AN ANALYSIS OF THE UNIVERSITY MATHEMATICAL EDUCATION IN PORTUGAL IN THE LATE EIGHTEENTH CENTURY

Nuno DIAS
School of Technology and Management of Leiria, Leiria, Portugal
nunodias@ipleiria.pt

Elza AMARAL
University of Trás-os-Montes and Alto Douro, Vila Real, Portugal
eamaral@utad.pt

José COBOS BUENO
University of Extremadura, Badajoz, Spain
jcobos@unex.es

ABSTRACT

The Portuguese University was founded in Lisbon in the late 13th century (by Papal Bull of Nicholas IV in August 9, 1290) and was composed by the Faculties of Arts, Medicine and Laws. This Portuguese institution, whose localization alternated between Lisbon and Coimbra, where it was established in 1537, held the monopoly of superior education in Portugal during about five centuries.
The teaching of Mathematics at the University had gone through long periods without teachers and its importance in the University curricula was secondary. This situation lasted until the reform of the University of the Marquis de Pombal, enacted by the Statutes of the University of Coimbra (in September 29, 1772). Those Statutes were made to place the Portuguese University as one of the best of the European enlightened nations and, according to Castro Freire (1872), so it happened. We do not agree that it had been exactly like that, but it is also true that this reform has fundamentally altered the structure and modernity of the Portuguese University.
Regarding Mathematics, the Statutes stressed the importance of this science in order to take a prominent place on the University and assigned a significant importance to the mathematical studies. This importance given to Mathematics by the Statutes led to the creation of the Faculty of Mathematics that presents a mathematical curriculum that we believe to be in tune with the ones in enlightened Europe.
We intend to present some of the most innovative aspects introduced in the teaching of Mathematics in Portugal at the time of the 1772 reform. We will give some special attention to the discipline of the second year of the Mathematical Course, Algebra, once the Statutes themselves value their teaching.

1 Brief description of the Portuguese educational system in the 18th century

The late 18th century was a period in which Portugal produced several reforms in the studies, both at university and non-university studies. The aim of these reforms was to improve the quality of our educational system and to place our University at the same level of the European Enlightenment Universities. But, why such reforms were needed? Was it crucial for the survival of the Portuguese educational system or was it just a need to change the ruling class, the Jesuits?

In fact, we can not talk about the Portuguese education until the 18th century without talking about the Society of Jesus because they held almost complete control of the Portuguese educational system between 1540 and 1759.

The religious order Society of Jesus was founded by Saint Ignatius of Loyola (1491-1556) in August 15, 1534 and it was confirmed by Pope Paulus III (b. 1468, 1534 − 1549) in September 27, 1540. In that same year the first two Jesuits arrive to Portugal, two of its founders: Simão Rodrigues (1510-1579) and Saint Francisco Xavier (1506-1552). While

Francisco Xavier leaves to evangelize the East, Simão Rodrigues stays in Portugal, to start the implementation of the Jesuit education in our country.

The first house that the Jesuits owned in Portugal (and in the world) was the monastery of St. Antão, founded in Lisbon on January 5, 1542. Their first school, for the exclusive use of Jesuit members, was the Jesus' College in Coimbra, founded in July 2, 1542. In 1551 is established the Espírito Santo College in Évora, where classes began public in August 28, 1553. Earlier, in February 1553, the monastery of St. Antão becomes the first Jesuit public school in Portugal and, we believe, the first one in the world. From its inception, the College of St. Antão had a large influx of students and, as we shall see, it was here that Mathematics gains more importance in Portugal until the first half of the 18th century, and not in the University.

In Coimbra, where the University was settled since 1537, the Society of Jesus gains control of the College of Arts. At that time, this College had the monopoly of the public education in Coimbra and was under the administration of the University of Coimbra. The interference of the Jesuits in the College of Arts, dependent of the University, causes several problems between both institutions. The disputes between these two institutions were reported in *Compêndio Histórico*; a compendium that gives a very anti-Jesuit point of view of their influence in the University.

The expansion of Jesuit education in Portugal continues: the Professed House of S. Roque in Lisbon in 1553, the colleges of Braga and Porto in 1560, Bragança in 1562, Funchal and Angra in 1570, Ponta Delgada in 1591, Faro in 1599, Portalegre in 1605, Santarém in 1621, Elvas in 1644, Faial in 1652, Setúbal in 1655, and so one. On this list are missing, for instance, the colleges that the Jesuits ran in the Portuguese domains. We do not have the data of their growth overseas. We can imagine that it was not as fast and extended as it was in Continental Portugal (especially in African territories), but certainly there were several Jesuit colleges in those territories to add to those listed above.

