

PORTUGAL AND THE 1876 SOUTH KENSINGTON INSTRUMENT EXHIBITION

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1.- The 1876 Special Loan Exhibition of Scientific Apparatus.

As part of the drive to improve science teaching in Britain, the Committee of Council on Education decided, in January 1875, to form a Loan Collection of Scientific Apparatus¹

“which was to include not only apparatus for teaching and for investigation, but also such as possessed historic interest on account of the persons by whom, or the researches in which, it had been employed”².

A 134 advisory committee was set up to look into the matter. Amongst its members, one finds such ‘household’ names as George Airy (1801-1892), the Astronomer Royal, James Clerk Maxwell (1831-1879), John William Strutt, 3rd Baron Rayleigh (1842-1919), and the engineer Carl Wilhelm Siemens (1823-1883). At the first advisory committee meeting, in 13 February 1875, the committee members unanimously decided that “an exhibition such as that proposed would be most instructive and valuable”³. From the start many

1 GREENAWAY, Frank (1993) “More than ‘a Mere Gazing Place’: The Special Loan Exhibition and the Science Conferences of 1876”. In: ANDERSON, R. G. W.; BENNETT, J. A.; RYAN, W. F. (ed.) *Making Instruments Count. Essays on Historical Scientific Instruments presented to Gerard L'Estrange Turner*, Aldershot, Variorum; HOBHOUSE, Hermione (2004) *The Crystal Palace and the Great Exhibition: art, science, and productive industry: a history of the Royal Commission for the Exhibition of 1851*, London, Continuum.

2 SOUTH KENSINGTON MUSEUM (1877) *Catalogue of the special loan collection of scientific apparatus at the South Kensington Museum*, 3rd edition, London, Her Majesty's Stationery Office.

3 *Ibid.*

also desired that the exhibition might provide a stepping-stone “towards something more permanent and much more extensive”, *i. e.* a “Museum for the illustration of the Physical, Chemical, and Mechanical Sciences” modelled upon the Parisian Conservatoire des arts et métiers⁴.

In order to better organize the exhibition and, in particular, to define its scope and instrument classification, five sub-committees were set up:

1. Mechanics (including pure and applied mathematics)
2. Physics
3. Chemistry (including metallurgy)
4. Geology, Mineralogy, and Geography
5. Biology⁵.

Initially the exhibition was to be held at the South Kensington Museum and open on June 1875. In the eventuality of the Museum space being insufficient, the possibility of splitting the exhibition between two years and different scientific topics was considered⁶.

In late February early March, several sub-committee meetings were held at the South Kensington Museum⁷. By May 12, it was decided to postpone the exhibition opening till March 1876⁸. On June 22, a classification scheme was approved. Eighteen classes were initially defined while the last catalogue edition included two more⁹. In July 1875, an exhibition opened between the 1st of April and the end of September 1876, was anticipated¹⁰. As we will see these dates were not adhere.

1.1.- Peculiar characteristics.

Despite its international character, the 1876 exhibition cannot be classified as universal due to its limited scope. In particular, the exhibition was not an industrial one, its focus laying on research and education rather than on the

4 (1875) “The Loan Collection of Scientific Instruments”, *Nature*, 11, n. 277, 301-302.

5 SOUTH KENSINGTON MUSEUM (1877).

6 (1875) “The Loan Collection of Scientific Instruments”, *Nature*, 11, n. 277, 301-302.

7 (1875) “The Loan Collection of Scientific Instruments”, *Nature*, 11, n. 279, 355.

8 (1875) “Notes”, *Nature*, 12, n. 289, 32-35.

9 The initial categories were: Arithmetic; Geometry; Measurement; Kinematics, Statics, and Dynamics; Molecular Physics; Sound; Light; Heat; Magnetism; Electricity; Astronomy; Applied Mechanics; Chemistry; Meteorology; Geography; Geology and Mining; Mineralogy, Crystallography, &c. and Biology. Educational Appliances and Miscellaneous being the two later additions. SOUTH KENSINGTON MUSEUM (1877).

10 (1875) “Notes”, *Nature*, 12, n. 298, 218-220.

practical applications of science¹¹.

