

A BRIEF HISTORY OF THE INTRODUCTION OF MODERN SCIENCE TO PORTUGAL DURING THE 18th CENTURY

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Abstract: The focus of this article is on the role played by members of the Society of Jesus, the Order of the Oratorians, and the Jewish community in the introduction of Modern science in Portugal during the 18th century. The record of their publications prove, contrary to common stereotypes on the permanent conflict between science and religion, that they all embraced Modern, anti-Aristotelian, natural philosophy fairly equally and unreservedly. The rhetoric they used in manuscript Dedications to prospective patrons also show that they were actively engaged in shifting Modern science from a context of private consumption to one of public circulation. I acknowledge that the dissemination of Modern science in Portugal during the 1700's was slow and protracted. This phenomenon, however, was not, as typically argued, caused by scientific conservatism on the part of the religious Orders, or the ill will of patrons of the sciences, but by the political motives of enlightened despots João V, José I and his Prime-Minister the Marquis of Pombal.

Keywords: Modern science, Society of Jesus, Congregation of the Oratorians, enlightenment, University of Coimbra, rhetoric of science

PART ONE. WHO WAS READY FOR MODERN SCIENCE DURING THE 18th CENTURY?

It is safe to say that the Golden age of Modern philosophy in Portugal started during the 1st half of the 18th century under João V (1707-1750), and continued to develop under José I (1750-1777).

Since the end of the 17th century, João V spent much wealth coming in from Brazil to modernize Colleges and Universities in Continental Portugal.

For example, he offered a fully equipped Astronomic Observatory to the Jesuit College of Arts, a place which he visited regularly for

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observations guided by Jesuit Carbone.¹ He founded an Astronomic Observatory and a Cabinet of Experimental Physics (or “Modern Laboratory”) at the Oratorian Real Casa das Necessidades.² He sanctioned their public sessions on experimental physics, and he attended them regularly as well. To the University of Coimbra, he donated a library (the “Biblioteca Joanina”), which quickly filled with books by Moderns such as Galileo, Descartes, Gassendi, Locke, Boerhaave, and Kepler. Furthermore, he created the Royal Academy of Portuguese History (1720) which, together with a few private Academies such as the Academy of the Generous (1685-93) and the Academy of the Discreet (1696-1717), facilitated the learning of Modern science by the Portuguese aristocratic elites.³ The curiosity of the King for the new sciences coming in from the North of Europe, as well as the lavish donations given by him to the Society of Jesus and the Congregation of the Oratorians for the purpose of having them absorb and develop these novelties, made both Orders perfect breathing grounds for the diffusion of Modern natural philosophy in Portugal. A cursory look at the history of the intellectual activities in Portugal of these two Orders during the 1700s only strengthens this claim.

The Society of Jesus.

The Jesuits acquired the monopoly over public education in Portugal almost as soon as the first Province of their Society was founded there in 1540. For centuries, their *curriculum* of studies had been steeped in Neo-Aristotelianism, their teaching inspired by both the Scholastic method typical of other European Colleges and Universities, and the methodologies described in the *Ratio Studiorum*. However, while it is the case that the College of St. Antão in Lisbon, the College of Arts in Coimbra, and the University of Évora⁴ were structured around a Scholastic framework, Modern science was present at these Jesuit schools very early on. In fact, in spite of the conservatism of the official Statutes in these Portuguese schools, their *curriculum* of

¹ The results of these observations, made by Italian Jesuit Carbone, were published in *Philosophical Transactions*.

² The Real Casa da Nossa Senhora das Necessidades had been offered by João V to the Order of the Oratorians in 1745.

³ The members in these International Associations were *savants* from the religious orders, Jewish scholars, secular clergy, and the aristocratic elite.