Consequently, from the arrival of the first Jesuits in 1540 until they were expelled in 1759 they had progressively increasing their dominance and control of the Portuguese educational system. What was the reason for such rapid growth in our educational system? We can explain it as a natural response to the necessity for training missionaries to go to the vast territories that the Roman Jesuit curia assigned to Portugal, like some parts of China, India or Japan.

One exception to the Jesuit domain in the Portuguese educational system was the University of Coimbra. Although it has never been subdued to the Society of Jesus, its influence in the University was felt and reported in the *Compêndio Histórico*.

The Jesuit educational characteristics were, at that time, a severe code and strict rules and also a very conservative attitude to education. For example, scientific investigation was not highly valued. Although some Jesuit mathematicians are known for developing mathematics, their main objective was not the teaching but the preaching of the Catholic religion.

As we know, the Jesuit studies were regulated by the *Ratio Studiorum* that, regarding Mathematics, was not very detailed. There were only three items concerning Mathematics. The first one describes the time of the classes, to whom it was intended, and its program: Euclid's Elements and some Geography or Astronomy. The second one state that the students should, once a month, resolve some celebrated mathematical problem and the third item was related to the revisions that should be made once a month.

REGVLAE PROFESSORIS MATHEMATICÆ.

Qui auctores quo tempore quibus explicandi. *P. 4. c. 12. C.

1 PHYSICÆ auditoribus explicet in schola tribus circiter horæ quadrantibus Euclidis elementa: in quibus postquã per duos menses aliquantisper versati fuerint, aliquid Geographiæ, vel Sphæræ, vel eorum, quæ libenter audiri solent, adiungat: idque cum Euclide, vel eodem die, vel alternis diebus.

Problema 2 Singulis, aut alternis saltem mensibus ab aliquo auditorum magno Philosophorum, Theologorumque conuentu illustre problema mathematicum enodandum curet; posteaque, si videbitur, argumentandum.

Repetitio 3 Semel in mense, idque fere die sabbathi, prælectionis loco præcipua quæque per eum mensem explicata publicè repetantur.

RE-

Ratio Studiorum, 1603, p.76

The Mathematical program in the Ratio Studiorum was not very ambitious. So, in the Portuguese Jesuit schools the teaching of Mathematics did not go beyond elementary Mathematic. Meanwhile, responding to a request of the Portuguese king, it was founded in Lisbon the Aula da Esfera. This was a public Mathematics class that took place in the College of Santo Antão and it worked continuously from around 1590 until 1759. Since this Aula was a result of a request by the Portuguese Corte, his curriculum wasn't the Ratio Studiorum curriculum but a mixture of it and other subjects, such as Astronomy, Nautical Science or Military Architecture, more advanced and recent concepts than those that would be taught in other Portuguese Jesuit schools.

Due to the lack of Portuguese teachers in the early years, most of them were foreigners and some of them well known in European science like Cristoforo Borri. These Jesuit scientists came to Portugal with the intention to go in mission to the East but most of them were kept in Portugal to teach Mathematics in *Aula da Esfera*. The best mathematicians

were selected to teach there, so this class became the center of the exchange of mathematical knowledge in Portugal, instead of the University of Coimbra as expected. For these reasons, the *Aula da Esfera* was the incoming center to the science discovered in Europe and it was from it that the Portuguese science was know; essentially Astronomical records and Portuguese Nautical science. To testify this opinion, we would like to mention that all Planetary Systems (the Ptolemaic, the Copernican and the Tycho Brahe) were studied and discussed in the *Aula da Esfera*. The reasons for non-acceptance of the Copernican system were not Astronomical or Physical, but Biblical grounds.

