From Paper to Erected Walls: The Astronomical Observatory of Coimbra: 1772–1799

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Abstract The idea to establish an astronomical observatory at the University of Coimbra (OAUC) was inspired by a major reform of that university in 1772. At that time the observatory was planned for the site where the Castle of the city was built. However, mainly due to financial difficulties, its construction stopped after 3 years. Meanwhile a small building was erected (1775–1777) to serve astronomical lessons. The problem of lack of a real and effective observatory to serve true scientific research required a solution that began to be formulated around the years 1785–1790. In this article we explore the problems related with the foundation of the OAUC and discus the importance of astronomical instruments in implementing its primary scientific mission—elaboration of the astronomical ephemeris (1803).

1 Introduction

On October 7, 1781 José Monteiro da Rocha (1734–1819), professor of Physics and Applied Mathematics at the Faculty of Mathematics of the University of Coimbra, in a letter to the Secretary of the *Academia das Ciências de Lisboa* (Academy of Sciences of Lisbon, ACL)[1], Luis António Furtado (1754–1830), shows no excitement at the idea of ACL organizing and publishing 'some kind' of astronomical/nautical almanac[2] (ACL Ms. Azul 1944). Monteiro da Rocha, besides finding that there was no such need, noted that the few astronomers in Portugal had easy access

[1] The ACL was created on December 24, 1779. José Monteiro da Rocha was one of its first members (elected in January 16, 1780).

[2] This letter of Monteiro da Rocha to the ACL's Secretary is, as much as we can understand, his answer to another one (unknown) of Luis António Furtado asking about his opinion on that ACL's project.

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to the French *Connaissance des Temps* (CDT) or the English Nautical Almanac (NA); neither does he think that such publication was possible at that time in Portugal. As Monteiro da Rocha believed, there was neither technical nor scientific national capacity to carry out such a project. However, he thought that it would be rather easy to produce a recalculated copy almanac from CDT or NA for the meridian of Lisbon. This hypothesis required a relatively small computing effort when compared with a direct calculation of ephemeris from astronomical tables, because to do so it would be enough to take into account the difference in longitude between the meridians of Greenwich and Lisbon[3]. What would be desirable, but impossible he argues, is to calculate the lunar distances directly from other astronomical tables "than those of Mayer's, in which the calculations of the English Nautical Almanac were based, as also its copy of *Connaissance des Temps*, such as Clairaut and Euler's tables". So he adds,

> An almanac of this kind would be interesting throughout all maritime European countries, and it would be glorious to the Court of Portugal, as it is the English Nautical Almanac founded in Mayer's Astronomical Tables.

The problem of determining the terrestrial longitude was a central issue of the astronomical and nautical science of the eighteenth century (Andrewes 1993; Boistel 2001), and the conception, calculation and elaboration of astronomical ephemeris were one of the main objectives of the scientific activity of the large European astronomical observatories, until about 1820–1830 (Wolf 1902; Lovell 1994). The Greenwich Observatory was founded by Charles II (1630–1685), in 1675, with the specific purpose of 'rectifying the tables of the motions of the heavens, and the places of the fixed stars, so as to find out the so much desired longitude of places for the perfecting of the art of navigation'[4]. This same problem of determining the longitude and cartographing the Earth, a matter of so great importance for the maritime and economic ambitions of Louis XIV (1638–1715), was also behind the creation of the Paris Observatory and the publication of *Connaissance des Temps* (1678).

At the time José Monteiro da Rocha was already recognized as one of the most prominent personalities of science in Portugal. He had been one of the main designers of the new curricula for mathematics and astronomy within the framework of Pombal's Reform of the University and he will also play a central role in all subsequent teaching, scientific and administrative activities of University life[5]. Monteiro

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[3] Instead of the meridian of Lisbon, Monteiro da Rocha suggested the meridian of the island of Ferro, commonly used at the time by national and foreign mariners.

[4] The need to stimulate a satisfactory solution to the longitude problem would prompt the British government to create in 1714 a prize of £ 20,000—the famous Longitude Act.

[5] Very little is known about the first years of Monteiro da Rocha's life. It is known that he joined the Jesuits in his youth (1752) and left Portugal to go to Brazil where he studied at the Jesuit school of Salvador da Bahia (1752–1759). Following the expulsion of the Jesuits from Portugal in 1759, Monteiro da Rocha left the Society of Jesus and later returned to Portugal (1766). In 1771, he was called by the marquis of Pombal to participate in the educational Reform of the University of Coimbra. Henceforth he will be the lecturer in charge of the courses of Physics and Applied Mathematics (1772–1783) and Astronomy (1783–1804). In 1795 he was appointed Dean and Permanent Director of the Faculty of Mathematics and Director of the Royal Astronomical

da Rocha will also be very important for the future scientific activity of the Astronomical Observatory of the University of Coimbra (OAUC), namely publication of the *'Ephemerides Astronomicas*, *calculadas para o meridiano do Real Observatório Astronómico da Universidade de Coimbra'* (Astronomical Ephemerides calculated for the Meridian of the Royal Observatory of the University of Coimbra, EAOAUC). That is why Monteiro da Rocha was certainly one of the best people in Portugal to advise ACL on the astronomical/nautical ephemeris project.

Actually the plan suggested by Monteiro da Rocha where astronomical ephemeris "will not be deduced or copied from the Greenwich Nautical Almanac, nor from any other, but instead determined directly from the astronomical tables", was carried out by himself about 20 years later in the OAUC, with publication in 1803 of the EAOAUC, as the Pombaline Statutes of the University of 1772 had settled for about 30 years before.

As we will see later on in this article the ACL, along with the *Academia Real da Marinha* (Royal Navy Academy, ARM), will end up publishing in Portuguese some nautical ephemeris copied from the English Nautical Almanac. This fact will be one of the main reasons that motivate the discussion and the future solution for the Astronomical Observatory of the University of Coimbra around 1785–1790.

2 The Reform of the University Of Coimbra (1772) and the Institutionalization of Mathematical Science in Portugal in the Late Eighteenth Century

The reform of the University of Coimbra performed between 1770 and 1772 and known as the Pombaline Reform is the realization of a master plan initiated by a group of men who, under the auspices and control of King José I (1714–1777) and his prime minister Sebastião José de Carvalho e Melo, 1st Marquis of Pombal, (1699–1782), aimed at synchronizing Portugal with the ideas of Enlightened Europe[6]. All of the regime's education policy was based upon Enlightenment ideas,

Observatory of the University of Coimbra. He was also vice-principal of the University from 1786 to 1804. In 1800 Monteiro da Rocha became a member of the royal council of Prince Regent João VI (1767–1826) and in 1804 became tutor to Prince Pedro (1798–1834) (future Emperor of Brazil and King of Portugal) and moved to Lisbon where he died on 11 December 1819. His scientific work covered quite separate mathematical and astronomical domains. The astronomical work of Monteiro da Rocha spans from theoretical to practical astronomy, the most significant elements being: a work on the determination of comet's orbits, several papers on calculation of eclipses, on longitudes; astronomical tables of the sun, moon and planets and charts of Jupiter satellites, on the use of the rhomboidal reticle and on the use and calibration of the transit instrument. About Monteiro da Rocha's scientific work see (Figueiredo 2005, 2011).

