legislature before the project was approved.[11] Perhaps Oliveira's work was overlooked because his plan was published only one year later, in 1828, by the official Imperial gazette, *Império do Brasil - Diário Fluminense*.[12]

The Postcolonial Approach to the History of the Imperial Observatory of Rio de Janeiro (IORJ)

To better understand this memoir, first I must present the approach I have chosen to follow. This paper draws on the global history of science approach that emerged from postcolonial theory. The 1990's saw the emergence of the postcolonial approach, proposing the use of concepts such as circulation, connections, intersections, appropriation, reappropriation and expropriation of theories, ideas, and practices at the local scale. Authors such as Kapil Raj, Sanjay Subrahmanyam, and Sujit Sivasundaram analyze contrasting dimensions of scientific production in the relations between India and the construct of "Europe."[13] They see the construction of scientific knowledge in the eighteenth and nineteenth centuries as part of a political narrative, consolidated primarily by academics located in the "so-called" academic centers from the main economic poles of the imperialist West. One premise is that the notions of modernity and progress were products of intricate politics, and these two elements led these nations to the standards of civilization.

This approach recalibrates the scales of analysis to the "local" specificities within "global" processes. Moving his lens to local connections, Kapil Raj notes the "transforming" dimension of "encounter, power and resistance, negotiation, and reconfiguration that occur in cross-cultural interaction."[14] Raj also emphasizes the idea of "science as practice," decentralizing the

[11] José Adolfo S. de Campos, "Candido Baptista de Oliveira: o Idealizador do Observatório do Rio de Janeiro," *Revista Brasileira de História da Ciência* 15, no. 2 (2022): 277-96.

[12] The *Império do Brasil - Diário Fluminense* was the official newspaper of the Brazilian crown between 1824 and 1831. It was edited by Manuel Ferreira de Araújo Guimarães, politician and military engineer. Historian Luís Miguel Carolino states that Guimarães was engaged in a project to give new contours to scientific education in Brazil, using the *Diário Fluminense* to publish memoirs and articles on scientific news. Cf. Luís Miguel Carolino, "Manoel Ferreira de Araújo Guimarães, a Academia Real Militar do Rio de Janeiro e a Definição de um Gênero Científico no Brasil em Inícios do Século XIX," *Revista Brasileira De História* 32, no. 64 (2012): 251-78.

[13] Kapil Raj, "Beyond Postcolonialism … and Postpositivism: Circulation and the Global History of Science," *Isis* 104, no. 2 (2013): 337–47; Sujit Sivasundaram, "Trading Knowledge: The East India Company's Elephants in India and Britain," *Historical Journal* 48, no. 1 (2005): 27-63; Sanjay Subrahmanyam, "Holding the World in Balance: The Connected Histories of the Iberian Overseas Empires, 1500–1640," *The American Historical Review* 112, no. 5 (2007): 1359-85.

[14] Raj, "Beyond Postcolonialism," 343.

hegemony of the Eurocentric (and westernized) narratives and moving forward to understand the protagonism and the entangled roles of individuals from the local.

Nevertheless, at the beginning of the nineteenth century, new nations willing to take part in this "modern" world considered or invested in the idea of building an astronomical observatory. The observatory itself represented a wide range of "mixed mathematics," such as astronomy, optics, mechanics, climatology, geodesy, and cartography, sciences in which mathematics functioned as a language and determined the comprehension codes of research.[15] Observatories provided different types of statistical resources that were used for administration (politics and economy), military purposes, and the control of territories. Observatories were ultimately also related to the constitution of modern and western "technoscientific and imperial networks."[16]

That said, to elucidate the place of astronomy in Brazilian history, we must understand how Portuguese astronomers understood this science. Portuguese colonization had established many administrative institutions, but the situation changed drastically when the Portuguese court fled the Napoleonic invasion of Portugal (1808-13) and established Rio de Janeiro as the new center of the Portuguese ultramarine empire. The court—with its administrative and cultural institutions—deeply altered the economic and political dynamics in Brazil. To keep this system in balance, the crown initiated a structural reform of the local policies.

