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The Historian, the Picture, and the  
Archive

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# The Historian, the Picture, and the Archive

*By Jennifer Tucker\**

## ABSTRACT

One of the persistent features of historical writing about the sciences in the last twenty years has been the concern of a number of historians who insist on the need for a new awareness of the role of visual images and image making. The author believes that, rather than reducing the analysis of visual culture to a single set of principles, the point of the academic study of scientific images is the recognition of their heterogeneity, the different circumstances of their production, and the variety of cultural and social functions they serve. This essay challenges historians to discover new ways of framing the historical meanings of scientific images within the larger contexts of signifying symbols, images, and mediations that make up culture. The study of nineteenth-century practices of building collections of scientific photographs provides the background for a discussion of the significance of picture archives in the history of science, of the historical mechanisms that frame some pictures as “scientific” and others as “unscientific,” and of the need for further research on how scientific images generate meaning.

THE STUDY OF IMAGES and image production in the history of science is a rapidly expanding area of inquiry. Its rise, in turn, reflects growing interest in larger questions about the changing relations between scientific practice and theory, pictures and truth claims about natural phenomena, seeing processes and scientific instrumentation, and science and its multiple publics.<sup>1</sup> Visual culture is tapped—and created—by scientists, and visual representations help construct social ideas of nature, of scientific truth and falsehood, and of the institutional relations of science. From new satellite images of Mars to visual-

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<sup>1</sup> For an excellent introduction to scholarship that explores questions such as these—and others—see esp. Caroline A. Jones and Peter Galison, eds., *Picturing Science, Producing Art* (New York: Routledge, 1998). For an overview of issues raised by recent literature in this area, particularly but not exclusively focused on nineteenth-century British photography, science, and visual culture, see also Jennifer Tucker, “Essay on Sources,” in *Nature Exposed: Photography as an Eyewitness in Victorian Science* (Baltimore: Johns Hopkins Univ. Press, 2005), pp. 273–283.

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izations of mathematical objects and molecular interactions, visual images and image production are (and have long been) central to modern scientific work and its cultural representations.

While a number of recently published works bear witness to the creativity and vigor of historical studies of scientific and medical images, however, it is perhaps easy to exaggerate what has been accomplished in this field and how widespread the analysis of visual images in the history of science really is. How much of a “pictorial turn” has occurred in the history of science?<sup>2</sup> Many studies in the history of science might give the impression that visual culture is sealed off from—rather than integrally involved in—the constitutive and rhetorical work of science. (Perhaps this is even implied in our common reference to the field as the study of “science *and* visual culture.”) While there are now more illustrated publications in the history of science than ever before, visual images are still added after articles and books are written (often, it seems, at the prompting of editors and publishers) rather than being incorporated as integral to the historical investigation from the outset. The “two culture” view of science and visual culture has intellectually hampered the development of the history of science in two main ways.<sup>3</sup> First, the focus in many histories on images as illustrative material—or, as one discussion puts it, as “an attractive product to potential buyers” of popular science—has often reflected an obliviousness by authors and critics to the variety of histories that scientific images have to tell.<sup>4</sup> A second problem, related to the first, is that problematics of context that historians regard as essential for analyzing written texts and documents are regularly ignored in the case of visual images. Of course, excavating information about the symbolic forms, language, strategies, and contexts of visual images requires some different research techniques from those that have become established for the study of scientific publications, newspapers, and books. Yet calls for new methodologies for defining visual representations in science as an object of study obscure a deeper underlying problem: the need for greater critical awareness of visual images as physical, material artifacts mediated by past and present forces. Many works still present visual images as illustrations “of” scientific subjects (from insects to technologies to popular science spectacles), with little or no discussion of their packed significance as pictorial statements relative to others, of what (or why) they signify meaning, or of how visualizations have operated—and continue to operate—within ideas of historically spe-

<sup>2</sup> The term “pictorial turn” was coined in the United States in the 1990s by W. J. T. Mitchell and has served as a focus for ongoing theoretical discussions on pictures in the humanities and social sciences. Mitchell further posited in 1995 that a new interdisciplinary of visual studies surfaced around the pictorial turn, running through critical theory and philosophy. At the same time, the related issues of vision and visibility have been explored across a broad range of the humanities, including the history of science—the trend that Martin Jay has called the “visual turn.” For an excellent recent discussion of the genealogy and objects of visual studies, including contributions brought to the study of visual culture by Mitchell, Jay, and many others, see Margaret Dikovitskaya, *Visual Culture: The Study of the Visual after the Cultural Turn* (Cambridge, Mass.: MIT Press, 2005), pp. 47–64.

