Peter Heering and Roland Wittje (eds.)

Learning by Doing: Experiments and Instruments in the History of Science Teaching.


This interesting volume of papers, stemming from a symposium held at the University of Regensburg in 2009, concentrates on the role of experiments, instruments, textbooks and exercises in the history of science teaching, at various levels and in different European and North-American contexts. The time span is from approximately the mid-eighteenth century to the 1930s.

The editors of the volume recall that, starting in the 1980s, the history of science benefited from historiographical approaches which drew new attention to the practical sides of science and thus spotted the “neglect of experiment” (as A. Franklin put it in the title of his famous 1986 book) as one of the obstacles to be overcome. Investigation, the editors also argue, is much less advanced if we want to know how the practical and experimental components of science were used in teaching. The volume focuses accordingly on the “neglected uses of instruments and experiments in science education” with a series of case studies by scholars in the history, didactics and philosophy of science, together with experts and curators of historical scientific collections. Most of the contributions concentrate on physics but chemistry, botany and biology are also considered. One grounding conviction is that “in order to understand the present state of science teaching as well as to envision potential future developments, one has to have some understanding of its history”. In this perspective, to be certainly endorsed, the volume can properly appeal not only to historians of science and education but also to present-day science educators.

The papers are generally arranged in chronological order but can also be considered from different standpoints. The articles of P. Heering and P. Brenni provide general frameworks for the physical sciences. Heering stresses that transfers from research science to the teaching level are complex and must be examined in their own right. As far as instruments are concerned, he identifies “simplification”, “downscaling”, “stabilisation” and “iconisation” as characteristic processes which take place in connection with teaching. Dealing with the evolution and production of physics teaching instruments in Europe between 1800 and the 1930s, Brenni manages the difficult task of identifying general trends in a broad and complex domain. R. Wittje examines how Robert Pohl at the University of Göttingen developed a system of physics demonstrations for large student audiences in the years following the Great War and during the Weimar period, which spread widely and was influential also in the following
decades. After the Great War, as both Brenni and Wittje recount, the history of physics became deliberately excluded from teaching. Reflection on this outcome is necessary if the role of history is to be reconsidered in the present-day teaching of physics.

The 1880s are usually recognised as marking the start of a substantial renewal in science teaching in North America, and three of the contributions return to this important stage. M. Hoffmann investigates how, in the 1880s, practical methods were introduced in the teaching of physics, chemistry, botany and zoology in Ontario high schools. The case is relevant because it established a model for other Canadian provinces. Focusing on physics in the US in the period 1880–1920, S. Turner broadens the standard picture by demonstrating that local textbook producers and instrument makers were active players in educational changes. R. Kremer argues that, in the 1880s, physics teaching was reformed in the US more as a result of internal forces rather than external pressure from new German physics. In a different paper D. Sanders explores how, in various nineteenth and twentieth-century Anglo-American social and disciplinary contexts, specimens and models were used to teach botany.

The articles by L. Roberts and P. Langman take us to the eighteenth century. Roberts shows how, as a result of general faith in meritocracy and other positive cultural conditions, Dutch orphans were given good instruction, with very remarkable scientific collections made also available to this purpose; Langman analyses the virtual engagement of audiences in the experimental practices of Newtonian natural philosophy through the reading of such successful popularising accounts as Algarotti’s *Newton for Ladies* and *Tom Telescope*. The projection of images was another powerful means to engage audiences and W. Hackmann explains how this started with the old magic lantern and developed over time to include the projection of scientific images and manipulations, in addition to the usual entertainment applications.

Concentrating on French chemistry in the first quarter of the nineteenth century, P. Grapí shows that frontier debates raised by Berthollet’s new conceptions of chemical affinities were in part echoed in teaching textbooks. Textbooks are also central to C. Skordoulis, G. Katsiampoura and E. Nicolaidis’ paper, in which the authors analyse how, between the late eighteenth and the early nineteenth centuries, experimental physics was taught in secondary level schools attended by the Greek speaking communities in various cities of the Ottoman Empire. In Spain, a general system of secondary school education was established in the years around 1845 and M. Cuenca-Lorente and J. Simon discuss how physics and chemistry collections were created and evolved in this context until 1861. The volume contains also a philosophical paper in