The **Challenger Deep–Sea Expedition** (1872-1876) in Brazil: the circulation of news and knowledge

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Introduction

Undeniably, due to concerns related to navigation, occupations, trade, fishing, migration, communication, warfare, transportation and leisure, for centuries the oceans and seas have played prominent roles in social, economic, political and scientific concerns of peoples and governments and thus in historiography. But it was in the second half of the nineteenth century that the oceans became part of expanding and different political–scientific projects for the investigation of large spaces, such as meteorological studies, the exploration of the Arctic or terrestrial magnetism. From the perspective of the history of science, a new dimension was added to the studies of the oceans and seas: the size of their depths – the *Deep Sea*. Collections, maps, reports and articles organized by experts from the collections and accumulated data by numerous Deep–Sea Expeditions and especially by the English *Challenger Expedition* (1872–1876), added a whole new field of knowledge related to the hydrographical, oceanographical, biological, climatological, geographical and geological processes.

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1 The author thanks Fabio D’Angelo, Irina Podgorny, Valter Ponte, Beverly Young and the support of the CNPq to the Research Productivity Project – proc. 306046/2014-8. Oceans – capítulos estratégicos na história das ciências geológicas (1870 – 1950) (2015–2018), in which this paper was produced.
6 *Report on the scientific results of the voyage of H.M.S. Challenger during the years 1873–76 under the command of Captain George S. Nares and the late Captain Frank Tourle Thomson*. Prepared under the superintendence of the late Sir C. Wyville Thomson and now of John Murray. Published by order of Her Majesty's government. [http://www.19thcenturyscience.org/HMSC/HMSC-INDEX/index-illustrated.htm](http://www.19thcenturyscience.org/HMSC/HMSC-INDEX/index-illustrated.htm) (Last access 02-02-2018). The other mentions to the texts of the *Challenger Expedition* when not indicated refer to this Report.
In Brazil, these initiatives related to the investigation of ocean depths in the second half of the nineteenth century, as well as throughout the world, were followed by newspapers. The scientific community, the journals and newspapers reported on the difficulties and scientific and technological achievements regarding the undertakings of the deep-sea expeditions, such as the British *Challenger* (1872–1876) and others. But until today the oceans and seas have not been more broadly studied by the History of Science and Technology in Brazil7. So this paper results from a thorough survey in Brazilian newspapers and publications to present an overview of the less known examples of the repercussions of these deep-sea expeditions in the country, as a contribution toward interpreting these endeavors.

The *Challenger Expedition* (1872–1876) was carried out with the support of the Royal Society and the British Navy led by the renowned biologist Charles Wyville Thomson (1830–1882) who had already participated in other expeditions such as the *Lightning* and the *Porcupine* in the 1860s. After Thomson’s death, John Murray (1841–1914) – the naturalist of the *Challenger* and who would become a leading authority on ocean studies – coordinated the publication of 50 volumes for nearly twenty years, with the results of the investigations carried out by the main experts of the time. During the 41 months in which the expedition covered about 68,890 nautical miles (or 127,580 km) while sailing the oceans, a multitude of data from hundreds of deep sea soundings, bottom dredges, open water trawls and serial water temperature observations and thousands of water samples and 600 cases of zoological, botanical, geological compilations were collected. In addition to thousands of studies and sediment samplings from different sea depths, it is estimated that as a result of their collections 715 new genera and 4,500 new species of marine organisms were described by renowned experts and which are currently deposited in museums8.

In the majority of traditional historiography concerning Oceanography, the *Challenger Expedition* is presented as the initial landmark of the modern discipline, which has been widely accepted by practically all the international classical works and countless manuals about Oceanography, in Brazil as well, until the first decades of the 20th century. However, in the approach questioning the official historiography of the founding fathers, other aspects of the *Challenger* journeys were already problematized, such as the financial gains amassed by Murray as a result of his scientific concerns regarding the processes of coral reef formation9. These investigations led to the identification and later exploitation of phosphate sources, used as essential fertilizers in English farming and the wealth of the acclaimed protagonist of the Oceanography discipline, in which he invested part of his financial resources in his own scientific research and in the production of the *Challenger* volumes. And it is no longer possible to characterize the *Challenger Expedition* as a ‘pure science expedition’ with unexpected results10. One cannot ignore that one of the

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8 See: The Natural History Museum. Ocean Bottom deposit collection. ‘The Museum’s ocean bottom deposit collection consists of samples from about 40,000 locations around the world… The most important sub-collection is the Sir John Murray Collection, which includes sea-bed samples from the HMS *Challenger* expedition (1872-76). It was given to the Museum by the Murray family in 1921 following his death in 1914’ [http://www.nhm.ac.uk/our-science/collections/mineralogy-collections/ocean-bottom-deposit-collection.html](http://www.nhm.ac.uk/our-science/collections/mineralogy-collections/ocean-bottom-deposit-collection.html) (Last access 02-02-2018).