<sup>3</sup> For a good discussion of the problematic status of the art/science binary in the history of science and art see Jones and Galison, eds., *Picturing Knowledge, Producing Art* (cit. n. 1).

<sup>4</sup> For the quotation see Lewis Pyenson and Susan Sheets-Pyenson, *Servants of Nature: A History of Scientific Institutions, Enterprises, and Sensibilities* (New York: Norton, 1999), p. 229. This book devotes several chapters to scientific practices (teaching, watching, traveling, measuring), but only six pages, housed entirely within a chapter on “Reading,” focus on scientific illustration. These pages are devoted to the commercial aspects of scientific illustration: “Successful popularization of science depended on supplying an attractive product to potential buyers. . . . In this marketplace, the presence of striking illustrations gave a competitive edge, a means of luring the reader and potential purchaser away from the competition” (*ibid.*). Not only does this work neglect the use of images in the constitutive work of science; it presumes, erroneously, that scientific illustrations circulated mainly in printed books.

cific legitimation. Consequently, in many works in the history of science there is an asymmetry between a sophisticated analysis of science and its complexities (its national styles, epistemologies, boundary formations, and audiences), on the one hand, and an unproblematic use of visual images as representations “of” scientific subjects, on the other.

I suggest that one way to advance the study of the role of visualizations in science involves looking further at the social formation of communities of collecting and exchanging pictures and understanding the historical (and increasingly institutionalized) mechanisms that developed for framing some as “scientific” and some as “unscientific” objects. As Elizabeth Edwards has argued in relation to anthropological photographs, images are not simply representations “of” things: they are cultural objects with their own “social biographies.” Ideas of social biography have been used in the analysis of material culture in recent years to show how things—like people—have “accumulative histories.” The social historian Asa Briggs once explained, in relation to his study of Victorian things, that in trying to reconstruct the “intelligible universe” of the Victorians he approached the history of artifacts not through abstraction or through generalizations about categories of objects and their typologies but, rather, “*through the detailed study of particular things.*”<sup>5</sup> Assessing the history of scientific enterprises and responses to them compels us to look closely at the social histories of individual images, including where they survive today and how and why they came to be there.

Drawing on examples from my research on how people in nineteenth-century Britain viewed and responded to photographs, I suggest here some techniques for historically contextualizing scientific images. What new frames of meaning emerge from regarding science as a visual culture locatable within a larger context—that is, as one among the signifying systems (symbols, images, and mediations) that make up culture? I discuss how the history of picture archives and the range of social practices associated with them informs the study of scientific imaging. After briefly discussing some of the places where individual scientific photographs were viewed and collected in the nineteenth century, I consider what stories their circulation through these places can tell us. I conclude with some reflections on parallels between the study of photographs and the study of other dimensions of visual culture.

The “two culture” situation I have described is partly the result of patterns of professional training that shape how the history of science is studied more generally. Historians of science schooled in the humanistic tradition still tend to be trained primarily in the analysis of written texts, not visual artifacts. Critical insights from the history of art, visual culture studies, and science studies often are not shared, or are shared only within a small circle of specialists. Compounding the tendency to compartmentalize the fields of the history of science and of visual studies is the history of internalism shared by history of science and history of art, both of which have been shaped by values of autonomy, connoisseurship, and the protection of the domain of high culture.<sup>6</sup> This is changing. In the history of art,

<sup>5</sup> Elizabeth Edwards, *Raw Histories: Photographs, Anthropology, and Museums* (Oxford: Berg, 2001), p. 13; and Asa Briggs, *Victorian Things* (London: Batsford, 1988), p. 31 (emphasis added).

