

A vulgar *Recreation*

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Abstract

Historical studies on public access to knowledge have been dominantly produced under the banner of “popularization of science”. Case studies on peripheral contexts can eventually disturb that unanimous bias, introducing a fresh approach in the way knowledge is accessed by a different but not necessarily wider audience. This case study focuses on *Philosophical Recreation*, a dialogue on natural philosophy for people who could not attend classes, written by the Oratorian priest Teodoro de Almeida (1722-1804). The essay suggests the expression “vulgarization” instead of “popularization” to clarify the way in which science was accessed in a peripheral context such as eighteenth-century Portugal.

Keywords: Popularization, public knowledge, vulgarization, peripheral context.

In the eighteenth century, natural philosophy encompassed a vast area of knowledge, practices and rhetoric about nature the boundaries of which were always somehow fluid and hardly unanimous.¹

Terms such as “physics”, “experimental philosophy”, “natural philosophy”, and “experimental physics” were usually used to describe a common body of knowledge about nature that nowadays we do include in scientific and engineering subjects such as mechanics, optics, electricity, hydrostatics or chemistry. It is always useful to emphasize that when we are talking about science or scientists in the eighteenth century, we are talking about something that was not recognised as such at that time, using expressions to refer to something that does not exist today, in the 21st century, namely natural philosophy.

It is a territory of variable geometry; it can even be said that there are several kinds of natural philosophy, which are relatable to particular ways of reasoning,

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¹ Simon Schaffer, “Natural Philosophy”, in G. S. Rousseau & Roy Porter (eds), *The Ferment of Knowledge* (Cambridge: Cambridge University press, 1980), pp. 55–91; John Gascoigne, “Ideas of Nature: Natural Philosophy”, in Roy Porter (ed.), *The Cambridge History of Science – Eighteenth-Century Science*, vol. 4 (Cambridge: Cambridge University Press, 2003), pp. 285–304.

practices and material means. The introduction of the concept of the public sphere comprised one of the major tools of analysis to understand the configuration processes of scientific knowledge in the eighteenth century.² However, the mechanisms of public access to natural knowledge in the eighteenth century have not been given as much attention, by historians of science, as that devoted to the processes and practices of science popularization in the nineteenth and twentieth centuries. The umbrella “science popularization” regarding the nineteenth and twentieth centuries does not fit the eighteenth century—at least the Portuguese eighteenth century — thus requiring a redefinition of terms used to characterize science as a public enterprise.

The case study developed here is a contribution to clarify some processes associated with public access to knowledge, in Portugal in the second half of the eighteenth century.

In 1751, the first two volumes of a ten-volume work usually designated as the *Philosophical Recreation, or Dialogue on Natural Philosophy, for the instruction of curious people who could not attend classes* (PR) (Figure 1), written by the Oratorian priest Teodoro de Almeida (1722–1804), were published in Portugal. To call it a “scientific book”, “textbook” or “book of dissemination of science” would imply establishing a demarcation that takes into account the factors of the context in which it was published. Popularization or vulgarization? Which is the most appropriate term to account for the place, the discourse, the practices and audiences assembled in this eighteenth-century text?

Addressing some of these issues will thus consist of describing the content of the PR, knowing how natural philosophy emerges in *it*, who was its real audience, and who read it.

1. Vulgar or popular?

The history of science popularization has been the subject of scrutiny by the latest historiography of science.³ Those proposals are all unanimous in criticizing the diffusionist model of science popularization based on an artificial distinction between the making and communication of knowledge.⁴

² Thomas Broman, “The Habermasian Public Sphere and “Science in the Enlightenment”, *History of Science*, XXXVI (1998), 123–149.

³ The literature on the subject is extensive. I confine myself here to mention the two most recent contributions: Jonathan Topham (org.), “Focus: Historicizing Popular Science”, *Isis*, 100 2 (2009), 310–368 and Faidra Papneloupoulou, Augustí Nieto-Galan and Henrique Perdiguero (eds), *Popularizing Science and Technology in the European Periphery 1800–2000* (Aldershot: Ashgate, 2009).

⁴ Jonathan R. Topham, “Introduction”, *Isis* 100 (2009), 318.

Following a trend theorized by James Secord in “Knowledge in transit”, Jonathan Topham resumes and develops the idea that science popularization—and related concepts such as “popular science” or “public science”—becomes part of the larger territory of science, seen as an “active form of communication.”⁵ This new umbrella in the history of science would include a more organic and articulated relationship between the making and communication of science, a historicization of the concept of popularization and a reformulation of the concept of history of popularization, now envisaged as history of “public knowledge” in a broad sense.

The study of practices, materials, actors and means of science popularization in peripherals and central contexts, carried out by some researchers of the group STEP (Science and Technology in the European Periphery) have added new perspectives to approach this field. These show not only the structuring character of popularization as a process of appropriation of science and technology in peripheral contexts but also the need to adopt comparative methodologies, which allow the mapping of routes of circulation of knowledge between centres and peripheries.⁶

Secord-Topham’s proposal of considering science as an active form of communication implies the matching of the emergence of science communication processes with that of “modern science” itself and, in this case, to consider the seventeenth century as the primary time of popularization. This logical step is precisely rejected—implicitly or explicitly—by historians of science. Science communication processes have had as many configurations as science, in the broadest sense, throughout their history. Therefore, as an alternative to “popularization” or “popular science”, other labels as “public science”, “polite science” or “public knowledge” have been used to designate discourses and practices of science construction as a public enterprise in Europe, in the seventeenth and eighteenth centuries. In the English case, Topham argues that “it makes no sense to speak of

⁵ James A. Secord, “Knowledge in Transit”, *Isis*, 95 (2004), 654–672. In truth, the first historiographical consistent reflection on the history of science popularization questioning the separation between the making and communication of science was made by Roger Cooter and Stephen Pumfrey, “Separate Spheres and Public Places: Reflections on the History of Science Popularization and Science in Popular Culture”, *History of Science*, xxxii (1994), 237–267.