If we consider the hierarchy that the Jesuits assigned to their disciplines[1] and the fact that the Mathematics in *Aula da Esfera* was taught outside the curriculum of Philosophy, this Aula was considered subordinate to that of Philosophy and therefore it was considered of less importance and prestige for Jesuit teachers and leaders. This was the main reason why the profession of mathematics was, according to Baldini (2004), considered an unpleasant burden by the foreign missionaries and a transition job, to a more important one, by the Portuguese teachers. To this unimportance of Mathematics Leitão (2007) adds the small interest in the scientific disciplines that had always characterized the Portuguese culture and education. As a consequence, this led to a low quality of Jesuit education, comparatively to Central Europe. Furthermore, the areas of development of mathematics in Portugal fluctuate according to national contexts; it is often that the guidelines of the Portuguese leaders overrode the Jesuit leaders in Rome so that, in the words of Baldini (2004), «the Society's curia in Rome was not responsible for the situation in Portugal, and at one point, it acted decisively against it». Baldini refers to the *Ordenatio*[2] that the Leader of the Society of Jesus, Father Tirso Gonzalez, sends to Portugal in 1692. In this *Ordenatio*, Tirso Gonzales requires several improvements in the teaching of Mathematics in Jesuit schools and point out a series of orders to be fulfilled by the Portuguese leaders.

To these arguments we may add the Portuguese Inquisition, which in this period had a strong power repressing and censoring books making it difficult and very dangerous the entrance of modern books in Portugal, to the reasons that hindered the implementation and the development of the science in Portugal.

Nevertheless, in the beginning of the 18th century, in the reign of King João V (helped by the gold of Brazil) the European scientific culture started entering in our country. For example, some scientific shows, like astronomical observations, were promoted, and several Academies were founded all over the country. For these reasons we can say that this king was a fan of cultural magnificence but not particularly of the scientific results. Even so, it is in the beginning of the 18th century that the Portuguese culture and science began to develop.

In 1758 there was an attempted murder to the king and, a year latter, the Jesuits were considered co-responsible and were expelled from Portugal. Once they were in control of the Portuguese educational system, it is easy to imagine the damage that their expulsion causes to our educational system. In these early years it will goes through serious

1 Theology was the most important and prestigious discipline, followed by the discipline of Philosophy, then Rhetoric and lastly Grammar.

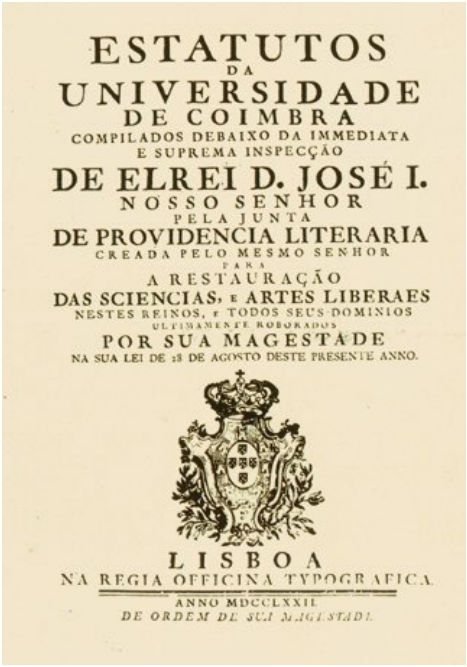
2 Ordenatio ad suscitandum fovendumque in Provincia Lusitaniae Studium Mathematicae. This document was transcribed from the original Latin by Ugo Baldini and Henrique Leitão on pages 648-664 of "appendix A: Documents and Letters" in Baldini (2004). In the same book we can find a translation into Portuguese, on pages 704 to 723, developed by Henrique Leitão and Bernardo Mota, from a partial translation by Vitor Manuel Leal Frost, published by Monteiro, A., 1998, *Inácio Monteiro e o Ensino da Matemática em Portugal no século XVIII*, Coimbra: Departamento de Matemática, pp. 186-192.

difficulties, particularly a severe lack of teachers.

In the same year that the Jesuits were expelled from Portugal the non-University studies were reformed. The aim of this reform was to widespread all over the country the elementary education, which should be financed and managed by the State. But, as we just say, because the education in Portugal was almost completely dependent on the Jesuit teachers, their expulsion led to a strong lack of teachers; both in non-University studies and in University studies. Therefore, the non-Universities studies had to be reformed again by Queen Maria I, only 20 years after their first reform.

2 The Faculty of Mathematics

The University of Coimbra was reformed in 1772; thirteen years after the Jesuits were expelled from Portugal.