⁴ The University of Coimbra was not Jesuit, even though most students who wanted to enroll there had to make their entrance examinations at the Jesuit College of Arts.

studies in philosophy⁵ was, by norm, ‘deviated’ by faculty to incorporate Modern subjects in disciplines such as mathematics, and theoretical and practical mechanics. This was typical of Jesuit colleges in other European countries, including in St. Petersburg, Russia, and at the Collegio Romano, in Italy. Even though the *Ratio* specified that mathematics, for example, should only be “introduced at the end of the (complete) course of studies,” it was being taught in “all six classes (years) up through to calculus.”⁶

Another case of “programmatically transgression”⁷ by the Jesuits in Portugal was the ‘Aula da Esfera,’ which had been founded in 1590 at Sto. Antão.⁸ The courses it offered included Reformed Astronomy (Copernicus, Christopher Clavius, and Tycho Brahe), and practical courses in Navigational Science, the Nautical Arts, and Cartography. Sto. Antão in Lisboa as well as the College of Arts in Coimbra, both of which had been donated to the Jesuits in 1555 by João III, became the “first (Colleges in Portugal) to receive the influx of the European Modern scientific movement, especially with regards to Mathematics, Astronomy, and Physics”.⁹ Over time, the Aula became the most notorious embodiment of public studies in the country, only to be seconded much later by the creation of Laboratory of experimental physics of the Oratorians.

That the Jesuits were teaching Modern science at their schools early on in the 18th century is evidenced not only by the transgressive teaching just mentioned, but as well by their attempts to introduce the new sciences officially in their *curriculum*. In 1712, they requested from João V permission to reform the Statutes at the College of Arts in Coimbra, so that they could combine the study of physics with Modern experimentation. Thirty years later, in 1746, they requisitioned the

⁵ The Jesuit *curriculum* in philosophy included mathematics (with astronomy) and natural science.

⁶ Daniel L. Schlafly, Jr., True to the *Ratio Studiorum*? Jesuit Colleges in St. Petersburg”, in *History of Education Quarterly*, Vol. 37, No.4 (Winter, 1997), pp. 428-9.

⁷ This concept was used by Elias J. Torres Feijó in “*Ad maiorem gloriam...feminae*. Enlightened Women and the Introduction of Models in Portugal during the Second Half of the Eighteenth Century”, in *Portuguese Studies*, Vol. 20 (2004), p. 75.

⁸ The “Aula da Esfera” lasted until the expulsion of the Jesuits from Portugal in 1759.

⁹ Maria Cândida Pacheco, “Filosofia e Ciência no Pensamento Português dos Séculos XVII e XVIII”, in *Revista Portuguesa de Filosofia*, Vol. 38, 4, Actas do Congresso Luso-Brasileiro de Filosofia (Oct.-Dec. 1982), p. 478.

King to let them introduce Moderns such as Descartes, Gassendi, and Newton at their College. Furthermore, after José I ascended to the throne, a group of professors from the same College in Coimbra wrote the *Ellencus Quaestionum* (1754), where they suggested that Modern philosophy and mathematics be introduced in the Jesuit *curriculum*. The *Ellencus* addressed a number of important physical phenomena, and then it listed the various explanations offered by Ancient and Modern philosophers alike (atomists, Aristotelians, Descartes, Gassendi, and Newton). On the topics of gravity, speed, motion, and the elasticity of bodies, for instance, the authors claimed that one ought to follow the Moderns, since they were the ones who used the “commendable method.”¹⁰ Later on, we address the effect of these continual requests to João V and José I on the official program of studies at Jesuit schools.

The Congregation of the Oratorians.

The Oratorians appeared in Portugal in 1668, about one hundred years after the Society of Jesus. Just like everyone in Catholic and Protestant Europe, they modeled their *curriculum* after the Jesuits’ *Ratio*. This picture changed in 1737 or 1738 when they started advertising themselves as “Modern eclectic” in natural philosophy. They taught natural science, Modern languages, mathematics, and geography, and they “prided themselves for offering better schooling than the Jesuits.”¹¹ The ascendancy of their influence over school education was further evidenced by the responsibility, given to them by João V, to craft the entrance examinations for the University of Coimbra, a task which had until then been the exclusive monopoly of the Jesuit College of Arts.