[6] When speaking of the eighteenth century European Enlightenment, we can't speak of a single and uniform movement that had taken root all over Europe. The Enlightenment is a plural motion of idiosyncrasies and paradoxes which manifested itself in various forms and ways. However these various expressions emphasize a common denominator: the use of the laws of reason as the way of knowledge of the world and of man himself. It had presented science as an ideal, a liberating force,

whose protagonists wanted to remove from the hands of the Church, specifically from the Jesuits and later from the Oratorians, the right to teach and to center it in the state's hands.

The University, as an instrument of the State, would be an irreplaceable and forceful tool for the development of a modern society 'enlightened' by science and technological progress. With that purpose new Faculties of Mathematics, Natural Philosophy and Medicine were created and their scientific courses organized in modern syllabi and curricula. In fact, in this reformist program science is seen as the only power capable of generating a real change in society (Maxwell 1995, pp. 87–110, 131–148). Pombal wanted the University to be become not only an educational center but also a center for the production of knowledge, as an answer to the technical and scientific demands of a country that urged modernization.

In this reformist context, mathematical sciences and in particular astronomy will play a special role[7]. Mathematics is seen not only as a fundamental theoretic subject (Geometry is required for all university students), but also as a very important practical one.

In the report that university chancellor D. Francisco de Lemos (1735–1822) wrote to the new Queen Maria I (1734–1816) after the death of King José in 1777 defending the continuity of the Pombaline University project, he underlines with respect to mathematics that,

> beyond its private excellence, which it enjoys by the lights of the purest evidence and the most accurate proceeding of its own demonstrations, directing virtually all the human understanding,

the mathematical sciences contain,

> a great amount of subjects of the utmost importance, to: regulate and measure the time, the measurement of the lands and the boundaries of the countries and determination of the geographical places, the military maneuvers and the campaign practices of the navy; the naval construction; the civil and military architecture; the industry and factories; as all kind of devices and artefacts to help the weakness of men, as well a plethora of other benefits to advantageously promote a large number of useful Arts, necessary to the State.[8]

In the same report Francisco de Lemos, concerned about the low attendance rate of mathematics courses, proposes that the Government legislates so that some professions like engineers and cosmographers would only be carried out by qualified mathematicians graduated from the University[9]. For example, in 1777, José

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a demonstrably successful method of interpreting the natural world, which exemplified human progress (Bektas and Crosland 1992). About the Portuguese Enlightenment see (Calafate 1990).

[7] The entire ideology that underlies the different science courses program, particularly those relating to the structure of the mathematics course syllabus, strongly materialized the scientific matrix corpus of the French Enlightenment, reflecting the ideas of d'Alembert, as well as other French authors (such as the authors of the textbooks that were adopted, Bezout, Bossut, Marie, Lacaille, Lalande). On the influence of the French Enlightenment in the Reform of the University of Coimbra see (Carvalho 2008; Figueiredo 2011, pp. 45–91).

[8] Lemos 1980, p. 81.

[9] Some years later, in June 9, 1801, was expressly created legislation establishing in each administrative and judicial district of the country a mathematician, whose functions would be drafting

Francisco de Lacerda de Almeida (1750–1798) and António Pires da Silva Pontes (1750–1805), who had got their PhD from the Faculty of Mathematics, were sent by the Government to a Geodetic Commission Survey of the southern borders of Brazil, as a result of treaty limits signed with Spain in that same year.

At the beginning of the new century, in 1801, the Faculty of Mathematics, facing new challenges, restructured the mathematics course, creating two new disciplines: Hydraulics and Practical Astronomy.

The construction of the bar of Aveiro (1781–1808) and the channeling of the Mondego River (1788–1808) and other hydraulic engineering public works undertaken by the government and for which the University had been asked technical advice, demanded new scientifically updated answers. The creation of the discipline of Practical Astronomy was closely related to the future activity of the OAUC inaugurated in the meantime (1799), which involves working,

> assiduously in more accurate observations, to contribute, verify and rectify the Astronomical Tables […] and to cooperate with more accredited European Observatories[10].

Manuel Pedro de Melo (1765–1833), a former student of the University and PhD in mathematics, at the time professor of the Royal Navy Academy, would be sent to Europe to organize the discipline of Hydraulics, for which he had been appointed professor. In France, in the 1800s, he will work with Jean B. Delambre (1749–1822) at the Observatory of Paris. In fact, due to this connection between Pedro de Melo and Delambre the EAOAUC got very favorable book reviews in CDT (1806, 1807 and 1808). This voyage of Pedro Manuel de Melo was in line with the new chart in law of OAUC (December 4, 1799), which established the need to initiate some scientific voyages to astronomical observatories and other foreign scientific institutions in order to improve and exchange knowledge and scientific practice on a regular basis (from 10 to 10 years).

With the Pombaline Reform of Coimbra's University studies the process of institutionalization of science in Portugal, namely of mathematics and astronomy, begins. For the latter this occurred with the inauguration of the OAUC in 1799.

2.1 The Mathematics and Astronomy Syllabuses Required by the University's Pombaline Statutes

The mathematics course was organized based on seven disciplines (four from the Faculty of Mathematics and the others from Faculty of Natural Philosophy) spread over 4 years. In the 1st and 2nd years the disciplines of pure mathematics were taught and in the last two the mixed or applied mathematics: 1st year, Geometry (+ Moral and Rational Philosophy + Natural History at the Faculty Natural of Philosophy), 2nd year Algebra (+ Experimental Physics at the Faculty of Natural

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a topographic map of that region according to the rules established by the Kingdom Geographic Charter of 1790.

[10] OAU char in law December 4, 1799 (EAOAUC 1803, p. v).

Philosophy); 3rd year Physics and Applied Mathematics, and in the 4th year, Astronomy. There was an extra discipline of Drawing and Architecture to be attended in the 3rd or 4th year.

Geometry and Algebra consisted of arithmetic, geometry, trigonometry, algebra, differential and integral calculus. The 3rd year discipline consisted of the study of kinematics and dynamics, hydrodynamics, acoustics and optics (which included the study of optical instruments). Astronomy, "applied to the movement of the celestial bodies", although considered a branch of applied mathematical physics (studied in 3rd year) was instead studied separately in the 4th year. This was justified by the vastness of its subject and of its own importance within the branch of mathematical sciences. Astronomy includes: history of astronomy; spherical trigonometry (spherical astronomy); the study of the so called 'physical astronomy', the planetary movements, the three body problem and theory of the Moon, comets movements, Sun and Moon eclipses, transits of Venus and Mercury; and practical astronomy to be undertaken at the astronomical observatory. Students were expected to acquire skills in the use of the observational instruments and knowledge in astronomical calculations—"throughout this course the theory and the practice should always be together", reinforces the Statutes.

