

2009

PREPRINT 385

Arne Schirrmacher (ed.)

Communicating Science in 20th Century Europe

A Survey on Research and Comparative Perspectives

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What can news about earthquakes, volcanoes and eclipses tell us? Science in the Portuguese press at the beginning of the 20th century*

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About an on-going project, methodological choices and database construction

Popularization of science and technology is an established field within the history of science and technology. In the past years, though, the historiography of science popularization has undergone a crisis. The received view of popular science as a downgraded version of science for lay-consumers does not hold any more. Proposals for critical revisions of the dichotomies built in the characterization of popular science, such as the dichotomy between production and consumption, creativity and passive reception, experts and lay audiences are open for discussion.¹

So far, contributions to the field have mainly used as primary sources periodicals and books, but have seldom dealt with newspapers. On the other hand, in the national context studies on popularization of science and technology have primarily concentrated on periodicals while newspapers have been used as primary sources for strict historical research works.

* We thank Alice Gago and Marisa Costa for their survey of news and Carlos Alvares for the construction of the database. We thank Conceição Tavares and Pedro Raposo for help in the interpretation of the two cartoons on the eclipse.

1 Newspapers abbreviations used: DA, Diário dos Açores; DN, Diário de Notícias. – Criticisms of the received view constitute a large group of bibliographical references. Especially important for this work are: James A. Secord, “Knowledge in transit” *ISIS*, 95 (2004), 654-672; Bernadette Bensaude-Vincent, A. Rasmussen, eds., *La science populaire dans la presse et l’ édition. XIX et XX siècles* (Paris: CNRS, 1997); Terry Shinn, Richard Whitley, eds., *Expository Science. Forms and Functions of Popularization* (Dordrecht: Kluwer, 1995); Roger Cooter, Stephen Pumfrey, “Separate spheres and public spaces: reflections on the history of science popularization and science in popular culture,” *History of Science* 32 (1994), 237-267; Jonatham Topham, “Scientific and the reading of science in early nineteenth-century Britain,” *Studies in the History and Philosophy of Science*, “ 31 (2000), 397-430; S. Hilgartner, “The dominant view of popularization: conceptual problems, political issues,” *Social Studies of Science*, 20 (1990), 519-539; G. Cantor, Sally Shuttleworth, eds., *Science serialized: representation of the sciences in nineteenth-century periodicals* (Cambridge: CUP, 2004). In what relates specifically to the rationale behind the Science and Technology in the European Periphery (STEP) international project as it relates to this work see: Kostas Gavroglu, Manolis Patiniotis, Faidra Papanelopoulou, Ana Simões, Ana Carneiro, Maria Paula Diogo, Jose Ramon Bertomeu-Sánchez, Antonio Garcia Belmar, Agusti Nieto-Galan, “Science and technology in the European periphery. Some historiographical reflections”, *History of Science* 46 (2008), 153-175; Faidra Papanelopoulou, Agusti Nieto-Galan, Enrique Perdiguero, eds., *Popularizing science and technology in the European Periphery, 1800-2000* (Oxon: Ashagte, 2009).

The research project *An open window to representations of Science and Technology in the Portuguese Press (1900-1926)*, funded by the Portuguese Research Council (FCT/MCTES),² which took off in March with a team of three senior researchers, five junior researchers and two scholarship holders contracted to collect data, aims at analyzing public perceptions of science and technology in a country of the European periphery with a high illiteracy rate during the first decades of the 20th century. It relies on a comparative methodology based on the contrast of news issued in generalist newspapers of different political orientations and geographical provenance and covers a period from the end of the Monarchy to the end of the First Republic. The goal is to assess specific characteristics associated with practices of popularization, including differences between ideological aims, the rhetoric of scientism, daily practices and their outcomes, expectations of editors and publishers and the delineation of (potential or real) profiles of audiences for science and technology in a peripheral country such as Portugal. At a theoretical level, the project aims at reaching a historiographical analysis of the drawbacks of popularization as a historiographical category, rather than a historical one.

This project grew out of the collective attempt to prepare the ground for a comparative study of the views on science and technology as voiced in newspapers in the beginning of the 20th century in different countries of the European periphery, which gave way to the organization of a session in the 5th STEP meeting (Minorca, 2006) in which papers were presented on the Portuguese, Spanish, Greek and Danish cases.³ Unlike our colleagues, who later published the results of further work in the journal *Centaurus*,⁴ the Portuguese group had to wait two more years to launch a full research project to develop the exploratory sample presented at Minorca.

The choice of Newspapers

In Portugal, both the end years of the monarchy and especially the First Republic, used science and technology as part of their political agendas and promoted popularization strategies, at times associated with the adult education movement. However, having in mind the high illiteracy rate of Portugal (around 70% at the turn of the century), which restricts the audience for popularization to an elite, a bottom-up approach seems particularly suitable. Accordingly, the primary sources used are mainly daily generalist newspapers from which perceptions of science and technology can be inferred.

2 The project number identification is PTDC/HCT/68210/2006.

3 Conceição Tavares, Ana Carneiro, Maria Paula Diogo, Ana Simões, "Public image of science and technology in the Portuguese press at the dawn of a new century," 5th STEP meeting Popularisation of Science in the European Periphery, Maó, Minorca, 1-3 June 2006; Conceição Tavares, Ana Carneiro, Maria Paula Diogo, Ana Simões, "A imagem pública das Ciências e da Tecnologia na Imprensa Portuguesa (1900-1901)," Colóquio Internacional A História da Imprensa e a Imprensa na História. O contributo dos Açores, Ponta Delgada, 28 -30 Maio 2009.

