

Essay Review

Pictures and Conversation: How to Study the Visual Cultures of Science

by José Ramón Marcaida

Klaus Hentschel. *Visual Cultures in Science and Technology: A Comparative History.* x + 496 pp., illus., figs., tables, bibl., index. Oxford: Oxford University Press, 2014. £60 (cloth).

Robert Hooke's enlarged image of a flea and the so-called Pillars of Creation photograph of the Eagle nebula are undisputed visual icons in the history of Western science and technology. But consider a random magnetic resonance imaging scan of a human brain or a diagram in a physics textbook for first-year undergraduates. These too will almost instantly be recognized as visual expressions associated with scientific, technological, and medical practices. Beyond this straightforward and rather unsophisticated appreciation, however, it is a complicated question to discern what constitutes the visual corpus accompanying a given scientific field or discipline—including the individuals and techniques involved in its production—and, more important, the role played by these materials and processes in the generation of knowledge within that particular field and discipline.

Since the publication of *Towards a Visual Culture* by Caleb Gattegno in 1969, the expression “visual culture” has undergone a convoluted process of transformation and adaptation; and just as we have now integrated the “material culture” turn in the history of science, technology, and medicine, “visual culture” too has become a familiar trope in our discipline.¹ But despite its currency, the implications of the adoption and use of this expression continue to be elusive and challenging. The book under review is the latest addition to a growing body of literature devoted to this issue. Its author, Klaus Hentschel, specializes in the history of nineteenth- and twentieth-century science and technology. Since 2011 he has been Director of the Database of Scientific Illustrators (1450–1950), hosted at the University of Stuttgart.²

Centre for Research in the Arts, Social Sciences, and Humanities, University of Cambridge, Alison Richard Building, 7 West Road, Cambridge CB3 9DT, United Kingdom; jrm213@cam.ac.uk.

¹ Caleb Gattegno, *Towards a Visual Culture: Educating through Television* (New York: Outerbridge & Dienstfrey, 1969). The literature on visual culture is significantly large. A good survey can be found in Margaret Dikovitskaya, *The Study of the Visual after the Cultural Turn* (Cambridge, Mass.: MIT Press, 2005); see also Nicolas Mirzoeff, ed., *The Visual Culture Reader* (London: Taylor & Francis, 1998). On the adoption of this term by historians and philosophers of science see, among others, Peter Galison, Caroline A. Jones, and Amy Slaton, eds., *Picturing Science, Producing Art* (New York: Routledge, 1998); Marita Sturken and Lisa Cartwright, *Practices of Looking: An Introduction to Visual Culture* (Oxford: Oxford Univ. Press, 2001); Luc Pauwels, ed., *Visual Cultures of Science: Rethinking Representational Practices in Knowledge Building and Science Communication* (Hanover, N.H.: Dartmouth College Press, 2005); and Norton Wise, “Making Visible,” *Isis*, 2006, 97:75–82 (part of an *Isis* Focus section on “Science and Visual Culture”). See the following footnotes for further references.

² http://www.uni-stuttgart.de/hi/gnt/dsi2/index.php?function=show_static_page&id_static_page=1&table_name=dsi.

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This review is divided into two parts. In the first part I will examine the book's main theoretical assumptions, as well as its methodological standpoints. In the second part I will highlight some of its achievements and hint at complementary themes for further discussion. I will also refer to its intended readership and its promise for pedagogical use, before turning to some brief closing remarks.

PEELING THE “VISUAL CULTURE” ONION

As stated in its introductory pages, *Visual Cultures in Science and Technology* is intended to provide a systematic and integrative account of the formation and development of a plurality of “visual cultures” throughout the history of Western science, technology, and medicine. At the core of its methodology is an exhaustive—and new—comparative approach based on a large number of case studies covering a period that extends from the early modern era to the present day. The selection and range of examples is indeed phenomenal. And so are the visual materials and bibliography that support the argument.

All through the book, but especially in the theory-oriented Chapters 1 (the introduction) and 2, it becomes clear that Hentschel has been careful to engage with as many pertinent interlocutors as possible in order to situate his work in the now decade-old “visual culture” historiographical debate. Just to name a few: Svetlana Alpers is repeatedly acknowledged as a major inspiration, especially her innovative use of the term “visual culture” in her work on the seventeenth-century Dutch context.³ James Elkins and his work on visual studies feature quite prominently too, not least in relation to his inventive efforts to explore the visual cultures of science and technology.⁴ Indeed, the fact that Hentschel introduces the concept of “visual or scopic domains” as a key term in his comparative approach—combining Elkins’s “domain of images” and Martin Jay’s “scopic regimes”—is a sign of recognition; but there are moments of disagreement too.⁵ Similarly (and not surprisingly), W. J. T. Mitchell stands out as a key figure; for example, he provides Hentschel with a useful distinction between “visual culture” and “visual studies,” where the former constitutes the object of study and the latter becomes the theoretical framework of such study.⁶ Not all forms of “visual studies” are acceptable for Hentschel, though. He is very critical of what he refers to as the “wrong turns of the ‘visual turn’” and even provides a list of the most disappointing derivations (pp. 76–80).⁷ However, he is inclined to share the open approach to images of visual studies; hence the book’s broad and unprejudiced selection of visual materials.⁸ Along these lines, Hentschel is receptive to the *Bildwissenschaft*

