

# THE RADIOACTIVITY IN THE PORTUGUESE JOURNAL OF CHEMISTRY IN THE EARLY 20<sup>th</sup> CENTURY

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## 1. The *Revista de Chimica Pura e Applicada* in the context of the XX<sup>th</sup> Century Portuguese Science.

The institutionalization of the scientific research activity occurred lately in Portugal. Only around the sixties in the XX<sup>th</sup> century the University integrated research in its activities in a systematic and organized way. However in the first years of that century there were isolated attempts of some university teachers to practice science following modern trends, as it was already made in other European Universities. Ferreira da Silva (1853-1923), one of the founders of the *Revista de Chimica Pura e Applicada* (*Journal of Pure and Applied Chemistry*) is one of these outstanding scientists. This journal is one of his initiatives intended to develop the scientific activities in Portugal.

The Municipal Laboratory of Chemistry of Oporto that had been created in 1881 was another of his achievements. This Institution attracted the attention of national and foreign scientists for the quality of the work produced. It was a real school of chemistry where several future chemists practiced the science and changed the orientation of their professional life.<sup>1</sup>



**Fig. 1 - Heather of the first number of the *Revista***

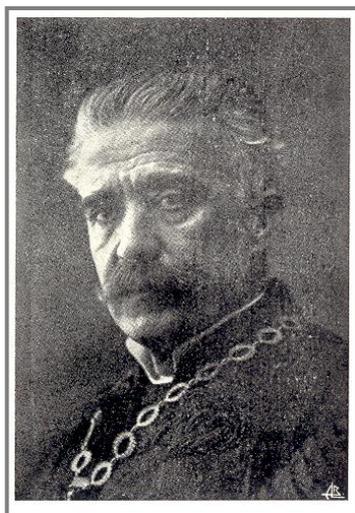
The scientific work carried out in the Municipal Laboratory was an important motivation for the foundation, in 1905, of the *Revista de Chimica Pura e Applicada* (Fig.1) by Ferreira da Silva (1853-1923), Alberto d'Aguiar (1867-1948) and José Pereira Salgado (1873-1946) (Fig. 2). In the first number of the Journal these chemists present their program. They start saying “The periodical and regular publication of a

<sup>1</sup> Editorial, *Revista de Chimica Pura e Applicada*, IV Série, Vol.33. , nº 1, p. 1, 1950

Portuguese Journal of Chemistry became an urgent necessity”<sup>2</sup>. In fact, the reforms of the chemical studies in universities, the creation of new chairs in the Schools of Pharmacy and the organization and improvement of laboratories in Medical Schools, together with the work undertaken in different areas of chemistry in state and industry laboratories, justified this necessity.”



**Ferreira da Silva (1853-1923)**



**Alberto d'Aguiar (1867-1948)**



**José Pereira Salgado (1873-1946)**

**Fig. 2 - The founders of the Journal**

The main objectives of the journal referred in this first number are: “Our mission will be to archive what is already produced in our laboratories, to orient those who work in the never ending progresses of science reported in foreign similar journals, to publish papers on scientific theories or experimentation that may be useful to students of different levels and to all who wish to be updated with the most remarkable progresses

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<sup>2</sup> *Revista de Chimica Pura e Applicada, Vol. I, n° 1, p. 1, 1905*

of chemical sciences.[...]The literature and history of chemistry will honor our journal [...].<sup>3</sup>

The development of the chemical sciences in Portugal led to the foundation of the Portuguese Chemical Society in 1911. This was largely publicized and supported by the *Revista* that became the official journal of the Society.

## 2. Main Characteristics of the Journal

The *Revista de Chimica Pura e Applicada*, in the words of its editors “is a journal of general notions and developments of pure and applied chemistry, in particular in what concerns our country”<sup>4</sup>. In the program published in the first number the main topics covered in the journal are indicated. They include the traditional areas of Chemistry and also special topics like mineralogical, industrial and toxicological chemistry. Other subjects covered were History of Chemistry, the review of journals, information about Chemistry in Portugal as well as short notes and correspondence (see Table I).