<sup>6</sup> The “cultural turn” in the humanities and social sciences brought reflection on the complex interrelationships between power and knowledge to the study of visual images; as a result, the work of art came to be seen as a communicative exchange. For an excellent discussion of the changes affecting concepts of the autonomy of art and of the variety of schools of thought about the field of “visual culture” or “visual studies” see Dikovitskaya, *Visual Culture* (cit. n. 2), esp. pp. 48–50; Nicholas Mirzoeff, “Introduction: What Is Visual Culture?” in *The Visual Culture Reader*, ed. Mirzoeff (New York: Routledge, 1998), pp. 3–13; and Keith Moxey, “Nostalgia for the Real: The Troubled Relation of Art History and Visual Studies,” in *The Practice of Persuasion: Paradox and Power in Art History* (Ithaca, N.Y.: Cornell Univ. Press, 2001), pp. 103–123.

as in the history of science, the move within the past thirty years to assess the significance of “lesser” cultural forms and bodies of knowledge that previously were excluded from the canons has produced meaningful and powerful new insights into the power of images other than those that have traditionally been studied, including scientific and popular illustrations. Today the history, theoretical frameworks, methodology, and pedagogy of the history of art and visual studies have much in common with those of science studies, including a shared interest in the historical relationship between technology and visibility and an understanding of perception as a product of experience and acculturation.<sup>7</sup> Studies of images and meaning in history, meanwhile, point to some assumptions and burdens that the disciplines of history and art history share, as well as to areas where their interaction may be especially fruitful.<sup>8</sup>

Visual images are the stuff of science and an important way that science has defined itself (and has been defined or perceived by others) for hundreds of years. The study of scientific illustration’s past refines and challenges our conventional understanding of key transitions in the history of scientific ideas and social practices.<sup>9</sup> Historians of science can engage with and in turn contribute to some of the exciting areas in the history of art and visual culture studies by reading and responding to the vast literature on art and science; looking at visual objects and incorporating them into essays, lectures, and student assignments; asking questions about particular images; and extracting insights from resources in the history of art and visual and communication studies—in short, by using every resource possible to figure out what meanings and significance scientific illustrations bear.

The nineteenth century witnessed the growth of a global culture around the viewing of mechanical reproductions of drawings and photographs, with the development of photojournalism, world’s fairs, public science, and advertising. Collections of photographs were part of scientists’ work in creating a “viewing culture” around science. Photographic collections in scientific institutions offer clues, therefore, to the social and cultural values that shaped science and culture as a whole.

A nineteenth-century observer remarked that photography was different “from any other species of representation that has ever been attempted.” Yet if photography was greeted as a new phenomenon, the story of scientific photography is inextricably connected with the age-old practice of scientific collecting. The Victorians were great collectors of things, not only their own artifacts but also old objects and pieces ransacked from other cultures. Some Victorian writers treated collecting as a biological drive; others related it to the psychological urge, often driven by rivalry, to possess a whole series of objects—books,

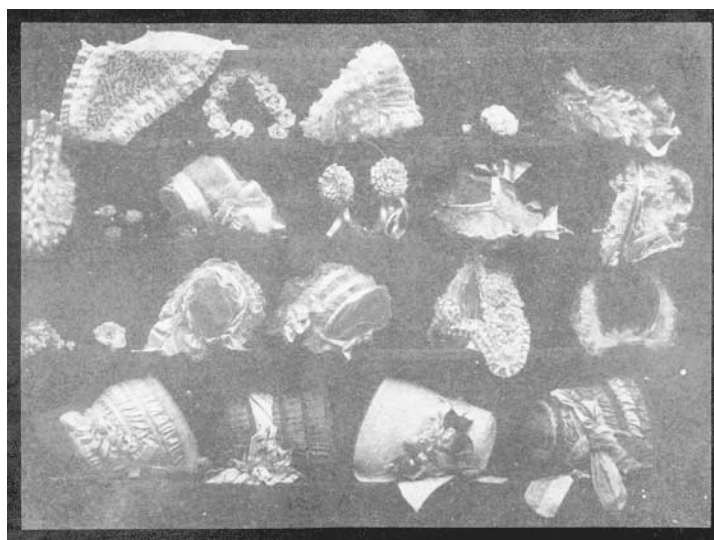
<sup>7</sup> Two works of art history that have contributed to the discussion on these topics are Svetlana Alpers, *The Art of Describing: Dutch Art in the Seventeenth Century* (Chicago: Univ. Chicago Press, 1983); and Michael Baxandall, *Painting and Experience in Fifteenth-Century Italy: A Primer in the Social History of Pictorial Style* (Oxford: Clarendon, 1972).