9 Murray was not able to his ideas about coral reefs displace Darwin’s theory of coral reef formation based on subsidence. As Murray believed in the permanence of oceans basin, he could not apply subsidence as the phenomena that explained coral reef formation. However, it can be said that Murray contributed to the debate about subsidence, which was opposed to the theory of ocean basins long-term geological permanence. M. E. JOHNSON, B. G. BAARLI, *Charles Darwin in the Cape Verde and Galápagos archipelagos: The role of serendipity in development of theories on the ups and downs of oceanic islands*, in «Earth Sciences History», 34 (2015/2), pp. 220-242.

10 H. L. BURSTYN, *Science Pays Off: Sir John Murray and the Christmas Island Phosphate Industry, 1886-1914*, in «Social Studies of Science», 5 (1975), pp. 5-34. The works of John Murray also established the general morphology of the deep-sea floor and the fundamental differences between the sediment deposits from shallow waters, continental shelves and deep waters. The confirmation of the existence of mineral resources (polymetallic nodules) of possible economic interest in large areas of the ocean depths proved to be one of the many highly relevant results obtained by the *Challenger* Expedition. The polymetallic nodules have become in the last years the subject of international research and investments aimed at the economic exploitation of these resources, with heavy environmental impacts. J. MURRAY, A. F. RENARD, *Report on the Deep-Sea Deposits Based on the Specimens Collected During the Voyage of H. M. S. Challenger in the years 1872 to 1876*, in Report on the scientific results…; F. J. A.S. BARRIGA, *Ciência e recursos naturais debaixo do mar*...
mains interests of the project of the voyage the endeavor awakened was not only the potential commercial fisheries all over the world, but also safer navigation routes and assuring the appropriation of the seas and its depth.

In fact, in dealing with the overall scientific importance of the Challenger Expedition and the scientific results gained, undoubtedly the expedition represents a turning point in the history of Oceanography. But as Charnock points out underscoring the works of Margaret Deacon: ‘marine science has grown gradually over the centuries at rates depending on individuals and the environment in which they found themselves’11. The inclusion of new actors in these interdisciplinary studies about the deep–sea expeditions arising from the cultural approaches of sciences has already drawn attention to the fact that it is possible to identify periods of a more systematic interest in the investigation of the oceans earlier, at least from 1840 to 1880. In this period, extracted from previous data from whale hunters and fishermen, marine officers and naturalists developed a series of technical advances to the systematic measurement of the depths of the oceans, including methods and dredging tools to collect samples12.

Erika Jones has pointed out that ‘the historiography of the voyage is largely limited to the travels of the ship at sea and the legacy of the expedition’s scientific findings13. But even this wide–ranging historiography has achieved little in the incorporation of local readings that others actors gathered from these journeys14, in the immense variety of places around the world that the Challenger investigated.

The purpose is therefore not to deal with details of the Challenger Expedition, which is already the subject of a vast bibliography, but rather to outline some examples of what was published about Brazil and particularly of what was said of the Challenger in Brazil, in the local newspapers and national publications until the first decades of the twentieth century. In the absence of a larger number of scientific journals in the country, until the end of the 19th century, the daily press played an important role in circulating news about international scientific and technical achievements and disseminating the production of knowledge, which an emerging scientific community since 1870 had been contributing to the processes of institutionalization of sciences in the country15.

**Brazil and the news about the Challenger**

As for Brazil – the institutionalization of modern oceanographic studies in the country dates back to the 1950s, following the organization of the São Paulo Institute of Oceanography in 1946. This was the period in which, in Brazil, ocean researches began to be taken into consideration in the planning and drawing of scientific policies since the first meetings of the Brazilian National Research Council (currently known as Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq), which was organized in 1951. Nonetheless, since earlier centuries the scientific, political and strategic interests concerning the oceans to map the coastal regions, to build harbors and ports and directed to marine resources exploitation for fishing, were on the agendas of governments, companies, funding agencies and scientific institutions. Hydrography and Oceanography became part of the training courses of the Brazilian Navy, since the second half of the nineteen century. More systematical actions towards maritime research date back to 1858 regarding the study of hydrography for the career aspirants in the navy; installing submarine cables for telegraphic networks, the hydrographic services in the 1860s, aimed at delimiting the continental platform by the expeditions of 1861 to 1866 led by Amedée Mouchez (1821–

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13 E. JONES, Making the Oceans Visible: Science and Technology on the Challenger Expedition (1872-1876), on-going PhD. [https://Erika-jones.org](https://Erika-jones.org) (Last access 02-02-2018).
1892) and the Brazilian Navy. To this end, a Hydrographic Office (Repartição Hidrográfica) was created within the Ministry of the Navy in 1876, as well as a Fisheries Inspectorate in 1912. Due to these initiatives in some government sectors, and especially the Navy specialists devoted to hydrology, oceanography, not to mention communication and national defense, the local newspapers described in long and detailed articles or in short notes within their columns, news about the journeys of the Challenger. In addition to the daily news, local newspapers transcribed discussions in the now organized professional and scientific associations of the country, as well as published articles of technical-scientific nature.