ESTATUTOS
DA
UNIVERSIDADE
DE COIMBRA
COMPILADOS DEBAIXO DA IMMEDIATA
E SUPREMA INSPECÇÃO
DE ELREI D. JOSÉ I.
NOSSO SENHOR
PELA JUNTA
DE PROVIDENCIA LITERARIA
CREADA PELO MESMO SENHOR
PARA
A RESTAURAÇÃO
DAS SCIENCIAS, E ARTES LIBERAES
NESTES REINOS, E TODOS SEUS DOMINIOS
ULTIMAMENTE ROBORADOS
POR SUA MAGESTADE
NA SUA LEI DE 28 DE AGOSTO DESTE PRESENTE ANNO.
LISBOA
NA REGIA OFFICINA TYPOGRAFICA.
ANNO MDCCLXXII.
DE ORDEM DE SUA MAGESTADE.

Statutes of the University of Coimbra, 1772

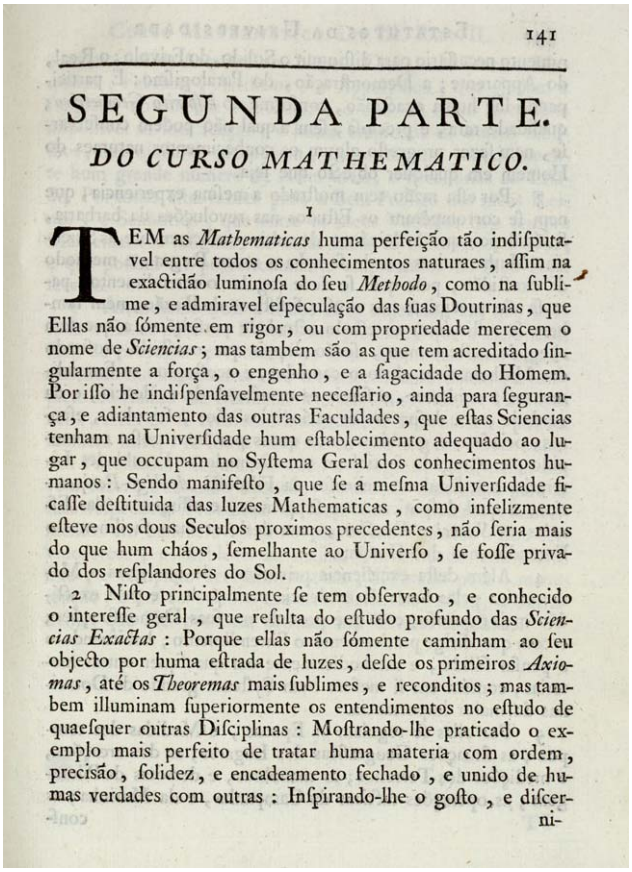
This reform intended to place our University in the top group of the European Enlightenment Universities.

Regarding Mathematics, before 1772, we should point out that for almost two hundred years no one taught Mathematics more than a few years and for more than sixty years that no one teaches Mathematics at all. At that time there were only two disciplines of Mathematics, namely Geometry and Astronomy which were included in the curriculum of Medicine. Since the majority of the University students were from the Canon and Laws, the number of students assigned to Mathematics was small.

The reform of the University of 1772 creates two new Faculties: the Faculty of [Natural] Philosophy (or, as we would call it today, Faculty of Sciences), and the Faculty of Mathematics - which was the first one in the World. This illustrate the importance that Mathematics had in this reform to become an autonomous Faculty in the University. Moreover it provides the infrastructures and resources for the improvement of these two newest Faculties like an Astronomic Observatory, a Chemical Laboratory, a Botanical Garden, a Museum of Natural History and the University Press. The University Press was

not for the exclusive use of the newest Faculties; it represents an important new tool available to the whole University.

The importance given to Mathematics by the promoters of this reform is well expressed in the introduction of the Second Part of the Statutes of the University of Coimbra, which concerned to the Course of Mathematics.



141

SEGUNDA PARTE.

DO CURSO MATHEMATICO.

1

TEM as *Mathematicas* huma perfeição tão indiſputavel entre todos os conhecimentos naturaes, aſſim na exactidão luminoſa do ſeu *Methodo*, como na ſublime, e admiravel eſpeculação das ſuas Doutrinas, que Ellas não ſómente em rigor, ou com propriedade merecem o nome de *Sciencias*; mas tambem são as que tem acreditado ſingularmente a força, o engenho, e a ſagacidade do Homem. Por iſſo he indiſpenſavelmente neceſſario, ainda para ſegurança, e adiantamento das outras Faculdades, que eſtas Sciencias tenham na Univerſidade hum eſtabelecimento adequado ao lugar, que occupam no Syſtema Geral dos conhecimentos humanos: Sendo manifeſto, que ſe a meſma Univerſidade ficaſſe deſtituida das luzes Mathematicas, como infelizmente eſteve nos dous Seculos proximos precedentes, não ſeria mais do que hum cháos, ſemelhante ao Univerſo, ſe foſſe privado dos reſplandores do Sol.