TABLE I - MAIN TOPICS COVERED IN THE JOURNAL

I. Chimica geral e chimica physica.	X. Chimica medica (biologica e pathologica).
II. Chimica inorganica.	XI. Chimica pharmaceutica.
III. Chimica organica.	XII. Chimica toxicologica.
IV. Chimica analytica.	XIII. Hydrologia medica.
V. Chimica mineralogica e geologica.	XIV. Bibliographia.
VI. Chimica agricola.	XV. Revista dos jornaes.
VII. Chimica sanitaria. Falsificações dos alimentos.	XVI. Movimento chimico portuguez.
VIII. Bacteriologia. Hygiene.	XVII. Variedades e correspondencia.
IX. Chimica technica. Industrias chimicas.	— Litteratura e historia chimica.

The journal was a monthly publication and it was published regularly until 1914. After that some interruptions occurred for shorter or longer periods and the *Revista* stopped in 1956 (see Table II). Later the Portuguese Chemical Society founded another journal.

TABLE II - VOLUMES PUBLISHED

SERIES	YEARS	VOLUMES
I	1905 a 1914	10
II	1916 a 1920	5
III	1924 a 1942	17
IV	1950 a 1956	7

## 3. Radioactivity in the *Revista de Chimica Pura e Applicada*

<sup>3</sup> *Idem*, p.2

<sup>4</sup> *Revista de Chimica Pura e Applicada*, Vol. I, n° 1, p. 1, 1905

Radioactivity, discovered in 1896, became a very important subject in the early 20<sup>th</sup> Century. The journal was founded in 1905 and, from the beginning, articles and news related with studies on Radioactivity as well as papers on radioactivity of waters, and minerals were published. The full texts of courses and conferences were also published. The following tables (Tables III-VI) give a brief account of those different articles published in the *Revista* from 1905 to 1950.

**TABLE III - RADIOACTIVITY IN WATERS**

<b>1906</b> – Reference to a work done by Pierre Curie and A. Laborde about “radioactivity of the gases emanating of thermal water fountains” in Caldelas, Portugal. (the work is published in <i>Comptes Rendues</i> , T. 142, 1906, p. 1462/5)
<b>1906</b> – Reference to a work published by Miguel José Rodrigues in <i>Ocidente</i> , nº 983, 1906, where he realises, using photography, that the water of the fountains of Santa Cruz contains radioactivity.
<b>1906</b> – Miguel José Muñoz del Castillo, <i>Sur la radioactivité des sources hydro-médicinales azotées d’Espagne</i>
<b>1907</b> – H. Mastbaum, Acknowledges the need to analyse the national mineral waters for their radioactivity properties. This is not done for lack of equipment.
<b>1908</b> – Miguel José Muñoz del Castillo, <i>La carte de radioactivité minérale et hydrominérale de l’Espagne à la fin de l’année 1907</i>
<b>1910</b> – P. d’Oliveira Pinto, <i>Primeira Contribuição Para o Estudo da Radioactividade das Águas Minerais de Portugal</i> .(pp. 269-279; 342-349)
<b>1910</b> – G. Costanzo, Reference to work published by the author in <i>Memorie della Pontificia Academia Romana dei Nuovi Lincei</i> concerning the radioactivity of rain water, snow and others.
<b>1914</b> – Oliveira Pinto, <i>A Radioactividade nas Águas Mediciniais de Fraca Mineralização</i> .
<b>1919</b> – Achilles Machado e Pereira Forjaz, <i>Água da Felgueira</i> .
<b>1928</b> – António Pereira Forjaz, <i>Hidrologia Portuguesa</i>
<b>1928</b> - António Pereira Forjaz, <i>Determinação da radioactividade das águas das nascentes da Torre e de Casas Novas (Entre-os Rios)</i> (pp. 41-43)
<b>1929</b> - António Pereira Forjaz, <i>Determinação da radioactividade das Águas de Monção</i> (pp.152-156)
<b>1931</b> - António Pereira Forjaz, <i>Constantes físico-químicas e radioactividade da água das Corgas</i> .
<b>1933</b> – A. Nasini, <i>Rapport sur les gaz rares des eaux minérales</i> .
<b>1934</b> – A. Lepape, <i>Les gaz rares des eaux minérales</i> .