The Challenger Expedition is presented by local newspapers as an English business venture that would likely increase scientific knowledge about the oceans. Some days before the HMS Challenger sailed from Portsmouth, England, on 21 December 1872, Brazilian newspapers published news that the scientific expedition was ready and that would include deep-sea sounding studies and astronomical observations to assure more precise ship navigation calculations. The newspapers praised the ‘famous and well-known’ Wyville Thomson, who had left his important post at the University of Edinburgh and the crew, 21 officers and around 216 crew members, many of which were volunteers. They transcribed, with location changes, the complete itinerary that the expedition would undertake in four years, while explaining that having left Cape Vert, the expedition would reach the shores of Brazil. The news summarized the main objectives of the expedition about conducting routine and priority investigations of seafloor surveys, the mapping of mountains and submarine valleys, studying the distances that light penetrated to discover creatures living in the depths, temperature verifications, chemical conditions of the waters, tracing the paths of submarine currents.

In a possible critique of the Brazilian government and navy, they described the ship to their readers throughout the country, citing details of the voyage’s preparation, praising the English government that had spared no resources to make the Challenger a magnificent explorer. Its cannons had been removed, except for two that would be used more to send signals, not for warfare purposes. An abundance of probes, lines, cables and machines, occupied the storage places of weapons and small steamboat to study the shores and bays. The deck had been divided into workshops for the numerous designers, photographers, chemists and naturalists. Transformed into a large laboratory, the Challenger would return in 1876, as a floating museum, with an archive of information until then unknown. With all that science or money could deliver, the greatest expedition success was expected.

In the description of the first months of the expedition, the newspapers continued to report that a huge collection of photographs and abounding samples taken aboard – collectibles, fishes, plants, birds and minerals deserved attention parallel to the information about the places visited by the naturalists, as well as the parties and receptions offered to the authorities both on dry land as well as on the ship. They highlighted information already disclosed about the existence of submarine mountain ranges between Greenland and Iceland that reached as far as the mouth of the Amazon, including a volcanic belt in the Azores. And the newspapers stressed the presence on board, in addition to the specialists, of a photographer. The importance given to the presence of the photographer and to the photo collections was due to the fact that the Challenger also innovated in this technology and was one of the first expedition to use photography to record their achievements and particularly the natives they encountered in the remote lands of the oceans. Such news in the newspapers of the capital of the Empire, Rio de Janeiro, and also in periodicals of several provinces of the country, were sometimes reproduced and repeated from Portuguese newspapers such as the ‘Jornal de Notícias’ of Ponta Delgada, Azores, or the Spanish ‘La Crónica de la Industria’, or the ‘Times’, ‘The Morning Post’ or the ‘Journal Officiel’, which also gives us a small sample of the English propaganda and reactions of the Challenger in other countries.

16 Amedée Ernest Mouchez (1821-1892), later became one of the main supporters of the Project of astronomical mapping “Sky Chart”, and director of the Paris Observatory.

17 The scientific work of the Expedition was conducted only by Wyville Thomson, John Murray, John Young Buchanan, Henry Nottidge Moseley, and Rudolf von Willemoes-Suhr. John James Wild was a Swiss oceanographer and the natural history illustrator of the Challenger.

18 Noticias Diversas. Correio do Brasil (RJ). Ano 1872/Edição 00397(1); Sondagem em alto mar. Jornal do Pará: Orgão Oficial (PA). Ano 1873/Edição 00171 (2); Diário do Rio de Janeiro. Ano 1873/Edição 00233(1) e Edição 00236(1). This latter news contained the information that an important person related to the royal house of England travelled incognito. The text possibly referred to Lord George Granville Campbell (1850-1915), fourth son of the eighth Duke of Argyll,
The Brazilian islands in the northeast of the country, the only one of its kind in the South Atlantic not occupied until today by England, represented mandatory stops of the Challenger. In addition to its political-strategic locations, understanding the geological constitution of the islands motivated Darwin, who visited them and comprised the fundamental reference for the Expedition. Also in the Luso-Brazilian case, the studies of the islands were associated, from the period of Portuguese colonial domination, to discussions about their oceanic or continental origins, about volcanism and earthquakes. And the Challenger evidently dealt with the subject, however without referring, at least explicitly, to an assortment of information and maps accumulated since the fourteenth century, when Portugal took possession of the northeastern islands of the territories that currently constitutes Brazil.