⁶ Agustí Nieto-Galan and Faidra Papanelopoulou, “Science, Technology, and the Public in the European Periphery: A Report of the Fifth STEP meeting (1 – 3 June 2006, Mahon, Minorca)”, *Journal of Science Communication*, 2006, 5 (4), 1 – 5; Faidra Papanelopoulou, et al, op. cit (6); Josep Simon and Néstor Herran (eds.), *Beyond Borders: Fresh Perspectives in History of Science* (Newcastle: Cambridge Scholars, 2008).

“popular science” in Britain before 1800”,⁷ thus reserving the designations “science popularization” and “popular science” for subsequent periods.⁸

This distinction becomes even clearer when complemented with one concerning the use of different linguistic designations related to different contexts of dissemination of science in the eighteenth century.⁹

In the current Portuguese context, “popularização” (popularization), “divulgação” (disclosure) and “vulgarização” (vulgarization) share the same semantic field; the last two even have a common Latin etymological root: *vulgus*, a noun meaning people, crowd; and *vulgo*, a verb that can mean to publish, to disclose, to offer to everyone, etc.¹⁰ In the early eighteenth century, the *Portuguese and Latin Vocabulary (Vocabulario Portuguez e Latino, 1720)* by Rafael Bluteau gives the same semantic field to “vulgo” (common people) and “povo” (people); according to this author, “vulgar” (vulgar) is what we say about the “names, and language that is not Latin and that the common people speak” and “vulgarizar” (to vulgarize), which means to reduce to the popular state, turning something noble into something common and vulgar. And still according to the same dictionary, “divulgar” (to disclose) means “to set abroad; to publish, to make known to everyone”.¹¹ In the transition from the eighteenth to the nineteenth century, the dictionary of Antonio de Moraes Silva adds to the possible meanings of “vulgarisar” (to vulgarise): “divulgar” (to disclosure), “traduzir em vulgar” (to translate into vulgar), “publicar a todos” (to publish to everyone).¹² In none of these dictionaries; however, can we find words like “popularizar” (to popularize) or “popularização” (popularization); and the word “popular” (popular) is defined as “*cousa do povo*” (thing of the people) or referring to “*estilo de pregador*” (preacher style)” or to “*modo de falar próprio da plebe*” (the way of speaking of the plebs).¹³

⁷ Topham, “Introduction”, p. 316.

⁸ Ralph O’Connor assigns to “popular science” a broader sense embracing “science popularization” Thus “popular science” refers to “science of or for the people” whereas “science popularization” refers to the science produced by an elite and aimed at a wider audience outside this elite (Ralph O’Connor, “Reflections on Popular Science in Britain”, *Isis*, 100, 2 (2009), 340 – 343).

⁹ With reference to the semantic tribulations of the term “popular science” in the Anglophone context as well as the contributions, in this field, of Bernardette Bensaude-Vincent for the French context, please see Jonathan Topham, “Rethinking the History of Science Popularization / Popular Science”, in Faidra Papaneloupoulou et al. (eds), *Popularizing Science*, pp. 6 – 11.

¹⁰ *Dicionário de Latim Português*, 2nd edition (Porto: Porto Editora, 2001), p. 714.

¹¹ Rafael Bluteau, *Vocabulario Portuguez e Latino* (Coimbra: Real Collegio das Artes da Companhia de Jesus, 1713), p. 268.

¹² António de Moraes Silva, *Dicionario da Lingua Portuguesa*, 2nd edition (Lisbon: Na Typographia Lacerdina, 1813), p. 631.

¹³ Bluteau, *Vocabulario Portuguez* (Lisbon: Na Oficinas de Pascoal da Sylva, 1720), p.706.

Some of these words, beyond their mere denotative function, also have a strong social mark, and even moral; “vulgo” (common people) could be used as opposed to noble or honourable, and “vulgarizar” (to vulgarize) according to Moraes, could also mean either a decrease of the social status or the prostitution of the body.¹⁴ This brief excursion into the eighteenth-century lexicon allows glancing at some characteristics of the configuration processes of science in that century. Access to knowledge by a wider social group meant the widening of the area of distribution and the increase of the circulation circuits of natural knowledge. This new configuration implied that the literary communication of said knowledge also be made – in addition to Latin – in the local language, namely, it would imply the vulgarization of knowledge, “to publish, to make known to everyone”, “to translate into vulgar, to publish to all”. In this context, “vulgo” (common people) is not yet “povo popular” (popular people), but which only began to be established in the nineteenth century, and simply, for the people who can read in the vernacular. This cultural evidence, the degree of illiteracy of the place, turns science vulgarization into a process marked by the social nature of the audience involved. It is inseparable, as we will see in the case of the *PR*, from the practices and rhetoric of science vulgarization of that time.

2. *Philosophical Recreation, a vulgarization machine*

Teodoro de Almeida was born in Lisbon on 7 January 1722, entering the Oratorian Congregation at the age of thirteen. After one year of novitiate according to the Oratorian custom, he spent three years studying philosophy followed by four years in theology. Almeida studied natural philosophy with Father João Baptista. At the age of 26 he was appointed Master Professor of philosophy at the College of the Congregation.