Like other colonial empires, the Portuguese were interested in positional astronomy. Latitude and longitude observations were largely used to connect distant parts of its maritime empire, consolidating a substantial network of information about the South Atlantic maritime routes. During most of the eighteenth century, the majority of astronomers or engineers with astronomical training were respectively from religious orders and the military and navy academies. The previous structure of the military academy was founded in Rio de Janeiro in the last decade of the eighteenth century, inspired by the *Aula de Fortificação e Arquitectura Militar* (Fortification and Military Architecture Class).[17] This initiative from the Viceroy D. Luís de Castro formally introduced higher education in engineering in Brazil, as part of the movement initiated by the Pombaline Reforms.[18]

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[15] Exploring this thematic, David Aubin, Charlotte Bigg, and Otto Sibum argued that these specific scientific institutions were closely related to the mapping and control of territories after the independence of ex-colonial spaces. See David Aubin, Charlotte Bigg, and Heinz Otto Sibum, eds., *The Heavens on Earth: Observatories and Astronomy in Nineteenth-Century Science and Culture* (Durham [NC]: Duke University Press, 2010), 24.

[16] Ibid., 15.

[17] Luiza Nascimento de Oliveira da Silva, "Práticas e Discursos: Ensino da Arquitetura Militar e o Governo do Rio de Janeiro (1700-1750)," *Temporalidades* 30, no. 2 (2019): 230-52.

[18] On the Pombaline Reforms, see: Lizete Shizue Bomura Maciel and Alexandre Shigunov Neto, "Brazilian Education in the Pombaline Period: A Historical Analysis of the Pombaline Teaching Reforms," *Educação e Pesquisa* 32, no. 3 (2006): 465-76.

Since 1750, the Marquis of Pombal had initiated political, administrative, economic, cultural, and educational reforms in numerous areas of Portuguese society, as well as in the colonies. The UC, the most important university in the kingdom at the time, was one of the reformed institutions. The result of this reform was to renew and expand the faculties and the curriculum, as the UC acquired a more important role in the educational system. This intervention was centered on the idea of the University as an instrument of the reproduction of the powers of the elite.[19]

To achieve this goal, the Faculty of Mathematics was created in 1772. This faculty was intended to provide a well-rounded higher education according to the tenets of the Enlightenment movement.[20] According to Jaime de Carvalho e Silva, the Portuguese government was willing to build a well-equipped astronomical observatory for the student's practices.[21] They started the construction of this facility in the following years on the highest area of the university campus, finishing it around 1799.

After the Pombaline Reforms, the Observatory of the UC led to significant changes but kept a continuous interest in "associating pedagogical activity and scientific production."[22] Among other activities, the facility was used to improve training in practical astronomy and to provide a workspace for university students and graduates willing to make professional careers in mathematics, astronomy and other scientific areas. In the following decades, the observatory of the UC became a "true astronomical observatory of national nature."[23]

Many mathematicians and astronomers who worked in different parts of the Portuguese empire, including people from Brazil at the turn of the nineteenth century, were trained at the Coimbra observatory. The intellectual center of gravity may have shifted to Rio (1808-21) with the migration of the Portuguese court but, as discussed earlier, Rio had no astronomical observatory. Still, after independence (1822) and the gradual return of some elite families to the court in Lisbon, the sons of the wealthiest social classes of Brazil continued to prioritize the study of mathematics and astronomy at European institutions.

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[19] See the collective book edited by Ana Cristina Araújo and Fernando Taveira da Fonseca, eds., *A Universidade Pombalina: Ciência, Território e Coleções Científicas* (Coimbra: Imprensa da Universidade de Coimbra, 2017).

