Anniversaries

Betim Paes Leme – Born 140 years ago

RESEARCHING THE EARTH FROM BRAZIL: ALBERTO BETIM PAES LEME (1883-1938)

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The Brazilian geoscientist Alberto Betim Paes Leme was a prominent figure during his lifetime, both at national and international levels, although his contributions became gradually forgotten as time passed. He was born in Rio de Janeiro and graduated in Mining Engineering in 1906 from the *École des Mines de Paris*. Soon afterward, he returned to Brazil and worked in various public institutions, including the Brazilian Geological and Mineralogical Survey (SGMB) and the National Museum. In 1916, he was one of the founders of the Brazilian Academy of Sciences (ABC) and formed part of the board of directors for four successive terms, from the first Provisional Board (1916–1917) to those ranging up to the mid twenties (1917–1920, 1920–1923, and 1923–1926). He was director of the National Museum from 1935 until his death on 6 July 1938. His international connections made him known and cited abroad, especially in France, where he belonged to the *Société Géologique de France* (SGF) since February 5th, 1912. He was made *chevalier de la Légion d'Honneur* and emeritus professor at the University of Paris (Sorbonne).

Figure 1. Alberto Betim Paes Leme.
Source: *História Física da Terr*a (1943)

Betim Leme dedicated himself to research in the field of spectral analysis applied to mineralogy. The spectrographic technique traditionally used, known as the 'total energy technique,' was modified and described in detail by him in 1918. He developed a cinematic method of quantitative analysis, which consisted of measuring the thickness of specific rays in spectrograms obtained by standardized processes. The development of the total energy technique is generally credited to Morris Slavin (1901 - ??). However, according to the revision carried out by Ramon Barnes and Slavin himself in 1974, the papers by Betim Leme were clearly the first description and application of the total energy technique. In the short note 'Les zéolites du Rio do Peixe (Brésil),' presented in a session of the Paris Academy of Sciences on 9 February 1914, he described the use of spectrography to establish the composition of six different species of zeolites found in the basalts from the Serra Geral Formation (Paraná sedimentary Basin). A second paper, 'Sur un gisément d'euxénite au Brésil', was also presented at the Paris Academy

of Sciences on 17 August 1915. In a review paper published in 1933 relying on his nearly 20 years of accumulated experience, Betim Leme discussed in detail the theoretical and experimental conditions, assumptions, and errors of this technique and its application to the determination of nine major and minor elements in eruptive magma samples from the Brazilian island of Trindade. These works carried out by Betim Leme were clearly in tune with a broader movement that sought precision, fine-grained details, and extensive use of instruments and technology in doing science.

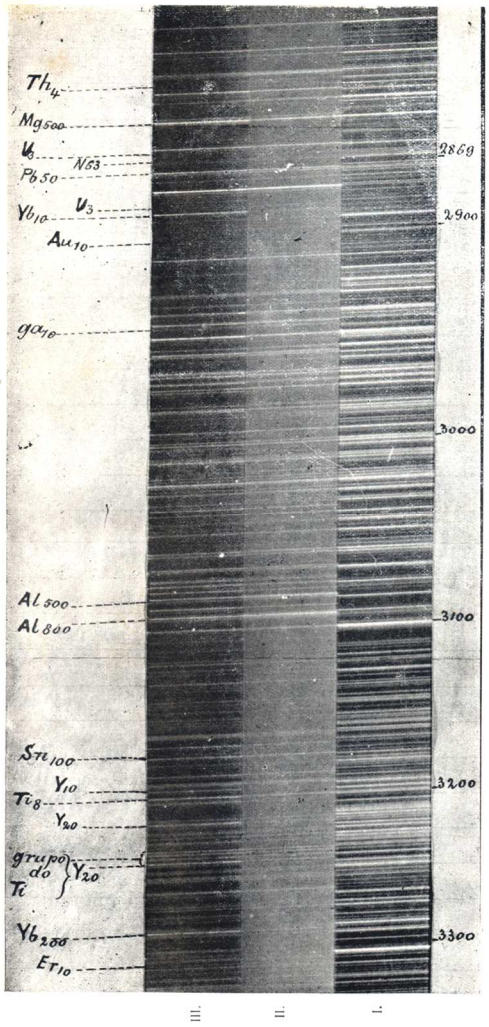
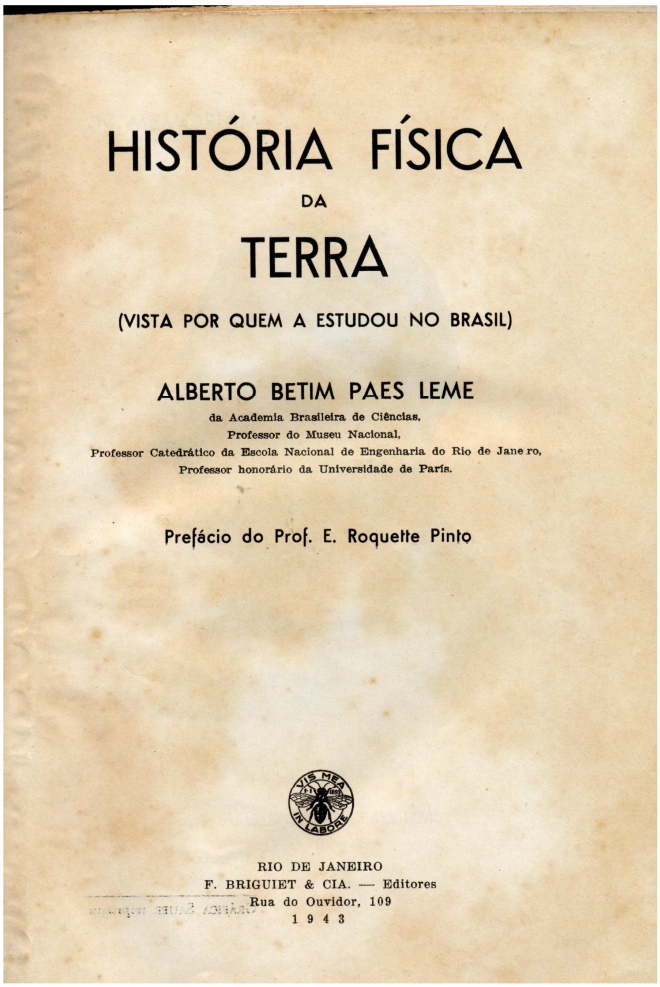