In 1751, the same year that Denis Diderot and Jean d’Alembert published the first of the twenty-eight volumes of *L’Encyclopédie*, the first two volumes of Almeida’s *PR* were published in Lisbon. Its purpose was clearly stated by Teodoro de Almeida from its very beginning. In the subtitle he made explicit reference to a “Dialogue on Natural Philosophy for the instruction of curious people who could not attend classes” and, in the Dedication to King José I, Almeida claimed to be writing “not for those who are educated in deep learning, but for those that, by lack of books

¹⁴ “Vulgarizar o corpo”, ou seja, devassa-lo, prostituí-lo, como na frase “mulher que se vulgarizava ao primeiro que chegasse” (Moraes, *Diccionario da Língua Portugeza*, 2ª edição, p. 537).

written in their mother tongue, live without instruction”.¹⁵ The Dedication also included a diagnosis of the Portuguese cultural context of the time:¹⁶

I see that the wonders of nature are hidden from people; I see that an ugly avarice prevents those wonders from coming to light in the classrooms; I see that many noble and witted men live yet in a vile submission, following and revering ancient errors, and that they adore respectfully the shade because they have not seen yet the light.

The first volume (1751) discussed properties of motion, gravity and phenomena related to liquids. The second (1751) dealt with properties related to the senses—light, colour, heat, cold, smell, taste and flavour—and included a contrast between Moderns and Ancients, namely, concerning “Eucharistic Accidents” and “The Soul of Beasts”. The third volume (1752) dealt with the four Aristotelians elements—Earth, Fire, Water, Air—and the weight of air. The fourth (1757), subtitled *About man*, dealt with dioptrics, catoptrics, and “the other senses of man”, as well as “The Fabric of the Human Body”. The fifth volume (1761) was subtitled *About beasts and plants*, and the sixth “and last” volume (1762) was subtitled *About heavens and the world*.

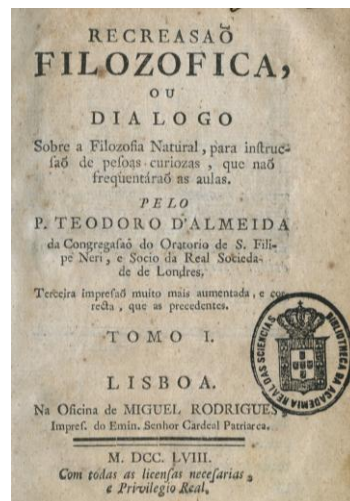


Figure 1 - Title page of Teodoro de Almeida’s *Philosophical Recreation*, Volume I, 3rd edition, 1763 (Library of the Academy of Sciences of Lisbon).

¹⁵ Teodoro de Almeida, *Recreação philosophica ou Dialogo sobre a filosofia racional para instrução de pessoas curiosas que não frequentarão as aulas*, I, 4th edn (Lisbon: Na Regia Officina Typografica, 1778), Dedication, pp. vii, ix. See, on Teodoro de Almeida and the appropriation of natural philosophy in eighteenth-century Portugal, José Alberto Silva, “The Portuguese popularizer of science Teodoro de Almeida: agendas, publics, and bilingualism”, *History of Science* 1 (2012), 93 – 122.

¹⁶ *Ibid*, pp. vi, vii.

Twenty-four years elapsed between the printing of vol. VII and that of vol. VIII, *Dialogue on metaphysics*, released in 1792. Then vol. IX, in 1793, was entitled *Natural theology or Harmony of reason and religion, or Philosophical answers to the arguments of unbelievers*, and vol. X, *Philosophical recreation about moral philosophy*, appeared in 1800.¹⁷ The first nine of those twenty-four years (1768–77), Almeida spent in exile, first in Spain and then in France, as a result of his opposition to the absolutist policy of the Marquis of Pombal, Prime-minister of King José I. Almeida returned to Portugal, in 1777, after the King's death and the dismissal of the Marquis of Pombal by Queen Maria I.¹⁸ In France, at Bayonne and Auch, Almeida had lectured on experimental philosophy and built instruments, while performing his pastoral duties as a priest.¹⁹

In his volumes Almeida criticized Aristotelian–Scholastic philosophy, advocating the use of modern philosophy, i.e., a mechanical explanation of natural phenomena based on experiment, which included, for example, the defence of atomism, the existence of a void, the weight of the air, the heliocentric view, and the Newtonian gravitational system.

A quick statistical survey conducted on the *PR*, shows the relative importance of the different topics covered in the work:

Topics	Pages	Afternoons ²⁰	Volume
1. Mechanics Kinematics, collisions, composition of movements Machines	240 (10.5%)	3	1
2. Hydrostatics	100 (4%)	1	1

¹⁷ Almeida wrote other works, mostly of a religious and moral nature. *One of them was The Happy Man, independent of fortune and of the world* (O feliz independente do mundo e da fortuna) (1779), a moral novel inspired in *Les aventures de Télémaque* by the French theologian François Fénelon, which became another best-seller in the Iberian Peninsula with 26 editions in Spanish (1779–1884) (See Zulmira C. Santos, “*Literatura e espiritualidade na obra de Teodoro de Almeida (1722–1804)*” (Lisbon: Fundação Calouste Gulbenkian / FCT, 2007), pp. 336 - 366).

¹⁸ For details on the banishment and exile of Teodoro de Almeida and other Oratorians see A. A. Banha de Andrade, *Contributos para a história da mentalidade pedagógica Portuguesa* (Lisbon: Imprensa Nacional/Casa da Moeda, 1982), 419 – 433.

¹⁹ During his exile in France Almeida exchanged letters with Francisco Sanches, asking for medical advice, and telling him about the machines he was building, his writings, and other incidents of his daily life. The letters were transcribed in Maria Leopoldina Azevedo, “P. Teodoro de Almeida, subsídios para o estudo da sua vida e obra”, B.A. diss. (Coimbra: Faculdade de Letras da Universidade de Coimbra, 1959, pp. 278–370).

²⁰ Dialogues were taken in the “afternoons” at Almeida’s house or rambling outdoors.