In the discipline of Drawing and Architecture students were given the basics of drawing and perspective, as well as civil and military architecture and representation of maps and topographic charts.

Regarding the adopted textbooks, they fall in the French tradition of 'livres élémentaires' (elementary textbooks), designed to teach the fundamentals of sciences (Schubring 1997). With the only exception imposed by Statutes of Euclid's Elements for the teaching of geometry, the others are all of French authors. Out of ten books used for teaching the different matters, seven were translated into Portuguese and Monteiro da Rocha was responsible for translating six of them. For pure mathematics the volumes relating to arithmetic, plane trigonometry, algebra and differential and integral calculus of the Cours de Mathématiques de la Marine (Paris, 1764–1769) of Étienne Bézout (1730–1783) were translated. For Physics-Applied Mathematics the textbooks of Marie's (1738–1801) Traité de Méchanique (1774), Bossut's (1730–1814) Traité Élémentaire d'Hydrodynamique (1771) and the Leçons Élémentaires d'Optique of Lacaille (1713–1762)[11] were chosen. For Astronomy the Lacaille's Leçons Élémentaires Physique et d'Astronomie Geometrique (1746), and also Lalande's Astronomie (1764) was adopted.

[11] Although the adopted authors have formal approaches similar to Bézout, who devotes in his Cours two volumes to the 'Principes generaux de la Mechanique', the reasons for not adopting the latter is to us related with Marie's and Bossut's books up-to-date. Those books, published respectively in 1774 and 1771, incorporated the latest scientific developments of its fields. The fact that each book was devoted to one branch of mechanics was also of some importance (Marie's compendium deals with the rigid bodies and Bossut's compendium with the fluids). An additional advantage for the Marie's compendium adoption was a single chapter devoted to the study of the central forces, a very important subject for the discipline of Astronomy to be taught in the following year, but which was not present in Bézout's book.

In 1801, about 16 months after the OAUC came into service, the primitive 4th year Astronomy was split into two autonomous disciplines: Theoretical Astronomy and Practical Astronomy, each with their own teacher. The justification for this is presented in the preamble of the document of its creation,

> Because of its vastness, Astronomy cannot be taught and understood with the breadth and depth that it should be, in only one discipline[12].

Therefore other textbooks were introduced. For celestial mechanics and the "*last discoveries of secular inequalities*", that would be studied in Theoretical Astronomy, the Mécanique Céleste (1799–1825) of Laplace (1749–1827) was adopted. In Practical Astronomy, which studied the theory and use of astronomical instruments as well as the methods of calculation and reduction of observations, especially the "calculation of Astronomical tables in all its parts", the book of Biot (1774–1862), Traité Élémentaire d'Astronomie Physique (1805) was adopted.

It is in this context of the Pombaline Reform of the University studies that the Statutes proclaim the construction of an astronomical observatory. That observatory was not only for students to carry out their astronomy practicals but also for teachers to investigate. Its main function was not that of a typical teaching activity facility, another dimension is required. In fact what the Statutes want is a University-based astronomical observatory, although with aspects of a National one. The role and practice that was required fulfilled the dual role of a university teaching/research facility with specific competences usually attributed to national observatories[13]—an observatory to carry out regular observations in order to verify the fundamental astronomical measurements and theories in order to determine the geographical longitude. This branch of national observatory is reinforced in the chart-in-law of December 4, 1799, that will establish the OAUC organization and mission, tuning it absolutely with the astronomical program of the great European national observatories of that time. This law's seventh paragraph establishes unambiguously the calculus of the astronomical ephemeris as its main scientific purpose,

> The Astronomical Ephemeris should be calculated for the Meridian of the Observatory, for its own use (a common practice of the most famous Observatories of Europe at this time), and for the use of the Portuguese mariners; the Ephemeris should not be reduced or copied from the English Nautical Almanac, or from any other, but calculated immediately from the Astronomical Tables.[14]

In fact, after the OAUC came into full operation in 1799 all its activity focuses on the development of astronomical ephemeris. The entire teaching activity is completely minimized to not interfere "with the daily astronomical observations and practices of the Observatory".

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[12] Chart in law of April 1, 1801 (AUC IV-1ªE-8-3-4).

[13] Regarding this concept of national versus university observatories see (Hutchins 1999, pp. 4–22).

[14] OAUC chart in law December 4, 1799 (EAOAUC 1803, p. viii).

2.2 The Astronomy of Precision in the Eighteenth Century and the Astronomical Practice for the Observatory of the University of Coimbra

The astronomical practice of an observatory is obviously linked to its instrumental collection[15], or, to be more precise, we should say that it is the instrumental collection that commands its possible observational program, that is, its real and effective astronomical practice.

The program of the major national astronomical observatories of eighteenth and nineteenth centuries moves around celestial mechanics (Loewy 1881, p. i). It's characterized by a constant request for accurate positions of the solar system bodies and stars, which may contribute to the improvement of the Newtonian theory and the mathematical tools involved in it,

> L'Astronomie, considérée de la manière la plus générale, est un grande problème de Mécanique, dont les éléments des mouvements célestes sont les arbitraires; sa solution dépend à la fois de l'exactitude des observations et de la perfection de l'analyse, et il importe extrêmement d'en bannir tout empirisme et de la réduire à n'emprunter de l'observation que les données indispensables.[16]

In this ongoing process (development of instrumental methods of observation, observational data reduction and refinement of the theory)[17] the astronomy practice takes place mainly around the angular measurement of the right ascensions and declinations of the celestial bodies passing through the meridian of the observatories—which is referred to as an international meridian program consensus by Jim Bennett,

> Thus programmes of meridian measurement came to be pursued in all the active observatories of Europe […] they [the observational data] were accumulated by the activity that became the sine qua non of an astronomical observatory[18].

Practical astronomy became the main routine of any observatory, a routine that is renewed continuously in search of greater observational accuracy and new methods of instrumentation and observation. This astrometric program was the basis of a triumphant progress in astronomical science, and promotes the development of real astronomical instruments industry, dominated by the English manufacturers, from the 1720s on (Daumas 1972, pp. 121–135). This instrumental industry makes the dissemination of this astronomical program through the European observatories possible according to J. Bennett (Bennett 1987, p. 113–129, 1992, p. 13).