The 1876 South Kensington Loan Collection and Universal exhibitions also pursued quite different organizational strategies. For instance, in the 1876 South Kensington exhibition, the transportation expenses were undertaken by the British government and exhibits were “handed over absolutely to the custody of the Science and Art Department”¹²; the items would not be displayed by country as usual in international exhibitions but strictly “according to the general classification” established, *i. e.* the instruments were displayed by category. The display arrangement was defined by the Science and Art Department. One should point out that, in the 1851 Great London Exhibition, a mixed approach was implemented in which each country had an exhibition space while all the machines were grouped in a single section for logistical reasons¹³. No medals or rewards were given¹⁴. Also following the British practice established at the 1851 Great London Exhibition, the Loan Collection was not a trading fair, no buying or selling of displayed items was allowed. A principle not adhered to elsewhere, for instance, at the 1876 Centennial Philadelphia exhibition, 60% of the objects on display were sold¹⁵. Still in the South Kensington Exhibition, prices were marked at least upon the educational objects “so that an accurate idea may be formed of the cost of a series of instruments required for a course of instruction in any particular branch”¹⁶.

1.2.- International participation.

According to the organizers, as soon

“as the program had been definitely settled, steps were taken to interest foreign countries in the Exhibition; and it was determined to obtain the co-operation of men of science on the Continent, who, while acting as members of the General Committee, should form special Sub-Committees charged

11 GREENAWAY (1993); (1875) “The Loan Collection of Scientific Instruments”, *Nature*, 11, n. 277, 301-302.

12 SOUTH KENSINGTON MUSEUM (1877).

13 *Ibid.*; AIMONE, Linda; OLMO, Carlo (1993) *Les expositions universelles 1851-1900*, Paris, Belin.

14 (1876) “The Exhibition of Scientific Apparatus”, *English Mechanic*, n. 581, May 12, 220-221.

15 AIMONE; OLMO (1993), 63-65.

16 (1876) “The Exhibition of Scientific Apparatus”, *English Mechanic*, n. 581, May 12, 220-221.

*with the due representation of the science of their respective countries*¹⁷.

Official invitations were forwarded through the Foreign Office stating that, "Science being the common property of all nations, the exhibition of the appliances by which it is promoted partakes of an international character"¹⁸.

For instance the invitation to the Portuguese authorities was sent via the British legation in Lisbon and somewhat unexpectedly dates from 13 November 1875¹⁹.

In a more pro-active attempt to rally support for the initiative, officers of the Science and Art Department visited several foreign countries²⁰. While we do not know the exact timeframe of these diligences, in October 1876, Joseph Norman Lockyer (1836-1920) and Major Edward Robert Festing (1839-1912) were in Rome and, in the following January, Francis Philip Cunliffe-Owen (1828-1894), Director of the South Kensington Museum, was present at the Berlin audience where Germany's Crown Prince and Princess received representatives of the country scientific community "in order to confer upon the means of securing an adequate representation" at the London exhibition. According to the journal *Nature*, this was

*"the latest adhesion to the scheme, and we are now able to say that the arrangements are complete in the case of Germany, the United States, Belgium, Holland, and Switzerland. In all these countries, committees appointed by Government are collecting instruments either for the Research, the Historical, or the Educational department"*²¹.

By March, Italy and France had "appointed committees to act in union with the general committee" while, in the United States, the government contacted various departments and scientific institutions²². The Russian Academy formed a committee under Otto Struve (1819-1905) and "the Austrian Minister of Instruction has taken the matter in hand for that country,

17 SOUTH KENSINGTON MUSEUM (1877).

18 (1876) "The Loan Exhibition of Scientific Apparatus at South Kensington", *Nature*, 13, n. 325, 20 January, 231-232.

19 CORVO, João de Andrade (1875) *Carta de 19 de Novembro*, Torre do Tombo, Ministério do Reino, Mç 3663.

20 (1876) "The Loan Exhibition of Scientific Apparatus", *Nature*, 13, n. 331, 2 March, 349-350.

21 (1876) "Notes", *Nature* 13, n. 323, 6 January, 196-198.

22 (1876) "The Loan Exhibition of Scientific Apparatus", *Nature*, 13, n. 331, 2 March, 349-350.

and one of his officers, Mr. Fidler, is in correspondence with the Science and Art Department²³.”

In Spain no local committee was established, “but the Government has promised to contribute, and Senor Riano has been specially appointed to make the necessary arrangements”²⁴.

1.3.- The exhibition opens.

Finally, almost a year later than initially envisaged, Queen Victoria officially opened the exhibition on Saturday 13 May 1876. Two days later, on the 15th, the exhibition opened to the general public. This delay was blamed on the late arrival of several exhibits²⁵. On April 27, the Russian contribution had not yet been received at South Kensington²⁶.