But the Challenger does not appear to have been so successful in its anchoring attempts in these Brazilian lands. The cliffs of São Pedro and São Paulo, uninhabited, were very difficult to access. The reports by the expedition mention that although excellent astronomical and magnetic observations were made, measurements of water temperature and formed collections of birds and fish were mostly not performed and additional conclusions on the geological nature of the cliffs were not obtained. The arguments in favor of the volcanic origins of São Pedro and São Paulo were not fully conclusive, contrasted with the samples that allowed Renard, following Darwin to advance the hypothesis that the existence of ‘peridotites might belong to the schisto–crystalline series’. The Report of the Challenger also includes the suggestion for the need to build lighthouses in the uninhabited rocks of São Pedro and São Paulo, whose importance has been repeatedly raised by the Brazilian Navy from the 1860s in the surveys of the coast. The legacy of the Challenger would remain in the several surveys that the Brazilian Navy carried out along the northeast coast of Brazil and would still be mentioned in the works about the English contribution to the sciences in Brazil. In 1929, Gago Coutinho (1869–1959), the Portuguese naval officer and aviation pioneer, who crossed the Atlantic by air in 1922 – flew over the cliffs, traced the history of its recognition since the fourteenth century, mentioned, in addition to the scientific visit of Darwin, the other English exploration voyages that had already performed surveys of the cliffs and reproduced maps of the English navy of 1832 completed by the Challenger. It aroused the attention of the Brazilian navy, which in several expeditions had also mapped the cliffs, for the strategic importance of the location of the cliffs to study the atmospheric currents and the installation of the meteorological station, besides the imperative need to construct a lighthouse, now also adapted to air trips. He regretted not having found in Rio de Janeiro Thomson’s work on the Challenger’s trip to prepare his article, with excellent photographs he would have liked to have reproduced. However, the 50 volumes published by

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Thomson and Murray on the *Challenger* – ‘the monumental bound edition with numerous maps and diagrams’ had been deposited in the National Library of Rio de Janeiro since 1896, when they were donated by the English government, through the Brazilian delegation in London. The volumes II - Botany and volume XVII - Zoology could be consulted in Rio de Janeiro, since nearly a decade before in the Library of the Faculty of Medicine24.

The archipelago of Fernando de Noronha was another island of the Brazilian Northeast visited by *Challenger*. It was quickly abandoned and with a certain ‘feeling of relief’ according to the *Challenger* report. It seems to have been another great disappointment, although observations of the relief, fauna and flora were carried out, as well as large collections and numerous measures taken in the waters along its coast. There was interest in verifying whether Fernando de Noronha was a submerged part of the South American continent connected to the rocks of São Pedro and São Paulo, but probes reaching great depths in its surroundings showed the volcanic origin of the typically oceanic archipelago. Despite its beauty, the island was no more than a prison. The stay of ten days on the planned islands was shortened to two days. The prohibition by the person in charge of the penitentiary of Fernando de Noronha to carry out studies in the archipelago, circulated extensively. According to reports, after the *Challenger* explored the interior of the island for a day and regretting not having had the opportunity to amass larger collections, but having verified the undoubtedly volcanic nature of the islands, did not oppose the prohibition and headed to Bahia along the coast of Pernambuco25.

In letters to his family, Joseph Matkin the ship’s young assistant, offers less polite references about Fernando de Noronha. The crew ‘had been unable to get a single thing’ there and it was only possible to buy some turkeys (probably chickens), melons and bananas. The ‘governor’ (in fact an army officer) of the island – ‘an obstinate old fool’ had assumed that at some point the *Challenger*‘s interest was to take possession of the island for England. Despite the explanations of the scientific mission by the Captain of the ship ‘the old fellow was too stupid to understand’. Lord Campbell, who considered Fernando de Noronha ‘a stupid little place’ also recounting the episode, states that at first the prison director had authorized the exploration of the island, and had even offered horses. But changed his mind the next day with no explanation. A republican newspaper of the south of the country opposed to the monarchist government, praised the importance of the expedition, in a review of the two great volumes of the Narrative of the Cruise, containing about 1,100 pages, 35 photographs, 43 letters, 22 diagrams and 340 woodcuts, received in 1885. They were furious at the prohibition of the *Challenger* to explore Fernando de Noronha, saying that they had only learned about this much later by reading the work, and ironically considered that such a prohibition gave the ‘wise world a broad sense of our degree of civilization’26.

The successive attempts by the British to appropriate the island of Trinidad in the same region since its occupation by the Portuguese in the fourteenth century were sufficiently well-known to the Brazilian authorities27. The military responsible for the prison of Fernando de Noronha, required an official authorization of the Imperial Government to allow the exploration of the islands. It was a customary, centralized and bureaucratic measure, but fundamental when considering the strategic position of the archipelago and the hegemony of Victorian England in the seas.


