how things can be made to talk out of love as well as hatred since the virtuosity and accuracy of the glass flowers made them not only objects of admiration on the part of both scientists, patrons, curators and the general public, but also objects of suspicion by some scientists who viewed them as unscientific. It also illustrates how they changed their status from scientific glass models into public wonders.

Overall, *Things that Talk is* a stimulating work that reveals the fluidity and inner structures of meaning associated with materiality. Yet its thematic and methodological variety makes it a somewhat disconcerting and puzzling collection of new "things" that talk.

Isabel Amaral, *A Emergência da Bioquímica em Portugal: As Escolas de Investigaçâo de Marck Athias e de Kurt Jacobsohn* (Porto, Fundaçao Calouste Gulbenkian- Fundaçao para a Ciência e a Tecnologia, 2006). ISBN: 972-31-1149-7.

By José Ramón Bertomeu Sánchez [*]

The book analyses the emergence of biochemistry in Portugal throughout a comparison of the two main research schools headed by Marck Athias (1875-1946) and Kurt Jacobsohn (1904-1991). Research schools became very

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important in nineteenth-century and twentieth-century science and the focus of many historical studies during the last three decades. Many important books and papers had been published on the research schools lead by Pasteur (Gerald L. Geison), Thomson (Jack Morrell), Liebig (Frederic L. Holmes, Joseph Fruton), Wurtz (Ana Carneiro), Dumas (Leo Klosterman), etc. Research schools can be defined as "small groups of mature scientists pursuing a reasonably coherent program of research side-by-side with advanced students in the same institutional context" (Geison, 1981). Thus, when studying research schools, historians have to pay attention not only to the life and scientific contributions of their leaders, but also to their disciples and collaborators (whose biographies are sometimes very difficult to reconstruct); the laboratories and the educative and research centers, in which a collective research program was developed; and, last but not least, the relationship with other research groups and the economic and political powers, which make possible the due funding and institutional support. Before discussing these issues, Isabel Amaral reviews the emergence of biochemistry as a discipline in the international context. Special attention is paid to the German and British cases. In Germany, biochemistry emerged from two different experimental cultures (organic chemistry and experimental physiology) while in Britain the origins are found in medicine and physiology. The main part of the thesis is the analysis of the mentioned two research schools, which, roughly speaking, mirror the mentioned paths of institutionalization of biochemistry: medicine (Marck Athias) and organic chemistry (Jacobsohn). Apart from the

research program, the differences between the schools included the biographical profile of the leaders and main collaborators, and the institutional setting. Marck Athias was born in the Madeira Island and studied in Portugal and France, while Kurt Jacobsohn was born in Germany and his early career was spent at the prestigious *Kaiser Wilhelm Institut für Biochemie* (Berlin). In 1929, he obtained a four-year position in the recently created *Instituto Rocha Cabral* (IRC), a Portuguese version of the Rockefeller Institution, in which Jacobsohn developed his research for the rest of his life. In contrast, Marck Athias's headquarters were placed at the Faculty of Medicine of Lisbon University, even if he and his group also worked in other centers. Marck Athias's research was focused on normal and pathological histology, while Kurt Jacobson's research was centered on enzymes kinetics and enzymology in general. The mentioned topics were important in the development of their disciples' careers but from different points of view in each case. When describing the disciples of Athias, Isabel Amaral distinguishes three different groups: the "central core" (those who worked in the same topics and in the same institutions for long periods); those who were trained along the lines of research and developed them in other institutions; and, finally, the temporary collaborators, that is, those for whom the work with Athias was just a temporary stage in their careers. Athias and the disciples of the first group are similar to other studied research schools: their training in experimental methods took place in the laboratories of the group; they followed similar publication patterns and they became influential members of crucial research institutions

and societies somehow related to the main research topics: histology and physiological chemistry. According to Isabel Amaral, that was not the case of Jacobson's disciples, whose collective characteristics fit better in what Joseph Fruton has called a "research group", that is, "scientists who achieved sufficient recognition to allow them to conduct an independent research program". Amaral includes not only Jacobson's direct collaborators and disciples but also the members of the IRC Physiology department and other temporary collaborators. The bulk of biographical and bibliographical data gathered about the two groups is amazing but it is a pity the lack of a list of names and institutions.

Thus, the book touches three current important historiographical issues: the emergence of disciplines, research schools and scientific peripheries. The emergence of disciplines and specialties has been analyzed by many historians but mostly focusing on countries such as France, Germany, Britain or USA, as the recent book by George Weisz clearly shows (*Divide and Conquer: a comparative history of medical specialization* (Oxford University Press, 2006)). The same situation applies to research schools. The book by Isabel Amaral enlarges the sample by adding two active research schools working outside the main European scientific centers. Many of these questions are discussed by Isabel Amaral thanks to a large amount of almost unknown sources (mostly papers, more than 600 are listed), which had been recovered and analyzed. Other sources (laboratory notebooks, archival documents, letters, material culture, etc.) are lacking, so the study also shows how much remains

to be done in order to guarantee the preservation of the memory of contemporary science. By showing the relevance of the studied schools, Amaral has made an important contribution in that sense. Moreover, the book offers avenues for future comparative studies with other similar cases in the scientific periphery, notably in the Iberian contexts. The role of the Nobel Prize Santiago Ramón y Cajal and the political circumstances (dictatorships) are just two examples. In conclusion, the book will be a fruitful reading for those interested in broadening their views on the emergence of disciplines and research schools.