The public sessions on experimental physics offered by the Oratorians at the Casa das Necessidades in Lisboa became famous very quickly. There, Oratorians taught the new scientific theories and illustrated them with experiments and practical demonstrations geared around technologies such as the air pump and the microscope. Their lessons on science included debates (“Exams”), where a member of the

¹⁰ In *Ellencus Quaestionum, quae a Nostris Philosophiae Magistris debent, in hac Provincia Lusitana Societatis Jesu* (1754). Cited by Dércio Rui Martins, “As Ciências Físico-Químicas em Portugal antes de 1772”, in Maria Cristina Araújo (ed.), *Pombal e a Universidade*. Coimbra: Imprensa da Universidade, 2000, p. 199.

¹¹ David Young, “The ‘Reform’ of Jesuit Education”, *History of Education Quarterly*, Vol. 20, 3 (Autumn 1980), p. 364.

Order, assigned for each particular session and supervised by a senior expert, developed arguments in favor of Modern science. Just as their Oratorian French counterparts, Oratorians soon became the “avant-garde educators” in Portugal.¹² Even though Oratorians were not ‘more’ on the side of Modern science or ‘more’ ready for it than were the Jesuits, they adopted Modern science officially only a decade after they started their religious and educational activities in Portugal.

‘Savants’ under João V, José I, Pombal, and the Rhetoric on Behalf of Modern Science

The views of Portuguese *savants* on the epistemological superiority of Modern science over Aristotelianism show the private picture conforming to the institutional one. The enthusiasm for ‘selling’ Modern science to the public is clear in manuscript Dedications to João V, José I, the Portuguese nobility, Academicians, and other patrons of the sciences.

What follows is a list of six of these men, together with the titles and dates of some of their works, as well the some of the rhetoric they used to favor Modern science (especially Newtonian mathematical astronomy and physics) over traditional Neo-Aristotelianism.¹³

1. Manuel de Campos.

The modernity in the scientific views of Campos’ *Elementos de Geometria plana e sólida Segundo a ordem de Euclides* (1735) is clear for two reasons. First, and according to a contemporary, it “lets you qualified to enter *Newtonian* Philosophy (in order) to make your own progress.”¹⁴ Second, Campos wants the book to be used by the public attending the Aula da Esfera at the College of Sto. Antão, where he was professor of Mathematics. In the Dedication to João V, Campos emphasizes that the book is invaluable because it introduces Modern philosophy to those interested in its practical applications. As he put it, “what (the Aula) needs the most - given the great number of those who frequent it – are classical books, textbooks to advance its

¹² Ronald Mortier, “The ‘Philosophes’ and Public Education”, in *Yale French Studies*, No. 40, Literature and Society: Eighteenth Century (1968), p. 63.

¹³ All translations are mine. As much as possible I tried to keep them close to the narrative style of these 18th century Portuguese texts.

¹⁴ Castro Sarmiento, “Prologue to the Reader”, in *Theorica Verdadeira das Marés, conforme à Philosophia do incomparável cavalheiro Isaac Newton* (1737), Londres, p. 6.

application. I well know that in Court they abound, and from the best Authors, that they have illustrated this science (of geometry); just as the one, that is being constantly communicated in the most polished Nations of Europe: however, I also know that the diversity of styles, idioms, and methods, do not cause little confusion to the Masters, and the Disciples, as I have been taught by experience.”¹⁵