<sup>8</sup> See, e.g., Theodore K. Rabb and Jonathan Brown, “The Evidence of Art: Images and Meaning in History,” in *Art and History: Images and Their Meaning*, ed. Robert I. Rotberg and Rabb (Cambridge: Cambridge Univ. Press, 1988), pp. 1–6. I thank Melissa Hyde for this reference.

<sup>9</sup> Works that have brought the study of visual images to bear on enduring problems in the history of science, such as the roles of amateurs versus those of professionals, the nature of popularization, and race and gender in science, include Bernard Lightman and Ann Shteir, eds., *Figuring It Out: Gender, Science, and Visual Culture* (Hanover, N.H.: Univ. Press New England, forthcoming); Gregg Mitmann, “Cinematic Nature: Hollywood Technology, Popular Culture, and the American Museum of Natural History,” *Isis*, 1993, 84:637–661; Londa Schiebinger, “Skeletons in the Closet: The First Illustrations of the Female Skeleton in Eighteenth-Century Anatomy,” *Representations*, 1986, 14:42–82; and Nancy Leys Stepan, *Picturing Tropical Nature* (Ithaca, N.Y.: Cornell Univ. Press, 2001).

coins, prints, and so on.<sup>10</sup> Collecting often started at school, where it was encouraged. There were values attached to collecting, including a love for the objects and a desire to know more about them.

The motivations for collecting photographs for scientific purposes changed over the course of the nineteenth century; we can track at least three related but distinct paradigms or stages. The first photographs, from 1839 to the 1850s, attracted the interest of scientific collectors as illustrations of a novel experiment.<sup>11</sup> One of the primary reasons photographers originally collected and exchanged photographs was to demonstrate and explain aspects of the physical process. Experimenters struggled with difficulties ranging from blurriness to the fading of prints. Collections of photographs in the first photographic societies and camera clubs served to show other members what work was being done and sparked discussions about how to improve the process. For example, a calotype by William Henry Fox Talbot, shown in Figure 1, both inscribed the collecting impulse in its taxonomic arrangement of milliners' hats and, at the same time, itself possessed the status of a collectible scientific specimen of an experimental process. In many cases it is impossible to know today, in the absence of surrounding information, why a photograph that survives from this period was of interest at the time. For example, a photograph in the Amateur Photographic Association collection shows a dark blob in the center of the frame. It has not been reproduced in any histories of photography, which—when they focus on scientific



**Figure 1.** William Henry Fox Talbot, “The Milliner’s Window,” ca. 1842. Salted paper print from a calotype negative. National Museum of Photography, Film, and Television/Science and Society Picture Library.

<sup>10</sup> M. A. Belloc, “The Future of Photography,” *Photographic News*, 17 Sept. 1858, p. 13 (quotation); and Briggs, *Victorian Things* (cit. n. 5), p. 47.

<sup>11</sup> As Grace Seiberling points out in relation to early amateur photography, issues of aesthetics (defined as ideas of beauty and artistic taste) were inseparable from technical concerns in the 1840s and 1850s. See Grace Seiberling, *Amateurs, Photography, and the Mid-Victorian Imagination* (Chicago: Univ. Chicago Press, 1986), Ch. 1.

photography at all—often show only images that convey beauty and charm to viewers today. Why was this picture preserved? As this example illustrates, it is often hard to figure out what purpose a surviving photograph might have been intended by its collector(s) to serve. In 1860, a photographer proposed an “album of failures” to the South London Society, a project to collect and exhibit unexplained results that occurred in photography.<sup>12</sup>