The instrumental core of a typical observatory of that time was then anchored in a set of half a dozen instruments. In the center of this group is the mural quadrant,

[15] For instance, the use of instruments is conditioned by the nature of the astronomical phenomenon; such is the case, for example, of the transit of Mercury and Venus over the solar disk.

[16] Laplace 1878–1882, vol. 1, p. i.

[17] "Le seul moyen de connaître la nature, est de l'interroger par l'observation et le calcul" (Laplace 1835, p. 207).

[18] Bennett 1992.

or the quarter-circle[19], which becomes the quintessential of the late eighteenth and early nineteenthcentury's observatory (Turner 2002). The quadrant, which already occupies a prominent role in the great medieval Arabic observatories, and later at the Tycho Brahe's (1546–1601) observatory and afterwards at Greenwich with John Flamsteed (1646–1719), assumes in the late eighteenth century a primacy, becoming the first of a new class of very precise instruments[20].

Along with the quadrant other instruments comprise that essential core of very precise instruments. The entry 'Observatoire', which Lalande writes for Methodique Encyclopedie, the following instruments are specified as essential:

> Un quart de cercle mobile […], une lunette méridienne […], un mural […], une bonne lunette achromatique de 3 à 4 piés, montée sur un pied parallactique […], pendule & le compteur.[21]

Those are also the instruments that Lalande devotes two chapters to in his book Astronomie: "*des instruments d'astronomie*" (Lalande 1771–1781, vol. 2, pp. 722–830) e *"de l'usage des instrumens & de la pratique des Observations"* (Lalande 1771–1781, vol. 3, pp. 1–82). The French astronomer Antoine Darquier de Pellepoix (1718–1802) also indicates those same main instruments as being necessary for an effective study of the heavens,

> [Avec les instruments ci-dessus détaillés, un observateur exercé & laborieux pourra faire beaucoup d'observations utiles]: 1º un quart de cercle de cuivre […]; 2º un bon instrument de passages de deux pieds […]; 3° une bonne pendule à secondes, à verge simple ou composée […]; 4° un compteur, vous savez que c'est un mouvement de pendule simple qui marque les minutes, se sonne les secondes, 5° une lunette ordinaire de deux pieds […]; 6° un petit quart de cercle de 18 à 20 pouces de rayon […]; 7° une lunette de 7 à 8 pieds, ou un télescope à réflexion de 18 pouces au moins.[22]

The quadrant with a telescope with a micrometer or a rhomboid reticle will eventually be the most versatile and widely used instrument in the observatories of the late eighteenth century[23], supplanting the mural quadrant that was difficult to build and install and above all too expensive and unaffordable for the budget of most observatories (Turner 2002; Brooks 1991).

In the eighteenth century these are the fundamental instruments that allow any astronomical observatory of that time to establish an effective astrometric program. And it is also this type of instruments that the Coimbra's Statutes of 1772 point out as the "collection of good instruments" that the University's observatory should have,

[19] A quadrant is a quarter of a circle, and the term refers to several different types of instruments covering an arc of that size (Bennett 1998).

[20] It is from the 8-foot mural quadrant made by George Graham in 1725 to be used by Edmund Halley (1656–1742) at the Greenwich Observatory that the model evolves, after becoming almost ubiquitous in all astronomical observatories (Learner 1981, pp. 52–72).

[21] Encyclopédie Méthodique (mat.) 1784–1789, t. II p. 481.

[22] Darquier 1786, pp. 5–7.

[23] "Le quart-de-cercle mobile est de tous les instruments d'Astronomie, celui dont l'usage est le plus ancien, le plus général, le plus indispensable, le plus commode" (Lalande 1771–1781, vol. 2, p. 743). (The corresponding Fig. (Fig. 149) of the portable quarter-circle is on p. 768).

> A mural quadrant, made it by some of the best European instrument makers, a good assortment of Quadrants; Sextants of different magnitudes, of Micrometers; transit instruments; parallactic machines; telescopes; levels; horologes and pendulum clocks […] and everything else needed for an observatory work in behalf of the progress of astronomy.[24]

And there are also those instruments which will actually be acquired in the 1780s. The OAUC didn't actually have a mural quadrant; instead it had several portable quadrants, the most important of which is the Troughton portable quadrant (c.1787–1792).

3 From Paper to Erected Walls: The Construction of the Royal Astronomical Observatory of the University of Coimbra

3.1 The Initial Plan for the Observatory of the Castle (Not Concluded)

The site of the Castle of the city of Coimbra located on the highest hill of the city "unshaded by all parties" and not far from the University, corresponded to one of the main requirements that an observatory demands (Estatutos 1772, vol. 3, p. 214)[25].

Guilherme Elsden (?-1779), an English engineer living in Portugal since the 1760s, will be the architect in charge of the works of Reform of the University and he will develop two versions for the building project of the Observatory of the Castle[26]. In the first version he makes use of the two towers of the castle, one having a square form and the other pentagonal, those frame both sides of a three floors building (Fig. 1).

However, due to the bad structural conditions of the pentagonal tower, it had to be demolished, so Elsden advances to other version where the square tower is the central element—the tower of the observatory—, standing in middle of the building and not at the top side. This second version, the most monumental of both, will be approved by the government in the last quarter of 1773 (Fig. 2).

In 1775 (September) when the bulk of the ground floor was built "at a height not less than 8 m" the construction works stopped and would never be resumed.

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[24] Estatutos 1772, vol. 3, p. 214.

[25] "The astronomical observatory must be unencumbered by all parties, it should dominate the horizon freely to able the observation of all phenomena which succeed in upper hemisphere. Furthermore, it should be spacious and comfortable, so several astronomers can simultaneously make their own observations." (Estatutos 1772, vol. 3, p. 214). Darquier concerning the most suitable place to install an astronomical observatory writes: "La position le plus avantageuse, pour un observatoire, seroit sans contredit d'être situe au rez-de-chaussée, isole de toute parts, & ayant un ciel découvert de tous les côtés jusqu'à l'horizon [lettre de 10 Juillet 1777]" (Darquier 1786, p. 4).

[26] In fact throughout the year 1773 there were huge uncertainties regarding the final draft of the observatory building, with several and successive plans drawn and discussed with all teachers, especially with Miguel Ciera (1725?–1782) who was at that time the professor of Astronomy.

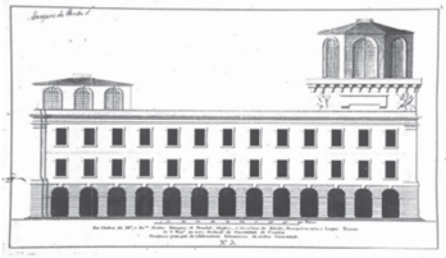

Fig. 1 Elevation view of the observatory of the Castle (c.1773) (MNMC Inv. 2945/DA 23)

Fig. 2 Architectural plan of the main front of the Castle's observatory (September 1773) (Franco 1983)

The high cost that the construction works achieved in about two and a half years when a significant part of the building was to be built, was the main cause.[27]

Meanwhile, a small interim observatory was built in the University courtyard for teaching classes, between the years 1775 and 1777. Distant from most of the city's accesses, at a more secluded place, the University courtyard had a wide open space in the north-south direction, but some constraints in the east-west horizon because of the Joanine Library and St. Peter College. Between 1777 and 1790 this small building would serve exclusively for teaching. The construction of the Observatory of the Castle would never be resumed.