The most frequent topics are the analysis of the radioactivity of water from different places carried out by several professors of the Universities of Lisbon and Oporto. In some cases a comparison with results of other countries is also presented.

The great number of studies on mineral waters is related to great therapeutic importance given at that time to radioactive mineral waters. It is interesting to note that doctors used to recommend to their patients not only to drink and to bath in radioactive waters but also to remain long periods near the radioactive water springs.

Although the mining industry was very important, and there are uranium mines in Portugal most of the papers concerning the subject were published in speciality journals. In spite of this we find some articles in the *Revista*, mainly related with chemical aspects.

**TABLE IV - RADIOACTIVE MINERALS**

<b>1911</b> – Max de Nansouty, <i>Como se fabrica o rádio.</i>
<b>1913</b> – Charles Lepierre, <i>Algumas considerações acerca analyse dos minérios de “Urânio pobres e fosfatados”.</i>
<b>1928</b> – Giovanni Costanzo, <i>O Radio nos Granitos de Portugal.</i>
<b>1931</b> - Giovanni Costanzo, <i>O Radio nos Minerais e nas Rochas de Portugal.</i>
<b>1933</b> - Charles Lepierre, <i>Contribution à l'étude des minerais d'uranium-radium portugais.</i>

In the *Revista* we also find full texts of conferences related to radioactivity and courses for Portuguese university students where radioactivity is the main subject.

**TABLE V - COURSES AND CONFERENCES**

<b>1912</b> , Odo Bujwid, <i>Action des Rayons ultraviolets sur les bactéries.</i>
<b>1919</b> - C.H. Moureu, <i>Lavoisier e os seus continuadores</i>
<b>1919 – 1920</b> - Giovanni Costanzo, <i>Notas das lições de Radioactividade dadas no Instituto Superior Técnico de Lisboa</i>
<b>1920</b> – A. Cardoso Pereira, <i>O Rádio</i>
<b>1931</b> - Giovanni Costanzo, <i>A Radioactividade e a Estrutura do Átomo</i>

Besides these articles the *Revista* published short notes about relevant events and publications. In some of the papers, experimental details, including adaptations of equipment, are also published (Figs. 3 and 4)<sup>5</sup>

**TABLE VI - NEWS (PUBLICATIONS AND CONFERENCES)**

<sup>5</sup> P. d'Oliveira Pinto, “Primeira Contribuição Para o Estudo da Radioactividade das Águas Minerais de Portugal” *Revista de Chimica Pura e Applicada*, Vol. VI, nº 8-10, p. 277-278, 1910

**1912** - Velásquez de Castro, *Estado actual de la cuestion del radio en Terapeutica*, Granada, 1912

**1914** – Henri Becquerel – *Algumas experiências sobre as substâncias radioactivas*

Mm. Curie – *As propriedades do radio*

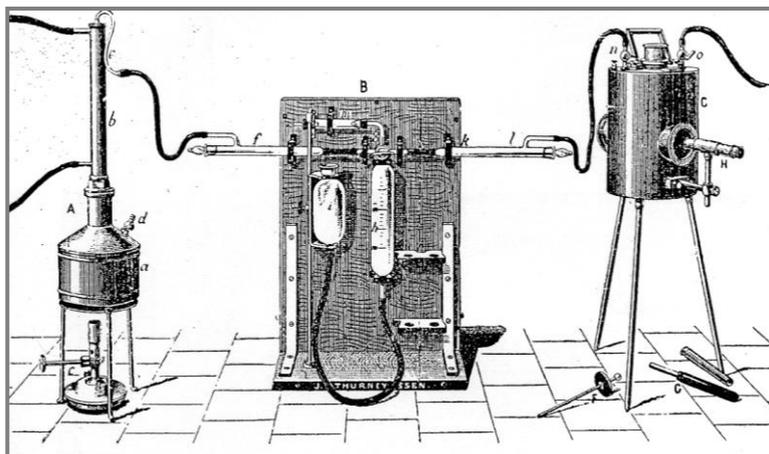
(Conferences delivered at the Museum of Natural History of Paris in 1905, in the presence of the king of Portugal, D. Carlos)

