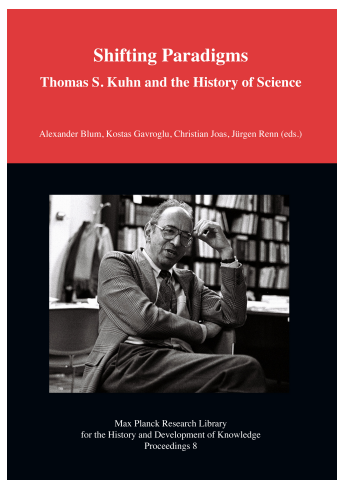


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Ana Simões:

History of Science and Technology in Portugal: Networking in the European Pe-
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Chapter 27

History of Science and Technology in Portugal: Networking in the European Periphery

Ana Simões

Introduction

Perhaps one of the most striking changes that took place in the discipline of history of science and technology in the last few decades has to do with the parallel processes of professionalization and internationalization of communities located outside of well-established communities such as those in the UK, France, Germany, the Low Countries or the United States of America. This process has encompassed communities in many countries of the European periphery, as well as countries in Central and South America, Asia, Oceania and to a lesser extent, Africa. The study of how the discipline has been developing in these various places will enable us to put into perspective developments that are associated with the so-called “European Center”¹ and the US, which are often taken as exemplary models. I have in mind questions such as: the background and training of future historians of science and historians of technology, the location of these communities within local university systems, their positioning vis-à-vis scientists and social scientists, their struggle for financial support and their relation to other co-related communities, such as those of historians of technology and historians of science, philosophers of science, science and technology studies scholars and so on. Furthermore, it will enable the enrichment of scholarly debates with various case studies stemming from other locations, using different methodological apparatuses and often contributing to the revision of former historiographical perspectives and the introduction of new ones, creating a global history of science and technology.

Notwithstanding contributions to the history of the nautical sciences and cartography associated with the Age of Discovery, as well as episodic and scat-

¹Since the sixteenth and seventeenth centuries, the reference to European science has usually encompassed the space enclosed by a “polygon starting in Krakow, going onto Padua and Florence, proceeding to Paris and London to Edinburgh and completed at Kracow including the Low Countries,” which has come to roughly define the European Center, Gavroglu (2012, 311–12).

tered contributions to the history of medicine and mathematics, often authored by scholars interested in the history of their respective disciplines, in Portugal, the emergence of a professional community of historians of science and technology working according to international standards of scholarship is a relatively recent phenomenon, dating back only to the early 1990s. This process profited from the confluence of several events. Among these were the end of a long dictatorial regime spanning half of the twentieth century, the establishment of a democratic regime following the revolution of 25 April 1974 (known as the Carnation Revolution), the subsequent decolonization process from former colonies in Africa and the integration into the European Union. These all posed innumerable challenges, which created the conditions for a reassessment of Portugal's position in the mosaic of nations, and the rethinking of its national identity in relation to other European countries, its former colonies and the world at large. Long held beliefs about national grandeur and the "importance" of Portugal during the last four centuries came under intense scrutiny, both at an academic level as well as in the public discourse. The environment and energy crises, together with severe criticisms towards science and technology as had been previously understood, brought forth the need for different models of development and questioned the strong relation of science and technology to "progress." In this framework, many people started to reconceptualize the past roles of science and technology, which came to include the history of science and technology, as well as the philosophy of science. With the onset of the democratic regime and the free circulation of information, the Portuguese book market opened up and publications skyrocketed. This was the period when Thomas Kuhn's *The Structure of Scientific Revolutions*, (in English or in various translations),² and books from participants of the *Annales* school, invaded academic libraries, bookstores and private homes, becoming catalytic for Portuguese intellectuals who started to rethink former models of historical and scientific change. These events set the scene for the creation of the first academic courses in history of science and technology and philosophy of science, as well as the training of those who were to become part of the first generation of professional historians of science and technology.

In the past 20 years, new undergraduate and graduate courses have been created, younger generations have steadily been trained and networking has contributed to the consolidation of the ties among members of this emergent community. At the same time, it has reinforced their participation in international events and collaboration in international research projects and/or networks. On a national level, this community has been discussing new case studies and revising

²Despite the fact that Kuhn's *The Structure of Scientific Revolutions* was just translated by a Brazilian publisher, never by a Portuguese one, Spanish and French translations, together with original versions, soon populated academic libraries.

old ones, avoiding the past discourses that often oscillated between nationalistic claims of unacknowledged grandeur or sheer miserablism.