2. Jacob the Castro Sarmento.

In 1737, Castro Sarmento publishes two works. The *Chronologia Newtoniana Epitomizada*, dedicated to “his Most Serene Prince of Brazil D. José”, son of João V and heir to the throne, is a translation of a book on reformed historiography that Newton had written a decade earlier for the education of the young Prince of Wales. The other book was the *Theorica Verdadeira das marés, conforme a Philosophia do Incomparável cavalheiro Isaac Newton*. In the Dedication to patron D. Manuel de Castro, Sarmento pleads that he help him “to protect, and recommend a Work, that pertains to that science, in which Your Excellency has made more studies, and bigger progress, than could be expected in a Kingdom, where the naturals have not been given themselves to the study of Mathematics, which has tireless application, and taste, of the remaining Nations of Europe”.¹⁶ Even though this book on the tides only represents a small portion of Newton’s science, Sarmento claims that it already demonstrates that, one, “that immortal Newton” was able to explain what had been considered for centuries most “wonderful and unexplainable Phenomena of Nature (...) by the Philosophical World”; and two, all philosophers were by then “satisfied” that Newton’s causal explanation was the “most exact and true explanation of this abstruse part of Natural Philosophy”. The book articulates to the Portuguese public these “infallible and clear (...) demonstrable principles” of Newtonian science. This is important to him because, while the London nobility (and the rest of Europe) was already “reading a Course on Experimental Philosophy and Mechanics” and they understood the demonstrations and deductions from Newtonian principles made with the help from “Mechanical” instruments and the “force of

¹⁵ Manuel de Campos, “Dedicatoria”, in *Elementos de Geometria plana e solida Segundo a ordem de Euclides* (1735). Lisboa Occidental: Na Officina Rita-Cassiana, pp. 3-4.

¹⁶ Jacob de Castro Sarmento, *Theorica Verdadeira das Marés, conforme à Philosophia do incomparável cavalheiro Isaac Newton* (1737), p. IV.

Geometry”, Portugal and Spain do not seem to be duly impressed with this knowledge. This is because, as Sarmiento argued, “our Portuguese generally retain the Ideas of Aristotle, and some of *Des Cartes*, (which) is an extremely grave impediment to the diffusion of this great Light in this Kingdom...”¹⁷

3. Luís António Verney.

O Verdadeiro Método de Estudar, para ser útil à República e à Igreja: Proporcionada ao estilo, e necessidade de Portugal (1746) is the first attempt in Portugal to have the Jesuit *Ratio Studiorum* replaced by Modern *curricula* and methods of teaching. In the book, Verney criticizes the Jesuit program on grounds that it makes exclusive reference to Neo-Aristotelian knowledge and to outmoded conceptions of experience which are detrimental to Modern science, because “Scholasticism causes ridiculous compositions”. Even though Scholasticism has been “exiled from cultured countries,” it still had a hold in Portuguese schools. This is embarrassing, for *savants* in “cultivated” countries have already accepted geometry since the explanation of “clear truths”.¹⁸ Modernizing the sciences in Portugal is fundamental because the sciences did not “augment until they started being developed by mathematicians Galilei, Cartesio, Gazendo, Hobbes, the two Pascals, F. Mersenne, Borelli, Torricelli... Huyghens... and then Newton.”¹⁹ Ancient physics, therefore, “must be despised” and replaced with Modern physics. One way to introduce Modern philosophy in schools is that students do not learn “unnecessary things”, but the “scientific style” of thinking instead, i.e., one which makes one “divested oneself from all kind of prejudice and passions, that he may examine reasons as they should be examined”.²⁰

4. Inácio Monteiro.

In the Prologue to the first volume of the *Compêndio dos Elementos de Matemática Necessários para os Estudos nas Ciências Naturais e nas Artes* (1754), Monteiro is adamant about

¹⁷ In *Theorica*, Sarmiento was replacing the Cartesian theory on the tides by Newton’s theory.

¹⁸ Luís António Verney, *O Verdadeiro Método de estudar, para ser útil à República e à Igreja: Proporcionada ao estilo e necessidade de Portugal*, (1746). Valenza: na Officina de António Ballas, p. 134.

¹⁹ *Ibid.*, p.186.