At the opening the

“number of exhibitors’ – governments, societies, departments, and individuals’ – amounts to about 1,000 and the collection contains altogether somewhere about 15,000 objects, arranged in this first edition of the catalogue, under 4,576 heads”²⁷.

Exhibits from the United Kingdom, Austro-Hungarian Empire, Belgium, France, Germany, Holland, Italy, Norway, Russia and Switzerland were on display. The Spanish contribution had not yet arrived²⁸. In the end, the United States of America failed to have an official participation. A situation blamed on the almost coincidental occurrence of the Centennial Universal Exhibition²⁹.

In the meantime, and “in consequence of want of room” in the South Kensington Museum, the exhibition venue had changed to the western galleries of the buildings previously used for the Annual International Exhibitions where it occupied approximately 40,000 square feet (approximately 3 700 m²).

23 *Ibid.*

24 SOUTH KENSINGTON MUSEUM (1877).

25 (1876) “Notes”, *Nature*, 13, n. 336, April 6, 455-458.

26 (1876) “The Progress of the Loan Collection”, *Nature* 13, n. 339, 503-505.

27 (1876) “The Loan Collection”, *Nature* 14, n. 341, May 11, 21-24.

28 *Ibid.*

29 *Ibid.*; (1876) “Loan Collection of Scientific Apparatus”, *The Times*, n. 13 May, 13.

Overcrowding was nevertheless still a problem³⁰.

The exhibition entrance rules copied those in use at the South Kensington Museum. The exhibition was opened from Monday to Saturday. Entry was free on Mondays, Tuesdays and Saturdays and cost six pence³¹ on Wednesdays, Thursdays, and Fridays. The opening hours were from 10 a.m. till 10 p.m. on the free days and from 10 a.m. to 18 p.m. on the others³².

1.4.- Outreach program - Conferences, lectures and demonstrations.

Attempting to fulfill the perceived audience needs and the exhibition aims, the organizers conceived a comprehensive outreach program although part of it appears to have been devised on the fly. It was believed that

“simply to show such objects under glass cases would not enlighten the public generally as to their use and value. It has, therefore, been determined to hold both conversaciones and conferences, and at the latter to have lectures given by eminent men of science, both English and foreign, on different branches of science, as illustrated by the collection. These conferences will be held in a room situated in the centre of the upper gallery, and will be opened to any one visiting the exhibition”³³.

The first of these initiatives was the May conferences planned to describe and discuss the most important instruments exhibited (table1)³⁴. In each conference day, presentations were delivered from 11 a.m. to 1 p.m. and from 2 p.m. to 4 p.m.³⁵.

30 (1876) “The Loan Exhibition of Scientific Apparatus”, *Nature*, 13, n. 331, 2 March, 349-350; (1876) “Loan Collection of Scientific Apparatus”, *The Times*, n. 13 May, 13.

31 The 10 pence quoted by De Clercq probably being incorrect. De CLERCQ, Peter R. (2002) “The Special Loan Collection of Scientific Apparatus. South Kensington. 1876. Part 1; The ‘Historical Treasures’ in the Illustrated London News”, *Bulletin of the Scientific Instrument Society*, n. 72, 11-19.

32 (1876) “Loan Collection of Scientific Apparatus”, *The Times*, n. 13 May, 13; (1876) “The Loan Collection of Scientific Apparatus”, *English Mechanic*, n. 582, May 19, 239-240; (1876) “Loan Collection of Scientific Apparatus at South Kensington”, *The Musical Times and Singing Class Circular*, 17, n. 400, 492-494.

33 (1876) “The Exhibition of Scientific Apparatus”, *English Mechanic*, n. 581, May 12, 220-221.

34 (1876) “Notes”, *Nature*, 13, n. 337, 474.

35 (1876) “Loan Collection of Scientific Apparatus at South Kensington”, *The Musical Times and Singing Class Circular*, 17, n. 400, 492-494.

Topic	Days	Number
Physics (including Astronomy)	16, 19, 24	32
Mechanics (including Pure and Applied Mathematics and Measurement)	17, 22, 25	18
Chemistry	18, 23	13
Biology	26, 29	15
Physical Geography, Geology, Mineralogy, and Meteorology	30, 1, 2	30

Table 1: Days of conferences and respective total number of presentations per exhibition section.