Although photographic societies continued to show an interest in images as specimens of processes and objects of scientific curiosity after the 1840s, the greater ease of making photographs, coupled with the dramatic rise of new scientific institutions, gradually shifted the focus in the 1850s and 1860s toward a second stage of collecting photographs in scientific institutions as visual records of things observed in nature. Collections of photographs had special disciplinary value for scientific research and teaching after the mid-nineteenth century.<sup>13</sup> The Great Exhibition of 1851 marked an important moment in the diversification of the scientific values attached to photography, as those who considered it a useful means for conveying information grew in numbers, kind, and influence. The public platform that the Great Exhibition gave scientists to articulate how they thought photography could be useful to science, both as a visual record and as a means of discovery, was of crucial significance in this connection.<sup>14</sup> From the 1850s on, the definition of “scientific” photography extended not only to the practices associated with it but also to its subject matter and relevance to scientific questions across a range of disciplines.

A third stage involved the mass circulation of scientific photographs across the private and public spheres of science from the 1870s on. New, highly public, material cultures of professional science provided the contexts for viewing scientific photographs in new ways, from scientific atlases to schoolbooks to world’s fairs and popular science magazines. The rise of photographically illustrated newspapers and magazines and the growth of amateur photography in the last third of the nineteenth century were part of a more general trend, evident in many cultures, toward the use of photographs in diverse areas of life. This development gradually expanded the viewing cultures around science in new ways. The ability to produce photographs in newspapers more cheaply had a democratic appeal because in myth (if not in practice) it opened up the archives of photography—and science—for all to see.

At the end of the century both Victorian scientists and lay audiences held firm to a notion that widening social access to scientific photographs increased their utility and function as eyewitness presentations of scientific events. The industrialization and spread of photography fostered its association with democratization. Looking at magic lantern shows, exhibitions of photographs at world’s fairs, and the photographically illustrated popular press helps us track the movement of some of these images into the wider scientific discourse. As Iwan Rhys Morus argues in this issue, there is much to learn about magic lantern slides, which were a crucial and often overlooked element of the scientific exchange system and a key way in which photographs were viewed. Through slides, photographs left the study and became “active performers” in the dissemination of scientific meanings.<sup>15</sup>

<sup>12</sup> “Photographic Failures and Accidents,” *Photog. News*, 21 Sept. 1860, pp. 246–247.

<sup>13</sup> As Seiberling explains in relation to early amateur photography: “A shift in emphasis from the medium itself to its uses for particular purposes—which seems in keeping with the modern definition of photography—distinguished the amateurs and professionals of 1860 from those of a decade earlier.” Seiberling, *Amateurs, Photography, and the Mid-Victorian Imagination* (cit. n. 11), p. 102. The shift toward photographic documentation in midcentury is also discussed in Edwards, *Raw Histories* (cit. n. 5), p. 31.

<sup>14</sup> Tucker, *Nature Exposed* (cit. n. 1), pp. 25–26.

<sup>15</sup> Edwards, *Raw Histories* (cit. n. 5), pp. 44–45. For more on the association of photography and the democ-

They contributed to a multiplicity of scientific visual cultures, from the public lecture to the teaching seminar to rituals of scientific courtesy. The Royal Astronomical Society loaned and sold its photographs for use in world's fairs, scientific exhibitions, and teaching. When reproduced in the periodical press, photographic prints took on new meanings and were contextualized in new ways.

When scholars dismiss the historical significance of “pretty pictures” by associating them exclusively with popularizing discourses of science and the packaging of scientific concepts for mass audiences, without critical reflection on the Victorian roots of such value categorization (or on the integral importance of popular culture studies in the history of science), they fall captive to the “illustration fallacy”—the mistake of assuming that illustrations produced “outside” of professional science lack scientific significance or value. In these circumstances, however, it should be clear that there is nothing self-evident about the concepts of science, history of science, or scientific illustration. Far from belonging to the order of things, scientific representations have been exposed as visual artifacts that are bound to the times and places of their creation.

