

Klaus Hentschel, *Mapping the Spectrum: Techniques of Visual Representation in Research and Teaching*, Oxford: Oxford University Press, 2002. Pp.562. ISBN 0 19 850953 7.

This is a fascinating and satisfying book. It is a hefty tome incorporating some 140 illustrations (four of them colour plates), copious footnotes and a leisurely, multi-threaded analysis dominated by abundant historical examples. Its subject is spectrum analysis, and especially the representation of spectra through the nineteenth and early twentieth centuries.

The Introduction notes that historians of science are trained to work, analyse, interpret and deconstruct written texts and to produce their own texts in turn. Except for the subject of astronomy, Hentschel argues, most historians of science have devoted too little attention to non-textual sources. The book redresses the balance by linking together seemingly disparate tools, studies and perspectives under the theme of visual representation. This unconventional perspective makes for interesting reading, because it valorises what might previously have been seen as incidental or irrelevant traits, and employs new criteria for analysis. Thus a discussion of the differences in prismatic and diffraction grating spectra focuses not on disputes about the standardisation of a wavelength scale, or on the different instrumental practices of spectroscopic sub-communities, but on the difficulty of recording, visually recognising and making use of the patterns of spectral lines.

The book is also interesting in that it avoids the intellectual locales most familiar and appealing to historians of science, focusing not on cases of contention and controversy, but on the routine practice of the spectroscopist and teacher of spectroscopy. Spectrum analysis was one of the busier branches of physical science in the last four decades of the nineteenth century and involved a changing assortment of specialists. By emphasising routine practice, the author highlights the fact that many practitioners – the engravers, lithographers and photographers active in the scientific printing industry, for example – remain shadowy figures. There are, even so, some well-known exemplars here such as John Herschel, Norman Lockyer, E. C. Pickering, Henry Rowland and Hermann Wilhelm Vogel. Many of them engaged in astronomical and photographic, as well as spectroscopic, research.

Hentschel argues that a preponderance of spectroscopists had a lifelong interest in the visual arts. He discusses some extended case studies, where archives have made documentation possible (some 29 archival locations are listed). These cases include E. C. Pickering's courses at Harvard, and those of Sarah Whiting at Wellesley College. The analysis covers America, Britain, Germany and France well. Many other brief anecdotal observations are carefully referenced and suggest the fruitfulness of this approach and its potential for further analysis.

The terrain explored includes methods of recording, including visual, photographic and photoelectric; forms of spectral representation, including maps of emission line positions and absorption; and printing technologies for scientific illustration such as hand sketches, woodcuts, engravings and lithographs. Hentschel devotes considerable space to the 'mapping metaphor' and investigates the 'rhetorics' of

spectra, discussing their claimed objectivity and information capacity, their omissions and simplifications, and implicit forms of classification and ranking.

The book devotes a chapter to the passing on of this largely undocumented visual knowledge to succeeding generations of spectroscopists. The tacit knowledge of spectroscopy was often taught by laboratory experiments, training in pattern recognition and, for more dedicated students, practice in developing the subtle aesthetics of spectral recording and depiction.

These emerging routines of research and teaching created new specialist communities. In common with other recent work especially in optics and modern spectroscopy, Hentschel identifies his spectroscopists as non-professional, inter-disciplinary practitioners or ‘research-technologists’. He shows that many of these practitioners were sensitive to visual aesthetics, which was evinced by their parallel work in photography, art or printing. Occasionally, the demonstration of the importance of this visual dimension can seem slightly strained; for example William Abney, a pioneer of scientific photography, was a promiscuous dabbler in optical methods, and a promoter of quantitative techniques at least as much as graphical ones. Hentschel rightly argues, though, that conventional biography tends to underplay or fails even to report the ‘marginal’ visual interests of physical scientists.

The text concentrates on the period between the first solar spectrum map made by Fraunhofer, up to the Bohr model, i.e. between the 1810s and 1910s. Hentschel’s main thesis – that visual representation in spectroscopy amounted to an enduring visual culture – seems harder to demonstrate beyond the early twentieth century. Thereafter, the phenomenology of spectra was replaced by theoretical explanations. The rise of quantification in spectrochemical analysis and spectrophotometry, combined with photoelectric recording methods, led to the submergence of visual modes of representation. By the mid-twentieth century, indeed, new spectroscopies such as infrared analysis relegated spectral information to punched cards and computer memories.

The final chapter (“Epilogue”) contrasts the book’s approach with other explanatory frameworks in history, philosophy and sociology of science. Hentschel makes a number of intriguing observations and points the way for further studies. There are only occasional points lacking clarity (for instance Fig 10.2 (page 440) seeking to plot the rise and fall of ‘iconic’ and ‘symbolic’ representations).

The text is beautifully produced, seemingly free of typos and with wide-ranging and readable footnotes. The illustrations are all of high quality. Bafflingly, however, the excellent bibliography and name and company indexes are not complemented with a subject index.

The book makes valuable reading both for its analytical perspectives and for the historical tapestry of individuals and techniques that it inter-relates.

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