4 Faidra Papanelopoulou, P. Kjaergaard, "Making the paper: science and technology in Spanish, Greek and Danish newspapers around 1900", *Centaurus* 51 (2009), 89-96; Matiana Gonzalez-Silva, Nestor Herran, "Ideology, elitism, and social commitment: alternative images of science in two fin de siècle Barcelona newspapers, *Centaurus* 51 (2009), 97-115; Eirini Mergoupi-Savaidou, Faidra Papanelopoulou, Spyros Tzokas, "The public image(s) of science and technology in the Greek daily press, 1908-1910", *Centaurus* 51 (2009), 116-142; Casper Andersen, Hans H. Hjermitsev, "Directing public interest: Danish newspaper science, 1900-1903," *Centaurus* 51 (2009), 143-167.

Newspapers were chosen on the basis of their broad ideological scope and geographical locations.⁵ Such are the cases of *Diário de Notícias* (founded in 1865), *Comércio do Porto* (f. 1854) and *Diário dos Açores* (f. 1870). In the beginning of the 20th century, both the Oporto's and Azores' newspapers were part of Portuguese mainstream press, which was politically engaged in a double sense, either by aligning itself with a particular political party, or by making politics its main theme: the Oporto newspaper was prestigious, had a wide circulation and showed republican leanings; the islander newspaper represented a sector of the monarchical intelligentsia linked to the *Partido Progressista* (Progressive Party). On the contrary, the capital city newspaper took a neutral stance from the political point of view as a result of its ideological commitment to a new descriptive trend in journalism, by counteracting a former style based on interpretative news (opinion news). It assumed itself as a popular newspaper, in which political neutrality combined with trivial news. Its main purpose was to eradicate long opinion articles, avoid discussions of political and polemic issues, leaving to the reader the task of forming his own opinion based on factual descriptions of events.



Fig. 1: Frontpages of newspapers *Diário de Notícias* and *Diário dos Açores*

Methodologically, the option is a comprehensive survey of the totality of news issued in the three selected newspapers. This option is based on the fact that Portuguese newspapers presented news on science and technology in a random way, according to local and momentary events, and not in a systematic, daily or weekly column.⁶ Although this approach is time-consuming, the authors believe that it is the only which affords a reliable analysis, in both quantitative and qualitative terms. By using previous experience, a database was designed, which encompasses the fields as indicated in classification of Fig. 2.

5 For an overview of the history of the Portuguese press see José Tengarrinha, *História da Imprensa Periódica Portuguesa* (Lisboa: Editorial Caminho, 1989).
 6 More information on the project can be accessed at http://chcul.fc.ul.pt/folheando_jornais.htm.

Although the tools for reaching the objectives of this research project are now manageable, in terms of quantitative data, there is little more to present beyond the exploratory survey of Minorca. The amount of news has now doubled, but is still around 2,000. By the end of the project, the team expects to have collected around 40,000 news

Preliminary characterization of news

Before going into the object of this article, it is worth going back to the paper presented at the Minorca STEP meeting and briefly summarize both the Portuguese cultural context on the eve of the 20th century and the characteristics of the newspapers to be analyzed here. The data collected so far corroborates the main trends identified in the STEP communication delivered at Minorca. Science and technology were associated with ideas of development and progress, and smoothly articulated with the political agenda of liberalism, as well as with trends informing both monarchical and republican movements in Portugal at the end of the 19th century. News about science and technology appear on a regular basis, including news of local, national and international import.

Different themes emerged as the most significant. Public health, especially infectious diseases with particular emphasis on tuberculosis, was a major issue, reinforced by the participation of the most renowned Portuguese physicians of the time as authors of the news. All these articles have a strong pedagogical dimension, aiming at enlightening the public on their causes and prevention.

In all newspapers technology comes next, with news focusing on electricity-based transports and communications, electrical lighting, leisure technology (photography, film and the phonograph), aviation and military technology. Technology is presented in close association with the ideology of progress, news on international and colonial exhibitions appearing in this context.

Science proper was not a major issue when compared with medicine and technology, but astronomy, especially the 1900 solar eclipse, held a prominent place, and reports on this event were often written in a style bordering the popularization genre. The Azorean newspaper emerges as an exception, by often dealing with questions of meteorology, oceanography, botany and occasionally geology.

Science and technology often appear associated with travels of exploration and scientific mythical personalities. Figures of unquestionable scientific and technical authority and almost saintly profiled are often convened.

In all newspapers, evaluations of the former century in terms of medical, engineering and scientific advancements were published focusing on developments which took place not only around the world, but also in Portugal. The great conquests of science and technology were object of extended news oriented to the construction of a heroic collective memory of humankind.



Science and technology in newspapers - Proposed classificatory scheme

- Identification of Journal
 - Name of Journal
 - Number
 - Year
 - Month
 - Day
 - Week
- Title of article
 - Main
 - Section
 - Other
- Articles
 - Opinion
 - News
 - Ads
 - Dramatization
- Name of author
 - Author's profile
 - Journalist
 - Collaborator
 - Anonymous
- Location of article (page, columns)

Fig. 2: Screen-prints of database and classificatory grid included in the database

The useful character of scientific and technical knowledge, rather than discussions on their cognitive contents, is emphasized. Indeed, both newspapers put considerable emphasis on the utilitarian dimensions of medicine, technology and science in this particular order. The appropriation and dissemination of knowledge was shaped by the need to respond to local social needs with practical relevance.