Fig. 3 — I. espectro de ferro; II. espectro da euxenita decomposta; III. espectro da euxenita.

Figure 2. Example of spectrographic bands for chemical composition determination of euxenite. (Leme 1915)

Throughout his thirty years of scientific activity, Betim Leme's vast and fertile contribution to geology included his involvement in the controversy about Continental Drift. In 1929, this was the subject of his talk at the SGF. This lecture, named 'État des connaissances géologiques sur le Brésil. Rapport avec la théorie de Wegener sur la derive des Continents' brought forth his critical arguments focused on paleontological and paleoclimatic problems, tectonics, and global geophysics. His French colleagues remarked on the "unusual breadth and wealth of arguments. (...) We must only hope that our colleague from Rio finds imitators: science today is making gigantic strides across the world, and it is a good thing that periodically, the authorized representatives of foreign schools come to summarize, for our benefit, the progress in which they are simultaneously witnesses and players". (Margerie, 1930: 64)



HISTÓRIA FÍSICA

DA

TERRA

(VISTA POR QUEM A ESTUDOU NO BRASIL)

ALBERTO BETIM PAES LEME

da Academia Brasileira de Ciências,
Professor do Museu Nacional,
Professor Catedrático da Escola Nacional de Engenharia do Rio de Janeiro,
Professor honorário da Universidade de Paris.

Prefácio do Prof. E. Roquette Pinto

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1 9 4 3

Figure 3. Title Page of the book História Física da Terra.

Betim Leme produced the textbook 'História física da Terra – vista por quem a estudou no Brasil' (Physical History of the Earth – from the viewpoint of those who have studied it in Brazil), with 1,020 pages, including a table for mineral identification and a reference section containing 1,273 references. Published posthumously in 1943, it constituted a substantial general geology manual with extensive information about Brazil and a representative bibliographical review comprising national and international texts. The book included several sketches, maps, and photos of Brazilian landscapes, ore deposits, and samples – most of which were taken from the National Museum's collections and archives. According to the author's own definition, it was a "Treatise on geology containing the geology of Brazil" (Leme 1943, 11). Therefore, Brazil was seen as part of a broader context, and data about Brazil was stressed in the text using a larger and bold font, thus highlighting the importance Betim Leme ascribed to locally acquired information and expertise, including his own. These insertions on Brazilian geological and geographical context varied from a few lines to a whole page and occurred relatively uniformly throughout the book. The book got its inspiration from the 'Traité de Géologie' by Albert-Auguste de Lapparent (1839-1908), a relevant catholic author and teacher of geology who was frequently explicitly cited by Betim Leme.

It is worth noting that Leme used the infrequent denomination 'Anthropozoic' while referring to the Holocene epoch, exposing his concerns with, as well as the importance attributed to, human beings in the Earth's geological history. The last part of the book ends with a text of a philosophical-speculative character called 'The death of the Earth'. He foresees the

"organic death" of the Earth – that is, of life – using some updated elements as his starting point (he considers global warming, for instance), though producing a different explanation from the current ones of the 21st century. But this is only part of the story. For him, humankind would disappear long before the conditions became unbearable because "*it may be that the decadence will result of a true autointoxication of the species, bringing the damping of its mental activity.* (Leme 1943: 945-46)

Due to his significant international standing, we can affirm that Betim Leme acted as an academic bridge between Brazil and Europe, especially France, helping the circulation of ideas and the construction of an international community of geosciences.

Further Reading

Figueirôa, S. F. de M. (2011), "Minerals Scrutinized: Alberto Betim Paes Leme (1883-1938) and the Application of Spectrography." *Centaurus* (Copenhagen). v.53, p.164–175. https://doi.org/10.1111/j.1600-0498.2011.00218.x

Figueirôa, S. F. de M. (2012), "A sample of geological textbooks: the book História Física da Terra (1943) by Alberto Betim Paes Leme." *Almagest*: International journal for the history of scientific ideas (Brussels), v.3, p.106–121. https://doi.org/10.1484/J.ALMA.5.100797

Leme, A. B. P. (1915), *A euxenita do Pomba e as condições geologicas de sua jazida (notas sobre um mineral radio-activo do Brazil)* (Rio de Janeiro: Papelaria Macedo).

Leme, A. B. P. (1918), "Sur un nouveau procédé d'analyse quantitative. " *Comptes Rendus de l'Académie des Sciences* (Paris), v.167, p.978–981.

Leme, A. B. P. (1933), "Processo cinemático de análise espectral quantitativa." Boletim Museu Nacional (Rio de Janeiro), v.9 (3).

Leme, A. B. P. (1943), *História física da Terra – vista por quem a estudou no Brasil*, Rio de Janeiro: F. Briguiet & Cia.

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