The conferences were intended to a specialist audience as may be ascertain by the invitations sent abroad³⁶. Despite this they were free and “besides the members of committee, contributors, and special ticket holders, the public will be admitted as far as space will permit³⁷”.

Later

“it became evident to those who were engaged in organizing and arranging the loan collection of scientific apparatus, that its usefulness to the general public would be very much increased, and the interests of science furthered, if explanations of the construction and uses of the various instruments could be given. Many of the exhibitors provided explanations at stated times of the instruments lent by them; but it was not possible to do this for more than a comparatively small proportion of all the apparatus shown, and it was felt that it would be very desirable to have lectures on the classes of instruments and apparatus used for different purposes”³⁸.

Despite the lack of funds, the Science and Art Department relied on the good will of lecturers to organize a series of popular lectures given on the evenings of the free days – Mondays, Tuesdays, and Saturdays³⁹. The first lecture, “John Dalton’s Apparatus and what he did with it”, was given by

36 LEGAÇÃO BRITÂNICA EM LISBOA (1875) *Carta de 13 de Abril*, Torre do Tombo, Ministério do Reino, Mç 3663.

37 (1876) “The Scientific Apparatus Exhibition”, *The Times*, n. 12, May, 10.

38 VICTORIA AND ALBERT MUSEUM, SOUTH KENSINGTON MUSEUM (1876) *Free evening lectures, delivered in connection with the special loan collection of scientific apparatus*, London, Chapman and Hall.

39 (1876) “The Loan Collection Conferences”, *Nature*, 14, n. 344, June 1, 92.

Henry Enfield Roscoe (1833-1915) on June 3. Twenty five lectures delivered until August 28 were published in book form. We are unsure whether these correspond to the complete set since an advertised June 19 lecture was not published⁴⁰. Later working-men were specifically invited to attend a new series of free Saturday evening lectures⁴¹. A series that outlasted the exhibition itself, the final lecture was given on March 30 1877, three months after the exhibition had closed⁴². Moreover a set of lectures targeted specially science teachers. Afterwards MacMillan published thirty-one lectures, delivered by eighteen different speakers, in two volumes⁴³.

At some point demonstrations started to be provided both by exhibitors and volunteers⁴⁴. It is difficult to judge the true extent of these demonstrations since we only found the schedule for the free days, between June 10 and 16 (table 2)⁴⁵.

Time	Demonstration	Sat, 10	Mon, 12	Tue, 13
11.00	Marine Engines in Motion	x	x	x
11.30	Fog Horns, Electric Light, Spectrum of Electric Light	x	x	x
12.45	Time Gun	x	x	x
13.30	Radiometers	x	x	x
14.00 - 17.00	Pictet's Ice-making Machine	x	x	x
14.30	Orreries	x	x	x
15.00	Sir J. Whitworth's Millionth Measuring Machine and True Planes		x	
15.30	Electric Light, Musical Instruments		x	
15.30	Ancient Musical Instruments			x
16.30	<i>The Times</i> Type-Composing Machine	x	x	x
19.30	Telegraphic Apparatus		x	x
20.00	Sir J. Whitworth's Machines		x	
20.00 - 21.00	Little Basses' Lighthouse	x	x	x

Table 2: Demonstrations between Saturday 10 and Friday 16 of June at the South Kensington Instrument exhibition.

40 (1876) "Notes", *Nature*, 14, n. 346, June 15, 157-159; VICTORIA AND ALBERT MUSEUM, SOUTH KENSINGTON MUSEUM (1876).

41 (1877) "Loan Collection of Scientific Apparatus", *Nature*, 15, n. 375, Jan 4, lxxvii.

42 (1877) "Notes", *Nature*, 15, n. 374, December 28, 188-191; (1877) "The Loan Exhibition of Scientific Apparatus", *Nature*, 15, n. 388, April 5, 490-491.

43 (1879) *Science lectures at South Kensington*, vol. 1 and 2, London, Macmillan and Co.

44 (1877) "The Loan Exhibition of Scientific Apparatus", *Nature*, 15, n. 388, April 5, 490-491.

45 (1876) "Notes", *Nature*, 14, n. 345, June 8, 138-139.