2 Niſto principalmente ſe tem obſervado, e conhecido o intereſſe geral, que reſulta do eſtudo profundo das *Sciencias Exactas*: Porque ellas não ſómente caminham ao ſeu objecto por huma eſtrada de luzes, deſde os primeiros *Axiomas*, até os *Theoremas* mais ſublimes, e reconditos; mas tambem illuminam ſuperiormente os entendimentos no eſtudo de quaeſquer outras Diſciplinas: Moſtrando-lhe praticado o exemplo mais perfeito de tratar huma materia com ordem, precisão, ſolidez, e encadeamento fechado, e unido de humas verdades com outras: Inſpirando-lhe o goſto, e diſcerni-

Statutes of the University of Coimbra, 1772, book III, p.141

"Having Mathematics a perfection so unquestionable among all natural knowledge, both in luminous accuracy of his Method, as in the sublime and admirable speculation of its Doctrines, that They, not only for the accuracy or property, deserve the name of Sciences; but also are those who have singularly believed the strength, the creativity and the shrewdness of Man. It is therefore indispensably necessary that, even for security and progress of other Faculties, these Sciences have in the University a suitable establishment for their place in the General System of human knowledge. Being clear that if the University stay devoid of the lights of Mathematics, as unfortunately it stayed in the previous two centuries, there would be no more than a chaos, like the universe, if it were deprived of the splendors of the Sun."

A very curious requirement of the Statutes was that all University's students (including Theology' students!) had to assist to some Mathematics disciplines. This implied an increase in the number of students attending mathematics and consequently its importance in the University.

As stated before, the Second Part of the Statutes concerned the Course of Mathematics, which was established at the Faculty of Mathematics. This was a four years course. During the first year students had to attend to a class of Geometry and one of Natural History, in the Faculty of Philosophy. On the second year they had to attend two classes,

one of Algebra and other of Experimental Physics, in the Faculty of Philosophy. The third year is devoted to Mechanics and the fourth to Astronomy.

This Course was clearly a lever for the Faculty of Mathematics promptly begin to graduate professionals in Mathematics.

The Statutes were very precise on writing the program for these disciplines. In Geometry it had to be taught the "*Elements of Arithmetic, and of Geometry, and the Plane Trigonometry; with applications to Geodesy, Stereometry, &c*" [Estatutos, page 166; a more detailed description of the program of this discipline is found in the pages 169-175]. In the discipline of the second year, Algebra, the professor had to teach "*Elements of Literal Calculus; or Elementary Algebra, the Principles of Direct Infinitesimal Calculus, and Inverse; with their application with Sublime Geometry, and Transcendent*" [Estatutos, page 166; with further description on pages 175-182]. In Mechanics it should be taught the "*General Science of movement, with its application to all branches of Kinetics, that constitute the Body of Physical-Mathematical Sciences; as Mechanic, Static, Dynamic, Hydraulic, Hydrostatic, Optic, Dioptrics, &c*" [Estatutos, page 166, also on pages 182-188]. Finally, in Astronomy it should be taught the "*Theory of Planetary motion, both Physical as Geometrical, with the Practice of Calculus, and Astronomical Observations; and with other Sciences, that depend on Astronomy*" [Estatutos, pages 166-167, more detailed on pages 189-195].

The Statutes also predicted the kind of exercises that students had to do: daily, weekly and monthly exercises, written exercises and small dissertations. [Estatutos, pages 197-205].

The acceptance age for the Course of Mathematics was 15 years old and the Mathematical prerequisites were just the knowledge of the four fundamental rules of arithmetic: add, subtract, multiply and divide numbers [Estatutos, pages 150-152 and 154-157].

In order to attract students to this Course, various privileges were given to those who finished their studies in Mathematics, like job and military privileges [Estatutos, pages 149-150].