²⁰ *Ibid.*, p. 124.

the need for such work in Portugal: “one who is not foreign to the Republic of Letters, but knows the state, in which the sciences find themselves today, in other Kingdoms of Europe, as well as in our small Lusitania, does not need reasons, to persuade oneself, that the argument of this work in all times would be useful, and in the one where we live, necessary. It consists of giving to all studious people of the natural sciences, as of all the other faculties, one necessary, and enough instruction in almost all matters Mathematical in a brief style, and clear, and does not bore the curious, nor needs an explanation of a Master, so that all can perfectly understand it.”²¹ The enthusiasm of Monteiro for the Moderns and for the mathematization of Physics is clear. To him, “no man in the world today can learn Philosophy without the intelligence of Mathematics.”²² Simplified explanations of the theories of Newton, Descartes, Boerhaave, etc., are essential for educated laymen, teachers, and students alike, since only then can they understand the principles of Modern science. In the Prologue to the second volume in the same book, Monteiro reasserts his plan to divulge the new ideas in physics and mathematics to the “infinite number of the curious from all parts of the Kingdom”.²³ Another of his books, *Philosophia Libera* (1766), dedicated to the Portuguese youth, is to be “in its whole Natural Philosophy, to which one gives usually the name of Physics, the necessary Prolegomena to that said science, the Foundations, and the Appendixes” which could be learned in just three years of study.²⁴ Like with the *Compêndio*, Monteiro argues that this is essential because of the state of confusion generated by a profusion of sectarian philosophical schools in Portugal. Modern science is too complicated even for the most educated of men and women to grasp without the appropriate theoretical and practical guidance.

²¹ Inácio Monteiro, “Prólogo ao Leitor”, in *Compêndio dos Elementos de Matemática Necessários para os Estudos nas Ciências e nas Artes* (1754), cited in Ana Isabel da Silva Rosendo (1998), “Inácio Monteiro e o Ensino da Matemática em Portugal no século XVIII”. Tese de Mestrado. Porto: Universidade do Minho, 1999, p. 163.

²² *Ibid.*, p. 164.

²³ *Ibid.*, 167.

²⁴ Inácio Monteiro, *Philosophia Libera seu Eclectica Rationis et Mechanica Sensuum* (1766), cited in Ana Isabel da Silva Rosendo, *op.cit.*, p. 68.

5. Teodoro de Almeida.

In the Dedication to the *Recreação Filozofica ou Dialogo Sobre Filozofia natural, para a instrusão de pessoas curiosas, que nao frequentaraõ as aulas* (1751-1800) to patron José I, Teodoro de Almeida argues that Modern natural philosophy in Portugal is no longer “hidden, solitary, and persecuted...I see it trying again and again experiments, I see it manipulate Machines carefully, I see it consult the important Laws of Mechanics, I see it finally form mathematical calculi”.²⁵ However, access to this knowledge had only been given to very restricted elites. While the educated public had attended traditional schools, still to them “are hidden the marvels of nature...I see many ingenious minds (“engenhos”) noble, and sharp live in such vile slavery, following and venerating the errors that they have carried from birth, and who adores shadows with respect, because they still have not seen the light.”²⁶ The purpose of the *Recreação* is to write about those news things in “plain language,” so that “all know what God made for all.”²⁷ Two decades later, Almeida publishes three volumes of *Cartas Physico-Mathematicas*. They are a series of Postscripts where he addresses assertions that he had made earlier in the *Recreação* about the theories of Galileo, Gassendi, Descartes, and Newton, which he now wanted to revise in light of new developments.²⁸ Like Monteiro, Almeida considers himself to be an eclectic, for “I will not limit myself to any school, nor will I follow blindly any particular author; but what I more sincerely understand, that is closer to the truth. And the truth is only one, and very diverse are the opinions of men.”²⁹

6. António Ribeiro Sanches.

Dedicated to José I, *Cartas sobre a Educação da Juventude* (1759) is a guide into what and when to teach Modern science, as well as by whom and for whom. Sanches sees this work as his own contribution to the secularization of Portuguese schools. In the

²⁵ Theodoro de Almeida, “Carta Dedicatória”, *Recreação Filozofica ou Dialogo Sobre Filozofia Natural, para instrusão de pessoas curiosas, que não frequentaráõ as aulas* (1758). Lisboa: Officina de Manuel Rodrigues, pp. 2-3.