3.2 The problem of the Inexistence of a Genuine Astronomical Observatory Call for Scientific Premises

The lack of a real and effective astronomical observatory at the University to carry out a genuine scientific research requires a solution that began to be drawn around the 1780s. There are several reasons why this problem has been put on the table. On the one side external constraints: tensions between the University and the ACL, and the government final support to University's requests. On the other side reasons

[27] The Book of Expenses related to the works of the Observatory of the Castle closed the month of September 1775 with a total amount of 18879$582reis (AUC liv. R/D 1772–1775). This amount represents about 15 % of the total cost of all construction works of the University until that year.

related to scientific aspects: astronomical instruments and proper physical conditions to perform observational and theoretical work.

With the death of king José I (1777) and the consequent dismissal of the marquis of Pombal, due to the change of government carried out by Queen Maria I (1734–1816), the action of some more conservative agents, who until then had been controlled by the king, reappear. In this context the Pombaline project for the University of Coimbra was seriously threatened, because it hadn't had the time required for its solid implementation. On the other side, in the first years of Queen Maria's reign, the teaching reform shifted to a more technical education system. In 1779 the *Academia Real da Marinha* (ARM) and in 1782 the *Academia Real dos Guardas-Marinhas* (Royal Academy of Midshipmen) were created. Teaching naval science and nautical astronomy was crucial for the development of navigation and maritime trade with overseas (mainly with Brazil and Far East). The ARM was created as a theoretical teaching establishment which set out to prepare officers for the Military Navy, Merchant Navy and Army Engineers; the latter to train officers for the Portuguese Royal Navy. The study program of those academies consisted, among other matters, in theoretical and practical mathematics, navigation and nautical astronomy. In 1779, in the city of Oporto, the discipline of Sketching and Drawing related to the nautical course that was offered in this city was created. Later other higher education schools and technical and scientific institutions appeared. For example, the *Academia de Fortificação, Artilharia e Desenho* (Academy of Fortification, Artillery and Design) in 1790, the *Real Corpo de Engenheiros* (Royal Corps of Engineers) in 1790–1793, the *Sociedade Real Marítima, Militar e Geográfica* (Royal Society Maritime, Military and Geographic) in 1798, the *Arquivo Militar* (Military Archive) in 1802–1805 and the *Academia de Comércio da Cidade do Porto* (Academy of Marine and Trade of Porto city) in 1803.

It was also during the reign of Maria I, in 1779, as we referred, that the ACL was created. The founders, the most important of which is the Second Duke of Lafões, D. João Carlos de Bragança (1719–1806), influenced by the Enlightenment values, wanted the country to develop economically and socially thanks to science and technology[28]. Because of this context the University sees its unique role seriously threatened. The opening of the ACL caused multiple and well documented reactions of some professors. During the chancellorship of José Francisco de Mendonça (1725–1808), which lasted almost 7 years (1779–1786), the University faced serious problems. All the construction works that were being done at the University stopped. The construction of the Castle Observatory remains unfinished. After the dismissal of Mendonça, the University was 'delivered' (1786–1799) to Francisco Antonio Rafael de Castro (1750–1816), with José Monteiro da Rocha as vice-chancellor at his side. Under the leadership of these two men a set of attempts were made to redirect and strengthen the role and purposes of the University Reform of 1772. At this time, some of Pombal's unfinished projects are finally resumed, which was the case of the astronomical observatory.

[28] The royal denomination was only established in May 13, 1783 with the government recognition of its public utility status.

One of the driving forces for the construction of the definitive astronomical observatory of the University of Coimbra (in the middle of 1780s) was the already mentioned ACL project of 1781 for astronomical/nautical ephemeris to be published.

As we saw before, Monteiro da Rocha caused this project not to be carried out. In reality ACL's project is only suspended. About 6 years later (1787) it will be discussed again, but this time formally. In the academic session of December 5, 1787, the ACL decided to publish it. A scientific commission composed by professors of the ARM, who had graduated from the University of Coimbra, Custódio Gomes Villas-Boas (1741–1808), Francisco Antonio Ciera (1763–1814) and Francisco Garção Stockler (1759–1829), was formally chosen to elaborate a nautical almanac to be published under the auspices of ACL[29]. In 1788 the first volume of the '*Ephemerides Nauticas, ou Diario Astronomico*' (Nautical Ephemeris or Astronomical Diary, ENDA), calculated to the meridian of Lisbon for the year of 1789, was published. The ENDA were not calculated directly from the astronomical tables, but copied from the English NA with the data recalculated to the meridian of the ACL astronomical observatory as Monteiro da Rocha had proposed in the past. The ACL's observatory had been constructed in the Castle of S. Jorge, in Lisbon. The construction of this building began in 1785 and was inaugurated on January 9, 1787. Its first director was precisely Custódio Gomes Villas-Boas. In 1797 the scientific responsibility of the ENDA will be assumed by the astronomical observatory of the Royal Academy of Navy (but the ACL will remain the institution responsible for its publication)[30].

As we can see ACL's project collides with the scientific one outlined by the University Statutes for the astronomical observatory of the University, the elaboration of some astronomical ephemeris "for use of the Portuguese Navigation". This purpose was somehow threatened by the advance of the ACL's own ephemeris project.

In fact the interim observatory of the University has neither physical nor material conditions to allow an effective astronomical scientific investigation, to make observations and to do the theoretical work needed to elaborate the astronomical ephemeris. It was only used to teach practical astronomy. It doesn't have the necessary instruments to start any kind of scientific activity, and mostly it doesn't have the necessary physical conditions to accommodate and install the future instruments. Because of this Monteiro da Rocha begins a campaign to pressure the government to find a solution for the astronomical observatory at the University (around 1785–1787). This campaign implies not only a pressure to build the OAUC, but also to purchase the necessary astronomical instruments. It seems that the Royal Notice from October 1, 1787, which states the definitive construction of the OAUC,

[29] All the scientific training of these men had been made at the University of Coimbra, where they were students of Monteiro da Rocha.

[30] The construction of the astronomical observatory of the Royal Academy of Navy, "to teach students in matters of nautical astronomy", was proposed by Francisco Antonio Ciera, teacher of Navigation, in 1791. The Royal Observatory Marine was only built in 1798 (its regulation date from July 23 of that year).

is a direct consequence of the successive interpellations of José Monteiro da Rocha to the government[31].