This process has run parallel with a concerted effort to inscribe scientific and technological historical narratives within the narratives of the history of Portugal, which despite new trends, is still often oblivious of the role played by science and technology in shaping past political, institutional, economic and social processes and episodes. At the international level, networking has proved fundamental to discuss, experiment and appropriate various methodological tools suitable to frame the narratives of Portuguese historians of science and technology.

There is much specificity about Portugal that should be kept in mind: Portugal is a very old peripheral European nation, facing the immensity of the Atlantic ocean, which has stabilized mainland borders dating back to mid-thirteenth century, and which possessed a huge and long lasting overseas empire stretching over three different continents (South America, Asia and Africa), posing huge logistical and political problems. Some historiographical frameworks have proved particularly helpful in informing new historical narratives.

In this paper, I will analyze how the recent process of professionalization and internationalization of an emerging community of Portuguese historians of science and technology has profited from its networking abilities, specifically from the ensuing discussion of a number of questions such as: how should one address the study of science and technology in countries of the European periphery, such as Portugal, in order to avoid the pitfalls of a historiography of transmission with its associated Manichaeistic opposition between creative center and passive periphery? How does the attention paid to the role of agents and settings stemming from peripheral contexts enrich the analysis of the circulation of knowledge in extended networks? How do they help to reassess the articulation between the local and the global? How does the perspective from the periphery help to historicize the notion of European science and to deconstruct its purported homogeneity into a dynamic interaction of heterogeneous spaces of practices evolving in an interconnected, lumpy world?

Mapping the Contours of a Young Professional Community

As often happens in peripheral countries such as Portugal, it was due to international networking, and specifically to the efforts of Aldo Mieli, that the so-called Portuguese Group of History of Science was created in the early 1930s, during the dictatorial regime of António de Oliveira Salazar. The group was responsible for the organization of the Third International Congress for the History of Science in 1934, in which George Sarton, then president of the Académie Interna-

tionale d'Histoire des Sciences, participated and delivered the inaugural speech.³ They launched a journal called *Petrus Nonius*, the Latin version of the name of the sixteenth-century Portuguese mathematician and chief-cosmographer, Pedro Nunes, who had fostered the transformation of navigation from a practical art into a scientific subject. The journal ran from 1937 to 1951, the year in which the group was dismantled. Eclectic in composition, the group included mostly university professors or academics, specifically physicians and mathematicians, whose approaches often resembled those of amateur scientist-historians.⁴ Many held positions at the University of Coimbra, the oldest institution for higher education in Portugal. Besides articles from members of the group and foreign experts, the journal published news of events related to the discipline, including conferences and courses, and discussed the connections between history of science and the teaching of science. The prominence given to topics in the history of the nautical sciences (fifteenth and sixteenth centuries) and to a lesser extent, to subjects associated with the eighteenth century reforms of the enlightened despot, Marquis of Pombal, reflected a nationalistic zeal to claim a place for Portugal in the scientific history of Europe. Furthermore, by often emphasizing the establishment of priorities as an integral part of the construction of a national historiography, papers often called attention to the purported originality of local scientists.⁵

Nationalistic (and colonialist) discourses were also typical of many commemorative events organized by the dictatorship, such as the 1937 First Congress on the History of Portuguese World Expansion, and the Congress on the History of Portuguese Scientific Activity, which took place during the impressive Exhibition of the Portuguese World (1940), organized to celebrate the nation's foundation in 1140 and its independence from Spain in 1640 (Corkill 2005). In these partisan celebrations the past of the sciences was used in a master narrative to exemplify the leading role of the country in building Western civilization.

From the 1940s onwards, the history of the nautical sciences, cartography and medicine, attendant to the history of Portuguese maritime expansion, grew as the result of the research of an handful of outstanding Portuguese historians (with backgrounds in science), including the brothers Jaime Cortesão (physician) and Armando Cortesão (agronomist engineer), Luciano Pereira da Silva, Duarte Leite and Luís de Albuquerque (all mathematicians by training). They often op-

³Sarton's recollections were published in *ISIS* (1935).

⁴Both in the history of mathematics and the history of medicine, a tradition can be identified going back at least to the nineteenth century. The physician Maximiliano Lemos contributed to the history of medicine, and the mathematician Gomes Teixeira to the history of mathematics, both of them playing leading roles in conferring authority and credibility to their respective areas.