[20] Fernando B. Figueiredo and António Leal Duarte, "A Reforma Pombalina da Universidade de Coimbra e a Institucionalização das Ciências Matemáticas e Astronómicas em Portugal," in *A Universidade Pombalina: Ciência, Território e Coleções Científicas*, eds., Ana Cristina Araújo and Fernando Taveira da Fonseca, 191-244 (Coimbra: Imprensa da Universidade de Coimbra, 2017), on 191-92.

[21] Jaime Carvalho e Silva, "A Faculdade de Matemática (1772-1911)," in *História da Ciência na Universidade de Coimbra: 1772-1933*, eds., Carlos Fiolhais, Carlota Simões, and Décio Martins, 9–42 (Coimbra: Imprensa da Universidade de Coimbra, 2013), on 9.

[22] Cf. Carlos Moura Martins, "A Aplicação da Ciência à Política do Território na Transição do Século XVIII para o XIX," in Araújo and Fonseca, *A Universidade Pombalina*, 290-91.

[23] Figueiredo and Leal-Duarte, "A Reforma Pombalina da Universidade de Coimbra," 244.

It is important to present an additional historiographical perspective on the production and circulation of scientific knowledge in observatories. Fernando Figueiredo and Leal-Duarte suggest two categories of analysis: a) national observatories and b) university/school observatories. For these authors, "national observatories" were often well equipped and established with the utilitarian purpose to assist the needs of the State, especially due to astronomical matters required for navigation, time measurements, and cartography. The observatories of Greenwich and Paris, for instance, are considered "national observatories," as they had institutional autonomy to compose the bylaws and other regulations and to make final decisions on essential matters. Nevertheless, the last word came from the government. Scientific and research activities were usually aligned with the government's agenda, which also had control over the appointment of directors, staff, and administration officers.[24]

On the other hand, university/school observatories did not have institutional autonomy. Their facilities were a section of the university campus. It must be emphasized that these observatories were commonly built to provide a training space to complement the curricular program of Practical Astronomy and Geodesy classes. Figueiredo explains that teaching does not exclude research activities, and this might be done to some extent but it was not the main goal of the astronomers involved.[25] Despite these characteristics, the OUC was of central importance for the development of Astronomy in Portugal between 1799 and 1863, the latter year corresponding with the foundation of the National Astronomical Observatory of Lisbon.[26]

In both cases, observatories were scientific institutions in which astronomers, professors and practitioners engaged in surveying works, data analysis and calculation. It is also important to note that national observatories also had the capacity to train and improve students and recent graduates seeking to build a career in research, politics and even in other affairs.

As a young graduate, Cândido Baptista de Oliveira (figure 1) followed this path. He became one of the most distinguished politicians and men of science after his return to his homeland. His project of the Imperial Astronomical Observatory in Brazil was, indeed, part of a complex strategy to secure the internal recognition of independence. The *observatory sciences* embedded this strategy by contributing to the administration of society, territory, and nature that leaders of the Brazilian Empire sought to achieve. According to his French biographer, Sébastien Sisson, Oliveira was born in Porto Alegre (capital of the Province of Rio Grande de São Pedro). After he graduated from the UC in 1824,[27] Oliveira moved to France aiming to "improve on the

[24] Figueiredo and Leal-Duarte, "A Reforma Pombalina da Universidade de Coimbra," 217.

[25] Ibid., 218.

[26] On further information about the Observatory of Lisbon, see Pedro M. P. Raposo, "Observatories, Instruments and Practices in Motion: An Astronomical Journey in the Nineteenth-Century," *HOST - Journal of History of Science and Technology* 8 (2013): 69–104.