³ Svetlana Alpers, *The Art of Describing: Dutch Art in the Seventeenth Century* (Chicago: Univ. Chicago Press, 1983). Hentschel (pp. 62–64) discusses Alpers’s treatment of the term and refers to the influence of Michael Baxandall’s notion of the “period eye”; see Michael Baxandall, *Painting and Experience in Fifteenth-Century Italy* (Oxford: Clarendon, 1972).

⁴ See, among his other works, James Elkins, *The Domain of Images* (Ithaca, N.Y.: Cornell Univ. Press, 1999); Elkins, *How to Use Your Eyes* (London: Routledge, 2000); Elkins, *Visual Studies: A Skeptical Introduction* (New York: Routledge, 2003); and Elkins, *Six Stories from the End of Representation: Images in Painting, Photography, Astronomy, Microscopy, Particle Physics, and Quantum Mechanics, 1980–2000* (Chicago: Univ. Chicago Press, 2008).

⁵ See Martin Jay, “Scopic Regimes of Modernity,” in *Vision and Visuality*, ed. Hal Foster (Seattle: Bay, 1988), pp. 3–23.

⁶ See, among his other works, W. J. T. Mitchell, *Picture Theory: Essays on Verbal and Visual Representation* (Chicago: Univ. Chicago Press, 1994); Mitchell, “Interdisciplinarity and Visual Culture,” *Art Bulletin*, 1995, 77:540–544; Mitchell, “What Do Pictures Really Want?” *October*, 1996, 77:76–83; and, for the “visual culture”/“visual studies” distinction, Mitchell, “Showing Seeing: A Critique of Visual Culture,” *Journal of Visual Culture*, 2002, 1:165–181.

⁷ Here Hentschel also recommends further reading, including Jessica Evans and Stuart Hall, eds., *Visual Culture: The Reader* (London: SAGE, 1999); and Matthew Rampley, ed., *Exploring Visual Culture: Definitions, Concepts, Contexts* (Edinburgh: Edinburgh Univ. Press, 2005).

⁸ Hentschel (p. 77) praises Martin Jay’s “democratic impulse” to study “all manifestations of optical experience, all variants of visual practice.” See “Visual Culture Questionnaire,” *October*, 1966, 77:25–70; Jay’s response is on p. 42.

(“image science”) approach, as well as to Horst Bredekamp’s take on scientific and technological imagery, as reflected by his praise of the latter’s coedited volume *Das Technische Bild* of 2008, recently translated into English.⁹ Finally, we should note Hentschel’s encomiastic references to some of the earliest studies of the visual cultures of science put forward by historians of science, such as Martin Rudwick’s work on the history of geology, which in Chapter 3 becomes the model for describing the formation of visual science cultures.¹⁰

Having referred to these interlocutors, whose main conclusions are handily summarized in a list toward the end of Chapter 1, Hentschel then proceeds to explain what his novel comparative approach is and what the book is meant to achieve with it. Marked by an admittedly “intentional generalizability,” his aim is to identify a set of recurrent features that would account for the development of visual cultures of science and technology throughout history. As the basis for his comparative method, Hentschel insists on searching for these patterns by closely examining a wide and unbiased selection of case studies, featuring a plurality of scientific and technological image-related practices. In his own words, the objective is “to scan the full spectrum of visual representations, from superb exemplars of top-notch scientific research to fairly down-to-earth examples of technical drawings, since they all can contribute to our structural inquiries into the mechanisms of formation and stabilization of visual cultures in science and technology” (p. 82).

Beginning with a notion of “visual culture” as a multilayered object of study—an idea inspired by Clifford Geertz’s “thick description” model—Hentschel then presents the elements that constitute the methodological backbone of his comparative approach: what he calls the “historiographic layers of visual science cultures.” Nine in total, these recurrent features of visual cultures include training and development of pattern recognition skills and visual thinking, a consideration of aesthetic and leisure-related dimensions within scientific practices, and the existence of a broad context of specialized expertise in image production—for example, the worlds of draftsmen, model makers, photographers, or graphic designers. Each of these interconnected layers is meant to capture different structural features of visual cultures, from disciplinary and educational aspects to cognitive and subjective facets. Having introduced them at the beginning of the book (Ch. 2), Hentschel devotes the rest of his work to exemplifying their explanatory potential.