In this paper, data will be analyzed in a slightly different way, by using as framework the two main characteristics formerly identified as catalysts for scientific news: worldwide events and local relevance. Are these two kinds of news presented in similar or different ways? Are the agendas behind their choice and presentation similar or dissimilar? Are they addressed to the same public or to different audiences? In this part of the paper two instances of popularization addressing natural phenomena will be discussed, one dealing with the 1900 eclipse, a ‘hot’ topic all over Europe, as seen by the capital newspaper; a set of news on seismology, written in the newspaper published in Azores, an archipelago with a significant volcanic activity.⁷

Earthquakes, volcanoes and weather in the Azorean newspaper

In the early twentieth century, the newspaper *Diário do Açores* (Azores Daily) published articles on science of various lengths and with distinct purposes. From short news on technological novelties produced in foreign countries to issues of public interest such as those on hygiene and public health, the newspaper also addressed scientific questions.

Since the nineteenth century, Azorean naturalists corresponded with foreign colleagues due to the peculiar features of the Azores’s fauna and flora, which attracted the attention of distinguished naturalists, usually fascinated by the peculiarities of islands, such as Darwin who exchanged correspondence with a local young naturalist Arruda Furtado (1854-1887). But Azores also captured the interest of experts of other scientific fields, such as oceanography, meteorology and seismology. The association of Afonso Chaves (1857-1926) with Prince Albert of Monaco stands out as most significant as it represents a case in which personal, local, national and international scientific interests coalesced in a successful partnership.⁸

By reflecting the cultural features and interests of local men of science, the *Diário dos Açores* engaged in the publication of news and articles on seismology and volcanology, given the geographical situation and volcanic nature of the islands. An earthquake in Mexico, a submarine volcano observed by a ship somewhere near Belle Isle, or the formation of a new island following a volcanic eruption in Burma, always deserved a few lines. In turn, more or less long articles on seismology and volcanism aimed at acquainting the readers with hypotheses and theories on the causes of these phenomena, and enlist them in the scientific projects and causes of the local intellectual elite. The hope of rendering these natural events predictable

7 S. Miguel, the island where the newspaper was published has three active volcanoes; in 1957, the major eruption of the Capelinho volcano enlarged the Faial island by 24 km², causing about 300 seismic activities during more than one year.

8 Conceição Tavares, *Viagens e diálogos epistolares na construção científica do mundo atlântico*. Albert I (1848-1922), Afonso Chaves (1857-1926) e a Meteorologia nos Açores, MSc unpublished thesis, FCUL, 2008; to be published in book form as *Albert I do Mónaco, Afonso Chaves e a Meteorologia nos Açores. Episódios oitocentistas da construção científica do mundo atlântico* (Ponta Delgada: Sociedade Afonso Chaves e CIUHCT, 2009).

and in this way diminish their impact was certainly assumed as being appealing to Azoreans, who live permanently under the threat of earthquakes whose consequences they know too well.

Long articles on seismology and volcanology were often published, usually on page one and in a serial form, by authors — under their own name or a pen-name— of whom little is known so far, or by an anonymous reporter. The approach is often historical as past theories are presented to the readers in a chronological framework, together with the discussion of the latest hypotheses and conflicting theories. Controversy is taken as part and parcel of the construction of scientific knowledge as well as its incomplete nature. The views of philosophers and of more or less renowned local or foreign experts, who were then trying to unveil the causes of earthquakes and volcanoes, are used as sources of authority and legitimation.

In a serial written by Theobaldo Câmara, one of the topics addressed was the origin of the Universe, the Earth's hidden interior, volcanoes and the causes of earthquakes.⁹ The Earth's interior is discussed, in particular its temperature and physical state, from the surface to the centre. Regarding volcanoes, a short review is made from the mythological interpretations of antiquity to the views of the American Thomas Sterry Hunt (1826-1892), advocating that between the surface and the centre of the Earth there is an intermediate layer of molten rocks from which lava originates. From his various sources, Câmara concludes that volcanic eruptions seemed to be the result of a struggle between the vapours inside the Earth and huge masses of solidified matter obstructing their passage. The geographical distribution of volcanoes in the vicinity of seas and oceans seemed to corroborate this interpretation, but Stanislas Meunier (1843-1925), the French herald of experimental geology, denied it: he claimed that the Andes and the Abyssinian mountains ridges pointed precisely to the contrary.

Earthquakes were up to then often associated with volcanoes, although they are distinct phenomena and not necessarily linked. Câmara sets out to discuss the causes of earthquakes. He begins with theories ascribing to the Moon, the Sun or other planets the cause of seismic phenomena, then moves to the tectonic theories of Albert Lapparent (1905-1975), and presents a typology of earthquakes based on their possible causes: subterranean collapsing, volcanic and structural. He then proceeds to the theories of the Austrian Eduard Suess (1831-1914) and the American James Dwight Dana (1813-1895), Lapparent, and the Irish Robert Mallet (1810-1881). Their views pointed to the fact that the Atlantic axis, where Azores is located, and the depression of the Great African Lakes were the regions of the globe of highest seismicity. Given the hypothetical status of all these theories, only the methodical and systematic recording of seismological data could lead to sound conclusions about the causes of seismic activity. Câmara reaches this conclusion at the end of this serial, which is telling. Although at this point he does not make explicit the importance of Azores in a network of seismological observatories, the fact that the islands were then part of an international meteorological network reinforces the mutual association of meteorology with seismology. Both were based on recording data by means of instruments, and linked by the same assumption, the need to predict phenomena in order to reduce possible damages.