⁵For a detailed discussion of the events mentioned in the first three paragraphs of this section, see Simões, Carneiro, and Diogo (2008). In a sense, this paper is a follow up of the discussion initiated therein.

posed the received historiography with its congratulatory and patriotic overtones, although from different perspectives. The Cortesão brothers, for example, took the standpoint of the History of Portugal, for which colonialism and territorial expansion were part and parcel of “being Portuguese” (*portugalidade*), while Albuquerque took the viewpoint of the history of science. He discussed with erudition and rigor the role played by the navigational practice of pilots and seamen, as opposed to a theoretical knowledge of nautical sciences, in informing successive stages of the oceanic voyages.⁶ Through Albuquerque, the Dutch historian of science, R. Hooykaas became aware of the role of the Portuguese oceanic voyages and geographical expansion, which for European and North American historians were obfuscated by those of the Spanish and the Dutch. Hooykaas took it upon himself to bring the attention of the international community of historians of science to the role of the Portuguese encounters in setting the stage for the emergence of modern science (Hooykaas 1966).⁷

A decade after the disappearance of the Portuguese Group of History of Science, an attempt to introduce history of science courses in the curricula of undergraduate science courses at the University of Coimbra took place due to the connection between Albuquerque and Hooykaas. While this attempt failed, it was only in democratic Portugal after 1974 that history of science courses were successfully introduced into the undergraduate curriculum in some Portuguese universities. The longstanding interest of some science professors at the University of Coimbra explains why the historian of science Allen Debus was invited to teach some short courses in the 1980s. It also accounts for the parallel organization of an international meeting, sponsored together with the International Union of the History and Philosophy of Science and the International Council of Scientific Unions (Debus 2009), as well as the organization of two celebratory symposia on the occasion of the bicentenary of the Academy of Sciences of Lisbon (founded in 1779), in which both Debus and the historian of science William Shea participated. These symposia gave way to the publication of various volumes addressing history of science in Portugal, often from a positivist perspective, unaware of recent trends in the social and cultural history of science (Peixoto 1986; 1992).

Contrary to the Anglo-Saxon world, history of science and history of technology courses were introduced in the mid-1970s in Faculties of Sciences and Faculties of Science and Technology, not in Departments of History or integrated in Faculties of Humanities. They became part of the curricula of science and

⁶The bibliography on this topic is extensive. See, for example, Albuquerque (1988).

⁷The impressive contributions to Enlightenment science in Portugal by the secondary school teacher, autodidact historian and poet, Rómulo de Carvalho, also date back to this period. For more details, see Simões, Carneiro and Diogo (2008).

engineering undergraduates (then amounting to a five year study program). At the Faculty of Sciences of the University of Lisbon, the introductory course titled “History of Ideas in Physics” was created, following the establishment of the democratic regime and upon the request by undergraduate students. It was taught by the physicist João Luís Andrade e Silva, a former PhD student and long-time collaborator of the Nobel Prize winner Louis de Broglie. Andrade e Silva was an enthusiast of history of science, deeply influenced by Alexandre Koyré.⁸ Following this course, many students of science read Kuhn’s *The Copernican Revolution* (1957) and *The Structure of Scientific Revolutions* (1962). Despite the initial attraction to concepts such as revolutions, paradigms, crisis and incommensurability, which at the time bore such strong resonance to the national political landscape, in the long run it was the constraints imposed on scientists by training and the role of educational institutions, the multifarious faces and inherent complexity of the practice of normal science, the importance of community building and its space-bound specificities, the role of resistances, persuasion and of legitimizing processes, all of which offered future Portuguese historians of science and technology conceptual tools to analyze the meanders of scientific and technological practices in the European periphery.

During the late 1980s, the first group of Portuguese students went abroad to get their PhDs in the History of Science and the History of Technology, most of them already holding undergraduate degrees in science. Certainly, these contingent events have shaped the ways and sites in which history of science and technology has developed as a new teaching and research field. There are both advantages and shortcomings in the proximity of historians of science to scientists’ and engineers’ academic environments, and the concomitant distance from historians. In any case, the physical separation from historians’ working places has materialized in the unfortunate inexistence to date of history of science and technology courses in history departments and the awkward intellectual gap often separating Portuguese historians of science and technology from historians. The fact that in counteracting this old trend, an increasing number of professional historians of science and technology hold undergraduate degrees in history (often with a strong background in the *Annales* tradition in economic history, history of culture and history of ideas) may help bridge the gap between the two communities and ease the way to an effective integration of scientific and technological historical narratives within narratives of the history of Portugal.