²⁶ *Ibid.*, pp. 6-7

²⁷ *Ibid.*, pp. 7-8.

²⁸ For instance, Almeida wanted to use Newtonian science to refute the Cartesian vortices.

²⁹ *Ibid.*, pp. 9-10.

Dedication, he tells the King that “since in the Kingdom were founded Schools and Universities”, the education of the Portuguese youth had been merely “Ecclesiastical or according to the dictates of Ecclesiastical men.”³⁰ The country does not need priests as much as it needs “Captains for defense; Counselors who are erudite and experimented; as well as Judges, Justices, and Administrators of the Royal revenues; and more than anything the situation in which Europe finds itself, Ambassadors, and public Ministers, who conserve the harmony that is requested in the States”.³¹ Furthermore, schools of Philosophy and the University in Coimbra “deserve equal reform”. The *curriculum* at the University of Coimbra fails in its mission to prepare for life unless it includes in its program of studies sciences such as “Physics, Natural History, (and) Astronomy”. Schools must per force include “all History of Universal Nature, of human Nature...Natural History, Botany, Astronomy, Chemistry, Metallurgy, and Medicine with all its parts.”³² Furthermore, the University needs to offer to students of Medicine, the mechanical, and the liberal arts, tools such as Cabinets of Curiosities, technology to learn Geography, Chronology, Natural History, and Natural Philosophy. The Cabinets should have “Birds, Fish, Animals, Insects, Trees, and the Plants of Africa, of Asia and America (...) Minerals, Stones, marbles, precious Stones, Salts (...) Balsams, and different soils and clays.” The Cabinet should also have a “pneumatic Pump, a Telescope, a Microscope, a prism, a model of a wind mill, a clock.”³³

The rhetoric used by these six authors demonstrates that none of them was Scholastic or Ancient-Peripatetic. They all argue for the epistemological superiority of the New Sciences. They all see themselves as enough experts on mechanical-mathematics and experimentalism to introduce it to Portugal *via* their published work. Also each advertises himself as the best candidate for two types of competitive positions as disseminators of Modern science: as science popularizers (Manuel de Campos, Castro Sarmiento, Inácio Monteiro,

³⁰ António Ribeiro Sanches, *Cartas sobre a Educação da Juventude* (1763). Coimbra: Imprensa da Universidade, 1922, p. 2.

³¹ *Ibid.*, p. 3.

³² *Ibid.*, pp. 153-154.

³³ *Ibid.*, pp. 161-162.

Teodoro de Almeida), or as radical reformist pedagogues (Verney, Sanches). In addition, they all make the case that by stubbornly refusing to reject Neo-Aristotelianism, science and education in Portugal will always lag behind all other European countries. Their works also demonstrate that the alleged connection, still part of the Portuguese unconscious collective and other cultural stereotypes, between preference for Modern natural philosophy over traditional Neo-Aristotelianism and religious affiliation, is not corroborated by the evidence. Manuel de Campos and Inácio Monteiro were Jesuits, Luís António Verney was regular clergy, Teodoro de Almeida was Oratorian, and Castro Sarmiento and António Ribeiro Sanches were Jewish physicians living in exile.