Regarding the second year discipline, Algebra, the statutes describe it as "the first Science in Mathematics" [Estatutos, page 162], which gives an idea about the importance of Algebra in the Course of Mathematics.

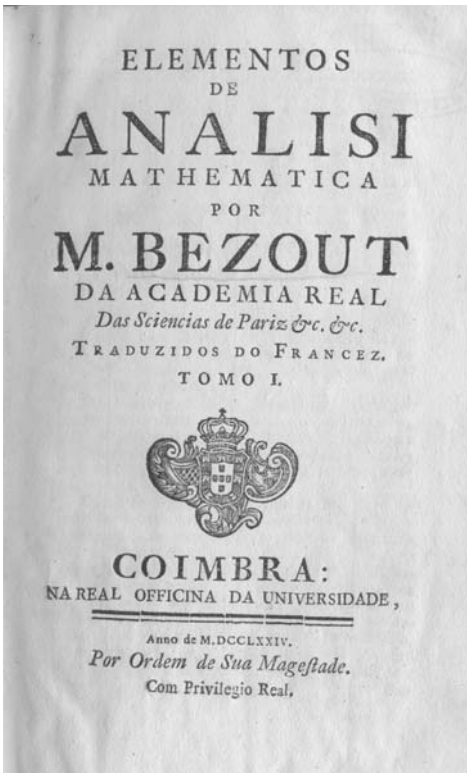
The program of this discipline was:

Elementary Algebra
- Preliminary notions
- Algebraic operations
- Equations
- Applications
- Conic sections

Infinitesimal Algebra
- Differential Calculus
- Differentiation rules
- General theory of curves
- Integral calculus
- Applications

The bibliography was not fixed in the Statutes; it would be chosen by resolution of the Congregation of Mathematics. This means that there is no indication to follow a particular book and it was implicit an update of the bibliographical references. The *Elementos de Analisi Mathematica por Bezout*, translated into Portuguese from his *Cours de*

Mathematiques, was chosen for the discipline of the second year, and it was used as a textbook until 1836, with five editions.


ELEMENTOS
DE
ANALISI
MATHEMATICA
POR
M. BEZOUT
DA ACADEMIA REAL
Das Sciencias de Pariz &c. &c.
TRADUZIDOS DO FRANCEZ.
TOMO I.
COIMBRA:
NA REAL OFFICINA DA UNIVERSIDADE,
Anno de M.DCCLXXIV.
Por Ordem de Sua Mageſtade.
Com Privilegio Real.

Elementos de Analisi Mathematica por Bezout, 1774, 1st edition.

The *Professors of Algebra* between 1772 and 1836 are presented in the following list. In the right column we point out the number of *Substitute Professors*, that is, those who substitute for a certain period of time the responsible Professors that were called to Lisbon by king's request.

Year	**Professor**	**Nº Subst.**
1772/1773	----------	----------
1773/1774	Miguel Franzini	
1774/1775		
1775/1776		
1776/1777		
1777/1778		1
1778/1779		1
1779/1780	Vitúrio Lopes Rocha	
1780/1781		
1781/1782		
1782/1783		
1783/1784	Manuel José Pereira da Silva	
1784/1785		
1785/1786		
1786/1787		1
1787/1788		1
1788/1789		1

1789/1790	Manuel José Pereira da Silva	
1790/1791		1
1791/1792		
1792/1793		
1793/1794		1
1794/1795		1
1795/1796	José Joaquim de Faria.	1
1796/1797		3
1797/1798		2
1798/1799		2
1799/1800	António José de Araújo Santa Bárbara	
1800/1801	----------	----------
1801/1802	Tristão Alves da Costa Silveira	
1802/1803	José Joaquim Rivara	
1803/1804		
1804/1805		
1805/1806	Tristão Alvares da Costa Silveira	1
1806/1807		1
1807/1808		
1808/1809		
1809/1810	José Joaquim Rivara	
1810/1811	*THE UNIVERSITY WAS CLOSED*	----------
1811/1812	José Joaquim Rivara	
1812/1813		
1813/1814		
1814/1815		
1815/1816		
1816/1817		1
1817/1818		
1818/1819		
1819/1820		
1820/1821		
1821/1822		1
1822/1823		1
1823/1824		1
1824/1825		2
1825/1826	Joaquim Lebre de Sousa e Vasconcelos	2
1826/1827		2
1827/1828		2
1828/1829	Manuel Pedro de Melo	2
1829/1830	Joaquim Lebre de Sousa e Vasconcelos	1
1830/1831		1
1831/1832		1
1832/1833		1
1833/1834		1

