

Ambix, November 2004, pp. 275-276.

Volta: Science and Culture in the Age of Enlightenment. By Giuliano Pancaldi. Pp. xvii + 381, illus., index. Princeton University Press: Princeton and Oxford. 2003. £24.95. ISBN: 0-691-09685-6.

Pancaldi's book is not a traditional, exhaustive story of the whole life and letters of Alessandro Volta, the famous inventor of the galvanic battery and forerunner of electrodynamics. The descriptive part is about the formation and changes of the "electrician" (meant as a member of the community dealing with phenomena and theories of electricity) and civil servant Volta and his epoch-making instrument up to 1801, including a kind of prosopographical sketch of the scientific community in the Northern part of the Italian peninsula. It sketches intertwined local and international circumstances, and describes different social, intellectual and political settings. Together with the culture of the Enlightenment these circumstances and settings yielded Volta's successful style of experimental laboratory work.

Mapping a cultural environment with centres in London and Paris, the account emphasises two important elements in Volta's search for recognition: first the variety of provinces and peers in the community of "electricians"; and second the game of imitation and competition played by enlightened administrations with predilection for "useful knowledge" and instruments. The efforts undertaken in these arenas led to a readjustment of Volta's ambitions to a more instrumental mode of research: inventing ingenious electrical machines, doing measurements, and developing midrange concepts such as his notions of tension, capacity, actuation and contact electricity. The climax is the invention of the voltaic pile, which Pancaldi sees as a paradigmatic example for the sources of innovation. The new instrument is presented as the outcome of communication between a strange grid of actors: Luigi Galvani, Alessandro Volta, William Nicholson - and the electric fish. Immediately, all over Europe "electricians" replicated the relatively cheap and simple instrument and used it in their own ways, changing the pile for instance into a new impressive chemical analytical device. In addition, Pancaldi presents two examples of the long term reception of Volta in Italy: a brightly interpreted fresco of the late 1870s showing Volta as a central figure of enlightened science, and the famous anniversary at Como in 1927. He shows that in these cases non-scientific groups used the hero and science itself as a mere symbol of virtues and values such as genius, success, fame and Mertonian disinterestedness.

The conclusion gives a concise interpretation of the study from a wider historiographical and epistemological point of view. For Pancaldi, the enterprise of science and technology was (and is) the result of an interplay between freedom and discipline, represented by the enlightened maxims of quantifying spirit and useful knowledge. But even quantification and usefulness bear uncertainty. This is shown by the differences between the mathematical physics of Coulomb or Biot, and the agenda of Volta led by sophisticated measuring techniques. Early galvanic batteries had nearly no profitable application, but they were instantaneously seen as useful in the sense of a new and important cognitive tool

and a generic symbol of achievement. In his central thesis the author stresses the tremendous importance of freedom (represented by diversity and contingency) as a source of competition and innovation. The plurality of the community of "electricians", together with contingent social conditions and the interplay of instruments and natural phenomena, were indispensable for the invention of the galvanic battery and its adaptation to new, unintended, unprecedented but partly fruitful purposes.

In his argument, and after of lengthy discussions about constructivism and traditional realism, internalism and externalism, Pancaldi takes, similar to Volta, a more pragmatic stance aiming at "midrange" concepts. The specific focus is on Volta as a scientist working in the field of electricity. Hence, there is no detailed discussion of his efforts in other fields of natural philosophy, especially his successful workings on gaseous chemistry. For a complete assessment of the scientist and perhaps even the "electrician" Volta, the connections between his different fields of investigation need a more detailed study. On this point, the book has to be supplemented by the wide range of recent works on Volta. Furthermore, the author's thesis on development and innovation in science and technology is open to further testing.

Universität Regensburg

THOMAS STEINHAUSER