PART TWO. REGALIST SECULARIZING REFORMS AND THE NEW MONOPOLY ON KNOWLEDGE

As the previous narrative account demonstrates, by the middle of the 18th century Modern science was (at least in the form of ‘balanced eclecticism’) taught in Portuguese institutes of education, Jesuit and Oratorian alike. Individuals from these institutions published books about Modern science in an attempt to bring it from a context of private consumption to one of public circulation. One would think that the enthusiasm of João V, José I, and Pombal for Modern science, which had led them to fund Modern science lavishly, would lead them to authorize the Society of Jesus and the Congregation of the Oratorians to disseminate it unrestrictedly, therefore making it available to students and the educated public. But what followed in practical terms was at odds with this unbound enthusiasm for Newtonian science on the part of powerful patrons.

We know that the Jesuits had acquired an expertise in Modern science, and that they were transgressing their *curriculum* to teach it at their schools. But their attempt to make this teaching official at the College of Arts in Coimbra as early as 1712 was denied by João V. In a ‘Provision to the Rector of the University of Coimbra’, the king points that “upon having news at my Tribunal da Mesa da Consciência (a tribunal of intellectual censorship) and the Orders that the college of the Society of Jesus wants to introduce in the chairs of Philosophy another form of Lesson from the one which had been there observed, and that the statutes order...For the good, and I order that if there is any (noticeable) change in this matter you make it avoided, trusting

from your Zeal that you do not authorize this introduction.”³⁴ An official request in 1746 to incorporate mathematical-physical sciences at the College of Arts was again denied by João V. This time, he argued that the views of the Moderns were still “little received and useful to the study of the major sciences, as are (the sciences) of Descartes, Gassendi, Newton, and others...which deny the reality of the Eucharistic accidents or any other conclusions opposed to the system of Aristotle, whom in these schools is to be followed as it has been repeatedly recommended in the statutes of this College of Arts.”³⁵ The prohibition to have Modern science taught at Jesuit Colleges was only lifted in 1750. This was too late for the Jesuits. By 1755, the Prime-Minister of José I, Pombal, decided that their monopoly on both knowledge and education had to end swiftly and abruptly, and that the Jesuits had no place in Portuguese culture. Four years later, he expelled them from Portugal and its overseas colonies and protectorates.

Following in on the steps of João V, José I and Pombal decided to secularize and reform the alleged Scholastic framework at Christian minor schools, colleges, and Universities, and to therefore replace the *curriculum* of classical studies for one with Modern and practical courses useful to the Civic State. One implementation of this enlightenment ideal was Pombal’s creation, in 1761, of the Real Colégio dos Nobres in Lisbon. Modeled after colleges which had been founded in Spain in 1725 and in 1752, it was geared to the scientific and civic education of noblemen. Equipped with state of the art technology, the College opened its doors in 1767.

After the expulsion of the Jesuits, the public sessions of the Oratorian Casa das Necessidades continued to thrive, their books consecutively reedited with great success in Portugal and abroad. One would think that Pombal would be more than willing to have Oratorians replace the Jesuits in education, and have them continue to disseminate Modern science in the country. After all, the Oratorians had since 1737 advertised themselves as Moderns, or as Modern eclectic. But, just as with the Jesuits, Pombal decided to remove the remaining monopoly on knowledge from the Congregation of the Oratorians and, just as with the Society of Jesus, he eradicated the Order from Portugal. Soon after, he shut down the College of Arts, the

³⁴ Cited by Rómulo de Carvalho in *A Física Experimental em Portugal no Século XVIII*. Lisboa: Biblioteca Breve, 1982, p. 37.

³⁵ Cited by Dércio Ruivo Martins, *op. cit.*, p. 197.

College of Sto. Antão, the Casa das Necessidades, and the University of Évora.³⁶

How about the University of Coimbra?