In the early 1990s, following the integration of a small group of historians of science and technology trained abroad at several faculties of science,

⁸Others, such as Ana Luísa Janeira and António Manuel Nunes dos Santos, followed the lead of Andrade e Silva in teaching history of science courses.

post-graduate courses were created⁹ simultaneously with the establishment of research units, which were regularly evaluated by international panels and funded by the Portuguese Foundation for Science and Technology (FCT).¹⁰ These were established in such a way that the minimum conditions were in place to develop and consolidate a community of professional historians of science and technology abiding to international standards of scholarship, publishing in international scholarly journals (not just in national ones) and entertaining networking ties with the international community.¹¹ The initial years of this steady professionalization process have run parallel with episodic contributions to the discipline by people marginally related to it, and to the participation of scientist-historians (especially mathematician-historians), a trend that has tended to diminish in time.¹² To date, there is still no active scientific society.¹³

Of particular importance, not only for the consolidation of international connections, but also for the creation of strong bonds among members of the emergent national community, was the participation in the project *Prometheus*, funded by the European Commission and coordinated by Kostas Gavroglu. The project aimed at studying how the ideas and practices stemming from the Scientific Revolution circulated and were appropriated by actors of the countries of the so-called European peripheries, especially during the Enlightenment.¹⁴ In what concerns Portuguese participation, it set the stage for a prosopographical study of the pro-

⁹Presently, there are two graduate programs on the history and philosophy of science, (both in Lisbon), one including both a MSc and a PhD program and offered at the Faculty of Sciences of the University of Lisbon, the other at the Faculty of Sciences and Technology of the New University of Lisbon, offering only a PhD program. A proposal to fuse the two PhD programs into one is under evaluation. A Minor in history and philosophy of science (corresponding to one semester out of a three-year undergraduate degree) is also offered at the Faculty of Sciences of the University of Lisbon. There are not yet undergraduate degrees being offered in these areas.

¹⁰At present there is just one research center on the history of science and technology accredited and funded by FCT. The center located in Lisbon is called the Interuniversity Center for History of Science and Technology (CIUHCT), and resulted from the fusion of two research centers associated with the University of Lisbon and the New University of Lisbon.

¹¹By professional historians of science and technology, I mean those who hold PhD degrees in the field and / or those who, regardless of their fields of origin, publish regularly on scholarly international forums.

¹²See Tavares and Leitão (2006). A similar survey is being done for the following decade.

¹³A Portuguese Society for the History and Philosophy of Science was founded in 1988, but its existence never went beyond the formalities of its creation. Following the professionalization of historians of science and technology and their scarce collaboration with the small community of philosophers of science, the aims of such a society were preempted. The agenda of the community of historians of science and technology has not included the creation of a society for the history of science and technology.

¹⁴CE, Human Capital and Mobility, Scientific and Technical Cooperation Networks, "Project Prometheus. The Spreading of the Scientific Revolution From the Countries Where it Originated to the Countries in the Periphery of Europe during 17th, 18th and 19th Centuries" (1994–1996), CHRXCCT93-0299.

files (educational, religious, political and scientific) of the eighteenth century *es-trangeirados* (Europeanized intellectuals) and the analysis of the contours of their appropriation of the ideas and practices of the new sciences, their networking tactics and legitimizing strategies, often inspired by their determined will to contribute to the modernization of their country (Simões, Carneiro, and Diogo 1999; Carneiro, Simões, and Diogo 2000).

Presently, the community of Portuguese professional historians of science and technology includes roughly 30 senior historians, and roughly the same amount of postdoctoral scholars. Senior historians of science and technology are mostly professors affiliated with major Portuguese universities (University of Lisbon, NOVA – New University of Lisbon, University of Évora, University of Coimbra and University of Aveiro), with a noticeable concentration in Lisbon. A few are researchers associated with universities, research institutes or museums of natural history and of science. There are around 40 PhD students and a much smaller number of MSc students. In the Lisbon area, there are currently 50 historians of science and technology (30 senior and junior scholars, and 20 post-docs, including Spanish, Italian, Swiss and German members) and around 20 graduate students.¹⁵ They are mainly affiliated with the University of Lisbon and NOVA—New University of Lisbon, and simultaneously members of the Interuniversity Center for the History of Science and Technology (CIUHCT). The history of science and technology has benefitted considerably from the program launched by the Portuguese government in 2007–2008 aimed at hiring junior post-docs at an international level and recently (2014) the Interuniversity Center for the History of Science and Technology was classified as Exceptional (the highest mark awarded) by an international panel of the European Science Foundation. However, the recent European economic crisis and its repercussions in Portugal, not only in what relates to the entrepreneurial reforms of the university system and the attacks suffered by the humanities and social sciences, but also in relation to cuts in research funding, may well be responsible for a reversal of this promising situation.