[27] The administrative documents of the University of Coimbra show that Oliveira has graduated in

knowledge he had acquired at the University of Coimbra." He "spent around two years visiting all public establishments for education, specializing in the cases of the École Polytechnique, . . . in which the professor of astronomy was the distinguished savant Arago, who honored him with his friendship."[28] Oliveira spent his life working for the imperial administration and scientific institutions. He was initially a professor at the Military School of Rio de Janeiro, where he became Chair of Rational Mechanics. During the 1830s and 1840s, as a member of the Conservative Party, he served as a deputy for the province of Rio Grande do Sul (1830-34)—his home province—and as Senator for the province of Ceará (1850-65). Oliveira's role in politics grew as he served as head Minister of the Treasury (1839) and the Navy (1848). He later became the director of the Botanical Garden of Rio de Janeiro (JBRJ) (1851-59), was a member and vice-president of the Brazilian Historical and Geographical Institute (IHGB) and a lecturer at the Military Academy, making him a respected scientist.[29]

The assignment to compose the Plan for the observatory was a special task commanded by José Feliciano Fernandes Pinheiro, Viscount of São Leopoldo, the Minister of the Empire. The Viscount was a strong critic of the limited educational system in Brazil and was particularly interested in creating a university in the capital, modeled on the UC standards.[30] However, this project was not feasible for several reasons, namely due to the lack of financial support and human resources. Hence Oliveira's assignment was to visit and analyze institutions like the École Polytechnique and the Paris Observatory to gather information and to write a proposal to support the creation of an astronomical observatory.

Mathematics by the end of the year 1824. See: *Relação e Índice Alphabetico dos Estudantes Matriculados na Universidade de Coimbra no Anno Lectivo de 1823 Para 1824, Suas Naturalidades, Filiações e Moradas*, (Coimbra: Real Imprensa da Universidade, 1824), 37.

[28] Sebastião Augusto Sisson, *Galeria dos Brasileiros Ilustres*, vol. 2 (Brasília: Senado Federal, 1999), on 126.

[29] In the historiography of science, Oliveira's trajectory has been widely explored for his contribution to a diverse corpus of scientific institutions. For more on Oliveira's trajectory, see, for instance, Begonha Bediaga, "Conciliar o Útil ao Agradável e Fazer Ciência: Jardim Botânico do Rio de Janeiro – 1808 a 1860," *História, Ciências, Saúde - Manguinhos* 14, no. 4 (2007), 1131-57; João Fernando Barreto de Brito, "Quanto Pesa o Quilo? A Adoção do Sistema Métrico Decimal Francês no Brasil e os Quebra-quilos do Norte Agrário (1862-1875)" (PhD diss., Universidade Federal do Rio de Janeiro, 2020), 88-90; Ildeu de Castro Moreira and Luisa Massarani, "Cândido Baptista de Oliveira e seu Papel na Implantação do Sistema Métrico-Decimal no Brasil," *Revista Brasileira de História da Ciência* 18, no. 1 (1997): 3-17.

[30] Waldemar Ferreira, "O Visconde de São Leopoldo e a Fundação dos Cursos Jurídicos do Brasil," *Revista da Faculdade de Direito*, Universidade de São Paulo, no. 42 (1947): 195-213.