3. Fire			
Nature of fire	178	3	II & III
Subterranean fires			
Fireworks	(7.8%)		
Gunpowder			
Heat			
4. Water			
	60	1	III
	(2.6%)		
5. Air			
Air weight and spring	170	2,5	III
Pneumatic machine	(7.4%)		
6. Light			
Properties, reflection and refraction. Diffraction.	290		
Colours: Newtonian system.	(12,7%)	5	II & IV
The eye Lenses and mirrors			
7. Sound			
Nature and Propagation. Echo	40	1/2	II
	(1,8%)		
8. Smell, taste and cold			
	52	1	II
	(2.3%)		
9. Eucharistic accidents			
The Soul of Beasts	102	1	II
	(4.5%)		
10. The Man			
Senses, anatomy, blood, organs.	178	3	IV
	(7.8%)		
11. The Beasts and Plants			
Soul, memory sensation and generation.	393		
Insects, Birds, Fish, Shellfish and Land animals	(17.2%)	6	V
12. Heavens and the world (Astronomy)			
	480	5	VI
	(21%)		

Table 1 - Topics covered by Teodoro de Almeida's *Philosophical Recreation*.

Besides a thematic coincidence with similar works by other authors, Almeida's is a more extensive approach to natural philosophy, as shown by the inclusion of subjects of natural history. Still some topics were left out of the *PR*, as electricity or magnetism, which, however, were later to be included in the *Cartas Físico-Matemáticas (Physical-Mathematical Letters)*.²¹

Although dialogue was the literary genre chosen for all volumes of the *PR*, characters changed throughout the ten volumes. In the first eight volumes, the

²¹ Teodoro de Almeida, *Cartas Físico-Matemáticas para servir de Suplemento à Recreação Filosófica*, Tomo I – Sobre os Elementos de Geometria (Lisbon: Na Oficina de Rodrigues Galhardo, 1784); Idem, Tomo II – Sobre a Mecânica ou Leis de Movimento (Lisbon: Na Oficina de Rodrigues Galhardo, 1784); Idem, Tomo III (Lisbon: Na Regia Oficina Typografica, 1799).

dialogue involved three characters: Teodósio, an advocate of the Moderns and Almeida's alter ego; Sílvio, an Aristotelian physician who had graduated in Medicine at the University of Coimbra and was an advocate of scholasticism; and Eugenio, a military man conducting business in Court and an apprentice of modern philosophy. In the first eight volumes the dialogues took place mainly at Teodósio's house, where experiments were staged, or else while the interlocutors were rambling outdoors.

The "light of reason" and "experiment"—or "strokes of experiment"—are the rhetorical devices around which Almeida articulated his discourse on natural philosophy. The different themes of natural philosophy are presented under the motto "instructing by recreation" and supported by rhetoric of persuasion based on a dialogue and by resorting to experimental evidence, described or graphically presented in the engravings placed at the end of each volume, or cited from other sources.

In Almeida's discourse, "reason" emerges as a pervasive methodological precondition, operating on two levels. One is generically understood as a search for the truth the final purpose of which is to penetrate the core of both creatures and natural phenomena and in this way to unveil the vestiges of God's wisdom, the signs of which the wise Author of the world had imprinted on it. Almeida punctuates frequently his dialogue with this reason of the ultimate purposes, which is but design elevated to the category of the world's organizing principle. At another level, it is an operational and instrumental category. It is the kind of reason that structures the explanatory scheme of natural phenomena by using a deductive and geometric reasoning, which, according to Almeida, is independent from questions of faith.²²

The use of experiment is another methodological instance to which Almeida resorts throughout his dialogue on natural philosophy. Experiments are interwoven in his discourse making his arguments more solid. He conducts and describes some of these experiments; other experiments are purely conceptual and in this case Almeida illustrates them with drawings that he describes, by placing them in the engravings at the end of each volume (Fig. 1). Finally, he also uses experiments mentioned in texts written by foreign authors, whom he cites in order to reinforce his arguments. When experiments could not be performed, Teodósio's arguments were supported by several plates and descriptions of experiments selected from periodicals written in French such as *Journal des Sçavans*, *Mémoires de Trevoux*, and *Mémoires de l'Académie*,

²² Almeida, *PR*, VI (1762), p. 280.

as well as books including those of Stephen Hales (1677 – 1761), Jean-Antoine Nollet (1700–1770), Noel Regnault (1683–1762), Petrus van Musschenbroek (1692 – 1761), Willem Jacobs’s Gravesande (1688 – 1742) and J. T. Desaguliers (1683 – 1744), Newton (1643 – 1727), Buffon (1707 – 1788), Voltaire (1694 – 1778), William Derham (1657 – 1735) and Jan Swammerdam (1637 – 1680). Each volume ended with an “Index of the most remarkable things” and several plates illustrating most of the experiments reported in the text.

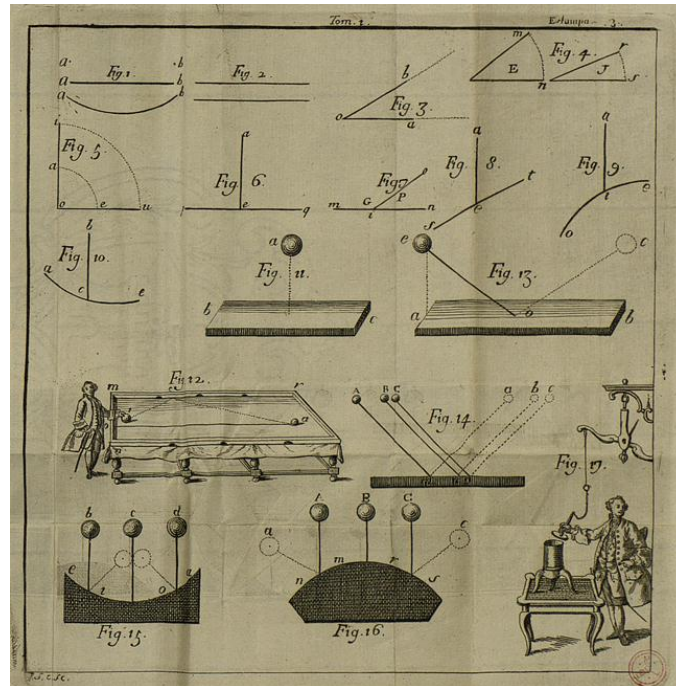


Figure 2 - Geometry and some laws of motion (PR, I, Plate 3). Figure 17 (bottom right of the plate) refers to weight of liquids.