9 Theobaldo da Câmara, 'Formação do Universo – Kant, Laplace, Faye e Du Ligondés – o interior da terra – teoria dos vulcões – causas dos “sismos” - como se registam os “sismos” – relações entre a Terra e o Sol' I-IV, *Diario dos Açores*, 4 May, 7 May, 14 May, 24 May, 3 July, 1907

Meanwhile, short news on earthquakes occurred in other parts of the world, notably in the UK, and began to make readers familiar with seismographs. As Mercurio, certainly a pen-name, reports: ‘From London, seismographs continue to record violent earthquakes (...).’¹⁰

It is worth mentioning that short news on seismology published in 1910,¹¹ also focussed on seismological stations, notably on the fact that nationwide, including the Azores, these stations were required to report any event to the Central Seismological Station Don Luis, in Lisbon; or that the geologists Alfredo Bensaude (1856-1941) and Paul Choffat (1849-1919) members of the committee in charge of outlining the seismological national project required the Observatory of the University of Coimbra to analyse seismograms from the earthquake felt on mainland Portugal, on 23 April 1909.

In this and subsequent serials on this topic the aim is increasingly to reinforce the agenda whose core argument was the need to establish in Portugal an internationally linked seismological network. Surely, the participation of Portuguese seismology in the international scene by means of its own network of seismologic stations was perceived as an element contributing to raising the country’s prestige abroad, still suffering the sequels of the trauma inflicted to national pride by the British Ultimatum, in 1890.

A serial by an unknown author focussing on the Seismological Service of Portugal began being published on 1 February 1910, reproducing a lecture delivered by the local expert Afonso Chaves, director of the Azores Meteorological Service. Following the earthquake of 1909, a movement involving the Portuguese Parliament and the press, prompted the government to initiate the process of creating a national seismologic service. To this end a committee was appointed by the Ministry of Public Works composed of the directors of the meteorological observatories of Oporto, Coimbra, Lisbon, and Azores. Afonso Chaves represented the Azores Meteorological Observatory in the committee, which also included the geologists Bensaude and Choffat. A plan and a proposal were outlined, and all were deeply committed to its materialisation.

It was in this capacity that the Swiss geologist Paul Choffat, who served in the Portuguese Geological Survey for more than 40 years, was interviewed about the possibility of predicting earthquakes through the use of seismographs.¹² Choffat’s penetrating eyes and vivacious expression, features usually present in descriptions of his persona, are emphasised by the anonymous reporter, undoubtedly to accentuate the authority of his source. Perhaps unexpectedly, Choffat argues unequivocally that, so far, there was not a single instrument capable of predicting earthquakes: seismographs simply record the motion of the ground while earthquakes are occurring, and seismograms are interpreted following the phenomenon.

Surely, with the aim of counterbalancing Choffat’s categorical statement, the reporter mentions Atto Maccioni (?-?), who argued that the magneto-electric waves produced by seismic phenomena can be detected by appropriate apparatuses shortly before an earthquake. But in view of Choffat’s authoritative statement, the reporter recognised with some dismay that Maccioni’s claims required further proof.

10 DA, 19 de Julho, 1907, 19 July.

11 DA, 1 de Fevereiro e 17 de Agosto, 1910.

12 DA, 4 de Fevereiro de 1910.

In the same issue, readers are informed that Choffat had replaced Afonso Chaves in the international conference on seismology, which took place in Zermatt, Switzerland. On his arrival, Choffat was again interviewed, and reiterated his views on the prediction of earthquakes by arguing that seismographs were still unreliable: the proof was that at Zermatt, none of the models competing for a prize met the requirements. Confronted with Choffat's authority, the reporter wondered how one could believe in the claims on earthquakes made by fortune tellers often published in newspapers. However, in the next issues, *Diario dos Açores* will allocate considerable space to extraordinary claims surrounding earthquakes and volcanoes.

Volcanoes could also play a part in utopias of progress — which the newspaper uses to seduce its readers and secure their support — with mankind profiting from natural resources and phenomena, reaching easily the highest standards of living, and even overcoming those then available only to a few fortunate millionaires. In par with synthetic dyestuffs and fabrics that would make women's dresses accessible, the power generated from volcanic eruptions would be used in the workings of civilization.¹³

The association between meteorology and seismology is made more explicit in a serial whose first article refers to an official report dating from 1904,¹⁴ the pretext being a lecture delivered by Chaves at the local Commercial Athenaeum. The unknown author begins by drawing attention to the past links between astronomy and meteorology, but the core argument is the meteorological relevance of Azores in the international scene and the use of various instruments like thermometers, hygrometers and barometers whose role in helping to predict the weather is explained in some detail. In effect, with the establishment of the submarine cable in 1893, linking Ponta Delgada (Azores) to Cascais (near Lisbon), meteorological data from the islands, relevant to the Atlantic routes, was sent by telegraphy to Lisbon and London, and from these cities to Madrid and Paris.