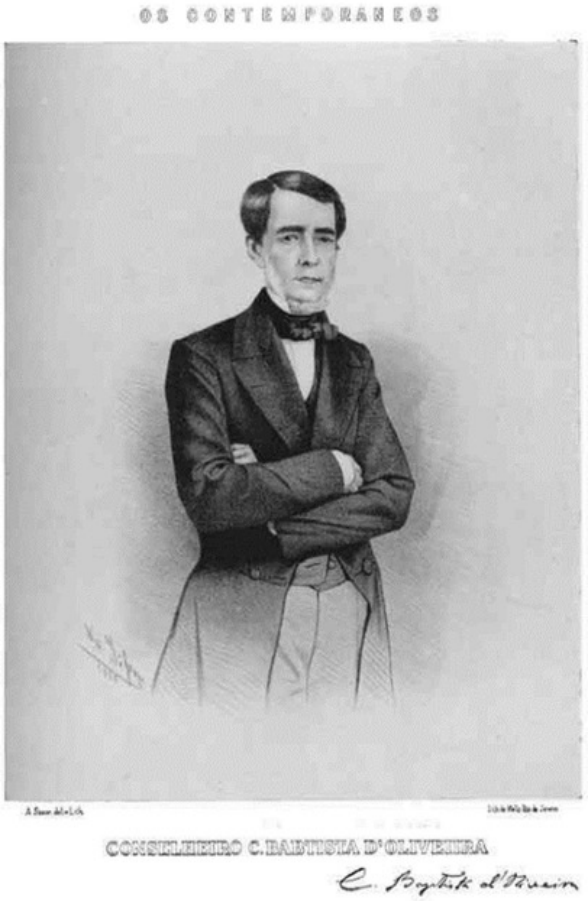

Figure 1. Cândido Baptista de Oliveira. Reproduced from Sisson.[31]

The Case of the "Central Observatory of Brazil"

The observatory project presented by Oliveira is divided into two major parts. First, there is a "Preliminary Discourse," in which the author presents his arguments in defense of the creation of an observatory. To this ambitious mathematician, it was important to outline the goals of the institution: it should be dedicated "especially to the culture and improvement of Physical Astronomy," as well as to promote the "in-depth study of other sciences on which it depends."[32]

[31] Sisson, *Galeria dos Brasileiros Ilustres*, 124.

[32] Cândido Baptista Oliveira, "Memória Sobre o Estabelecimento de Observatório no Rio de Janeiro," *Império do Brasil-Diário Fluminense* 11, no. 27 (1828): 105-07, on 106.

The second part is called "Plan for the establishment of an observatory in Rio de Janeiro with the denomination of Central Observatory of Brazil" (henceforth COB). It is divided into seven sections: a) Establishment of the Observatory, b) Works of the Observatory, including b.1) Ordinary works, b.2) Investigative works and b.3) Public education; c) Statistical Yearbook, d) Popular courses, e) Management and Inspection of the Observatory, f) Employees of the observatory, their nomination and respective salaries and, finally, g) Addition - Method of execution of the present plan.[33] Each part of the Central Observatory Plan was individually analyzed and compared to the curricular requirements of the observatory in Coimbra and the École Polytechnique.

In "Preliminary Discourse," Oliveira argues that he aims to use this project to encourage public education, and for this goal, the observatory's outputs must provide the means to achieve this. He raises the issue of civilization and progress by referring to the ideas of the Enlightenment movement, such as the vulgarization of knowledge and the circulation of books:

> Considering, however, that the dissemination of light is the greatest need our country now suffers, and that the vulgarization of useful knowledge is the most direct, brief, and effective means to operate the civilization of a people, I have not limited this proposal to the simple work of the original observatories' practices. I have added a new kind of work dedicated to public education. This is the composition and annual publication of a Statistical Yearbook. [34]

Oliveira saw the proposal of an observatory as an opportunity to join forces with other intellectuals to develop a national agenda since the observatory would supply not only qualified personnel but tangible resources with up-to-date knowledge about the nation. Thus, to Oliveira, the observatory should play the role of a leading research institution, compensating somehow for the lack of a university. According to Fernando Taveira da Fonseca, "universities are a logical and physical space where the demand and supply of socially recognized qualifications meet."[35] The UC had, therefore, this centralizing role as a pedagogical and scientific model, providing symbolic and cultural capital to the Portuguese Monarchy—in Europe and colonial territories—over the years.[36]

The opening sections of the plan refer to the objectives and structure of a national observatory. Nevertheless, it is possible to identify similarities with the regulations and statutes of the Observatory of the UC published in 1799. In the first section, "Establishment of the Observatory," Oliveira explains the stages to install the observatory in Rio de Janeiro: the construction of the

[33] The plan is presented in topics, divided into three sections followed by numbered paragraphs.
[34] Oliveira, "Memoria Para o Estabelecimento...," 106. Translated by the author.
[35] Fernando Taveira da Fonseca, "The Social and Cultural Roles of the University of Coimbra (1537-1820). Some Considerations," *e-Journal of Portuguese History* 5, no. 1 (2007): 1-21, on 4.
[36] Ibid., 4.