The six volumes devoted to natural philosophy covered a variety of topics (see Table 1). From this list of topics it is easy to conclude that the purpose of the *PR* extended beyond natural philosophy, by addressing subjects that were considered to be part of natural history, such as descriptions of insects, fish and birds and even of some geological phenomena.

In the last two volumes of the *PR*, the context changed and the number of characters increases. Here he focuses on natural theology and moral philosophy; the opposing theses being those of the philosophers Diderot, Voltaire and Rousseau, presenting a number of characters with whom Teodósio, Almeida’s alter ego, and the fictional Baroness of Armendariz exchange arguments. The military and rural aristocracy—guests and visitors of the baroness’s house—shape the human landscape of the *PR*: a “Chevalier Sansfond”, an atheist colonel, a Protestant major, a baron, a

count, a marchioness, aunt to the baroness and play writer, and a commander, confront the views of the *philosophes* by resorting to “healthy philosophy,” which endorsed “Divine Religion” against the “unbelievers,” as advocated by Teodósio.²³

The program undertaken by Almeida to instruct those who could not attend classes, in other words with no secondary education, led him to avoid, although not completely, the introduction of mathematics in the *PR*. The nature of the subjects that he addresses such as, for example, the composition of motions, levers, hydrostatics or the relation between forces and speeds, makes him resort to arguments of the geometric nature included in the prints of the book. There were situations, however, in which he could not avoid the use of mathematics, as in the case of the Kepler's laws, the law of gravitational attraction, the determination of the mass of the planets, or the Newtonian theory of tides covered in the *PR*'s Volume VI.²⁴

3. The reaction of his contemporaries

The publication of the *PR* was devilled with controversy from the very beginning. One of the disagreements revolved around themes that today one could no longer consider marginal to the scientific paradigm but which, in the eighteenth century, were still part of the corpus of natural philosophy, due to their relationship with religion: the existence or not of a soul in beasts and the Eucharistic accidents. Is not the place here to develop this line of controversy but merely to mention that Almeida defended in the *PR* a line of argument close to the Cartesian *doxa*: beasts have no soul, or at least not the same as humans; as regards the Eucharist, Almeida claimed that accidents are not entities distinct from substance, as defended by the advocates of scholasticism; and as such, as form was not an entity distinct from matter but the way matter presents itself, it is thanks to the miraculous divine intervention that the bread and the wine—when they become, in the Eucharist, the body and blood of Christ—retain their characteristics, such as taste or smell.²⁵

The other line of controversy involved experimental philosophy and the way it was conveyed in the *PR* in opposition to a qualitative, speculative and inclusive approach of natural phenomena hitherto practiced in colleges and universities, known as “ancient philosophy” or “peripatetic philosophy.” Conversely, Almeida

²³ Almeida, *PR*, IX (1793), “Dedicatória”, pp. 7, 8.

²⁴ In the latter case, the cause of tides, Almeida not only proposes its own theory, even more complete than the one proposed by the Newtonian doctrine, but he constructs a tool intended to prove his theory.

²⁵ Almeida, *PR*, I, p. 308.

defends an approach to the natural phenomena of nature based on experiment and the use of mathematics as an analytical instrument.

One of the argumentative strategies of the staunchest opponents to modern philosophy and, namely, of the *PR*, consisted of its depreciation and philosophical downgrading by relegating it to a mere text to be used in schools that taught children how to read and, at the same time, philosophise.²⁶ There were two distinct arguments to temper this controversy: one was the use of the vernacular, or vulgar, instead of Latin; the other concerned the public nature of lectures on experimental philosophy, which were inaugurated in 1751 in one of the colleges of the Oratorians in Lisbon, *Casa das Necessidades*, by Father João Baptista, and then continued by Teodoro de Almeida. One of the staunchest critics of Almeida was the Jesuit Paulo Amaro who criticized the public lectures on experimental physics delivered by Almeida in the *Casa das Necessidades*: “what was practiced there was a deception of simple idiots who considered that to be a Physicist was as easy as to visit two exhibitions, which, without any science of Physics, are shown in some cities of France and Italy, simple Machinists.”²⁷ He added ‘that there [at *Casa das Necessidades*] Science was almost prostituted, as it was communicated to many people who were even deprived of the rudiments of the Latin language.”²⁸

In addition to epistemological arguments, Almeida’s critics directly related these new practices of public access to knowledge to the social status of their attenders. On the frontispiece of another printed text, which criticises the theses defended in *the PR*, one reads, anonymously, that the *PR* is a “very useful work for the present century, since even maids, and simple barefoot women, pride themselves of knowing much philosophy.”²⁹

A criticism of a different nature was the accusation of plagiarism against the *PR*. This accusation has to be understood in the light of the Portuguese context of the time. It began right after the publication of the first two volumes, became recurrent

²⁶ This is the argumentation presented by Philiarco Pherepono, *Mercurio Philosophico dirigido aos Philosophos de Portugal* (Augusta: Veith Martin, 1752), p. 44-45. This text, signed with a pseudonym, is assigned to the Jesuit Paulo Amaro (1695-1754/8), professor of rhetoric at the College of the Arts (See Francisco Contente Domingues, *Ilustração e Catolicismo: Teodoro de Almeida* (Lisbon: Colibri Editions, 1994) pp. 53, 77-78).

²⁷ The original reads: “que o que ali se praticava era hum engano de simplicis idiotas, que cuidavão, que o ser Physico custava tão pouco, como o ver huas exibiçoens, que, sem sciencia algua da Physica, ostentaõ em algumas Cidades de França e Itália, huns puros Maquinistas.” Paulo Amaro, *Idem*, p. 8.