The publications produced as consequence of the exhibition were also an important part of the outreach program. On the opening day, visitors would be able to buy the exhibition catalogue as well as an accompanying handbook at a cost of one shilling each. The catalogue first edition only partly described the exhibits due to the late arrival of so many of them but according to *The Times* newspaper “the wonder is that the Catalogue was issued at all, not that it is incomplete”⁴⁶. The catalogue number of pages increased from approximately 600 to 1 000 between its first and third editions. The German Committee decided to translate and publish the Handbook and the Catalogue third edition. A French edition of the Handbook was also printed⁴⁷.

1.5.- Overview.

The exhibition opened to the general public on May 15 and closed on December 30, 1876⁴⁸. Due to the late arrivals the number of exhibits increased by 40% after the opening day, (table 3).

	Opening	Ending
Exhibitors	1000	1400
Objects	15000	20000
Catalogue entries	4576	6000
Countries	10	11(*)

Table 3: Overview of the 1876 at the opening day catalogue, and according to the third, (and last), edition of the exhibition catalogue. (*) Number of official participant countries. As already referred several foreign exhibits appeared as United Kingdom contributions.

If one believes in the journal *Nature* press coverage, since its director Norman Lockyer was involved in the organization and had a vested interest in a successful event, the exhibition opened to good reviews. The main negative criticisms referred the reduced benefit non experts would gain from

46 (1876) “Loan Collection of Scientific Apparatus”, *The Times*, n. 13 May, 13.

47 De CLERCQ, Peter R. (2002) “The Special Loan Collection of Scientific Apparatus. South Kensington. 1876. Part 3; Contemporary Publications”, *Bulletin of the Scientific Instrument Society*, n. 74, 16-21.

48 (1876) “Notes”, *Nature*, 15, n. 374, December 28, 188-191.

looking at instruments behind glass cases and the crowded rooms due to the large number of exhibits⁴⁹. The same journal also published a few daily visitor numbers (table 4). Not surprisingly the free days, Monday, Tuesday and Saturday, had the largest attendance⁵⁰. If one considers these as typical numbers, the exhibition visitors approximately doubled those of the nearby Patent Office Museum.

Weekday	21-27 May	5-9 June	31 July - 5 August
Monday	1822	11964	2951
Tuesday	2816	5656	3377
Wednesday	772		488
Thursday	891		441
Friday	939		441
Saturday	3457		3422
Total	10697		11120

Table 4: Available visitor numbers to the 1876 Loan Collection of Scientific Apparatus.

2.- The Portuguese participation.

Of the invited countries, only Denmark, Portugal, Sweden and the United States of America do not appear explicitly as contributors in the exhibition catalogue⁵¹. The catalogue third edition hints at a possible Portuguese connection. The Consul-General of Portugal, Vicomte Duprat, sent two exhibits: a chrono-goniometer, with magnifier, and an azimuthal planisphere.

These instruments were invented by João Carlos de Brito Capello (1831-1901), a Portuguese Navy officer and D. Luiz Meteorological Observatory director, and were destined to ease the burden of some of the calculations done on board. The chrono-goniometer allowed one to “find the time at sea and the latitude by two altitudes of the sun taken at any time” and gave the

49 (1876) “Loan Collection of Scientific Apparatus”, *The Times*, n. 13 May, 13; (1876) “The Loan Collection of Scientific Apparatus”, *English Mechanic*, n. 582, May 19, 239-240.

50 (1876) “Notes”, *Nature*, 14, n. 344, June 1, 119-122; (1876) “Notes”, *Nature*, 14, n. 345, June 8, 138-139; (1876) “Notes”, *Nature*, 14, n. 354, August 10, 320-323.

51 (1876) “The Loan Collection of Scientific Instruments”, *The Times*, n. 9 February, 4; SOUTH KENSINGTON MUSEUM (1877).

hour angle with a one minute precision. With the azimuthal planisphere, one could obtain a quick estimate of the celestial body azimuth, if one knew the height, declination and observer longitude⁵².

Although Duprat appears identified as a United Kingdom (UK) contributor, we found out that these instruments were intentionally sent to the exhibition by the Portuguese government⁵³. One should also point out that this contributor misidentification extends to at least another country. The Washington Naval Observatory exhibits sent over by Rear-Admiral Charles Henry Davis (1807-1877) are equally included under the UK distributor list. Due to the lack of an official USA participation English representatives contributed with "objects they have received from their American friends"⁵⁴.

The absence of an American participation was regretted, "especially in the fields of astronomy and geologic exploration", but excused due to the occurrence of the Philadelphia Centennial Exhibition⁵⁵. Could the same reason explain the lackluster Portuguese participation? To answer this question we looked for the Portuguese presence at the American exhibition, specifically in the areas overlapping with the South Kensington ones.