The government formed (in 1777) after the rise to power of Queen Maria I did not contribute to give new impetus to the construction works of the University. Rather, the minister who would replace Pombal, Tomás Xavier de Lima (1727–1800), lacked commitment and persistence to make a lot of already planned public construction works. This government (1777–1788) is known for hesitating and procrastinating. Only in 1788 when another government led by José de Seabra da Silva (1732–1813), a former secretary of the marquis of Pombal, was formed a new impetus would be given to the public plans of the construction works.

It is then (in 1788) that the project to build the astronomical observatory at the University is given credit. The instruments had already been ordered from several London instrument makers (Sect. 4). Now, it is necessary to construct a proper building to install them and be able to provide working conditions for astronomers. Several projects are then conceived under the considerations of Monteiro da Rocha.

3.3 After Such a Long Wait Finally a Building: The Royal Astronomical Observatory of the University of Coimbra

The final location of the OAUC was thought to be in the southern part of the University courtyard (the interim observatory was then demolished). Guilherme Elsden's primitive design for the Observatory of the Castle is therefore definitely abandoned.

The construction plan of the OAUC was highly debated. There are several proposals of the architect Manuel Alves Macomboa (?-1815), in line with Monteiro da Rocha's considerations. In a 4 year period (1788–1792) five architectural projects are conceived (three of them in less than half a year): a first version in 1788, a second version in September 1790, a third version in November of 1790, a fourth version in February 1791 and the final one in September of 1792.

The project of the future OAUC is a very rich process of drawings, all of which have common points: the program, the location and the lasting nature of the building; what changes is its shape and the volumetric disposal.

On February 5, 1791 the University Council approves the architectural plan of the OAUC, and in 1799 the building is completed. It consists of a horizontal body with a flat roof and a central tower with three floors (a front of 41 m; side of 11 m and a height of 24 m), with specific rooms for the storage of instruments and observation, rooms for the ephemeris calculators, rest rooms for astronomers, a common living room, a library, as well as class rooms for the students (the chart-in-law of OAUC is published in December 4, 1799)[32].

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[31] "Her Majesty the Queen considers that this construction work will be done as you present it […] but nothing should be done until further notice" (Almeida 1937–1979 vol. 2, pp. 177–78).

[32] EAOAUC 1803, pp. iv-xii.

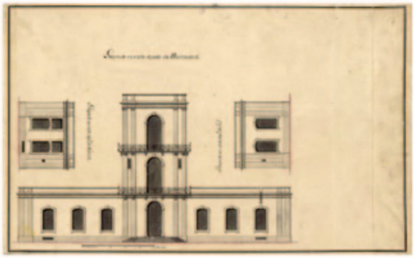

Fig. 3 View from the university's courtyard (BGUC Ms. 3377–44)

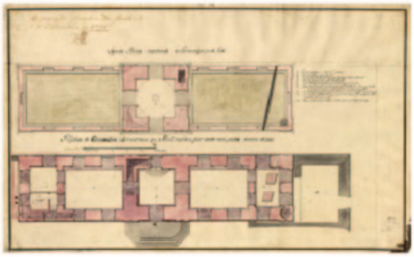

Fig. 4 "Architectural plan of the astronomical observatory that the university had to make in its courtyard in the year 1791" (BGUC Ms. 3377–44)

This final project of the OAUC is a good example of the gap between the initial ambitions (1772) of the Pombaline Reform and the new reality of the 1780s and 1790s. The astronomical observatory for the site of the Castle was thought as a building detached from all the other scientific buildings of the University. But in the project of 1792 the OAUC will end up being one of the most modest architectural designs of all. The final plan gave up the symbolic function and the urban design of the Castle's Observatory and focused its attention on a simple and functional astronomical building (Figs. 3, 4, 5 and 6).

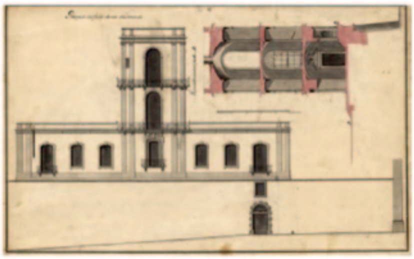

Fig. 5 View from Trindade's street (BGUC Ms. 3377–45)

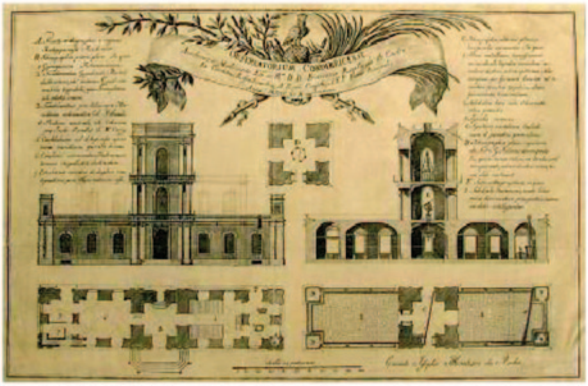

Fig. 6 "Observatorium Conimbricense Academian […], Anno MDCCXCII" (Astronomical observatory of the Coimbra University […], year 1792) (OAUC G-006)

4 The Acquisition of Instruments for the OAUC

The instruments commissioned by Monteiro da Rocha for OAUC are clearly marked on the architectural plan of 1792 that will serve for its construction (Fig. 7).

They are: a Troughton portable quadrant, a Dollond transit instrument, a parallactic machine from Cary and an Adams' sector.[33]

This set of instrumental levels the OAUC to the good European observatories of the time. In 1808, the Italian statistician and geographer, Adrien Balbi (1782–1848), in a visit to the OAUC says it is well built and situated, and "il était aussi-trés bien fourni d'instrumens" (Balbi 1822, vol. 2, p. 95). Lalande also says something about the OAUC and its Troughton quadrant,

> Nous avons reçu encore une description de l'Observatoire de Coimbra, par laquelle on voit qu'il y a des instruments considérables; un secteur de dix pieds, une lunette méridienne de cinq pieds, un quart-de-cercle de trois pieds et demi, divisé à Londres par Troughton.[34]

Those instruments were purchased in London through João Jacinto de Magalhães (1722–1790), a Portuguese scientist member of the Royal Society living in London[35].

[33] On the architectural plant they are labeled as: "Fundamentum Quadranti Mutrali destinatum ubi interim Quadraras mobilis tripedalis, opus Troughtoni absolutissimu; Fuandamentum pró Telescópio Meridiano acromático Cel. Dollondi; Podium australe, ubi columna Inst. Parallat. De W. Cary; Ichnographia plani superioris, ubi Sector G. Adams decempedalis, quem ternae columnae limbo ortu respiciente, ad occidentem verso, ternae aliae sustinente". They are also represented three pendulum clocks and small telesopes ("speculae minors").