²⁸ The original reads: “que ali [Casa das Necessidades] quasi se prostituía a Ciência, comunicando-a a muitos, que se achavam destituídos ate dos primeiros rudimentos da língua latina.” *Ibidem*, p. 7

²⁹ The original reads: “obra utilíssima para o século presente, em que athe as creadas de escada abaixo, e as mulheres de pé descalço, cântaro, e rio, etc., se prezão de saber muita Philosophia.” Famião Ferão Philaethe, *Palinodia Manifesta* (Sevilha: Antonio Bucaferro, 1752).

and was taken up again thirty years later, when the Royal Academy of Sciences of Lisbon was founded, in 1780, Almeida being one of its founders.

Already in 1752, Almeida had been accused of having plagiarized “certain little French books” written in the form of a dialogue and which he had identified, when replying to the accusation, as being *Les Entretiens physiques* authored by the Jesuit priest Noel Regnault.³⁰ A simple comparison between the *PR* and the *Entretiens* shows, however, the abusive character of the accusation. In effect, the similarities end with the themes Almeida dealt with, the format he adopted and the use of dialogue as a literary device. The differences between both works are, indeed, more substantial: a more accentuated and obvious Cartesian character in Regnault rather than in Almeida, in explaining natural phenomena, and a more obvious distance from the Newtonian approach to natural phenomena adopted by the French author.³¹

About fifty years later, the new-born Academy of Sciences of Lisbon, has its inaugural session on 4 July, 1780. Teodoro de Almeida was the selected speaker and his *Oração de abertura (Inaugural Speech)* was surrounded by controversy among his critics and fellow academicians.³² One of the various letters criticizing Almeida’s *Speech* reads: “today who will bother to look at it, when other much more perfect philosophical courses by Gravesande, Muschenbroeck, Nollet, which your Reverend has subserviently plagiarized, are in the hands of the Portuguese?”³³ This time the accusation is even more unreasonable, because not even formally their writings have any resemblance to the *PR*.

In his reply to the accusers, Almeida touches a recurring aspect, which in some way derives from his position as an author of a peripheral country. By pointing out the differences between his *PR* and the *Entretiens*, Almeida argues that the absence of references to scholasticism in the French text is explained by the fact that

³⁰ Teodoro de Almeida, *PR*, III (2nd ed., 1753), pp. 11 – 19.

³¹ José Alberto Silva, *A apropriação da filosofia natural em Teodoro de Almeida (172 – 1804)* (Lisbon: CIUHCT - Centro Interuniversitário de História das Ciências e da Tecnologia, 2009), pp. 38 – 40. In his defence a contemporary, the Jesuit Inácio Monteiro in his *Compendio dos Elementos de Mathematica (1754/1756)* mentioned that the accusation of plagiarism against Almeida’s *PR* was a criticism with “less sincerity and truthfulness than it should have” claiming that “its author benefited his nation with this book” (Inácio Monteiro, *Compendio dos Elementos de Mathematica*, vol. I (Coimbra: Real Colegió das Artes, 1754), pp. 328 – 329, apud Miguel Corrêa Monteiro, Inácio Monteiro (1724-1812). *Um jesuíta português na dispersão* (Lisbon: Centro de História da Universidade de Lisbon, 2004), p. 384).

³² Almeida’s inaugural speech as well as letters criticising it are transcribed in Cristóvão Ayres, *Para a História da Academia das Ciências* (Coimbra: Imprensa da Universidade, 1927), pp. 97 – 121.

³³ “Sátira. Espalhada contra um religioso de S. Filipe Néri por ocasião de uma prática que disse na abertura da Academia das Ciências em Lisbon, 1783”, BNP, ms. 236, n° 20.

“in France people no longer talk about it,” contrary to “our Lisbon, where there are many patrons of scholasticism.”³⁴ Almeida is referring to Portuguese cultural backwardness, which he had already addressed on another occasion, at the end of the “Preliminary Discourse about the History of Philosophy”. From the third edition onwards, it is located at the beginning of volume I of the *PR*: “no wonder the progress of it [philosophy] which will be made by the Portuguese, when daylight although late will dawn on them intense and bright enough to lead them to the knowledge of the truth.”³⁵ He would address this topic again in the inaugural speech of the Academy of Sciences of Lisbon, which stirred harsh criticism towards him.

4. The audience of *Philosophical Recreation*

Criticism of authority, eclecticism, the use of Portuguese instead of Latin and the refusal to tackle metaphysical issues supported the main rhetorical devices used by Almeida:

I will not follow any school; neither will blindly follow any specific Author; but only what, to the best of my knowledge and belief, enables me to reach the truth.... I do not follow the style used in schools since it is less pleasant and less clear; neither do I argue through metaphysical issues used in classes, because my plan is to write to all and not to only a few.... My aim is to enlighten and at the same time entertain my readers.³⁶

The didactic or pedagogical purpose of the *PR* is clear. Many texts of this period, the eighteenth century, which addressed topics of natural philosophy, shared this same goal. The *PR* did not escape the spirit of its time: Regnault, Nollet and Antoine-Noël Pluche (1638–1761) are some of the authors who ornament the reference frame claimed by Almeida in the *PR*. This pedagogic trace is enhanced by Almeida when, to justify the publication of the seventh volume on Logic following the other six volumes on Natural Philosophy, he refers to it as advantageous for the instruction of youth to give first “such a good idea of the study of Physics”³⁷ followed

³⁴ Almeida, *PR*, III, p. 12

³⁵ Almeida, *PR*, I, p. lviii, lix.

³⁶ *Ibid.*, prologue, pp. VII, IX and X.

