

## THE APPLICATION OF ISOTOPES TO INDUSTRY DURING THE FRANCOIST PERIOD

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After World War II the applications of isotopes in the fields of agriculture, industry, medicine and the physical, chemical and biological sciences offered scientists and technicians numerous opportunities. As nuclear reactors began to produce isotopes, these elements were employed to cure disease, to preserve food, to examine soldered joints and to measure thickness in the paper and metallurgical industries. The applications of isotopes brought about significant changes in industry, which benefited society considerably.

In 1951, at the time of the creation of the Junta de Energía Nuclear (JEN), isotopes had very few applications in Spain. Of these applications, medicine was the most important, but isotopes were only applied in the radiography of soldered joints in industry. The JEN was entrusted with the task of supplying products, training technicians, promoting the use of isotopes and drawing up guidelines for their proper use. However, it was not until 1957 that a department dedicated to this subject was set up.

This paper examines the beginnings of the industrial applications of isotopes in Spain, the measures taken by the JEN to fulfil their responsibilities and the reaction of universities and industries to the opportunities offered by the different uses of isotopes. Finally, the most important applications of the period known as “desarrollismo” are presented.

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## MOLECULAR BIOLOGY AT THE ENGINEERING SCHOOL: THE DEPARTMENT OF MACROMOLECULAR CHEMISTRY

*Francesc Xavier Calvó*

Recent studies in the history of molecular biology have stressed the importance that must be attributed to the instruments in the development of the discipline. This paper presents the case study of a research group which

emerged in Barcelona, Spain, in the mid sixties, within a general process which also took place in other European countries: the Department of Macromolecular Chemistry. The distinctive feature of this research group lies in their physical location within an Engineer's School and in the academic training as chemists of their founders. Their postdoctoral training in the United States, United Kingdom and Israel, set their research towards structural molecular biology and to the adoption of the X-Ray techniques and to the development of their own instruments to be applied in the structural analysis of biological macromolecules (DNA and histones). The Engineer's School workshop allowed them the design, construction and modification of some X-Ray diffraction cameras. This paper deals with the so called Catalan structuralist school, headed by Joan Antoni Subirana and Jaume Palau.

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## **THERMODYNAMICS AS LEGITIMIZATION OF APPLIED AND THEORETICAL PHYSICS IN SPAIN IN THE SECOND HALF OF XIX CENTURY**

*Stefan Pohl Valero*

In this article I will explore the construction of a particular image of the science of thermodynamics. Focusing in three Spanish engineers that published several works on thermodynamics in the last third of the nineteenth century, I will argue that these scientists, with a common institutional agenda, appropriated the new science of heat in order to legitimize the institutionalization of theoretical physics in the Spanish university.

Not only the popularization of thermodynamics but the ontological interpretation of its laws and the argued epistemological approximation that allowed its emergence were shaped by local circumstances. This article will focus in one of these circumstances, namely the institutional weakness of physics in the Spanish university.

Exploring textbooks, scientific lectures, and popular books written by these engineers, I will try to show how these works complemented each other and presented thermodynamics as the exclusive result of theoretical and mechanical speculation. On the other hand the importance of thermody-

namics for the economic progress of the nation and for its international prestige was emphasized. After the construction of this image, the way was open to link theoretical physics with national progress and modernization.

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## EARLY APPLICATIONS OF ELECTRICITY IN BARCELONA IN 1850

*Jesús Sánchez Miñana*

This study follows previous papers by the author on the beginnings of electric telegraphy in Barcelona, centred mainly on the work of military engineer Ambrosio Garcés de Marcilla (1816-1859). Although the present text contains further notice of telegraphs, especially in connection with the operation of the first railroads, it reflects research on the emergence in the city of other early applications of the newly-born electric technology, in the period extending roughly from 1840 to 1860. Attention is focused first on the teachings of the applied science chairs maintained by the Junta de Comercio and the work on electric motors and telegraphs of Juan Agell, one of its trainees. The initiatives of another former student at the Junta schools, apothecary Francisco Domènech, in electroplating –a technique he probably introduced in Catalonia and Spain–, electric light and electric synchronization of public clocks are duly described. Still a third –and younger– Junta student, Ramón Rosselló, an able instrument maker, is tentatively presented as the first commercial builder of electric devices in Barcelona, whose association with optician Francisco Dalmau for a few years may be in the origin of the latter's well-known subsequent business interest in electricity. At the end of the period under study other opticians are recorded selling electric instruments, and participants in a local exhibition held in 1860 include Rosselló and Francisco de Miquel, a supplier to the railroads and associate of Garcés de Marcilla, but new names also appear: Roque Llovet, a former Roselló's employee, and clock-maker Alberto Billeter.

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## MATHEMATICS IN AN EUROPEAN STYLE AS AN INSTRUMENT OF MODERNISATION: THE CASE OF THE PETROVIAN RUSSIA

*Dmitri Gouzevitch, Irina Gouzevitch*

The rise of mathematics in Russia is closely linked with the reforms of Peter I, in the early 18<sup>th</sup> century. Indeed, their introduction as a matter of teaching and research, but also as a tool of the engineering practice, goes back to this period during which the old Moscovy embarked irreversibly the rails of modernization. The Academy of Science of Saint-Petersburg, with its famous group of mathematicians, crowns this reign which, as far as the mathematics are concerned, crossed in 30 years the cognitive distance which separates the elementary arithmetic from differential calculus. This historical situation seems particularly favourable to analyze the relationship between mathematics and the State and to understand the mechanisms which allowed this latter to use this knowledge as an efficient tool of modernization. By proposing the overview and the main stages of the rise of mathematics in Russia, the authors would also like to reconsider on this occasion the famous antithesis between the pragmatism of the Peter I's reforms and the excessive ambition of his great civilizing projects. The example of mathematics will hopefully enable them to follow the ambivalent character of the reforming process which contributed, finally, to build a new imperial Europe-oriented Russian civilization.