main building to accommodate astronomical and meteorological observations, the purchase of instruments and scientific apparatus for the measurements, observations and experiences, and the supply of books, research materials, maps and other documents needed for the activities — to be stored in the COB library, also to be used as an archive.[37] This was not simply a result of the economic crisis of the first emperor's government. The budget was limited, and the imperial administration also lacked human and technological resources, such as large telescopes and other instruments.

The second section is the largest and most detailed one. There were many instances of observatory techniques and practices in the section "Works of the observatory." Oliveira organizes these works into three "classes": b.1) ordinary works, b.2) research works, and b.3) public instruction. This organization was a matter of relative order of the observatory's priorities.

The first part, "ordinary works," focuses on the observatory's astronomical and meteorological observations and its commitment to publishing astronomical ephemerides. Oliveira explains that this publication was to be modeled after the *Nautical Almanac*—from the Royal Observatory in Greenwich—and the *Connaissance du Temps*—from the Paris Observatory. Like these almanacs, the COB almanac would be published annually and would include local useful data for navigation and geodesy, sets of tables determining the movement of the moon for the calculation of longitude at sea by the lunar distance method, and other useful information.[38] In addition, Oliveira included other elements, such as the description of the world-system, the general physics of the globe with an emphasis on the theory of winds, currents, and tides.[39]

His concerns about achieving a "first class" status for the COB went even further. One of Oliveira's personal interests during the nineteenth century was the introduction of the international standards of weights and measures in the Brazilian measure system. Several works in the history of science highlight the importance of the standardization and reliability of data collected in different parts of the world.[40] In 1834, a commission of prominent military officers, which included Oliveira and other mathematicians, was entrusted with reviewing metric and monetary systems to be adopted in Brazil and presented a report that sought a standardization of measures. It should be noted that the Empire implemented the metric system many decades

[37] Oliveira suggests that the COB Council should present a full report, stating the chosen site, an architectural plan and the full list of scientific instruments to be purchased in Europe.

[38] On this matter, the first attempt to launch this project will only take place in the beginning of 1850's when the Imperial Observatory of Rio de Janeiro published the first volume of the Ephemerides, using as parameter the Meridian of Rio de Janeiro crossing the Morro do Castelo (Castle Hill). See: *Ephemerides do Imperial Observatório Astronômico para o Ano de 1853* (Rio de Janeiro: Typografia Nacional, 1852), 274.

[39] Oliveira, "Memoria Para o Estabelecimento...," 106.

[40] Aubin, Bigg and Sibum, *The Heavens on Earth*.

later, on June 26, 1862, made official in Brazil by the Imperial Law n. 1157, signed by D. Pedro II.[41]

Oliveira considered Greenwich and Paris as world-class observatories. As Roger Hutchins highlights, the success of the Greenwich data-gathering network was the connection with the British university observatories of Cambridge, Radcliffe, Dunsink, Durham and other observatories worldwide.[42] Since the late eighteenth century, there was a considerable increase in astronomical practice and, consequently, an increase in the number of observatories in British territories and colonies. Many of these observatories were established in the nineteenth century and were part of the implementation of a strict discipline of observatory practices and techniques throughout the British empire. The same movement was happening in France. The Paris Observatory was at the center of a network of observatories and meteorological stations distributed across the country and overseas territories. The operation of these local and global networks relied on the collaborative and effective circulation of information, which was an essential element for the success of the constant correction of astronomical data.

Under the second topic, Oliveira lists "research works" as four major activities. The first was related to the previous section's experiments and improvements on the astronomical and meteorological observations. Next, he proceeds to the second item, the physics and chemistry experiments, to "verify an existing theory or to discover new facts, to enrich the physical sciences."[43] This intersection between observatories and physical sciences also made these institutions a fruitful place for local scientists to study local issues. This leads to the third item of this section: the "Statistical Yearbook."