2.1.- Portugal in the 1876 Philadelphia International Exhibition.

The Centennial exhibition opened from May 10 to November 10 1876. Upon receiving the invitation to participate, the Portuguese government considered it for a long time, postponing its decision to the prior acceptance of other nations. Taking part in a far away exhibition had particular difficulties, namely high transportation costs would be incurred⁵⁶. At some point the government believed that it would be counterproductive for Portugal not to be represented and, on February 4, a bill was presented to the Parliament to cover the estimated exhibition participation expense of 30:000\$000 réis. The final cost of the Portuguese participation ascended to the substantial sum of

52 GUIMARÃES, Rodolfo (1909) *Les mathématiques en Portugal*, Coimbra, Imprensa da Universidade.

53 ALBUQUERQUE, Luiz Almeida (1876) *Carta de 9 de Março*, Torre do Tombo, Ministério do Reino, Mç 3663.

54 (1876) "Loan Collection of Scientific Apparatus", *The Times*, n. 13 May, 13.

55 *Ibid.*

56 AIMONE; OLMO (1993), 45.

42:010\$745 réis, an increase of 40% more than initially envisaged⁵⁷.

From the Portuguese Philadelphia exhibition catalogue, one realizes that several exhibits from Department III, *Education and Science*, fell well within the aims purposed for the South Kensington Loan Collection. On group XXV, *Instruments of Precision, Research, Experiment and Illustration, including Telegraphy and Music*, six Portuguese individuals and/or institutions exhibited instruments in the classes:

- 320 - Astronomical, surveying, and leveling instruments. Meteorological instruments and apparatus;
- 321 - Indicating and registering apparatus, other than meteorological;
- 323 - Chronometric apparatus;
- 325 - Electric apparatus.

The Lisbon Industrial Institute contributed with the largest and most important exhibit in this group. More than twenty small instruments made at the Institute were on display a few of which of national design. Amongst them it is worth referring the teaching apparatus for exhibiting the properties of steam, devised by Francisco da Fonseca Benevides (1835-1911), and Francisco António de Brito Limpo's (1829-1891) precision level, with two telescopes. The Lisbon Industrial Institute was established in 1852 and it had previously received several awards in international exhibitions: Copper Medal (London, 1862), Silver (Paris, 1867) and Progress (Vienna, 1873)⁵⁸. In Philadelphia, the jurors of group XXV recognized the "good collection of mathematical and electrical instruments, constructed at the Institute, of good design and workmanship⁵⁹".

Their general report also singled out "a leveling instrument of novel design, for work of precision". An award was specifically attributed to Brito Limpo for the "excellent and novel design of a leveling instrument of

57 PIMENTEL, Antonio de Serpa; AVELINO, Antonio Cardoso (1876) "Proposta de lei no 10-H", *Diário da Câmara dos Deputados*, 279-280; CUNHA, João Gualberto de Barros e Cunha (1877) "Proposta de lei no 49-B", *Diário da Câmara dos Deputados*, 770-772.

58 (1876) *International exhibition, 1876 at Philadelphia. Portuguese special catalogue. Departments I., II., III., IV., V. Mining and metallurgy; manufactures; education and science; fine arts; machinery*. [N. p. 1876; Available on line: <http://ia600406.us.archive.org/18/items/cu31924021899574/cu31924021899574.pdf>].

59 WALKER, Francis Amasa (ed.) (1878) *United States Centennial Commission. International Exhibition, 1876. Reports and awards*, Vol. 25, Philadelphia, J. B. Lippincott.

precision, with two telescopes"⁶⁰. In total three awards were attributed to Portuguese 'scientific' instruments in group XXV.

Portuguese representation on group XXVIII, *Education and Science*, included predominantly publications and descriptions of institutions. No instruments were exhibited and only two Portuguese higher education institutions, the Porto Industrial Institute and the Lisbon Polytechnic School via its Infante D. Luiz Meteorological Observatory, were represented. The Infante D. Luiz observatory sent:

Annals of the Observatory, Maps of the Gulf of Guinea, Meteorological and Magnetic Maps, Photographs of the Sun;
Photographs of the Stains of the Sun;
Photographs of the Eclipse of the 29th of September, 1875;
Photographs of Instruments;
Photolytographs of the Meteorological Charts;
Deviation of the Magnetic Needle on Board⁶¹.