³⁷ *Cartas*, tomo I, p. 4

by the study of Logic, finding in Physics “good examples of its dictates.”³⁸ Moreover, consistent with his perspective, Almeida would also publish three volumes of *Cartas Físico-Matemáticas (Physical-Mathematical Letters)*, designed to serve as a complement to the *PR*, in which some of the topics addressed in the *PR* are developed in the form of letters.

The *PR* brought together the necessary ingredients to become, as it came to pass, a publishing success. It was a didactic approach to natural philosophy, written in Portuguese and in a peripheral context in which the editorial production of texts on natural philosophy in Portuguese was scarce, not to say non-existent. It corresponded to what is now called, with some understatement, “market needs.” Each volume of the *PR* had at least five or six different editions in Portuguese and several Spanish translations, the last of which dated back to 1873.³⁹ Each volume of the *PR* sold in the library of the Oratorians of the *Casa do Espírito Santo*, was worth 400 réis on paper or 500 réis with a cover⁴⁰. However, in accordance with the standards of that time, that price was not within reach of every pocket.

Latin America was, by way of the translations intended to the Spanish colonial circuit, another area of appropriation of the *PR*. The Jesuit priest and historian Guillermo Furlong (1889–1974) mentioned that Almeida's *Philosophical Recreation* was as popular in the province of Rio de la Plata, Argentina, as the writings of Benito Feijóo (1676–1764), and that there were several texts of natural philosophy written by local authors throughout the eighteenth century, which quoted Almeida, alongside Nollet, the Oratorian Vicente Tosca (1651–1723) and Gravesande, among others.⁴¹ Also in Mexico, the writer Fernandez de Lizardi (1776–1827), in his novel

³⁸ *PR*, tomo X, p. 2.

³⁹ A list of Almeida's books translated into French and Castilian are included in Zulmira C. Santos, op. cit. (17), pp. 433 - 438.

⁴⁰ In comparative terms, in 1733, the daily wage of an apprentice with two years of training ranged between 200 and 240 réis and the one of a workshop master was 600 réis; in 1755, the cost of a pound (459 g) of codfish or rice was about 35 réis (E. F. de Oliveira, *Elementos para a história do município de Lisbon*, volume IX (Lisbon: Tip. Universal, 1882-1943), apud Marie-Hélène Piwnik, *O Anónimo – Journal Portugais du XVIIIème siècle (1752 – 1754)* (Paris: FCG, 1979), p. 88. In Porto, in 1780, a green wine almude was worth 180 réis and a chicken 240 réis; the daily working time of a agricultural laborer was 80 réis e the one of a worker with a yoke of oxen was 250 réis (Vitorino Magalhães Godinho, *prix et Monnaies au Portugal, 1750-1850* (Paris: Armand Colin, 1955), p. 82-84, apud João Luís Lisboa, *Ciência e política: Ler nos finais do Antigo Regime* (Lisbon, 1992, p. 60). The salaries of the 837 teachers and professors created by the law of November 6, 1772 were around 90,000 réis a year in Lisbon and between 40,000 and 60,000 réis in the rest of the country.

⁴¹ Guillermo Furlong, S.J., *Nacymiento e Desarrollo de la Filosofia en el Rio de la Plata, 1536-1810* (Buenos Aires: Guillermo F. Kraft, 1952), pp. 254-255, 271-271, 296, 376, 400. On the translations and Spanish subscribers of Teodoro de Almeida see, of Marie-Hélène Piwnik, “Les souscripteurs espagnols du P. Teodoro de Almeida (1722–1804), *Bulletin des Études Portugaises et Brésiliennes*, (1981), 95 -119 and “Une entreprise lucrative: Les traductions en espagnol du Père Teodoro de Almeida”, Archives of the Portuguese Cultural Center, XXXI (Paris: Fundação Calouste Gulbenkian, 1992), 199 – 206 and Robert Ricard, “Sur la difusion des oeuvres du P. Teodoro de Almeida”, Off-print of the *Boletim InternacionaL de Bibliografia Luso-Brasileira*, IV, 4 (1963), 1-9.

El Periquillo Sarniento, introduces Almeida's *PR*, alongside works by Nollet, or Pluche Bufon, as works that "are useful, entertaining and fun, because the understanding does not find in them the abstract character of theology, the uncertainty of medicine, the intricacies of law, nor the thorniness of mathematics. Everything fulfils, everything delights, and everything captivates and teaches, both in physics and in natural history."⁴²

Another case of circulation of the *PR* is its use in the university context. In Portugal, Giovanni Antonio Dalla Bella (1730–1823), from 1772 professor of experimental physics in the reformed University of Coimbra, used the *PR* as a reference in organizing the Physics Cabinet, by quoting it in the *Instrumentorum Index*.⁴³ Also at the University of São Carlos in Guatemala, the *PR* was used as a manual in the eighteenth century.⁴⁴

Although it was intentionally written for an audience that Almeida characterized as "curious people who could not attend classes," one should envisage this audience as a virtual entity that hardly corresponded to the low level of illiteracy characteristic of the eighteenth-century Portugal. In the absence of a list of the *PR* subscribers, or the number of copies of each volume, it is therefore necessary to resort to indirect evidence such as the number of editions of each volume, the translations, the profile of the audience for similar publications or the price at which each volume of the *PR* was sold. An analysis of the subscribers list of the three most significant periodicals of the time, *Anónimo* (Anonymous) (1752–1754), *Gazeta Literária* (Literary Gazette) (1761–1762) and *Jornal Enciclopédico* (*Encyclopaedic Journal*) (1779–1806), allows us to infer the socio-professional profile of the *PR* readers as being characterized by a literate elite — which includes teachers, clergy, state officials, judges, academics, lawyers, soldiers, nobles, and burghers.⁴⁵

⁴² The original reads: "son útiles, amenos y divertidos; porque el entendimiento no encuentra en ellos lo abstracto de la teología, la incertidumbre de la medicina, lo intrincado de las leyes, ni lo escabroso de las matemáticas. Todo llena, todo deleita, todo embelesa y todo enseña, así en la física como en la historia natural." Fernández de Lizardi, *El Periquillo Sarniento*, tomo I, cap.VIII, 1817, transcription of the 4th edition in http://www.cervantesvirtual.com/obra-visor/el-periquillo-sarniento-tomo-i/html/a40e3bfe-0032-4f4f-8a9e-a38607b7cb08_3.html#12 (10/8/2012).