The degree of internationalization of this community can be measured in part by its ability to organize major international conferences¹⁶ and participate in sev-

¹⁵These numbers should be viewed against a population of roughly 10 million inhabitants with a narrow 10% holding undergraduate degrees, and a high 2.7% holding graduate degrees (relative to the population in the age range of 30–34 years). For more information on the activities of this research unit see (<http://www.ciuhct.org>).

¹⁶A considerable number of national and international meetings have recently been organized by the Portuguese scholarly community, and others are in preparation. They include the 2nd STEP Meeting (2000), HoST Annual Meetings associated with the online journal HoST (since 2006), 19th-Century Chemistry: Spaces and Collections (2007), the XXVII Symposium of the Scientific Instruments Commission (2008), SHOT 50, the Society of the History of Technology Annual Meeting (2008), Annual

eral networks. Examples of this are the international group Science and Technology in the European Periphery (STEP), Tensions of Europe (ToE), International Network of Engineering Studies (INES) and several other European networks which included “Circulation of Knowledge in Early Modern Science,” “Scientific Periodicals in Modern Europe,” and “Thesaurus-Network of Portuguese and Brazilian Museums of Science.”

This networking reflects the importance conceded by the Portuguese community to explore the interface between history of science *and* history of technology, which has been facilitated by the strong ties entertained between Portuguese historians of science and historians of technology, to the extent that in the Portuguese context, one should talk about a community of historians of science *and* technology. This community is behind the creation of an online international journal specifically devoted to the history of science *and* technology (HoST). Launched in 2007, it aims to strike a balance between local concerns and international trends, interweaving history of science and history of technology (and also at times history of medicine) and extending the geography of papers’ provenance, while giving a place for contributions by Portuguese authors.¹⁷

Networking options also reflect a view of history of science *and* technology broadly conceived in order to include material culture, instruments and scientific collections (Pantalony 2009). This last connection has profited from the relation of the Interuniversity Center for the History of Science and Technology to the University of Lisbon, which houses an impressively broad scientific heritage, integrated in the National Museum of Natural History and of Science, located at the heart of Lisbon, and including an impressive nineteenth Chemical Laboratory and Amphitheatre, the Botanical Garden and two nineteenth-century astronomical observatories, one devoted to teaching and the other to research (Simões, Diogo, Carneiro, 2012). This relation also accounts for the preeminence of research topics focusing on Portuguese institutions, approached from various perspectives and

International Workshops Libraries and the Scientific Book (fifteenth–seventeenth centuries) (2011, 2012, 2013), Annual International Workshops History of Iberian Cartography. Old Maps, New Approaches (2012, 2013), History of European Universities. Challenges and Transformations (2011), University Collections. University History and Identity (2011), and more recently the meeting Shaping Landscapes and Building Expertise. The Role of Imperial Technology in the Making of the 19th and 20th Century World (2013), the 2014 ESHS meeting and the 2014 STEP meeting. See (<http://www.ciuhct.org>).

¹⁷So far, issues have been often, but not always thematically organized, addressing topics of relevance both to the national and the international communities. Examples of this are The Circulation of Science and Technology; The Fascistization of Science; Moved Natural Objects. Spaces in Between; and Communication Science, Technology and Medicine. See (<http://www.johost.eu>).

for the importance conceded to the organization of exhibitions, which brings the history of science to the public at large.¹⁸

The scarcity of bibliography on the history of science and technology in Portuguese libraries and the limited accessibility to online journals is still a problem haunting the community of historians of science and technology. In addition, many Portuguese archives are difficult to access and are often poorly organized or not organized at all, and offer only reduced timetables for the interested public. Small steps to circumvent this constraining context include translations of recent landmarks of the literature on history of science,¹⁹ publication of primary sources, (both printed and manuscript²⁰) and the offer from the well-known historian of science S. G. Brush to use his private library.²¹

The community of professional historians of science and technology covers a wide variety of thematic areas, ranging from early modern science, to science and technology in the twentieth century. With a few exceptions, most publish on Portuguese topics. This fact does not indicate a lack of internationalization, but rather the willingness to unveil and interpret many new episodes, revise received views in the cases in which they exist and offer case studies informed by recent mainstream historiographical trends, and in the process enrich international scholarship with case studies stemming from the history of science and technology in Portugal. The exploration of alliances with the community of Brazilian historians of science and technology is also deemed fundamental, but is still at an initial stage. Historians of science and technology apply a broad range of methodological approaches, most of them in accordance with recent trends in the social and cultural history of science and technology, as well as science and technology

¹⁸Examples are “360° Ciência descoberta,” Fundação Calouste Gulbenkian (2013), *Exposição Medir os Céus para dominar a Terra: a Astronomia na Escola Politécnica de Lisboa, 1837–1911*, Museu de Ciência da Universidade de Lisboa (2009–2010), “À Luz de Einstein,” Fundação Calouste Gulbenkian (2005).