THROUGH THE KALEIDOSCOPE OF SCIENCE AND VISUAL CULTURE

Visual Cultures in Science and Technology is an ambitious book. Its selection of case studies, for example, is truly impressive. Indeed, beyond acknowledging the generally accepted prominence of the visual in several scientific cultures—for example, natural history and astronomy—one of Hentschel’s key merits here is that he has brought to light the extraordinarily rich diversity of visual elements associated with so many disciplines and subdisciplines in science, technology, and medicine. From Albrecht Dürer’s (1471–1528) contributions to geometry and perspectival drawing and Roger Hayward’s (1899–1979) collaboration with Linus Pauling (1901–1994) to the invention of the cyanometer by Horace Bénédicte de Saussure (1740–1799)

⁹ See Klaus Sachs-Hombach, ed., *Bildwissenschaft: Disziplinen, Themen, Methoden* (Frankfurt: Suhrkamp, 2005); and Horst Bredekamp, Vera Dünkel, and Birgit Schneider, eds., *Das Technische Bild: Kompendium zu einer Stilgeschichte wissenschaftlicher Bilder* (Berlin: Akademie, 2008) (for the English translation see Bredekamp et al., eds., *Technical Image: A History of Styles in Scientific Imagery* [Chicago: Univ. Chicago Press, 2015]).

¹⁰ Martin J. S. Rudwick, “The Emergence of a Visual Language for Geological Science, 1760–1840,” *History of Science*, 1976, 14:149–195.

and the engineering- and astronomy-related endeavors of James Nasmyth (1808–1890), the book is filled with fascinating and truly eye-catching stories.

Moreover, the book gives prominence to less popular—and yet mesmerizing—visual cultures, such as, for instance, those involving the first stereoscopes and stereophotographs and their multiple practical applications in the nineteenth and early twentieth centuries, the work of Johan Heinrich Lambert (1728–1777) and his contributions to the early history of photogrammetry, or Jean Comandon's (1877–1970) work on microcinematography, to offer just three examples. Likewise, the book conscientiously deals with what until recently were considered minor, even negligible, characters in the literature of the discipline—illustrators, technicians, designers, and the like—which no doubt is a sign of the author's interest in incorporating the latest historiographical developments in the discipline.

Also highly welcome is the book's emphasis on looking beyond microanalysis or microhistory and its attempts to produce a survey that is both synchronic and diachronically consistent. In this regard, it is worth highlighting Hentschel's intellectual courage in discussing examples that range from early modern botanical illustrations to the most up-to-date debates about the influence of imaging techniques such as nuclear magnetic resonance and positron emission tomography on medical diagnosis.

In many ways, *Visual Cultures in Science and Technology* achieves what it intends to achieve. A particularly solid case study is the one devoted to the development of spectroscopy in the nineteenth century (Ch. 4). Hentschel's prosopographic survey of the community of spectroscopists and his exploration of shared interests and training in visualization techniques—to name two of the nine historiographical layers—shows the potential of his comparative method, with rather convincing results. A personal favorite case study is the discussion of visual rhetoric and illusionism in connection with current visualization techniques used, for example, in academic publications, conference presentations, textbooks, and websites. Referring to the work of Annamaria Carusi, among others, Hentschel examines the power of these image-making techniques to create illusory realities or turn unobservable phenomena into veritable events.¹¹ The elements of persuasion and deception associated with these visualization strategies echo, in many ways, the illusionistic power attributed to certain early modern pictorial genres—for example, still-life painting—and the concern shared by naturalists as to how to keep their collaborating artists' representational skills under control.¹²

Despite the attentive inclusion of these and many other examples, given the book's ambitious agenda it inevitably misses themes and leave some authors unmentioned. Chapter 7, for instance, addresses the question of repeated copying: images that are consistently replicated over long periods of time. As someone who works on the early modern context, I could not help thinking of the work of Peter Mason and Florike Egmond, among others, on the recurring presence of certain images in natural history publications—"persistent beasts" like Dürer's famous rhinoceros, to use the expression coined by William Ashworth, Jr.¹³ Another case study

¹¹ See, e.g., Annamaria Carusi, "Scientific Visualizations and Aesthetic Grounds for Trust," *Ethics and Information Technology*, 2008, 10:245–254.

¹² See, e.g., Giuseppe Olmi, *L'inventario del mondo: Catalogazione della natura e luoghi del sapere nella prima età moderna* (Bologna: Il Mulino, 1992); and, from a different angle, Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone, 2007). For a more general account see Pamela H. Smith, "Art, Science, and Visual Culture in Early Modern Europe," *Isis*, 2006, 97:83–100.