Here I want to focus and expand on the second stage: the way in which photographs became integral to many scientific collections in Britain beginning in the second half of the nineteenth century. The Royal Astronomical Society is typical of many scientific organizations that started formal collections and catalogues of photographs in the 1870s and 1880s, after years of relying on an informal system of exchanging drawings and photographs of solar eclipses, comets, stars, and planets made by amateur and professional astronomers. The availability of cheap photographic prints, coupled with the idea that even nonscientists could make scientific discoveries “by chance” with the use of cameras, contributed to the expansion of scientific exchange networks. Not all practitioners were university trained or of scientific eminence; consequently, many collections of scientific photographs survive today outside of universities, in scientific societies and libraries as well as hospitals. Images flowed into archives and from scientists to interested parties. During the second half of the nineteenth century the British Association for the Advancement of Science initiated photographic collections for various subjects, relying on its extensive network of amateur scientists and scientific photographers. “Peer” collecting of photographs occurred in areas such as natural history, archaeology, and meteorology.

Ontological faith in photography underlay the growth of these early photographic collections and underwrote the recruitment of photographic prints not only from professional scientists but also, crucially, from people who were outside professional scientific circles. As Lorraine Daston and Peter Galison have argued in relation to the reshaping of objectivity in the nineteenth century, photography was an important component of a new cultural economy of value and exchange. Photography emerged as a new standard and symbol of scientific evidence, however, in a moment when the cultural meaning and authority of science—and photography—was contested. Predictably, under this set of circumstances, “scientific photography” was not immediately credible simply by virtue of being scientific. Rather, certain forms of photographic vision emerged as privileged within scientific institutions and relations of power when they met criteria of use and production established by the consensus of authorities in the discipline.<sup>16</sup> As Edwards has noted in relation to

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ratization of scientific knowledge and institutions see John Tagg, *The Burden of Representation: Essays on Photographies and Histories* (London: Macmillan, 1988); and Tucker, *Nature Exposed*, Chs. 1–2.

<sup>16</sup> Lorraine Daston and Peter Galison, “The Image of Objectivity,” *Representations*, 1992, 40:81–128. On the emergence of certain forms of vision as privileged see also Tucker, *Nature Exposed*.

anthropological photographs, exchange systems belonged to a “developing scientific discourse that linked the professionalisation of knowledge to the flow of information, the sharing of data and the maintenance of scientific ‘social’ networks” of emergent disciplines. Over time, the forces of professionalization in Victorian science made it essential that practitioners’ entry to scientific photography depended on knowledge, including theories and practices particular to each field of study. Eventually, photographers who worked with scientists were urged to study the subjects for the particular branch to which they applied themselves (botany, zoology, and archaeology, for example), although the practice of hiring photographers outside of scientific disciplines was strong in the nineteenth century and continues today.<sup>17</sup>

Librarians and archivists were crucial to the process by which photographs became part of the scientific canon. Not only did they archive and preserve visual material; they also recruited some specific subjects for scientific and medical collections. Collections within scientific archives took a variety of different forms. Photographic atlases and photographically illustrated scientific journals for professional scientific viewers carried out some of the same functions as collections. The survival of photographic albums, for example, shows how individual collections, cohering around private interests, become related to the development of larger ones. Anthropological, geological, and tourist photographs often found their way into larger scientific collections, as with the photographs made during the HMS *Challenger* expedition during the early 1870s, which became part of the British Museum of Natural History’s collection. As Edwards has explained in relation to anthropological photographs, “As individual scholars donated or bequeathed their collections to the central archive, they became absorbed within specific institutional agendas of description, function and usage.”<sup>18</sup> In an age of popular fascination with science, meanwhile, individuals often kept scrapbooks with photographs and print reproductions of scientific phenomena that eventually found their way into scientific collections, further evidence of the diverse viewing audiences of science.

The reproduction of photographs for scientific teaching and research purposes historically has raised a host of issues pertaining to matters such as intellectual property and the quality of copies in comparison to originals, as well as the question of how image and text were related. Archivists and collectors within scientific institutions wrestled with questions of how to organize and classify what in some cases—particularly after the advent of new forms of mechanical reproduction—became massive amounts of visual material. Should they be organized by the photographer’s name? By scientific subject? By visual medium? Librarians and scientists were obliged to consider other questions as well: Which images should be discarded? Which were best for circulating in atlases and at public exhibitions? Over time, many (perhaps most) photographs did not survive; even some that survived one culling were discarded by later generations in order to make room for more objects. Their initial contexts were often lost when they were archived, and this affected how others might use them. Although information can sometimes be reconstructed by reading verbal sources (transcripts of scientific meetings, correspondence, and reports in the photographic press, for example), as well as by comparisons with other visual materials, including drawings and prints made around the same time, it is often hard to trace the names of

<sup>17</sup> Edwards, *Raw Histories* (cit. n. 5), p. 31; see also Henrika Kuklick, *The Savage Within: The Social History of British Anthropology* (Cambridge: Cambridge Univ. Press, 1991). The issue of scientific specialization among photographers is discussed in “Photography and Medical Science,” *Photog. News*, 4 Nov. 1859, p. 97.