1834/1835	Guilherme António Dias Teixeira	1

The scientific production of this academic community was relatively scarce, as can be seen in the Curriculum Vitae of the professors. José Joaquim de Faria improved of the 2nd edition of the *Elements of Analysis por M. Bezout*, (1793-94); Manuel Pedro de Melo published, in 1815, at the Royal Academy of Sciences of Lisbon (recently founded in 1779) "Memória sobre os binomiais", *História e Memórias da Academia Real das Sciencias*, **IV**, pp. 41-51; and José Joaquim Rivara published, in 1818, *Resolução analytica dos problemas geometricos, e indagação da verdadeira origem das quantidades negativas*, Coimbra: Imprensa da Universidade.

The ambition to create the Faculty of Mathematics and its Mathematics Course was great. However, there were some obstacles to the progress of this Faculty, and of the Portuguese educational system and science in general. Besides the lack of teachers and students (for instance, there were only six students in the first five years of the Course of Mathematics) we must consider the power of the Portuguese Inquisition and the State influence in the Portuguese educational system. The social and political environment were also not propitious; in this period Portugal has fought several wars: the war against Spain, in 1801; the three French invasions, in 1807, 1809, 1810, and consequently the transfer of the Portuguese court to Brazil, between 1807 and 1821; and the Portuguese civil war, between 1828 and 1834.

Nevertheless, the first step to improve scientific knowledge in Portugal was taken and there was no turning back.

REFERENCES

- Andrade, A., 1981, *A Reforma Pombalina dos Estudos Secundários (1759-1771)*, Coimbra: Acta Universitatis Conimbrigensis, Vol. 2.
- Baldini, U., 2004, "The teaching of Mathematics in the Jesuit Colleges of Portugal, from 1640 to Pombal", in *The Practice of Mathematics in Portugal: Papers from the International Meeting organized by the Portuguese Mathematical Society*, Saraiva, L., Leitão, H. (eds.), Coimbra: Acta Universitatis Conimbrigensis, pp. 293-465.
- Carvalho, R., 1985, *História do Ensino em Portugal (desde a fundação da nacionalidade até ao fim do regime de Salazar-Caetano)*, Lisboa: Fundação Calouste Gulbenkian.
- Compêndio Histórico, 1771, *Compendio historico do estado da Universidade de Coimbra no tempo da invasão dos denominados jesuitas* …, Lisboa: Regia Officina Typographica.
- Bezout, E., 1774, *Elementos de Analisi Mathematica por M. Bezout da Academia Real das Sciencias de Paris Etc, Etc. Traduzidos do Frances*, Coimbra: Real Officina da Universidade.
- Estatutos da Universidade de Coimbra, 1772, Coimbra: Imprensa da Universidade, book III, part II.
- Farrel, A. (trad.), 1970, *The Jesuit Ratio Studiorum of 1599, translated into English with an Introduction and Explanatory Notes*, Washington: Conference of Major Superiors of Jesuits.
- Freire, F., 1872, *Memória histórica da Faculdade de Matemática, nos cem anos decorridos desde a reforma da Universidade em 1772 até ao presente*, Coimbra: Imprensa da Universidade.
- Leitão, H., 2007, *A Ciência na «Aula da Esfera» no Colégio de Santo Antão 1590 * 1759*, Lisboa: Comissariado Geral das Comemorações do V Centenário do Nascimento de São Francisco Xavier.
- Lemos, F., 1777, *Relação Geral do Estado da Universidade* (1777); Coimbra: Atlântida Editora.
- Ribeiro, J., 1871-1893, *História dos Estabelecimentos Científicos, Literários e Artísticos de Portugal nos Sucessivos Reinados da Monarquia*, Lisboa: Tipografia da Academia Real das Ciências.
- Silva, A., 1828-1830, *Collecção da Legislação Portugueza desde a última Compilação das Ordenações*, Lisboa: Tipografia Maigrense.
- Silva, A, 1842-1844, *Suplemento à Colecção de Legislação Portuguesa*, Lisboa: Tipografia de Luiz Correa da Cunha.
- Teixeira, F., 1934, *História das Matemáticas em Portugal*, Lisboa: Academia das Ciências de Lisboa.