**1917** – F. Soddy, *La Chimie des Eléments Radioactifs*, Gauthiers-Villars, Paris, 1915

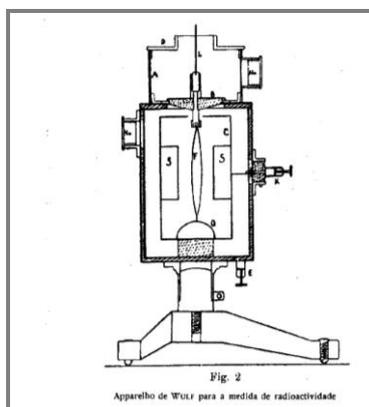
**1924** – Nature, nº 2624, Supl., p. 17, *O preço do Rádio*

**1931** – Luís Simões Raposo, *A acção biológica e terapêutica das radiações*, Lisboa, 1930

**1936** – La Nature and Les Nouvelles de Chimie, announce the Nobel Prize for Chemistry and Physics



**Fig. 3 - Aparelho de Danne para a medida da radioactividade**



**Fig. 4 - Aparelho de Wulf para a medida da radioactividade**

#### 4. The Physics Centre of Faculty of Sciences of Lisbon and the *Revista de Química Pura e Aplicada*

Results of fundamental research, mainly by Portuguese scientists, were also published later in the *Revista* (Table VII). During the thirties and forties some original papers by Portuguese researchers who worked with Marie Curie in the Curie Laboratory were also published in the *Revista*. These researchers, Manuel Valadares, Aurélio Marques da Silva e Armando Gibert constituted the main group of scientists of the *Centro de Estudos de Física* of the Faculty of Sciences of Lisbon that was a very important pole of development of scientific research in Portugal.

TABLE VII – SOME FUNDAMENTAL RESEARCH

<b>1934 - Manuel Valadares, <i>Mecanismo de emissão da radiação gama</i></b>
<b>1934 - Manuel Valadares, <i>Spectrographie, par diffraction cristalline, des rayons "Gamma" et "X" de la famille du thorium</i></b>
<b>1934 - Manuel Valadares, <i>Spectrographie, par diffraction cristalline, des rayons "Gamma" et "X" de la famille du radium</i></b>
<b>1940 - A. Marques da Silva, <i>Contribuição para o estudo da materialização da energia</i></b>
<b>1942 - Armando Gibert, <i>Descrição e montagem de uma instalação de contadores de partículas ionizantes</i></b>

These articles were also published in foreign journals and the second and fourth papers correspond to the PhD thesis presented by the authors, Manuel Valadares and Marques da Silva at Sorbonne. In the mean time the journal was inactive (see table I) and these scientists continue to publish their research results and also papers for a more general public in Portugal and another countries, mainly in France. In spite of its development, this Center lost its importance when, in 1947, the activity of those researchers was interrupted because they were expelled from the University for political reasons<sup>6</sup>.

These facts plunged the Faculty of Sciences of Lisbon into a deep crisis. The *Revista de Química Pura e Aplicada* also suffered the consequences of these expulsions. In its fourth series, published after eight years break (1942-1950), there aren't any more papers on fundamental research on radioactivity. Actually, this fourth Series (1950-56) was very irregular and presented characteristics that differentiated it from the previous Series publishing mainly translations of old papers and only some papers on original research. This is why in this communication the analysis is restricted to the three first series.

The publication of the *Revista de Química Pura e Aplicada* ended in 1956. In 1958 the then Portuguese Society of Physics and Chemistry started a new journal called *Revista Portuguesa de Química*.

<sup>6</sup> Pereira, A. and Serra, I., *La Physique et le Pouvoir Politique au Portugal dans les années 40*", Proceedings of the XX<sup>th</sup> International Congress of History of Science, Vol. I, pp. 181-189, 1997.