For Oliveira, one of the main purposes of the COB would be the drawing up of a statistical yearbook in two volumes, the first of which would contain astronomical and meteorological data. The general idea of this publication was similar to the *Connaissance des Temps*. The second volume would contain information about the local administration, social and political dynamics, inspired by the program of the class of *Arithmétique Sociale*, from the *Polytechnique*: "Statistics of population and mortality. Average life expectancy. Population distribution according to age and sex. . . . The profits and expenses of public institutions on local level."[44] This volume would also contain a summary of world history as well as the political history of

[41] Elenice de Souza Lodron Zuin, "José Joaquim D'Avila: In Defense of a New System of Weights and Measures in Brazil in the 19th Century?," *Educação Matemática Pesquisa* 19, no. 2 (2017): 187-210, on 188–89.

[42] Roger Hutchins, *British University Observatories, 1772-1939* (Aldershot and Burlington, USA: Ashgate, 2016).

[43] Oliveira, "Memoria Para o Estabelecimento...," 106.

[44] *Programmes de l'Enseignement de l'École Royale Polytechnique Arrêtés par le Conseil de Perfectionnement pour l'Année Scolaire 1826-1827* (Paris: L'Imprimerie Royale, 1826), 27.

Brazil. This last detail cannot go unnoticed. Indeed, despite the Brazil's recent independence, the COB plan aligned with the idea of nation-state building. The younger Brazilian Empire was in need of statistical information collected in a systematic and standardized way because the astronomical, geodetic, and other scientific information was "inherited" from the Colonial Portuguese administration. Hence, Oliveira wanted to centralize this data on the yearbook and publish it alongside updated maps of each Province. He considered this material imperative to assist with imperial administration.

As mentioned before, astronomical observatories concentrated large amounts of data, mainly collected through fieldwork. For this, Oliveira set the fourth item of the "research works" section: it included fieldwork and expeditions all over the Brazilian territory and "any place in the world."[45] He also remarked the need for experiments and observations for the progress of science.

The next section of the plan addressed the interest in the vulgarization of science. For Oliveira, the COB should offer "popular courses" to reach the widest audience possible. The courses would be focused on physics and chemistry, but he aimed to give brief courses about the world-system, which could use the tools of geography, chemistry, physics, statistics, and history. Charlotte Bigg analyzes Popular Astronomy and popularization of science by astronomers during the second half of the nineteenth century. As she explains, popular astronomy "can be conceived of as a matrix from which a number of specialized constituencies progressively merged in the period: astrophysicists, science popularizers, and amateur astronomers."[46] Nonetheless, in the beginning of the century, popularization of science was already happening as part of the Enlightenment movement by allowing access to knowledge to a wider audience. By the time Oliveira lived in France, François Arago was lecturing popular astronomy, following the steps of Pierre-Simon Laplace, who suggested a public astronomy course led by the *Bureau des Longitudes* in 1812.[47] Arago began his weekly lectures the following year, publishing manuals and giving tutorials for astronomical observations and measurements. The public lectures inspired Oliveira to feature popular astronomy in the plan for the observatory.

In the next two sections of the COB plan, Oliveira listed the assignments of the observatory administration and staff. The criteria for the admission of astronomers followed the Observatory of the UC's Statutory Decree from 1799, borrowing some elements from the administrative and political organization of the OUC. The OUC operate under the statutes of the Faculty and was managed by the Professors, while the assistantships and other activities were reserved

[45] Oliveira, "Memoria Para o Estabelecimento...," 106.

[46] Charlotte Bigg, "Staging the Heavens: Astrophysics and Popular Astronomy in the Late Nineteenth Century," in Aubin, Bigg and Sibum, *The Heavens on Earth*, 305-34, on 307.