¹⁹I refer to the collection titled *História e Filosofia da Ciência (History and Philosophy of Science)* published by the well-known publisher Porto Editora and organized by Ana Simões and Henrique Leitão. Starting in 2003, 14 volumes came until the collection was discontinued recently “due to the economic crisis.” See (<http://www.ciuhct.com>).

²⁰The publication of *Obras de Pedro Nunes (Complete Works of Pedro Nunes)* coordinated by Henrique Leitão, with extensive critical comments, is coming to its end and is an impressive scholarly venture. Other examples include the publication of catalogues listing the rich collections, for long unknown, of scientific manuscripts held at the National Library of Portugal (BNP), or the Collection titled *Ciência e Iluminismo (Science and Enlightenment)* published by the well-known publisher Porto Editora, and organized by Ana Simões, Francisco Contente Domingues and José Luís Cardoso, which includes printed and manuscript transcriptions of works by Portuguese eighteenth century natural philosophers, and was discontinued after the publication of 9 volumes due to the crisis. For other ventures, see (<http://www.ciuhct.com>).

²¹Recently, some of the books by the physicist Per Dahl were also offered to CIUHCT’s branch located at the Faculty of Sciences of the University of Lisbon.

studies, including an integrated approach to material culture and collection-based history of science and technology.

Networking and Historiographical Options

In the past 20 years, the conceptual and methodological contributions from social and cultural history of science, together with post-colonial and subaltern studies, have put emphasis on science and technology in action, the situatedness of knowledge production and the emphasis on the circulation or transit of knowledge as a creative process, as well as on the innovative role of peripheries and colonial spaces and agents.²² However, this theoretical apparatus has been applied mainly to peripheral and colonial spaces that have a close relationship with the so-called European Center as a common characteristic, either as “satellites” of centers located in their mainland territories or as part of their colonial empires.

European peripheral countries and their colonies remain in the shadows for a variety of reasons, including the language barrier and more difficult access to historical sources. In what relates to Portugal, it fell on the emerging community of historians of science and technology to reverse this state of affairs, aided by its networking abilities and especially by its participation in the international groups Science and Technology in the European Periphery (STEP) and Tensions of Europe (ToE), all the more so that through its history, Portugal has become a privileged laboratory for the study of European and colonial topics, as well as those related to centers, peripheries and ultra-peripheries.

The frameworks developed within these international networks have contributed to the ongoing debates on the various difficulties that have hampered a systematic study of the sciences and technology in the *European periphery*, the dynamics of the hidden agenda of Europeanization, the process of *Europeanizing the World* and *Provincializing Europe* and the role of both as privileged standpoints to illuminate and deconstruct the notion of *European science and technology*, in the sense of enlightening the process of emergence of science and technology as a global phenomenon and as one of the main building blocks in the construction of an imagined, European intellectual identity.

The international group STEP was created in 1999, and presently gathers around 200 members from 30 different countries and four continents (Europe, North and South America, Asia and Oceania). A considerable fraction of its members come from the European periphery, especially from Greece, Portugal and Spain, where a substantial part of the group’s founding members are from.

²²The bibliography on these topics is extensive and well known to readers of this volume. Some representative examples are Biagioli (1999); Chakrabarty (2007); Raj (2007); Schaffer et al. (2009); Secord (2004); Simon and Herran (2008); Sivasundaram (2010).

It is purposefully a loosely structured group, sharing a website and a discussion list.²³ The group organizes conferences every two years, which were thematically arranged until 2008.²⁴ Besides individual publications, it has published several collective volumes²⁵ as well as historiographical reflections related to science and technology in the European periphery.²⁶

The study of the circulation of science and technology within Europe has been done in such ways as to overcome the constraints of local contexts often heavily tinted by positivist approaches, avoid the dangers of parochial antiquarian approaches, solve the problem of fragmentation produced by a myriad of local studies and at the same time, exploring ways to tie research endeavors with mainstream historiography. By using different methodological approaches to discuss a variety of topics, encompassing travels, textbooks, popularization of science and technology, science and technology in the press, national historiographies of science, science and religion, universities, transnational histories, science and gender and so on, the contours of a new historiography of science and technology in the European periphery (EP) have been delineated.