Chaves's lecture is then reported in the next page (p. 2), his main argument being the need to create an institute devoted to seismology, following the example of other countries. The topics addressed by Chaves are listed: methods of weather forecasting; history of the use of telegraphy in communicating weather reports; the situation of meteorology in the most advanced countries, with particular emphasis on the USA; the creation of the Azorean Meteorological Service and the importance of the islands from this point of view; seismology and earthquakes prediction; classification of earthquakes; seismic and a-seismic regions; modern distribution of three seismic regions based on geosynclines; underwater depressions and sea floors; propagation of quakes, seismographs and Maccioni seismic monitor; finally, Azores's seismicity, especially of São Miguel island.

This accurate account on the state of seismology does not exclude fantastic accounts from the newspaper, the article titled 'Earthquakes and the future of Europe'¹⁵ being a fine example of its kind. It is based on the claims of a French geologist whose name, Moreaux,¹⁶ is only mentioned at the end of the article, surely to raise readers' expectations. Total suspense is in order!

13 Anónimo, DA, 15 Fevereiro de 1910.

14 DA, 13 de Maio 1910.

15 DA, 2 de Julho de 1910, p.1.

16 We know nothing about who Moreaux was.

According to Moreaux, the Iberian Peninsula would become an island, in the future. Great convulsions such as volcanoes and quakes would cause the disappearance of southern France in the Ocean, and Portugal and Spain would be surrounded by the sea. But readers had nothing to fear, as the reporter reassures them that the structure of the Iberian Peninsula and life would be pretty much the same, unlike southern France and the Balearics, which would be swallowed by the Mediterranean.

Despite the bleak prospects, all these terrifying events would also lead to providential results, in the end: with France reduced to a half, the French were then concentrating on the plans to build a canal right through their nation, between the Atlantic and the Mediterranean, which would be far better than resorting to Gibraltar.

Surely, the experience of French entrepreneur-engineers in building canals such as the Suez, in 1866, explains Moreaux's burst of optimism shared by the Azorean newspaper. Despite the loss of part of its territory, it seems that with the providential help of nature Moreaux was giving French engineers the chance to recover from the failure in building the Panamá Canal (1880-1885).

But natural providence would be felt more widely even if disguised in a catastrophe of this magnitude. In Moreaux's account, England would vanish and Germany's expansionist pretensions would be equally punished: Germany had no choice but to resign to a smaller territory. Russia, in turn, would lose the steppes and Italy, for so long enduring violent earthquakes and volcanic eruptions, would be spared as a kind of compensation.

The future would belong to the Latin race, concluded the anonymous reporter from Moreaux's forecasts. While the British, the Saxons and the Slaves would be left with practically nothing, the Latin world would finally regain its former glory and power, since Portugal, Spain and Italy would remain unaffected by these extraordinary natural events.

The possibility of Moreaux being a *blagueur* is, however, raised by the reporter, but he argues that the French *savant* had based his predictions on scientific data. By comparing Moreaux's with Camille Flammarion's (1842-1925) less radical theories, he ends by reassuring his readers that, in any case, these events would take place in a time span of hundreds of years.

An article signed by Carlos A. Menezes,¹⁷ on the origin of the vegetation of the Atlantic islands, establishes a connection between their flora, climate and volcanic origin. He argues that the islands were spared from the glacial cooling, the descendants of the Tertiary flora remained, and the affinity between these floras and those of the European continent were explained by the prolonged communication between the islands and the continent. Menezes resorts to the hypothesis raised, in 1855, by the Swiss palaeobotanist Oswald Heer (1809-1883), who had collaborated with the Portuguese Geological Survey, about the possible existence of Atlantis, the mythical continent linking Europe, Africa and America, of which the Atlantic islands would be the vestiges. This very hypothesis was to be adopted by the Portuguese geologist Pereira de Sousa (1869-1957), in his seismological studies published in the first decades of the twentieth century.¹⁸

17 DA, 31 de Agosto de 1910, p.1.

18 Carneiro e Mota, Pereira de Sousa

Azores 's peripherality in relation to mainland Portugal, which in turn is peripheral to the rest of Europe, seems to have awakened a wish of belonging to a brotherhood of nations articulated on the basis of common racial, linguistic, cultural and territorial roots, like Atlantis, and translated into expressions like the Latin race, or the Atlantic/Mediterranean people, which although more abundant in popular accounts of science, also appear in scientific writings. As localism and nationalism were not enough to affirm the Azores and Portugal in the European chessboard, both politically and scientifically, a coalition of Latin countries would have more chances to succeed even if in the realm of utopia. Besides, Nature seemed willing to cooperate again with its providential hand as it had done in the ancient past, when Atlantis existed in its greatest splendor, or when the Romans controlled a vast empire.

The volcanic nature of Azores and its geographical location in the Atlantic made meteorology and seismology appealing to local readers who had firsthand experience of the effects of earthquakes and of the vagaries of the weather. Both sciences relied on the systematic recording of data by instruments, with a twofold purpose: the explanation of causes and the prediction of events. However, the degree of predictability and reliability of instruments was seemingly higher in meteorology than in seismology, but in both sciences the participation in international networks of meteorological and seismological observatories was perceived as crucial, given the widespread and even global impact of geophysical phenomena. In order to make the islanders realize that the advancement of both sciences was of their own interest, various strategies of persuasion were put in place. The popularization of seismology and volcanology in *Diário dos Açores* relied primarily on the scientific authority of the sources, used history as a form of legitimating arguments, and resorted to utopia and predictions of overwhelming natural disasters to persuade readers of the need to engage with the advancement seismology, volcanology and meteorology, as championed by the local elite, eager to win the support of its fellow islanders.