[34] Lalande 1803, pp. 871–872.

[35] In English he is known as John Hyacinth de Magellan. He was born in the city of Aveiro. He joined the Order of Canons Regular of the Holy Cross with 11 years-old and it was during this time that Magellan became familiar with science, particularly astronomy. From 1758 to 1762 (he left the Order in 1758) he travels around Europe and he lives in Paris. During these years he began an important contact network with several European scientists and philosophers. In 1763 he travelled to London, where he would reside until his death. Magellan's work and notoriety earned him membership in Académie Royale des Sciences de Paris (1771) and in the Royal Society of London (1774) among others. For his life and work see (Malaquias and Thomaz 1991; Malaquias 1994).

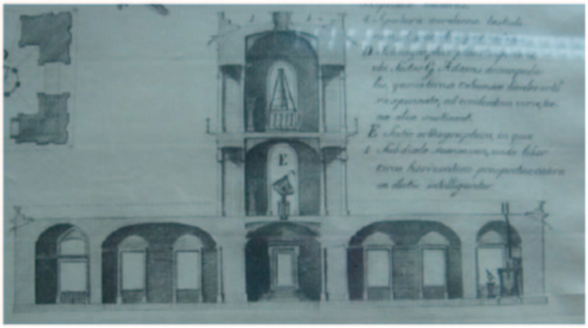

Fig. 7 Detail of the architectural plan of 1792 (Fig. 6), where we can see the instruments and its disposal on the OAUC building

Hyacinth de Magellan was the obvious choice for carrying out this service, due to his privileged personal contacts network among the leading London instrument makers. In the past (1778–1783) Magellan had already acquired instruments for the Portuguese government[36].

When Magellan settles in London the British industry of scientific instruments is at its peak. English precision mathematical instrument makers enjoyed universal reputation, "precision mechanics is an activity typically British" (Bennett 1993, 1997). All over Europe scientific establishment, observatories and experimental physics cabinets included had scientific instruments manufactured by Graham, Sisson, Dollond, Adams, Bird, Ramsden and Troughton (Bennett 1987 pp. 88–92, 113–129).

As these kinds of instruments were not immediately available for sale, they had to be ordered and then built under certain specifications defined by the customer. In a letter from March 26th 1787 Monteiro da Rocha instructs Magellan about his requirements on the stability, stiffness and division of the limbo scale of the quadrant[37].

Monteiro da Rocha wants the instrument basis to have a triangular shape instead of a quadrilateral one, "you should prevent that notwithstanding the reasons that seem contrary, the pedestal must rest on three points only, and no way in four". Monteiro da Rocha also worries about the stability (the rigidity of the axis structure of the instrument) and shape of the perfect body of the quadrant, so he demands that it be taken into account, "you for your great ability and wide experience must try that an instrument as capital like this one has all the perfection possible". Monteiro da Rocha didn't need to worry about that because Magellan was well versed in that kind of instruments, since he had already written a small essay on the quadrant, in 1779[38]. Some years later, in 1788, he sent a communication on astronomical

[36] Magellan collaborated with several personalities and governments (Portugal, Spain, France and Prussia) in the acquisition of instruments (Turner 1974). To Portugal, he sent several scientific instruments for the demarcation of the borders of Brazil and to an offer that queen Maria I made to the Chinese emperor Che-K'ien Long (1736–1796), and also to several Portuguese institutions (Carvalho 1990–1991).

[37] The manuscript is located in the Oxford Bodleian Library, MS. Rigaud 38, fols. 151–153verso.

[38] "Lorsque instruments ces sont bien faits, tous les & garnis avantages, dont ils ont été par les fournis Astronomes & Artistes Anglais, ils sont les plus comodes, les plus utiles, & les estimables

instruments to the Academy of St. Petersburg which was read at the meeting of April 7, 1788 by the Secretary of the Academy.[39]

Regarding the instrument's limbo, Monteiro da Rocha requires that the quadrant has two scale divisions, one in degrees and the other divided in 96 parts:

> I must remember you that it must have two divisions, one in 90° and the other in 96 parts, and must have its azimuth circle at least one foot in diameter, with its Nonius showing the minutes.

A parallactic machine "with a small telescope mounted, and a rhomboidal lattice" and a transit instrument were also commissioned. With respect to the latter nothing special was required[40].

The quadrant was ordered to the firm that belonged to the brothers John (1739–1807) and Edward Troughton (1753–1835). This firm was already one of London's most prestigious firms for the making mathematical instruments, in the mid-1780s[41].

In 1788 J. D. Cassini (1748–1825) considers the Troughton brothers the best instrument makers after Jesse Ramsden (1735–1800) (Cassini 1810, p. 30). In 1801, after the death of Ramsden, Lalande says about Edward "il est actuellement le plus célèbre artiste d'Angleterre" (Lalande 1803, p. 861)[42]. The construction of the quadrant for the future OAUC was then delivered to one of the best craftsmen of the time[43].

The instruments' arrival at Coimbra is uncertain. Between the commissioning and the instrument delivery many months or years might have gone by. Most likely, they didn't arrive all at the same time, once the order had been made to different craftsmen. Regarding the parallactic machine Monteiro da Rocha saw no problem in its arriving before the other instruments. Besides that, John Hyacinth de Magellan died in February 1790, putting an end to a privileged relationship between Coimbra and the British instrument makers.

The instruments probably arrived at Coimbra around 1797 (at the moment there is no conclusive primary font that can provide an answer to that). In 1798 the first

plus tous les instrumens" (Magalhães 1779, p. 25).

[39] "Le 7 Avril. Le Secretaire a lu une lettre de M. de Magellan, datée de Londres le 17 Mars, qui communique une nouvelle construction pour le Quart-de-cercle & les autres instrumens astronomiques, inventée & exécutée par M. Troughton." (Nova Acta Academiae 1790, pp. 12–13). This memory (not founded today in the Academy's archives) is possibly related with the order of the instruments for the Observatory of Coimbra.

[40] The parallactic machine which was acquired is described in the inventory of 1810 as "Parallactic Machine, construction of W. Carry. London"; the transit instrument is described in the same inventory as, "Transit Instrument, 42-inch focus, aperture 2.5, and 40 shaft. Construction of Dollond. London" (Anonymous 1810, 1824).

[41] About the Troughton's firm see (Skempton and Brown 1973).

[42] Also Marc Pictet (1752–1825), professor of physics in Geneva, refers the Troughton brothers among the best instrument makers, "Troughton me paroit jouir ici de l'une des premières réputations en ce genre." (Cited in Turner 1976, p. 4).

[43] In Allan Chapman's opinion the work of E. Troughton took the élite of craftsmanship to impressive levels of excellence (Chapman 1993, p. 418).

observations were made with the quadrant for the determination of the precise latitude and longitude of the OAUC.