[47] James Lequeux, *François Arago, Un Savant Généreux: Physique et Astronomie au XIXe siècle* (Paris: EDP Sciences/L'Observatoire de Paris, 2008), on 380-84.

for practicing students and graduates.[48] Conversely, according to Oliveira's plan the COB's administrative staff, director, astronomers, and researchers were to be appointed by the imperial administration.[49] He specified the functions of at least three astronomers of the observatory: one would be committed to the research and experimental works, and two for ordinary techniques and practices. Although Oliveira did not state his criteria for the admission of astronomers, he suggested to cross-exchange personnel—professors and researchers—between the COB and the Military School.

Oliveira's observatory plan was to create a national astronomical observatory that embodied what he had learned abroad about observatories and institutional framework, specifically drawing upon his own experiences in Paris and Coimbra, and included a dialog between the two models: national and university/school observatories. By mixing these two models, Oliveira could promote the study of natural phenomena with systematic surveys and create a complex and well-equipped structure for the observatory's head-office in Rio de Janeiro. Coimbra, for instance, was immersed in the observatory networks established by astronomers and mathematicians, in dialogue with observatory practices from several places, including Paris and Greenwich. Oliveira's goal was to create an observatory in Brazil which could also join this network.

Conclusion

The plan of the Central Observatory of Brazil by Cândido Baptista de Oliveira, published in 1828, is the result of multiple processes of encounters and circulation from three different social, political, and scientific cultures: the Brazilian, the Portuguese, and the French. The composition and motivations of Oliveira were connected to the cultural and scientific context of post-independence Brazil. Oliveira was not just imitating foreign traditions and institutions, rather his plan is a convergence and appropriation of different scientific traditions and models.

I believe that Oliveira's plan also shows how entangled Astronomy and Military Engineering were at the start of the nineteenth Century. As Sven Widmalm explains, military cartography and physical astronomy were quite important in this period, especially for the nation-state building of several new independent countries rising from the fall of large overseas empires.[50] The Portuguese colonial project—of which Brazil was a protagonist for more than 300 years—did not include the modernization ideal. The local complexities of independence had a vital impact on the scientific agenda itself.

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[48] Figueiredo and Leal Duarte, "A Reforma Pombalina da Universidade de Coimbra," 223-24.

[49] Oliveira, "Memoria Para o Estabelecimento...," 106.

[50] Sven Widmalm, "Astronomy as Military Science: The Case of Sweden, ca. 1800-50," in Aubin, Bigg and Sibum, *The Heavens on Earth*, 174–98.

The political significance of scientific knowledge grew with the participation of mathematicians and scientists in the Brazilian imperial project. To become a modern state, the empire needed to invest in astronomy, cartography, and navigation. Such enterprise was embodied by Oliveira's plan: the pedagogical interest in popular astronomy, the encyclopedic aspiration of the Statistical Yearbook, the "mixing mathematics" sciences and the role of science and astronomy itself in the nation-state building narrative. This fostered the process of establishing the astronomical observatory in the following decades.

Additionally, in Oliveira's view what mattered was the strategic use of the observatory to make the Empire more manageable. He intentionally chose Rio de Janeiro—the capital and the political center of this Empire—to host the observatory. By holding public lectures, he was aiming to promote interest in astronomy and the physical sciences, making room for the emergence of new local scientists since there was no university (civilian) faculty of mathematics within the Brazilian Empire as in Coimbra or Paris.

In contrast to the early narratives of the institutionalization of astronomy in Brazil, the postcolonial approach is still useful to analyze this matter of circulation and appropriation of knowledge and science. Oliveira's plan must be considered among the scientific debates in the early-nineteenth-century astronomy in South America. The plan was the first milestone in the subsequent creation of the Imperial Observatory of Rio de Janeiro, officially established by the statutes of 1846. It is very significant that Oliveira's plan is now accessible to historians of science and astronomy since it represents the first project to establish an observatory with financial support from the Brazilian imperial administration.

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