Reverberations of the 1900 solar eclipse as seen through the lenses of the capital newspaper

It is certainly not a coincidence that it was the capital newspaper which gave greater prominence to the 1900 solar eclipse. The solar eclipse was an international astronomical event of great importance, commanding the attention of foreign well-known astronomers, who visited Portugal to take part in the eclipse's observations.¹⁹ The capital newspaper assumed its function of a national, not just local, newspaper, reporting on international events especially relevant to the Portuguese population. The newspaper listed the names of foreign astronomers, including the British Frank W. Dyson, Charles Davidson, G.F. Chambers, William H. Christie, the Germans G. Muller, and E. Jost, as well as Alexander C. Dixon, Augustin Morford, and two American women astronomers G. Sawyer and Trittwitz.²⁰ Furthermore, it announced special exemptions for them, their luggage and instruments, special train schedules and fares, and

¹⁹ Popularization of astronomy, and especially eclipses, have been studied by Pedro Ruiz-Castell, "Popularizing Science", "A 'National Fiesta': total solar eclipses and popularization of science in early twentieth-century," in Josep Simon et al., eds, *Beyond Borders. Fresh Perspectives in History of Science* (Cambridge: Cambridge Scholars Publishing, 2008), pp.171-8, pp.179-198.

²⁰ DN 7 May 1900. DN 10 May 1900. DN 22 May 1900. DN 23 May 1900.

best observational sites.²¹ Foreign astronomers, including teams from the same country, split between the two best observational sites, Ovar and Viseu, and as usual in similar situations specialized on different kinds of observations.²² The British astronomers from Greenwich, Dyson, Christie and Davidson chose Ovar as their observational site,²³ as well as the German astronomer Jost while Muller went to Viseu.²⁴ News from weather predictions — thunders and rain — for the day of the eclipse were voiced by the Spanish astronomer Escolastico and given wide publicity.²⁵

The solar eclipse became also a genuinely national event, and Portuguese scientific institutions were intimately associated with its observation. Both the National Geographical Society and the Royal Astronomical Observatory of Lisbon took part in tasks attendant to the preparation and reception of astronomical expeditions by providing logistical and scientific support to foreign astronomers, and involving local authorities and the army in the preparations.²⁶ They were also involved in the organization of expeditions including local astronomers from Lisbon.²⁷ Astronomers from the Observatory of Coimbra, the oldest active observatory in Portugal, made astrophysical observations in Viseu.²⁸ A memoir with the results of their observations, including photographs of the different phases of the eclipse and the solar corona was announced.²⁹ Furthermore, the National Geographical Society organized a ‘scientific excursion’ to Viseu for those interested,³⁰ including members and spouses. Members were supposed to cooperate in observations, to follow specific instructions,³¹ and preliminary and final results were to be published in the Society’s newsletter.³² Photographic works were especially encouraged due to their scientific and artistic worth.³³

The scientific excursion was a success involving more than 300 people.³⁴ Students from the Naval School, Army School and Polytechnic School participated also in expeditions, which held mainly a training character.³⁵ Teachers and students from a school in central Portugal

21 DN, 1 April 1900: Astronomers were exempted from charges on luggage and instruments. DN, 15 March 1900: The Royal Railroad Company offered 50% discount in the fares.

22 DN 3 May 1900. Indication of observational site in Viseu.

23 DN 17 May 1900.

24 DN 27 May 1900. Special reference to Muller.

25 DN 20 May 1900.

26 DN 13 May 1900. The Astronomical Observatory secured the transmission of time by its pendula to the telegraphic stations of Ovar and Viseu. Personnel of the telegraphic stations were asked to provide help to astronomers if needed.

27 DN 21 May 1900. It is mentioned that Oom, Campos Rodrigues and Teixeira Bastos went to Ovar but further down it is said that the expedition from the Astronomical Observatory went to Serra da Estrela, close to Viseu. DN 15 May 1900. DN 23 May 1900. It is mentioned that Campos Rodrigues, Teixeira Bastos and Guilherme Capelo, from the Observatory of Lisbon were preparing the instruments for observing the eclipse in Serra da Estrela.

28 DN, 3 May 1900. DN, 23 May 1900. DN, 27 May 1900.

29 DN, 2 September 1900. Apparently this memoir was never published.

30 DN, 18 April 1900. List of members of the commission assembled to prepare the scientific excursion. DN, 22 April 1900. Special prices listed for first and second class passengers on the train for first 250 members of the Geographical Society. # DN, 19 April 1900.

31 DN, 26 April 1900. The instructions were taken from the memoir prepared by the Royal Astronomical Observatory, which also prepared a map with the totality path.