25 Narrative v. I… in Report on the scientific results …; A Viagem do Challenger. Diário do Rio de Janeiro (1860–1878). Ano 1874/Edição 00009 (1) 09/01/1874. In the prison of Fernando de Noronha, in1872, according to the reports of the Ministry of War, there were 1,800 individuals in the police force, officials, families of the detainees, 1,300 of whom were convicted military, political opponents and common criminals. There was also a fortress, an artillery park, and eight forts. These islands remained throughout the century as ‘the advanced sentries of the Empire of Brazil that guarded the greater commercial roads of the world’. The prison was closed at the beginning of the 20th century and today its occupation consists predominantly of tourist activities.


27 In 1895, England was still involved in a long diplomatic discussion with Brazil, demanding possession of that island, particularly arguing the various times it had occupied the island. M. N. KAMPF, *A ocupação Britânica da Ilha da Trindade (1895–1896): Uma questão de suscetibilidades*, Dissertação de Mestrado, Instituto Rio Branco, 2011.
In the trajectory of São Pedro and São Paulo, Fernando de Noronha to Salvador, Bahia, according to Lord Campbell and the *Challenger* reports, despite the setbacks, it would not have been totally unrewarding to collect ‘numbers of fishes – many quite new’, a few beautiful crinoids, enormous coarse sponges specimens’ and an extensive massive reef-forming corals was mapped at great depth. According to the newspapers, which in 1898 were still repeated news from 1876, the corals along the coast of Pernambuco were of comparable or better quality than those found in Naples, and insisted on the need for further research in the region, since the extraction of corals was a very lucrative industry.

But from Bahia, the *Challenger* also departed ahead of schedule. Its ten days of rest were interrupted due to a case of yellow fever among the crew. In the local newspapers, the *Challenger*’s passage through Bahia gained prominence regarding the news about the precarious sanitary conditions of the province, without, however, failing to record the extensive collections and the trips made. Three shipments of products from Bahia to England had been made, and six large boxes with botanical specimens and Natural History were deposited at the British consulate to be sent to the British government by the Neva liner. The cargo to be sent to the English ambassador in Rio de Janeiro, by the ship Boyne, included a ‘scientific book’ written by Professor Thomson to be offered to his majesty the Brazilian emperor. In the region of the port of Salvador they fished many previously unknown fish with special nets prepared for this purpose. Having received the most hospitable reception of the local British colony, the officers played cricket with the English members of the Bahia Cricket Club and visited the cities of Cachoeira, Feira de Santana, Santo Amaro, traveling free of charge in the wagons of the British owned San Francisco Railway Company which was under construction and linked Salvador to the city of Alagoainhas, in Bahia.

Although the Bahia rainforest, with its large number of exotic animals, had astonished the crew and naturalists, Joseph Matkin and Lord Campbell were not too impressed by their stay in Bahia, where two sailors deserted. The predominantly black population, made up of a majority of slaves, did impress them: ‘the blacks were not as not such fine people’ and slavery was gradually being abolished, all children after specific dates were free and slaves could buy their freedom very cheaply, many slave-owners were against slavery and treated their slaves well. Sixty slaves were used to carry 200 tons of coal to the ship in one day.

The continuation of the voyage with emphasis on a variety of subjects was accompanied by Brazilian publications and newspapers in its international news and transcripts of technical and scientific articles. From Bahia the *Challenger* went to the islands of Tristão da Cunha and to Cape Town, where it remained in quarantine until it was verified there were no other case of yellow fever. The newspapers emphasize the continuity of the surveys and observations that were sufficient to ‘undoubtedly’ guarantee the overall information that the bottom of the Atlantic Ocean was almost similar to that of the North Seas. It also confirmed the existence of a plateau of shallower waters and higher temperatures that connected the islands of Tristan da Cunha to the coasts of South America with some deeper channels that took to the cold waters from Ecuador to the north. There is no shortage of details about the animal life of the deep seas, and the news describing a four-eyed crab, two located in the paws; discussion summaries of the sessions of the English Geography Society on the surveys carried out and the hydrographic maps prepared by the *Challenger*, condolences for the death of the German naturalist Rudolf von Willemoes-Suhm (1847–1875) who died a board during the voyage due to an infection; or that the Government of Norway planned a scientific expedition to the North Atlantic along the lines of the

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30 Campbell, Log-Letters, p.47. Rehbock (ed.-), At Sea with the Scientists, p.102.
Challenger to obtain further information about the region, and which had sent the captain in charge of the mission to England\(^\text{31}\).

The return of the Challenger was also highlighted. The journals published detailed summaries of the journey's voyage. The results of the surveys had been unexpected, as well as the valued information to better understand sea currents, shipping and marine life in the oceans’ deeper regions. Collections of shells and sea organisms found in the depth of 4,900 until around 10,000 yards were among the outstanding features of the news. These new-found depths measured in the Pacific, in the Sea of Japan, and on the islands of the Society, were virtually unbelievable. And there was no shortage of rarities, such as a colossal turtle caught on the Society’s islands, very rare birds hunted on the Kerguelen Islands, giant seals found in the Strait of Magellan. Collections of shrubs, flowers, cryptogams collected in Japan, the Sandwich Islands, Tahiti and in Juan Fernandez, which would enrich the ‘celebrated’ botanical gardens of Kew and later briefly described and published, were also reported\(^\text{32}\).