¹³ See, e.g., Peter Mason, *Before Disenchantment: Images of Exotic Animals and Plants in the Early Modern World* (London: Reaktion, 2009); and Florike Egmond, "A Collection within a Collection: Rediscovered Animal Drawings from the Collections of Conrad Gessner and Felix Platter," *Journal of the History of Collections*, 2013, 25:149–170. See also William B. Ashworth, Jr., "The Persistent Beast: Recurring Images in Early Zoological Illustration," in *The Natural Sciences and the Arts*, ed. Allan

that surely would have fit in Hentschel's account is that of those images allegedly produced "*ad vivum*"—from the life—on which Claudia Swan and others have made interesting contributions.¹⁴ But these are only suggestions for further conversation.

It is at a more theoretical level—especially on matters of methodology—that some readers may have reasons to object to aspects of the book's ambitious approach. All through this work there seems to be a tension between the interest in finding shared structural features in visual cultures across history and the realization that each period—and the cultures within it—is marked by its own historical specificities. This puts a lot of pressure on Hentschel's theoretical apparatus: the nine historiographical layers at the core of his comparative approach need to be sufficiently abstract to work as transhistorical markers, but at the same time they need to be adaptable and variable enough to do justice to the complexities of more than five centuries of historical development. In this sense, those readers interested in the study of recurring cultural patterns will be thrilled by Hentschel's ability to unveil hidden connections and draw unsuspected parallels. But for those interested in sharper historical distinctions, some of his assumptions may rightly seem questionable. That is: in the effort to establish associations across centuries, the book runs the risk of overlooking the unique historical specificities of each particular context.

One constructive way out of this impasse is to think of this book as an open invitation to continue the debate on the visual cultures of science, either by engaging with its original theoretical input or by exploring any of its captivating case studies in further detail. In this regard, my impression is that the book will perform particularly well as a pedagogical tool. After all, its target audience is not just the community of experts but also those new to the debate (for whom this "state of the art"—like account will be an ideal starting point), as well as the general public, who will surely appreciate Hentschel's effort to evaluate critically and—one may hope—improve our present-day "visual literacy."

CONCLUDING REMARKS

In a famous passage of *Alice's Adventures in Wonderland*—whose 150th anniversary we are now celebrating—Alice somewhat bitterly wonders what is the use of a book "without pictures or conversation." *Visual Cultures in Science and Technology* is definitely not a book without pictures. I am not just referring to the wonderful illustrations that populate it, but also and especially to those that are evoked throughout the text. The fact that one is always motivated to look for these images and find out more about them shows how enriching the experience of reading this book can be.

Fortunately, too, the book does include conversation. Led by Hentschel's distinct voice, this nearly five-hundred-page-long dialogue not only incorporates an outstanding cast of

Ellenius (Stockholm: Almqvist & Wiksell, 1985), pp. 46–66. Actually, Hentschel comes close to addressing this issue when discussing, in Stephen Jay Gould's words, the "mindless recycling" of Ernst Haeckel's images of embryos, which "has led to the *persistence* of these drawings in a large number, if not a majority, of modern textbooks!" (Hentschel, pp. 261–262; emphasis added). On Haeckel's images it is worth noting the recent publication of Nick Hopwood, *Haeckel's Embryos: Images, Evolution, and Fraud* (Chicago: Univ. Chicago Press, 2015).

¹⁴ See Claudia Swan, "Ad vivum, naer het Leven, From the Life: Defining a Mode of Representation," *Word and Image*, 1995, 11:353–372. More recently see Noa Turel, "Living Pictures: Rereading 'au vif,' 1350–1550," *Gesta*, 2011, 50:163–182; Boudewijn Bakker, "Au vif—naar 't leven—ad vivum: The Medieval Origin of a Humanist Concept," in *Aemulatio: Imitation, Emulation, and Invention in Netherlandish Art from 1500 to 1800: Essays in Honor of Eric Jan Sluifjter*, ed. Anton W. A. Boschloo et al. (Zwolle: Waanders, 2011), pp. 37–52; and Sachiko Kusukawa, "Conrad Gessner on an 'Ad Vivum' Image," in *Ways of Making and Knowing: The Material Culture of Empirical Knowledge*, ed. Pamela H. Smith et al. (Ann Arbor: Univ. Michigan Press, 2014), pp. 330–356. See also the *Ad Vivum?* conference, organized by Joanna Woodall and Thomas Balfe at the Courtauld Institute of Art, 21–22 Nov. 2014.

interlocutors—from canonical authors to Wikipedia—but also succeeds in capturing the intricacy and relevance of the debate on the visual cultures of science from its origins to its most up-to-date developments. The book's explicit intention to keep the dialogue open and running supports the impression one gets when reading through its pages: that the way forward is through more analysis of pictures and more conversation around them.