32 DN, 19 March 1900.

33 DN, 19 April 1900.

34 DN, 28 May 1900.

35 DN, 29 April 1900. DN 27 May 1900. The team from the Polytechnic School made observations in Viseu.

made several observations, including a registration of the variation of temperature during the eclipse. Their results were published afterward, and highly regarded by the authoritative Frederico Oom, astronomer and vice-director of the Astronomical Observatory.³⁶

The solar eclipse became also a national event by enrolling the expertise of national scientists. Members of the scientific commission created for the event were announced in the newspaper.³⁷ Oom stood out. He wrote extensively on the eclipse both from the scientific and educational point of views, preparing the population for the events to come before, during and right after totality. He published a long memoir, including qualitative descriptions and quantitative calculations of the eclipse, characterization of instruments, and specific instructions for all those who wanted to participate, which followed the pattern of eclipse's memoirs.³⁸ Five hundred copies were initially printed and the National Geographical Society was granted a special permission to sell them.³⁹ The parts selected to appear in the newspaper included the characteristics of the eclipse and its progressive phases,⁴⁰ mapped its totality path and presented calculations,⁴¹ described the effects it provoked on animals, and called attention to its importance for the observation of the solar corona and prominences.⁴²

Although the Lisbon Observatory specialized in positional astronomy, and Oom belonged to such a tradition, the new roles for eclipses as a consequence of the recent transition from positional to physical astronomy were highlighted in the selected parts. His scientific description was couched in poetic terms meant to captivate his broad readership. He certainly knew how to do it as he had long experience of writing popularization texts on astronomy.



Fig. 3: Scientific characterization of the eclipse

36 DN, 12 December 1900.

37 DN, 3 April 1900. The commission included Mariano Cyrillo de Carvalho, professor at the Polytechnic School, Campos Rodrigues, Frederico Oom and Artur Teixeira de Bastos, all three astronomers from the Royal Observatory of Lisbon and José Nunes da Matta, professor at the Naval School.

38 Frederico Oom, *O Eclipse solar de 1900* (Lisboa: Imprensa Nacional, 1900).

39 DN, 29 April 1900.

40 DN, 28 April 1900.

41 DN, 25 May 1900.

42 DN, 30 April 1900.

The eclipse also became a national event by enrolling the participation of the population, from the Queen and the consort Prince⁴³ to uneducated people, all becoming amateur observers of such a rare phenomenon. They were so many that Viseu accommodated 3000 visitors, a number which amounted to 1/3 of its population.⁴⁴ Social and cultural events were organized for special guests, from tours to cultural sites to outdoor dinners.⁴⁵ The eclipse's national relevance materialized in 38 articles, distributed from 8 March to 12 December, making often the first page of the capital newspaper. Extensive information of the happening, with descriptions of preliminary observations from various places, was included on the two days following the eclipse.⁴⁶ Its importance was such that both the eclipse's day and the day after were declared holidays.⁴⁷



Fig. 4: Scientific characterization of the eclipse and its phases

43 DN 23 May 1900. DN 24 May 1900. DN 28 May 1900.

44 DN 28 May 1900.

45 DN 24 April 1900. The mayor of Viseu is preparing visits to the cathedral and an excursion on the eve of 29 May to the mountain of Bussaco to see the sun's rise. DN 3 May 1900. Outdoor dinner. DN 8 May 1900. Special accommodations, meals, resting places arranged by the mayor. DN 27 May 1900. The paintings of the famous school of Grão Vasco will be shown to visitors.

46 DN, 29 May 1900. DN, 30 May 1900.

47 DN, 13 May 1900. DN, 17 May 1900. DN 22 May 1900. DN 23 May 1900.

If the astronomical event was single, it gave way to different extra-scientific uses. An advertisement of German lenses (Bacon lenses) specially fit to follow the eclipse safely through all its phases and sold in a Lisbon shop testifies to its commercial appropriation (Fig. 5).⁴⁸

Óculos Bacon para a Eclipse do Sol
 O álcool e o tabaco fca, sem
 adivida, constituindo um dos mais
 curiosos e procurados volumes da
 «Collecção do Povo».
 É de 100 réis o preço de cada
 exemplar cartonado.

AS MELHORES FAZENDAS DE
 verão para fatos de homem
 encontram-se na alfaiateria
 de Manuel Nunes Correia F.^{co}
 & C.^a, Rua S. Julião, 196.

Eclipse do sol
LENTEs BACON PARA APRE-
CIACAO d'este magnifico phe-
nomeno. A' venda unicamente
 na **OURIVESARIA FLORINDO,**
 rua Aurea, 99.

Roubo importante
Trafaria, 21. — A sr.^a Victoria
 Joaquina, de 61 annos de idade e
 residente no lugar de Abarra-
 mento, d'esta localidade, quando
 hontem regressava a sua casa apoz
 i meses de ausencia, pois que es-
 tivera durante esse tempo em Lis-
 boa, deparou com duas caixas de
 phosphorus amorphos em cima de
 um cotheter e junto d'ellas uma
 ponia de cigarros. Esta sr.^a ficou
 devras intrigada com o que aca-
 bava de presenciar, pois que teve
 sempre a chave da casa em seu
 poder durante o tempo que esteve
 na cidade, e dirigindo se a um ba-
 hi que tinha a um canto da casa,
 encontrou uma euberta que ella ti-
 nha deixado estendida sobre o
 mesmo guardado, bem como uma
 pta pendente do mesmo baú e que
 ella a tinha deixado dentro a roupa.
 As fechturas d'aquele novel acheta-
 vram-se gastadas e o baú abriu e con-
 tnu a poupa toda remexida dando
 por falta de um cordão de ouro no
 valor de 27.000 réis, outro no va-

Papel RAINHA D. AMELIA
 Papelaria PALHARES
Rua do Ouro

Contra a debilidade
RECOMMENDAMOS O VINHO
 nutritivo de carne, da phar-
 macia Franco, Filhos, por ser
 o unico legalmente autorisa-
 do, e foi premiado com as
 medalhas de

Fig. 5: Commercial advertisement

Its political appropriation gave way to two different cartoons (Fig. 6).