Following the congresses of Hygiene, Medicine and Zoology held in the context of the 1878 Paris Universal Exhibition, excerpts from Ernest Haeckel's lectures (1834-1919) in favor of Darwin's theories and his work on jellyfish and deep-sea radiolaria of the oceans collected by the ‘most beautiful scientific exploration of the century’ - the Challenger - were reproduced in an article by the well-known Portuguese historian, Ramalho Urtigão. Even the provincial newspapers reported in the following years the death of William Carpenter (1813-1885), presented as the author of very important works on physiology and microscopic observations and one of the pioneers in research and exploration of the depths of the oceans such as the Challenger. In 1892 the newspapers continued to write about Murray's lectures as the ‘land and water of the world’, presenting him as a member of the Challenger and one of the greatest authorities in oceanography\(^\text{33}\).

The Challenger as an authority argument

The Challenger has also been used as an authoritative argument in technical and scientific journals to attest to the quality of information, equipment, or technical-scientific disputes. As in the case of the installation of submarine telegraph cables in the Northeastern capitals of the country, the only Thomson apparatus that the Hydrographic Office of the Navy possessed, considered as the most perfected survey instrument ever known and successfully applied to ocean depths by the Challenger. Since the sea currents represented the greatest interest for shipping and trade, in December 1876, and throughout the early months of 1877, engineers, military and naval officers assembled in various sessions at the Brazilian Polytechnic Institute, discussed topics related to already released results details of the Challenger. Discussions on the warming of the waters of the Gulf of Mexico and the formation of the Gulf Stream were accompanied by the newspapers and published in the Institute's journal. Arguments for and against the theses presented on deep water warming by sunlight or the central warming of the earth and underwater volcanism invoked observation data on the various ocean currents in different directions and the numerous water temperature variations at different depths recorded by the Challenger, which could not be attributed to a single cause. The expedition information was also used to support the explanations of local experts that the waters of the Gulf of Mexico were considered to be warmer than those of the Atlantic because of the difficulty in communicating with the polar waters, given that this phenomenon

\(^{31}\) *O Espírito-Santense* (ES) – 1870 a 1889, Ano 1875/Edição 00093(1); *Diário de Belém: Folha Política, Noticiosa e Comercial* (PA) – 1868 a 1889, Ano 1874/Edição 00213 (1); *Gazeta de Noticias* (RJ) – 1875 a 1879, Ano 1875/Edição00008 (1).

\(^{32}\) Revista Científica, Folhetim do Cruzeiro, *O Cruzeiro*, Ano1878/Edição 00070(1); *Gazeta de Notícias* (RJ), Ano 1876/Edição 00179(1); *Diário do Rio de Janeiro*, Ano 1876/Edição 00204(1); *A Constituição: Orgão do Partido Conservador* (PA), Ano 1876/Edição 00125(1).

\(^{33}\) R. URTIGÃO, *Notas de viagem através dos Congressos*, *Gazeta de Noticias*, Ano 1879/Edição00012(1); *Pacotilha* (MA) 1808 a 1909, Ano 1886/Edição 00006(1); *Jornal de Recife* (PE), Ano 1886 /Edição 00010 (1); *Diário de Noticias* (RJ), Ano 1886/Edição 0191 (1); *Jornal do Recife* (PE), Ano 1892/ Edição 00178(1).
occurred in inland seas, small stretches or channels surrounded by islands, as found by the *Challenger* in Solu and Tablas and even in the two parts of the Atlantic\(^{34}\).

The interest for the geological constitution of the Brazilian islands led to more national and foreign naturalists to systematically explore Fernando de Noronha. John Casper Branner (1850–1922), who participated in the North American expeditions to Brazil, joined the Brazilian Geological Commission in the 19th century and coordinated the Stanford Expedition to the Northeast in 1911, publishing numerous works on coral reefs in the Brazilian Northeast and on the oceanic islands. In his manuscripts kept in the Stanford archives, about the detailed notes he took describing Fernando de Noronha when he was there in 1876, there is a newspaper clipping about *The Challenger Expedition*. Using these data and referring to the expedition, he began to write his botanical and geological observations, considered the first detailed descriptions of the islands. He stated that “the few notes made by Mr. Darwin, and those of the *Challenger* party, furnish almost all the trustworthy information thus far published concerning it”\(^{35}\). Fernando de Noronha was visited by the North American Orville A. Derby (1851–1915) – former director of the São Paulo Geological Commission (1886 - 1904) and first director of the Brazilian Mineralogical and Geological Survey (1907-1915). One of the objectives of his expedition was to analyze the economic viability of the phosphate deposits of one of the islands of Fernando de Noronha, which resembled those of the Pacific islands exploited by Murray for commercial purposes. In his studies on the different types of rocks from Fernando de Noronha, Derby accepted that the soundings made by the *Challenger* had shown Fernando de Noronha was the culminating point of the submarine mountain chain, the Cape Verde and Canary Islands. The islands were separated from the continent by a deep valley, with some of the profoundest depths already measured in the Atlantic\(^{36}\).