A medal was awarded by the group jury for the exhibits "interesting character [...] which shows the importance of the establishment"⁶². As we will see this participation would be equally adequate if sent to the London exhibition.

Analyzing the Portuguese Philadelphia participation, it is clear that it was well within the country capability to send a larger number of scientific/educational exhibits to London. Interestingly the two instruments sent to South Kensington were not sent to Philadelphia.

2.2.- The Portuguese participation at the 1876 South Kensington Exhibition.

The official invitation to the South Kensington Exhibition was sent via Edward Robert Lytton (1831-1891), Minister to Lisbon, to the Portuguese government on November 13, 1875. The short letter suggested the nomination of a small commission of representatives from the different branches of science

60 *Ibid.*

61 (1876) *International exhibition.*

62 WALKER (ed.) (1878).

to be present at the exhibition and to co-operate with the South Kensington Museum. This request was forwarded by João de Andrade Corvo (1824-1890), Secretary of State to Foreign Affairs, to António Rodrigues Sampaio (1806-1882), the Prime Minister. Due to its scientific scope the matter was forwarded to the General Direction of the Kingdom Department responsible for the Portuguese Public Instruction⁶³.

At the time, the Portuguese higher instruction/education was taught at Coimbra University, Lisbon Polytechnic School, Porto Polytechnic Academy, the Medico-Surgical Schools of Lisbon, Porto and Funchal, Lisbon Higher Course of Letters (Curso Superior de Letras) and at the Military and Naval Schools. The Coimbra University and Lisbon Polytechnic School were also responsible for a Meteorological/Magnetic and an Astronomical Observatory each.

By December 7 the government wrote to the Coimbra University, Lisbon Polytechnic School and Porto Polytechnic Academy, querying which scientific and teaching instruments could be sent over to the exhibition⁶⁴. No communication was to our knowledge established neither with the Military and Naval Schools nor with the Lisbon and Porto Industrial Institutes. One must note, however, that these establishments were under the responsibility of different government departments, War, Navy and Public Works, respectively.

The Coimbra University rector consulted the three scientific faculties, Medicine, Mathematics and Philosophy, about the matter. They all declined to send any teaching instruments to London since "all of them, or at least the majority and the most important, were invented and built abroad". The Physiology Professor proposed sending drawings of the instruments used in his classes and the Faculty of Philosophy claimed it would be beneficial if a professor visited the exhibition, during the University summer break, to study the instruments on shown⁶⁵.

Porto Academy, apparently, did not bother to reply. The Lisbon Polytechnic School accepting a Brito Capello suggestion, proposed sending two instruments of his invention⁶⁶. Basically from this point onward the fate of the

63 CORVO, João de Andrade (1875) *Carta de 19 de Novembro*, Torre do Tombo, Ministério do Reino, Mç 3663.

64 (1875) *Nota de 6 de Dezembro*, Torre do Tombo, Ministério do Reino, Mç 3663.

65 PIMENTEL, Júlio Máximo de Oliveira (1875) *Carta de 22 de Dezembro*, Torre do Tombo, Ministério do Reino, Mç 3663.

66 (1875) *Nota de 6 de Dezembro*, Torre do Tombo, Ministério do Reino, Mç 3663.

Portuguese instrumental exhibition participation was sealed.

The instruments left Lisbon in March 1876. In the meantime, two explanatory booklets were written in English to accompany the instruments, an unknown number of copies of which were printed⁶⁷. Apparently the instruments arrived earlier than several other contributions, but for some unknown reason they were nevertheless not mentioned on the exhibition second catalogue edition⁶⁸.

On April 13, the British government informed its Portuguese counterpart of the May conferences: “to allow it to be able to nominate scientific representatives to assist to the said conferences and elaborate reports about the collection”⁶⁹. The government selected António dos Santos Viegas (1837-1914), professor of Physics at the Faculty of Philosophy of Coimbra University, and Brito Capello. Despite a government request, the Porto Academy and the Medico-Surgical School declined to send participants to the London conferences⁷⁰.

3.- Discussion and Conclusions.