In the ‘Preface’ to the *Compêndio Histórico do estado da Universidade de Coimbra*, written in 1771 by a team of intellectuals and aristocrats supervised by Pombal, José I made clear the need to reforming the University at Coimbra, whose reputation for excellence had been according to him irretrievably tainted by the presence of the Jesuits in Portugal. As the King put it in the introduction to the *Compêndio*, “after having ruined the Minor Studies with the occupation of the Royal College of Arts...the (Jesuits) moved on successfully to destroy successively the other Major Studies, with the bad end, today manifest to all, of precipitating my kingdoms....in the darkness of ignorance”.³⁷ The only way for him and for Pombal to get rid of the pernicious influence of the Jesuits was to completely destroy the entire institutional structure of the University of Coimbra and its Scholastic *curriculum*. This Pombal did in 1772. The *savants* who he selected to help him modernize the scientific culture at the University of Coimbra included Verney and Manuel do Cenáculo Villas-Boas, a Franciscan, for the Faculty of Philosophy, and Castro Sarmiento and Ribeiro Sanches, for the Faculty of Medicine.

The 1772 *Statutes of the University of Coimbra* announce the creation of six faculties: Theology, Canon, Law, Medicine, Mathematics, and Philosophy. He also followed in on the advice of Sanches and Sarmiento to build a Cabinet of Experimental Physics (with “machines” for teaching experimental physics), a Botanical Garden, a Chemical Laboratory, and a Museum of Natural History.³⁸ These so-called “Establishments” were all for the Faculty of Philosophy. The technology used in these laboratories as well as the books on Modern philosophy, were inherited by the University of Coimbra after the shutting down of the Jesuit University at Évora.

³⁶ It is not clear what happened to all of the books from the Library of the Jesuit University in Évora. Some were sent to the University of Coimbra, others to private libraries. Others were collected by Franciscan Villas-Boas for what is today the National Library of Portugal.

³⁷ Pombal et al. *Compêndio Histórico da Universidade de Coimbra no tempo da invasão dos denominados Jesuítas e dos estragos feitos nas Sciencias e nos Professores, e Dorectores que regiam pelas maquinações dos novos estatutos por eles fabricados* (1771). Lisboa: Regia Officina Typographica, p. 95

³⁸ Dércio Ruivo Martins, *op. cit.*, p. 220.

The results of Pombal's radical reforms were not as positive as he had expected. On the one hand, the Real Colégio dos Nobres failed to advance the scientific and practical areas, and it did not attract the sons of noblemen. It was shut down in due course, its technology and books also inherited by the University of Coimbra. The "program of implementation of the exact and natural sciences" at Coimbra was partly a failure as well. Once Jesuits and Oratorians were expelled from Portugal, almost no one in the country knew Modern science enough to teach it at the University. Pombal's solution was to hire professors from abroad, especially Italian, but this proved complicated because of linguistic barriers between students and teachers. The courses had to be taught in Latin, a move which, given the Enlightenment program he so wanted to follow, was at best idiosyncratic.

CONCLUSION

The Society of Jesus, the Congregation of the Oratorians, the Jewish community in exile, that were represented by the six individuals mentioned in this article, were all Modern, and their desire to introduce Modern natural philosophy to Portugal cut across religious boundaries. The perceived conflict between religion and science during the 18th century resulted from continual denials on the part of João V to authorize the Jesuits to modernize the philosophy *curriculum* at their schools, and José I and Pombal's historiographical revisionism which, like everywhere else in Europe, categorized the Jesuits as irremediably "Peripatetic-Arabic". Besides this powerful tool of anti-Jesuit propaganda, Pombal antagonized the Oratorians as well. More, he excluded from the scientific culture of Portugal intellectuals of every stripe whom he perceived as a threat to the Enlightened State and to his own administrative, cultural, economic, and educational imperialism. In the process, he stalled the Modern scientific *momentum* which was being disseminated in Jesuit and Oratorian Colleges during the first half of the 18th century.

In spite of all kinds of intellectual controls over the production of knowledge, which included censors from both the Inquisition and the Royal Academy of History, the most important books on Modern natural philosophy were produced during the reigns of João V and José I, as many of them were published abroad. An in depth explanation of the political motives which led to this state of affairs will be the topic of another article.

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