The numerous samples collected and the measurements obtained along the Brazilian Northeast coast that resulted in charts, showing for instance the distribution of the water density on the surface of the ocean, continued being mentioned in Brazilian publications, as well as the identification of a shallow submarine bank with depths of less than 200 meters around the island of Trindade (off the Espírito Santo coast) and much larger than that of Fernando de Noronha. Among other results, the botany of the rocks of São Pedro and São Paulo and Fernando de Noronha studied by William B. Hemsley (1843–1924) published in the *Challenger Reports* are mentioned in the studies of Herman von Ihering (1850-1930), director of the Museu Paulista of São Paulo from 1894 to 1915\(^{37}\). The Brazilian Academy's Annals emphasizing the importance of the studies of foraminifera were significant for the petroleum stratigraphy also mentioned in the 1950s the work of Henry Brady published in 1884 about *Challenger*'s results, in which he described foraminifera collected from the coast of Northeast Brazil\(^{38}\).

The *Revista Maritima Brasileira*, published uninterruptedly since 1881, was one of the few Brazilian journals entirely devoted to technical-scientific research on the oceans. It published texts of the professors and theses defended by the students of the Naval School of Rio de Janeiro, in addition to matters related to war and merchant naval activities. In 1903 it reproduced as teaching material for the


Navy the General Instructions for the Hydrographers of the English Admiralty, who still held the Challenge as an example to handle various procedures. The text explained in detail how to perform a good determination of the mean sea temperature level, despite the relatively small number of observations taken at regular intervals following Challenge's instructions. It recommended as a constant rule that deep sea surveys should be accompanied by thermometers to determine the temperature of the waters at different depths, noting that the temperature series obtained by the Challenge had already provided diverse information on the circulation of marine currents at different depths, but that the contingency of these measures was fundamental at every opportunity to expand these mappings.39

In the historiographical reports on the great deep-sea expeditions the referrals to the Challenge were mandatory, preceded by the adjectives ‘formidable’, one of the ‘most beautiful’, the ‘famous’ voyage, which with its surveys contributed more than any other to from the Atlantic Ocean. These were rhetorical statements, which often are not accompanied by further developments about their achievements. In other cases, for explaining the existence of marine life in the depths of the oceans, the writers of the Revista Maritima had more references for the studies of the French on the oceans. The motivation of the deep-sea expeditions, even the Challenge, is attributed to the French zoologist Alphonso Milne–Edwards (1835-1900). Ignoring previous contestations, it was his work on corals and other animals obtained at depths of 2,000 ms, with the rupture of the telegraph cable linking Sardinia to Algeria in 1861, that the azoic theories of Forbes, about the inexistence of life in the great oceanic depths were questioned.40

Other studies bestowed all merit to the Challenge's results on the brightness and color of deep-sea fish. These observations questioned the belief that light was indispensable for the coloring of animals, a much more general and complex issue related to the ability of bodies to absorb certain light rays and reflect others. The details of directions, depths of the vast high-elevation mountain range in the Atlantic bed between the American and African coasts were some of the other results that largely interested the experts of oceans in the country.41

Among the textbooks that were used as reference for teaching Brazilian students and addressing the importance of the oceans in the early 20th century by dedicating a broad chapter to the geological processes of the oceans or the hydrosphere, the books by John Casper Branner, 'Elemental Geology prepared with a special reference to the Brazilian Students and Geology of Brazil' of 1915 and by Alberto Betim Paes Leme (1883–1938) 'Physical History of the Earth (seen by those who studied it from Brazil)' supported their explanations based on the data from the Challenge. They often refer to the Challenge data and to subsequent expeditions concerning the country and to the different sedimentation environments in the South Atlantic. The chapters on Hydrosphere, or the intemperate action of the sea, mention, among many other subjects, the enormous limestone deposits in shallow seas, the exceptional density of the sea along the Brazilian Nearshore that the Challenge reports showed. And they attributed this fact to

41 A. VINHAES, A luz fria abyssal. Secção de Pesca, «Revista Maritima Brasileira», Ano 1926/Edição 00104(5); L. M. de B. FOURNIER, Vestigios Arqueológicos no Brasil, Conferência em 24 de março de 1938 na Sociedade de Geografia do Rio de Janeiro, «Revista da Sociedade de Geografia do Rio de Janeiro», XLV (1938), pp. 113-138. Fournier also referred to the German expedition Meteor (1925-1927), which applied new acoustic sounding techniques for the systematic and detailed survey of the South Atlantic, more accurately identifying the continuous lower depth areas corresponding to the meso-Atlantic chain.
the greater proportion of dissolved calcium carbonate due to favorable local conditions of rising water temperatures. The clayey deposits of the ocean floors at greater depths, the sea densities along the coast of the Brazilian Northeast, the chemical composition of the red ‘abyssal clays’ of the Atlantic, the meso-oceanic chain mapped for the first time by the Challenger.