By criticizing the value-ladenness associated with the center-periphery dichotomy and the assumptions behind diffusionist models, they moved away from a historiography of transmission to a new historiography built on the concept of appropriation. The concept of appropriation stems from cultural history and calls attention to the specificities of the “receiving” culture, with its social, political, religious and cultural specificities. In this new framework, the local agents are endowed with creative functions, and attention is paid to the ways practices are transformed when they move from one place to the other. Furthermore, appropriation draws attention to the fact that when practices “arrive” at a certain place, they are never integrated into an ideological vacuum. On the contrary, they are articulated with the multiple cultural traditions of a specific society at a particular moment of its history. New scientific discourses are articulated in the local context, legitimizing strategies and spaces are created and resistance to the new

²³Website: (<http://147.156.155.104>). List: NODUS: Science and Technology in the European Periphery e-mail list (nodus@uv.es).

²⁴Scientific Travels, Lisbon, Portugal 2000; Scientific and Technological Textbooks, Aigina, Greece, 2002; Traditions and Realities of National Historiographies of Science, Aarhus, Denmark, 2004; Scientific and Technological Popularization in the European Periphery, Mao, Minorca, 2006; Looking Back, Stepping Forward, Istanbul, Turkey, 2008; Galway, Ireland, 2010; Corfu, Greece, 2012; Lisbon, Portugal, 2014.

²⁵STEP volumes coming out of STEP conferences include Belmar et al. (2006); Papaneloupoulou, Nieto-Galan and Perdiguero (2009); Simões, Carneiro and Diogo (2003); Special Issue *Nuncius* (2008). For more publications by the STEP group see the group’s website.

²⁶Examples are Fontes da Costa and Leitão (2008); Gavroglu (2012); Gavroglu et al. (2008); Nieto-Galan (2011); Patiniotis (2013); Patiniotis and Gavroglu (2012); Raposo et al. (2014); Simon and Herran (2008).

practices usually emerges. The local peripheral context “chooses” to be influenced in certain specific ways, and choices are taken in simultaneity with the rejection of various forms of influence.

The former historiographical standpoint was aimed at unravelling the specificities and contours of appropriation processes that took / take place in different peripheral contexts, in different periods and for different thematic situations. By stressing various and multidirectional responses, one contributes to the international historical scene with a variety of new case studies, which enrich current views and often revise received ones. Additionally, and without eliminating asymmetries, its main purpose is to highlight *similarities*, rather than differences, among the various peripheral contexts in order to unveil common trends.²⁷ This novel enterprise is oriented towards writing a historical narrative, which will concur to the emergence and structuring of a concept of *periphery*, beyond the traditional center-periphery dichotomy with its associated value judgments, and based on the awareness of the dynamics of the historical co-construction of *both* centers and peripheries. The re-definition of the concept of periphery should be mainly operational, in the sense of enabling historians to move from the *perspective of the center* to the *perspective of the periphery*. In this sense, *Science and Technology in the European periphery* is taken as a *historical problem* while the *European periphery* becomes a *historical actor*.

ToE is an international network consisting presently of almost 300 social scientists. Like STEP, it was founded in 1999, but contrary to STEP, its founding members were social scientists from Great Britain, Germany, Sweden and the Netherlands, who were joined in subsequent years by scholars from Southern and Eastern Europe. Biannual conferences, summer schools and a series of 20 thematic workshops were organized (one in Lisbon in 2000). By 2004, around 200 social scientists from over 21 countries had already joined the network. The project “Inventing Europe: Technology and the Making of Europe from 1850 to the Present”²⁸ was presented during the first ToE conference in Budapest (2004) and has given way to a major publication of a new history of Europe: a six-volume book series *Making Europe: Technology and Transformations, 1850–2000* of which the first volumes have already been published.²⁹

²⁷Traditionally, a sub-group of comparative reception studies has been concerned with accounting either for the *differences* between centers and peripheries or between peripheries. While there are not many comparative studies written by “peripheral” authors, impressionistic comments are abound, oscillating between a hagiographic type and the rhetoric of backwardness or decadence. In turn, the accounts about peripheries built up by historians of the so-called centers tend to assess peripheries using criteria stemming from the center, thereby overlooking the creative role of peripheries.

²⁸(www.tensionsofeurope.eu/www/en/files/get/Intellectual_Agenda.pdf).