<sup>18</sup> Edwards, *Raw Histories*, p. 30.

individual photographers of surviving images, their subjects, and, most important, their visual contexts.

Photographs are a major historical form for the late nineteenth and twentieth centuries, and it is arguable that we have hardly started to grasp their historical meaning and what it means to have a history of photography. Much more needs to be known about the field of images that defined science in the nineteenth century—for example, about the cultural mechanisms that sorted scientific images from others that came to be regarded as unscientific and those that distinguished photographic artists from photographic scientists.

The case of photography poses broader questions about the study of science as a visual culture. Historians of different time periods and places often rely on different techniques for understanding the interplay of words and images in the cultures they study. Scholarship in the history of science can profit from allying recent studies of the history of perception (“visualization”) in science with the close and methodical looking at pictures that has been the hallmark of art history. Here I have argued for building a stronger connection between the history of scientific photography and the study of art and material culture. As work in the history of scientific imaging goes forward, studies are needed that recognize the heterogeneity of scientific representations, the different circumstances of their production, and the variety of cultural and social functions they serve. Scientific fields of study that are sometimes separated by the conventional focus on disciplinary histories in the history of science may bear closer relationships when approached through the perspective of visual histories. Future studies may well engage with critical theories and historical perspectives from the history of art and visual studies.<sup>19</sup> As they do so, they may reveal the variety of things that had to happen in order for some visual works to be recognized as providing scientific value, while others are not. This work also might entail more nuanced assessments of their symbolic meaning in different cultural and historical contexts and of the particular resonance they might have for viewers today.<sup>20</sup>

Now that historians of science are focused on visual images, it is time to reflect more on what critical practices and theories are to be brought to bear on their study. Scientific images, whether serving as illustrative material for preexisting concepts or as part of the constitutive work of science—or both—may be considered as part of what the social historian of art T. J. Clark once called a “battlefield of representations,” “on which the limits and coherence of any given set are constantly being fought for and regularly spoilt.”<sup>21</sup> Applying Clark’s insight to the history of scientific illustration, it is apparent that scientific representations derive meaning not only from their location in the history of scientific

<sup>19</sup> Elizabeth Edwards’s *Raw Histories* and Howard Becker’s *Art Worlds* (Berkeley: Univ. California Press, 1982) both insist, e.g., on an understanding of the complexity of the cooperative and collective networks through which “art” and “science” happen. Erving Goffman also offers an interesting take on how meanings of visual experiences are framed; see Erving Goffman, *Frame Analysis: An Essay on the Organization of Experience* (1974; Boston: Northeastern Univ. Press, 1986), esp. his discussion of photographs on pp. 68–73.

<sup>20</sup> The art historians James D. Herbert and Jules David Prown have both argued in different contexts for an object-based theory of material culture. See James D. Herbert, “Visual Culture/Visual Studies,” in *Critical Terms for Art History*, 2nd ed., ed. Robert S. Nelson and Richard Schiff (Chicago: Univ. Chicago Press, 2003); and Jules David Prown, “Mind in Matter: An Introduction to Material Culture Theory and Method,” *Winterthur Portfolio*, Spring 1982, 17:1–19.

<sup>21</sup> T. J. Clark, *The Painting of Modern Life: Paris in the Art of Manet and His Followers* (Princeton, N.J.: Princeton Univ. Press, 1984), p. 6.

theories and practices but also in competition and dynamic tension with forms of art and visual culture that are often outside the usual purview of the historian of science. Taking a wider view of the pictorial landscapes in which scientific representations derive their meaning and significance will yield new historical perspectives on scientific practices, visual culture, and the writing of history.