ASTRONOMIA POLITICA
 O Proclama editor da sol, segundo os astrólogos... da república

ECLIPSE INTERNACIONAL
 «Bavos»
 —O general
 homlen o
 y lindsay.
 O ministerio
 em um bele-
 os comba-
 im o levan-
 não foram
 endo apenas
 ando feridos
 Vinte e sete
 pondem.
 ções
 —Nos centros
 é bé que os
 o grande re-
 stituidos dos in-
 apenas de re-
 a de Roberts
 e vitar gran-
 perderem o
 de gente. Tam-
 os bores não
 os ingleses
 rmente e terri-
 vial, tomando

Fig. 6: Political cartoons: political astronomy and international eclipse

On the eclipse's day a cartoon dubbed 'International eclipse' depicted two astronomers looking at the face of the Sun which represents the politician Paul Kruger, leader of the Boer resistance against British dominion, and elected President of the Republic of Transvaal for the fourth and last time, in 1898. During the Second Boer War, his position became unstable. By the day of the eclipse, the situation could not be worse.⁴⁹ At the national level, the political appropriation of the eclipse by those opposing the government materialized in a revealing cartoon named 'Political Astronomy' (Fig. 6).⁵⁰ The sun represents the face of the politician José Luciano de Castro, leader of the Party in power (Partido Progressista). The government was to resign on 25 June, but by 14 May Luciano de Castro was still the commanding Sun, albeit challenged by protests and political rallies (white clouds) and by Ernesto Hintze Ribeiro, a man of the opposition and central figure of the rival party (Partido Regenerador), whose face's contour is symbolized by the big black menacing cloud. He was soon to become Prime-Minister.

By contrasting the coverage of the 1900 eclipse with the 1905 eclipse of 30 August, whose totality path crossed Spain but not Portugal, we realize that they were clearly asymmetrical. In 1905, there were substantially less news, which were mainly concerned with the organization of training expeditions to Spain for students of the Naval School.⁵¹ Seen through the lenses of the capital newspaper we can argue that the series of articles surveyed represent the 1900 eclipse in multiple and complementary facets pointing to its mixed nature. Articles embodied assorted features of organizational leaflets, scientific news, popular texts and cartoons satirizing political events. In turn, the eclipse acquired extra lives. It started as an international scientific event which turned national with both scientific and social implications. It became the occasion for educating the population, for celebrations and partying. Finally, by turning the eclipse's day and the day after into two successive holidays, Portuguese astronomy and astronomers were given extra credit and legitimacy.

49 DN, 28 May 1900. He left Pretoria the day after the eclipse, at first kept in hiding and then left for exile. The interest of Portugal in the Boer War was associated with the construction of railway linking Lourenço Marques, Mozambique, to the Transvaal.

50 DN, 14 May 1900.

51 DN 8 April 1905. DN 21 May 1905. DN 27 June 1905. DN 21 July 1905. An exception is the long article by the naturalist and popularizer J. Bettencourt Ferreira in DN 29 August 1905.

Concluding remarks

In this paper, two different instances of popularization involving the discussion of sporadic natural phenomena with different characteristics were discussed. Earthquakes and volcanoes are natural episodic phenomena whose occurrence was basically unpredictable while eclipses had been for long accurately predictable by astronomers. Earthquakes and volcanoes commanded respect for their frightening consequences and eclipses for their spectacular features. Their impact could not go unnoticed by the population. Their choice for news' topics shaped the ways the two sorts of events were popularized: the unpredictability of the first gave way to sophisticated historical digressions, calm outlines of future projects, and fictional accounts; the eminence of the second turned newspapers into efficient vehicles for enlightening readers on the eclipse's astronomical features and impact, and entreated people to become active participants in the observations.

Furthermore, their choice for news' topics cannot be taken as neutral information on scientific matters of local or national interest. In fact, both were used by the scientific community as legitimizing strategies through the mediation of journalists who acted between them and the masses. On the one hand, they provided the occasion for the affirmation of Portuguese science and scientists both in the national and the international context; on the other, they provided the opportunity to renegotiate the country's situation in the political and scientific geography of nations. In this context, they emphasized the participation of Portugal in an international network of seismologic stations, welcomed foreign astronomers, and fictionalized a situation in which Portugal would occupy a central position as a mediator between a reshaped Europe and the USA. All added up to a reaction to the negative consequences for Portugal of the British Ultimatum (1890) and the Berlin Conference (1895).

Finally, at the historiographical level, the news on the eclipse reveal how popularization of science has to be viewed as a two-way process, in which the population was involved as an active participant, by collaborating in observations which were subsequently incorporated in scientific reports on the eclipse. As instances of popularization of science, eclipse news not only contributed to the affirmation of Portuguese science but also to the affirmation of Portuguese astronomy as part and parcel of the life of the country, counting whenever possible with the active participation of its people.

The case of the Azorean newspaper portrays a distinct situation. The contents and style of the articles were oriented to an educated audience, which was expected to lobby for the interests of the island both in the national and international context, by promoting the participation in a nationwide internationally linked seismological network.