Initially we thought the uninspiring Portuguese participation was rooted in the small number of national instrument makers and country low industrialisation. We soon realized that, despite these handicaps, recognized by the national elite, the national participation at the 1876 Centennial Universal Exhibition, although modest, was well received taking into account the prizes awarded and more importantly was considerably more substantial than the one presented at South Kensington. Could a possible ‘competition’ exerted by almost simultaneous occurrence of the two exhibitions explain this? We

67 CAPELLO, João Carlos de Brito (1876a) *Chronogoniometer to find the time at sea and the latitude by two altitudes of the Sun taken at any time*, Lisbon, National Printing Office; CAPELLO, João Carlos de Brito (1876b) *Azimuthal planisphere to find the azimuth of the sun*, Lisbon, National Printing Office.

68 SOUTH KENSINGTON MUSEUM (1876) *Catalogue of the special loan collection of scientific apparatus at the South Kensington Museum*, 2nd edition, London, Her Majesty’s Stationery Office.

69 LEGAÇÃO BRITÂNICA EM LISBOA (1875) *Carta de 13 de Abril*, Torre do Tombo, Ministério do Reino, Mç 3663.

70 (1876) *Nota de 27 de Abril*; MACHADO, Adriano de Abreu Cardoso (1876) *Carta de 2 de Maio*; SOARES, Bento de Freitas (1876) *Carta de 3 de Maio*; LEITE, Manoel Maria da Costa (1876) *Carta de 3 de Maio*; (1876) *Carta de 4 de Maio*, Torre do Tombo, Ministério do Reino, Mç 3663.

did not find any document supporting this hypothesis in fact they point to a quite different, almost mundane, explanation: a misinterpretation of the event true scope.

In our opinion the problem stems from an increasing narrow understanding of the exhibition scope as the initial British invitation was forwarded, interpreted and replied to within the government and several higher instruction institutions.

By redirecting the British invitation to the Kingdom Department, the Portuguese Secretary of State to Foreign Affairs led, in practice, to the exclusion of the Lisbon and Porto Industrial Institutes since the Public Works Department run these. Furthermore, while the exhibition program accompanying the invitation referred that it “will include apparatus illustrative of the progress of science”, from the surviving correspondence, the possibility of sending historical instruments was apparently not at all considered during the process. Coimbra University could, in principle, have sent, for example, a 17th century nautical astrolabe or an 18th century Edward Troughton (1756-1835) quadrant⁷¹. Several astrolabes were on display at South Kensington from various sources. Spain, for example, contributed with five instruments made between the 11th and the 18th centuries⁷². Finally the lack of a national commission in direct communication with the organizers prevented a better understanding of what could constitute an ‘acceptable’ exhibit. A particular good example is provided by Capello’s failing to send any of his solar photographs to London. Twenty-two photographic displays appeared under section XI, *Astronomy*, subsection VII, *Celestial Photography*, of the final exhibition catalogue. Amongst them one finds the daily solar photographs made at Kew and Wilna (currently Vilnius) Observatories as well as Janssen’s and Rutherford’s enlarged solar photographs⁷³. At the time Capello was one of the leading solar photographers. He established a program of daily solar photography at the D. Luiz Meteorological Observatory in 1871 and was particularly interested in obtaining high amplified sunspot pictures. Capello exchanged correspondence on the subject with several of the leading contemporaneous

71 UNIVERSIDADE DE COIMBRA. OBSERVATÓRIO ASTRONÓMICO (2000) *Inventário da Coleção Astronómica do Observatório da Universidade de Coimbra. Ano 2000*, URL: www.astro.mat.uc.pt/novo/observatorio/site/museu/Acesso.htm; MCCONNELL, Anita (1992) *Instrument Makers to the World. A History of Cooke, Troughton & Simms*, York, William Sessions Limited.

72 SOUTH KENSINGTON MUSEUM (1877).

73 *Ibid.*

solar photographers. His photographs had a wide private international circulation, were exhibited in the 1873 and 1876 Universal Exhibitions, and one was later used to illustrate Angelo Secchi's book *Le Soleil*⁷⁴.

Someone leafing through the published Loan Collection of Scientific Apparatus might easily miss the Portuguese participation. An invisibility primarily due, in our opinion, to the formal British government invitation being sent to the government department responsible for the Portuguese Public Instruction. We conclude that the country could easily have presented a more valuable contribution to the South Kensington exhibition.

74 BONIFÁCIO, Vitor; MALAQUIAS, Isabel; FERNANDES, João (2007) "Solar Photography in the Nineteenth Century: the Case of the Infante D. Luiz Observatory in Lisbon (1871-1880)", *Journal of Astronomical History and Heritage*, 10, 101–113.