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Lorraine Daston, Peter Galison. *Objectivity.* New York: Zone Books, 2010. Illustrations. 504 pp. $38.95 (cloth), ISBN 978-1-890951-78-8; $28.95 (paper), ISBN 978-1-890951-79-5.

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Historians of science have expended much effort on the study of objectivity. The ways they have done so, however, have changed enormously in the last fifty years. Charles Coulston Gillispie's *The Edge of Objectivity: An Essay in the History of Scientific Ideas* (1960) was one of the most influential works of the history of science in the 1960s. Gillispie presented the development of scientific ideas as the means to understand the route taken by the "advancing edge of objectivity ... through the study of nature from one science to another" (p. 521). The Scientific Revolution, the majority of historians of the time agreed, was demarcated by Copernicus's advocacy in 1543 of a heliocentric universe and Newton's *Philosphiae Naturalis Principia Mathematica* of 1687. By the end of the revolution, modern science had been born and objective knowledge could be secured through appropriate methods and scientific techniques. For historians of science in the mid-twentieth century, the emergence of objectivity in the seventeenth century was a given.

A study of objectivity of a very different sort from Gillispie's is provided by Lorraine Daston and Peter Galison's *Objectivity*, originally published in 2007 but recently reissued in paperback with a new preface. For Daston and Galison, unlike for the earlier students of the Scientific Revolution, objectivity means different things at different times and its history did not begin in the seventeenth century. In their telling, mechanical objectivity emerged as a scientific ideal in the mid-nineteenth century, and it did so in tandem with subjectivity.

Objectivity is concerned with images and provides a meticulous examination of visual practices in various disciplines that range from astronomy to zoology. Much of the book offers detailed commentaries on the numerous images that are reproduced in the book, some in color. Daston and Galison are relentless too in establishing what these images meant for the scientists who produced them. While far from a work on British science alone, many of the examples deal with images created by British scientists. Indeed, the book starts with the efforts of the British physicist Arthur Worthington to capture images of the impact of a liquid droplet, and there are remarks on such British figures as John Herschel elsewhere in the book.

Daston and Galison deal with scientific depictions of various kinds (photographs, drawings, and so on), but their focus is on collections of images in scientific atlases. These the authors take to be "any compendium of images intended to be definitive for a community of practitioners. These profusely illustrated volumes depict carefully chosen observables–bodily organs, constellations, flowering plants, snowflakes–from carefully chosen points of view" (p. 63). From their analysis of atlases, Daston and Galison identify three epistemic virtues–truth-to-nature, mechanical objectivity, and trained judgment–which they associate with different historical periods. Daston and Galison argue that together with the different epistemic virtues came different self-images for scientists so they write at length about what it meant to be a scientist as well as how scientists conceived of themselves, that is, the "covariance of scientific self, image, procedure and object" (p. 371).

In their account of truth-to-nature, Daston and Galison quote Goethe who in 1798 described how in his research in morphology and optics he sought "pure" phenomena. But teasing out a pure phenomenon demanded a careful series of observations. "To depict it," Goethe warned, "the human mind must fix the empirically variable, exclude the accidental, eliminate the impure, unravel the tangled, discount the unknown" (p. 59). Daston and Galison present numerous examples of natural historians who fashioned images such that each was the distillation of many individual specimens diligently recorded. Carolus Linnaeus, for example, stressed that botanists should seek out certain and constant characteristics and not be misled by irrelevant details.

Capturing what practitioners of truth-to-nature might have regarded as "irrelevant details," however, was central to the program of mechanical objectivity. An image-based scientific objectivity began to emerge in the scientific atlases of the 1830s and 1840s, and it was nearly ubiquitous by the 1880s and 1890s. The appearance of mechanical objectivity meant major shifts not only in the methods of depicting nature, but also in ethics and metaphysics, with the ethical requirement now being restraint so as to enable nature to appear on the page through rigorous procedures, and sometimes the workings of a machine, untainted in the ideal case by human interventions.

In the early 1900s, the strategy of trained judgment started to be added to the goal of producing objective images by mechanical means. As one example, Daston and Galison show an image from 1959 of the sun's magnetic field which was the result of both the output of complex scientific apparatus together with intervention of scientists, using trained judgment, to smooth the data in order to eliminate artifacts produced by their instruments.

Objectivity is a provocative book. It has generally been received with enthusiasm by philosophers of science, but has been given a much more mixed reception by historians. Its approach certainly goes against the grain of some contemporary historical practices. With their concentration on the production of scientific atlases, Daston and Galison rarely tackle questions about the reception or actual uses to which the scientific atlases were put and how those uses compared with the employment of images found, for example, in the pages of scientific journals. Nor are they concerned with how and why images traveled through different social spheres, the subject of substantial research by an assortment of historians of science as well as specialists in science studies.

Objectivity is therefore narrow in terms of the emphasis on work on images by scientists within particular scientific communities and disciplines. At the same time, Daston and Galison's view of their subject is also a "panoramic" one in terms of both time and space, as it stretches from Linnaeus and his botanical images in the eighteenth century to contemporary practitioners of nanotechnology. This is an ambitious approach. It is not in line with much of the recent work in the history of science–toward which Daston and Galison are critical–which has to do with microstudies and thick description rather than sweeping across centuries and disciplines.

Essential reading for anyone interested in the visual culture of the sciences over the last few centuries, *Objectivity* is a bold, challenging, and important book. It raises questions of great consequence, but how many historians will be persuaded to follow its methodological strictures remains to be seen.

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