5 The Astronomical Activity of the OAUC: The Astronomical Ephemeris

After its inauguration in 1799 the scientific activity of the OAUC was entirely focused on the calculation and publication of the EAOAUC[44]. The work of calculating the ephemeris demanded an intense observational activity linked to a huge theoretical work. Monteiro da Rocha as the OAUC's director was the person in charge to guide all that work. In fact all future astronomical and scientific activity of the OAUC was under his responsibility. He was not only responsible for the design and instrumentation of the OAUC, but he was also the scientific mentor behind the applied mathematical and astronomical methods, algorithms and tables that allowed the OAUC to establish and publish its most important and significant scientific production, the EAOAUC.

The activities involving the observations to establish the OAUC's geographical coordinates were made in the early 1798. The latitude was determined using 20 observations (between January 19 and February 2) of the Polar heights in its upper and lower passages through the meridian. The value obtained was 40° 12' 29.6"(40.208°N) (EAOAUC 1803, p. 240). There is a perfect match between these observations because they differ not less than 6".[45]

The determination of the longitude was achieved by comparing the observations of the solar eclipse of August 17, 1803 in Coimbra (OAUC) and Paris (at the College de France by Messier and Lalande). Monteiro da Rocha determines that there is a difference of 43 min of time (10.75°) between both meridians. Through other observations (eclipses of the Sun, stars and by satellites of Jupiter) Monteiro da Rocha had already determined that the difference in longitude between Paris and Coimbra lies between 42 m 55 s and 43 m 6 s of time (so he fixed 43 m as the average value). This value was confirmed by observations of the eclipse of August 17, 1803[46].

The first volume of the EAOAUC was published in 1803 (by the University's press) with the astronomical data for the year 1804 and providing all the conventional outputs (12 pages for each month with the position of Sun, Moon, planets and

[44] The chart-in-law of the OAUC clearly expresses that all activity should start with the essential tasks for the preparation of the astronomical ephemerides for the year 1804 (EAOAUC 1803, p. viii).

[45] In the 1850s and 1860s Rodrigo Ribeiro de Sousa Pinto (1811–1893), director of the OAUC between 1858 and 1866, makes with a Troughton & Simms meridian circle, purchased in 1851 and installed on OAUC in 1855, new observations and he determines the new latitude of OAUC as to be 40° 12' 25.75"N—a difference of 3.8" compared with Monteiro da Rocha's value.

[46] In 1867, using the culminating stars method Sousa Pinto determines the longitude of the OAUC as to be 33 m 34.51 s west of Greenwich, i.e. 42 m 56.51 s west of Paris (taking as the difference between Paris and Greenwich the value of 9 m 22 s) (Pinto 1887, pp. 24–35).

lunar distances). Since the first volume the EAOAUC adopted some particularities: they were calculated in reference to the mean Sun instead of the true Sun (like CDT or NA did). The EAOAUC used the 360° measure and not the widely used sign unit; they provide the lunar distances not only for the Sun and the stars but also for Mars, Jupiter and Saturn. Unlike the foreign ephemeris where the positions of the Moon were calculated for both noon and midnight directly from the astronomical tables, at the EAOAUC only the noon position was directly calculated from those tables, being the position for midnight calculated using a particular interpolation method proposed by Monteiro da Rocha (Rocha 1808, pp. 121–180). This method that used finite differences up to eighth order, also served to calculate the lunar distances to other instants (in the EAOAUC the lunar distances were tabulated every 12 h).

Similarly to the CDT, the EAOAUC also published scientific articles most of them written by Monteiro da Rocha. Some of these were translated and published in France by Manuel Pedro de Melo, *Mémoires sur l'Astronomie Pratique (Paris, 1808)*.

In 1813 Monteiro da Rocha published the *Taboas Astronomicas ordenadas a facilitar o calculo das Ephemerides da Universidade de Coimbra* (Astronomical Tables to facilitate the calculation of the Ephemerides of the University of Coimbra) (Coimbra 1813), that would be the basis for calculating the EAOAUC until the mid-nineteenth century[47].

6 Conclusion

The creation of the OAUC was fundamental for the institutionalization of astronomical science in Portugal in the second half of the eighteenth and early nineteenth centuries, a period in which astronomy, supported by major theoretical advances of celestial mechanics and of applied mathematics, tries to finally solve the major issues that it had been facing since Newton's time. These issues related to the problems of navigation, geodesy and cartography, determination of planets and comets' orbits, measurements of time, which were part of the work plan of any national observatory at that time, are also the basis for the creation and planning of the Astronomical Observatory of the University of Coimbra. Through it Portugal would tune in with the scientific Europe of the time—"All over the world Astronomy has deserved the attention of all the Kings, who built magnificent Observatories for its progress" (Estatutos 1772 vol. 3, p. 213).

The construction of the observatory began in 1773 at the site of the Castle, but due to the lack of financial means the works quickly stopped. And so the project

[47] The first volumes of the EAOAUC were calculated using the astronomical tables published by Lalande in the 3rd edition of his Astronomie (1792) (except the positions of the planet Mars that were calculated using some tables composed by Monteiro da Rocha in 1802). The positions of the Sun and Moon, published between 1807 and 1813 in the EAOAUC, were calculated upon the tables of Burg and Delambre, published by the Bureau des Longitudes in 1806.

to construct an astronomical observatory in the University was delayed for several years. In the 1780s, the problem of the non-existence of a true scientific astronomical observatory at the University began to be questioned.

There are several reasons why this problem was only then put on the table. One is related to astronomy itself: astronomical instruments and proper conditions to do observational reductions and theoretical work. There are also external constraints, namely the tensions that develop between the University and the ACL.

Monteiro da Rocha knew that only with good tools and good facilities would it be possible to undertake the astronomical project designed for University of Coimbra, of which he was the main mentor and future responsible. He wanted the project to be a national one, focused on the training of astronomers for the research and development of astronomical ephemeris, to serve the interests of the nation.

So, when the ACL threatened his project, Monteiro da Rocha turned to the government demanding that the OAUC be built. It is in this context that he decides to commission the instruments to several important manufacturers in London. The fact that he ordered the instruments before the existence of a building to shelter and install them, gave Monteiro da Rocha a strong argument for the construction of the OAUC—he has virtually all the necessary astronomical instruments but no place for them. At the end of the 1780s began the discussion around the architectural plan for the future OAUC, which will be designed taking into account those instruments. In 1790 the construction work began and in 1799 the OAUC was finished and ready for the astronomers to work in.

From its inception and throughout its history the OAUC tried to follow and contribute to contemporaneous astronomical research trends and developments. While at the beginning celestial mechanics and its applications were the institution's main research topic, in the nineteenth and twenty centuries it pursued the new avenues opened up by the development of astrophysics and in particular of solar studies.

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