⁴³ Rómulo de Carvalho, *História do Gabinete de Física da Universidade de Coimbra* (Coimbra: Universidade de Coimbra, 1978), pp. 128 -130

⁴⁴ John Tate Lanning, "The reception of the Enlightenment in Latin America", in Arthur Whitaker, ed., *Latin America and the Enlightenment* (Ithaca: Cornell University press, 1961), p.73.

⁴⁵ For a more detailed discussion see José Alberto Silva, op. cit. (15), 107 – 111. Despite women being absent from these subscribers lists, it does not allow us to exclude them from the group of *PR* readers. In fact, 126 (5%) of a group of 2420 library catalogs, collected by the Royal Censorship (Real Mesa Censória) in 1769/70 all over the country, were owned by women (Maria Adelaide Salvador Marques, A Real Mesa Censória e a Cultura Nacional", *Boletim da Biblioteca da Universidade de Coimbra*, XXVI (1964), 83 – 87).

In the Iberian circuit, the translation and dissemination of Teodoro de Almeida's books went beyond the translations of the *PR*. The promotion and subscription of the *Physical-Mathematical Letters* in Spain, was analysed by Marie H el ene Piwnick from the list of subscribers of the *Gazeta de Madrid* (*Madrid Gazette*). The profile of the readers is similar to the formerly presented: nobility (5%), clergy (20%), and then a group of people belonging to a foreign elite of magistrates, physicians and civil servants (85%).⁴⁶

One of the specificities of the *PR* in relation to French and Dutch similar texts has to do with the double linguistic barrier, which Almeida set out to overthrow. This specificity derived from his situation of a peripheral author. It was not Latin, only, but also the ignorance about foreign languages—'French, English German and others'—which, according to Almeida resulted in an obstacle preventing access to natural philosophy, a 'barbarian cruelty', which forced 'those who knew no other language besides their own to be ignorant.'⁴⁷ The vernacular of the *PR* fulfilled the purpose of circumventing the Latin barrier—a common purpose shared by other foreign books also written in the vernacular—but added another, that of circumventing the inaccessibility to part of the Portuguese audience of texts written in foreign languages.

It is not surprising that a multivolume book published over 50 years, encompassing such a multiplicity of topics, has had different receptions throughout this very period. In the Iberian context and of its colonial ramifications it is unique. The absence of publications vulgarizing the natural sciences, in the local language—Portuguese and /or Castilian—made obvious the *PR*'s popularity. A hypothesis to be considered is that in Iberian colonial contexts, the difficult availability of publications popularizing science, in addition to the linguistic barrier, made the *PR*, and to some extent the *Letters*, a vehicle more immediately accessible to the sciences.

5. Conclusion

The processes of access to scientific knowledge by a wider and unskilled audience have usually been labelled "science popularization". In the nineteenth century and

⁴⁶ About the translations and Spanish subscribers of Teodoro de Almeida see Marie-H el ene Piwnick, "Les souscripteurs espagnols du P. Teodoro de Almeida (1722 – 1804)", *Bulletin des  tudes Portugaises et Br siliennes*, 42 (1981), 95 -119 e "Une entreprise lucrative: Les traductions en espagnol du P re Teodoro de Almeida", *Arquivos do Centro Cultural Portugu s*, XXXI (Paris: Funda o Calouste Gulbenkian, 1992), 199 – 206.

⁴⁷ Almeida, *PR*, I, Pr logo, p. 17.

even in many contexts of the twentieth century, of which the Portuguese case is an example, popularization is an essentially urban phenomenon, where it involves only part of the literate population. The fact that scientific knowledge overflows beyond the limits of the production elite does not imply that we should hasten to label this process “science popularization. “Terms such as “disclosure” or “vulgarization” are more appropriate to describe the phenomena of public access to science in the eighteenth century.

Teodoro de Almeida’s *Philosophical Recreation* is a good example of how, from a historical point of view, the determination of the scientific character of a text is inextricably linked to its circumstances. One obviously risks anachronism when looking at *Philosophical Recreation* on the basis of equivalence. To vulgarize natural philosophy is not the same as, or not equivalent to, popularize science.

The apparently paradoxical fact that one is dealing with a work that was intended for the instruction of curious *people unable to attend lessons* and was, at the same time, a reference text used as a university manual, shows this. Without being popular in the proper sense of the term, it was, however, read by a wider, new type of elite, different from the hitherto usual consumers of natural philosophy. While summoning an audience until then unable to access scientific knowledge, Almeida presented them the model. The characters who populate the *PR* served as a model to the very audience to whom it was intended: Eugenio, a military man holding business in Court, a doctor, a baron, a brigadier, a colonel, a baroness, a marchioness and a bailiff.

Spanish subscribers of the *Letters* together with the Portuguese subscribers of publications vulgarizing the natural sciences such as the *Encyclopaedic Journal (Jornal Enciclopédico)* define the sociological profile of an elite indexed to new rituals and circuits of knowledge from which Latin and university scholastics were excluded. An elite, free from scholastic confinement, took the sciences and their vulgarization as a vehicle of cultural expression. This public could purchase and read the *PR* and their social status defined a degree for vulgarization and this, in turn, acted as their cultural legitimization.

If I were to choose a designation for the *PR*, I believe a “book of vulgarization of natural philosophy in the eighteenth century” would be the most appropriate.