Conclusion

The Challenger was mentioned by the newspapers, mainly due to the economic advantages that the surveys conducted would bring to the commercial navigation routes or the rarities found in distant and deep seas that could interest more readers of each newspaper. The expedition was relatively well publicized by the newspapers of the country’s capital and the information also circulated mainly in the provinces of the North and Northeast, possibly due to the interest the adventures of the expedition could arouse. It must be considered that at the time there were not many Hydrographic specialists in the country and that the Brazilian Navy had only been able to initiate efforts for its systematic surveys at sea through the organization of its Hydrographic Office. It was in the first decades of the twentieth century, new courses, initiatives and proposals to stimulate the systematic investigation of the oceans in Brazil, would recover the history of Hydrography and Oceanography and incorporate data obtained by the Challenger in their investigations.

The collections of marine organisms and water samples, sediment and fossil samples from different marine geological environments, dredged by instruments that were being perfected in the expeditions and investigations in the change of the century, gathered specific and sporadic empirical data, which began to demand coordinated observations in all oceans. Its depths became visible and to make visible the inaccessible spaces by direct observation, sailors, fishermen, explorers and researchers of the oceans combined the accumulated data in tables, graphs, maps and scientific papers. The ‘vast voids’ in the oceans were transformed into ordered and delimited square grids crossed by isopleths indicating barometric measures, depths, amplitudes of current and ancient tides, ocean currents, magnetism, density and water temperatures, ascribing shapes, contents, properties and historicity to marine depths and ocean floors

These issues were studied in Brazil by the professionals in scientific institutions, such as John Casper Branner, Orville Adalbert Derby, Hermann von Ihering, Betim Paes Leme (1883–1938) and marine engineers such as Francisco Calheiros da Graça (1845–1906) and Augusto Vinhaes (1858–1941), as well as others. Until then, although several coastal mappings had already been carried out, the references of the Challenger still deserved citations alongside the new international information that was being obtained and the investigations being carried out by the Brazilian navy.

The results of the Challenger on the scientific imaginary of certain educated elites of the country, still had unusual outreach. The work of Henry Nottidge Moseley - Notes by the Naturalist on the Challenger - would be invoked as an argument of authority in the Chamber of Deputies of 1884. In a discussion of the draft law on the Emancipation of Slaves by Rui Barbosa, one of the best known Brazilian jurists and diplomats, merits of the Expedition and its scientific personnel were recalled as reinforcement to the criticism that the abolitionist propaganda would be the cause of the fall of market prices to buy and sell slaves. At the time of the voyage, Moseley had attributed the fall of the price of slaves to the law, known as the Ventre Livre [Free Womb] of 1871, which rendered free the children of slaves born after that date. His assertion was used as yet another argument to explain that the use of slave labor was no longer


44 Lista dos trabalhos hidrográficos nacionais levantados por oficiais de marinha, por engenheiros e particulares, organizada de acordo com o catálogo das cartas, plantas e reconhecimentos hidrográficos existentes no arquivo da Repartição Hidrográfica em outubro de 1887, in A. L. VON HOONHOLTZ, Secção de Navegação e Hidrografia do Instituto Polytechnico. Revista do Instituto Polytechnico Brasileiro (RJ). Ano 1888/Edição 00018(1).
profitable for a long time and the pressing need for the end of slavery, which would only happen in 1889\textsuperscript{45}.

Using the *Challenger* as an authority argument in scientific disputes, the use of equipment, and also political rhetoric, shows that the *Expedition* was used locally due to the editorial policies of newspapers and opportunities to access international journals. Moreover, the circulation of knowledge produced by the *Challenger* by the technical-scientific community, particularly linked to the navy, persistently asked public authorities to give more attention to its demands for scientific investigations, because without this initiative the country’s fishing, commercial navigation and defense would lack the proper conditions imposed by the internationalization of the oceans.

\textsuperscript{45} Estado Servil, *Jornal do Commercio* (RJ), Ano 1884/Ediç\~{a}o00258(1); *A Província do Espírito Santo*, (ES) Ano 1884/Edição 0633(1). Moseley, besides a renowned specialist in invertebrate morphology, was interested in the customs of the people he visited, using much of his time ashore in the study and organization of anthropological collections. H. N. MOSELEY, *Notes by a naturalist on the ”Challenger”,* being an account of various observations made during the voyage of H.M.S. ”Challenger” around the world, in the years 1872–1876, under the commands of Capt. Sir G. S. Nares and Capt. F. T. Thomson, London, Macmillan and co, 1879.
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