²⁹See (<http://www.makingeurope.eu>). So far, the books Oldenziel and Hård (2013); Kohlrausch and Trischler (2014) have come out. A virtual exhibit will accompany the book series, allowing for a more

A broad range of themes has been explored, centered on the role of technology as an agent of change in European history in the nineteenth and twentieth centuries. Unveiling both collaborative agendas and fierce disputes, it focused on the linking and delinking of infrastructures, the emergence of transnational technical communities and the circulation and appropriation of artifacts, systems, knowledge and people, both within Europe and former European empires (Misa and Schot 2005; Schot, Misa, and Oldenziel 2005). The analysis of the role played by European/Western technology in the organization and hierarchical structure of colonial and postcolonial worlds became a topic of keen interest very early on, together with issues such as mobility, the rise of consumer society, agriculture and food, communication, big technological systems, military technology and information systems. Unlike traditional accounts of European integration, mainly based on a political approach, which highlights the international relations between nation-states, the emphasis has been on a historical narrative based on how the design and uses of technology became critical actors in the “hidden integration,” but also in the “hidden fragmentation” of Europe.

Inspired by the two former theoretical frameworks, the community of Portuguese historians of science and technology has framed the study of science and technology in Portugal by analyzing the dynamic relationships of Portuguese actors (scientists, engineers, agents of various profiles and institutions, etc.) among themselves and with actors of other countries (European or otherwise). In addition, they scrutinize how scientific, technical and engineering expertise was crucial to the Portuguese agenda concerning management and exploitation of the overseas territories in Africa from the mid-nineteenth century to the 1970s, and finally, elucidating how *both* science and technology have informed successive political agendas and have been used as tools (often forgotten yet extremely powerful) of the former Portuguese Empire. Furthermore, they have looked at the role played by travels, circulation and networking; the writing of books, textbooks, papers and the exchange of correspondence; the creation of scientific and technical institutions; the material vehicles used for the communication of science and technology in a country with a largely illiterate population and the images of science and technology they conveyed.³⁰

They have done so by shifting the emphasis from transmission to appropriation, from the perspective of the center to the perspective of the periphery and from the isolated study of the periphery to the comparative assessment of developments. This theoretical shift has informed historical narratives produced

interactive approach to the topics discussed in the books, and providing an innovative pedagogical instrument useful for teaching purposes

³⁰Some examples are Carolino and Simões (2012); Diogo and Amaral (2012); Silva and Diogo (2006); Simões and Carolino (2014); Simões, Carneiro and Diogo (2012); Simões, Diogo and Carneiro (2012b, 2012a); Simões, Zilhão, et al. (2013).

by Portuguese historians of science and technology when dealing with European and other spaces (often colonial), due to the specificities of Portugal—a small peripheral European country, which acted towards its huge overseas empire as the central metropolis. More recently, they have been exploring ways to reappraise the recent historiography of circulation, by focusing on the associated notions of exchanges, displacements and translations, not only as a way of mobilizing knowledge but also as a way of producing it. They also focus on *locality* as a notion not necessarily coincident or constrained by *location*, and on how closely scrutinizing the relations between purported centers and peripheries will give way to a much more nuanced picture of circulation within networks of evolving lumpiness (Raposo et al. 2014).

Concluding Remarks

Conversant with the new trends in social and cultural history, it is not too optimistic to predict that the first preliminary overview of many episodes can be offered, answering new questions, revising old ones and contributing in the not so distant future in the creation of a “big picture” of the history of science and technology in Portugal. On one hand, Portuguese historians of science and technology are contributing to the enrichment of recent narratives of early modern Iberian science and technology, complementing the wealth of new sources already analyzed and re-assessing historiographical revisions proposed,³¹ with narratives offering an integrated and balanced account, able to explore the similarities and differences in the scientific contributions of the two Iberian countries.³² On the other hand, in what relates to later periods (from the seventeenth and eighteenth centuries up to the present), and again focusing on the circulation of people, instruments, objects and skills, contributions will help to build an integrated historical narrative by focusing on the co-production of scientific and technological knowledge and its various forms of circulation *and* the political agendas of the different political regimes which ruled Portugal and its colonies during these centuries.

In sum, the goal of the Portuguese community of historians of science and technology has been threefold. By stressing the circulation of science and technology of all sorts of agents including experts, expertise and skills, between European countries, between Europe and its overseas colonies, as well as between colonial powers, and by bringing to the forefront the case of smaller peripheral countries which acquired power in Europe through the translation of colonial into

³¹Now already standard accounts of this new trend are Barrera Osorio (2006); Bleichmar et al. (2008); Cañazares Esguerra (2002, 2004, 2006); Navarro Brotons and Eaman (2007); Pimentel (2001); Portuondo (2009).

³²See, for example Leitão (2006, 2007, 2009); Leitão and Alvarez (2011).

national power in the global arena, they have sought to enrich the international literature on the history of science and technology with new case studies stemming from a country of the European periphery, and in the process contributing to the rewriting of the history of Portugal in such a way that science and technology play a central role and at the same time, inscribing their narratives within standard accounts of the history of Europe.

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