

## Visualising women in the Periodic Table: A Spanish research line on fluorine (1920s-1930s)

Ignacio Suay-Matallana,<sup>1</sup>

<sup>1</sup>Universidad Miguel Hernández, Facultad de Medicina, Sant Joan d'Alacant, Spain, [isuay@umh.es](mailto:isuay@umh.es)

**Topic:** History of women, the elements and the Periodic Table

### Abstract:

Traditional historical works associate the discovery of fluorine to Henri Moissan (1852-1907) a French Nobel laureate, and Otto Ruff (1871-1939) a German Liebig Medal. However, fresh histories of science recognize the complex process of construction of the periodic table. A larger number of chemists (and other experts, and non-experts), countries, and institutions also played a key role in the study, analysis, and application of many chemical elements. This contribution is focused on the study of fluorine during the first decade of the 20th Century. It links some famous works by Moissan and Ruff with other published by some Spanish chemists working at the laboratory of José Casares Gil (1866-1961). The lab was attended by many young women with two main goals: learning about material culture of chemistry for didactic purposes, and improving their practical knowledge to develop their own original research. First, I will study the beginnings of a research school on fluorine created in early 20<sup>th</sup> Century by a group of women students (figure 1). Second, I will explore the contributions of two women: Maria del Carmen Brugger Romani, and Trinidad Salinas Ferrer. Both were graduated in pharmacy, and also obtained a PhD in Pharmacy at the University of Madrid.<sup>1</sup> Their research involved quantitative analysis of fluorine, and the development of new techniques to find fluorine in different organic and animal substances.<sup>2</sup> Finally, I will discuss the problems of Brugger and Salinas to consolidate their scientific careers after the Spanish civil war (1936-1939). Their works were disregarded, and other (male) pupils of Casares appropriated their research lines during the dictatorship. In any case, this case study shows the relevance of scientific collaboration, that was essential to prepare original works with international impact, to teach new generations of students, and to open new research lines of the analysis of fluorine in Spain not just on water, but also in a larger number of organic substances.

Jenara Vicenta Arnal Yarza	Fichter, F. and Arnal, V. E. (1931). Oxydationen mit Fluor XVIII. Einwirkung von Fluor auf Cer(III)sulfat und auf Jodate, <i>Helvetica Chimica Acta</i> , 14(4), pp. 862–867.
Carmen Brugger Romani	Brugger Romaní, M. C. (1927) <i>Contribución al estudio de la química analítica del flúor</i> . (Artes Gráf. J. Gamón, Valencia).
Trinidad Salinas Ferrer	Salinas Ferrer, T. (1934) <i>Estudios sobre la determinación cuantitativa del flúor y su aplicación a varios productos del reino animal</i> . (Universidad Central, Madrid). Casares Gil, J. and Salinas Ferrer, T. (1935). Burke, J. E. (1964). Scattering of surface waves on an infinitely deep fluid, <i>Revista de la Academia de Ciencias de Madrid</i> , 32, pp. 88–119.

Figure 1: Main works on fluorine analyses by Arnal, Brugger, and Salinas

**Acknowledgements:** This work was partially supported by the Spanish research project “Viviren un mundotóxico: expertos, regulaciones y controversias públicas en la España del siglo XX” (HAR2015-66364-C2-2-P).

### References

1. MC. Brugger Romaní, *Contribución al estudio de la química analítica del flúor*, 1927, Artes Gráf. J. Gamón, Valencia; T. Salinas Ferrer, *Estudios sobre la determinación cuantitativa del flúor y su aplicación a varios productos del reino animal*, 1934, Universidad Central, Madrid.
2. C. Magallón, *Mujeres en las ciencias físico-químicas en España: el Instituto Nacional de Ciencias y el Instituto Nacional de Física y Química (1910–1936)*, *Llull*, 1997, 20, 529–574.