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Résumé de l'article

En mettant l'accent sur les collections photographiques d'importance internationale du National Science and Media Museum (Bradford, Royaume-Uni), cet article explore les questions centrales qui suivent : qu'est-ce qui est considéré comme « scientifique » dans un musée consacré à l'histoire de la photographie (ainsi qu'au cinéma, à la télévision et aux médias numériques)? Et quelle est la place de la photographie dans l'histoire des sciences et de la technologie? L'article explore une série de collections photographiques du Royaume-Uni et du Canada, et offre un cadre de réflexion sur la relation entre l'histoire de la photographie, l'histoire de la science et de la photographie, et les pratiques de collection institutionnelles.

Conceptualizing ‘Science’ in the Photography Collections at the National Science and Media Museum

Geoffrey Belknap

Abstract: *Focusing on the internationally significant photographic collections at the National Science and Media Museum (Bradford, UK), this article explores the central questions: What counts as ‘scientific’ in a museum dedicated to the history of photography (as well as film, television, and digital media)? And what is the place of photography in the history of science and technology? The article explores a set of photographic collections in the UK and Canada and offers a framework for thinking about the relationship between the histories of photography, histories of science and photography, and institutional collecting practices.*

Résumé: *En mettant l’accent sur les collections photographiques d’importance internationale du National Science and Media Museum (Bradford, Royaume-Uni), cet article explore les questions centrales qui suivent : qu’est-ce qui est considéré comme « scientifique » dans un musée consacré à l’histoire de la photographie (ainsi qu’au cinéma, à la télévision et aux médias numériques)? Et quelle est la place de la photographie dans l’histoire des sciences et de la technologie? L’article explore une série de collections photographiques du Royaume-Uni et du Canada, et offre un cadre de réflexion sur la relation entre l’histoire de la photographie, l’histoire de la science et de la photographie, et les pratiques de collection institutionnelles.*

Keywords: Collections, History of Science, Museums, Photography, Visual Culture

What counts as ‘scientific’ in a museum dedicated to the history of photography (as well as film, television, and digital media)? And what is the place of photography in the history of science and technology? These are questions facing the curatorial staff of the National Science and Media Museum (NSMM) in Bradford, one of five museums in the Science Museum Group (SMG) in the UK. Is it the photographic output of data, such as the 400,000-plus glass-plate-negative collection of astronomical observations made by Harvard University Observatory between 1880 and 1900?¹ Or maybe the documentation of scientific activity, such as the photographic archive of the British Antarctic Relief expedition between 1902 and 1904?² Or, as Kelley Wilder has described, should it also include photographic science itself, and the pioneering pursuit of creating new ways to capture and record light as a visual record, such as the first experiments by the astronomer John Herschel to create a photographic negative on glass?³ At the museum, should we embrace an understanding of ‘scientific photography’ that goes beyond the two-dimensional, and includes the tools of photographic technology developed to capture photochemical and digital photographic images, such as the rich photographic technology collection held by the George Eastman Museum in Rochester, New York?⁴ Or even include photographic images used to communicate about the work of science in media, such as the folder on ‘rockets’ in the photographic archive of the Daily Herald or the Globe and Mail newspapers?⁵



Figure 1. Original glass negative photograph of the 40' telescope at Slough, produced in 1839 by Sir John Herschel, SMG 1919-501.

The NSMM has a complex history related to how it has approached the relationship between science and its photographic collections.⁶ The museum opened in Bradford in 1983 as the National Museum of Photography, Film and Television. The collections of the museum included objects foundational to the histories of these three media, including the William Henry Fox Talbot collections; the first moving-image cameras used by Louis Le Prince; and the experimental television apparatus of the Scottish inventor John Logie Baird. In 2006, the museum became the National Media Museum with the expansion of our collecting areas to include the broader creative industries of gaming and digital computing. In 2017, the museum's name changed again becoming the National Science and Media Museum. NSMM's relationship to science and to photography in particular has, therefore, always been intertwined with the broader concepts of media heritage.

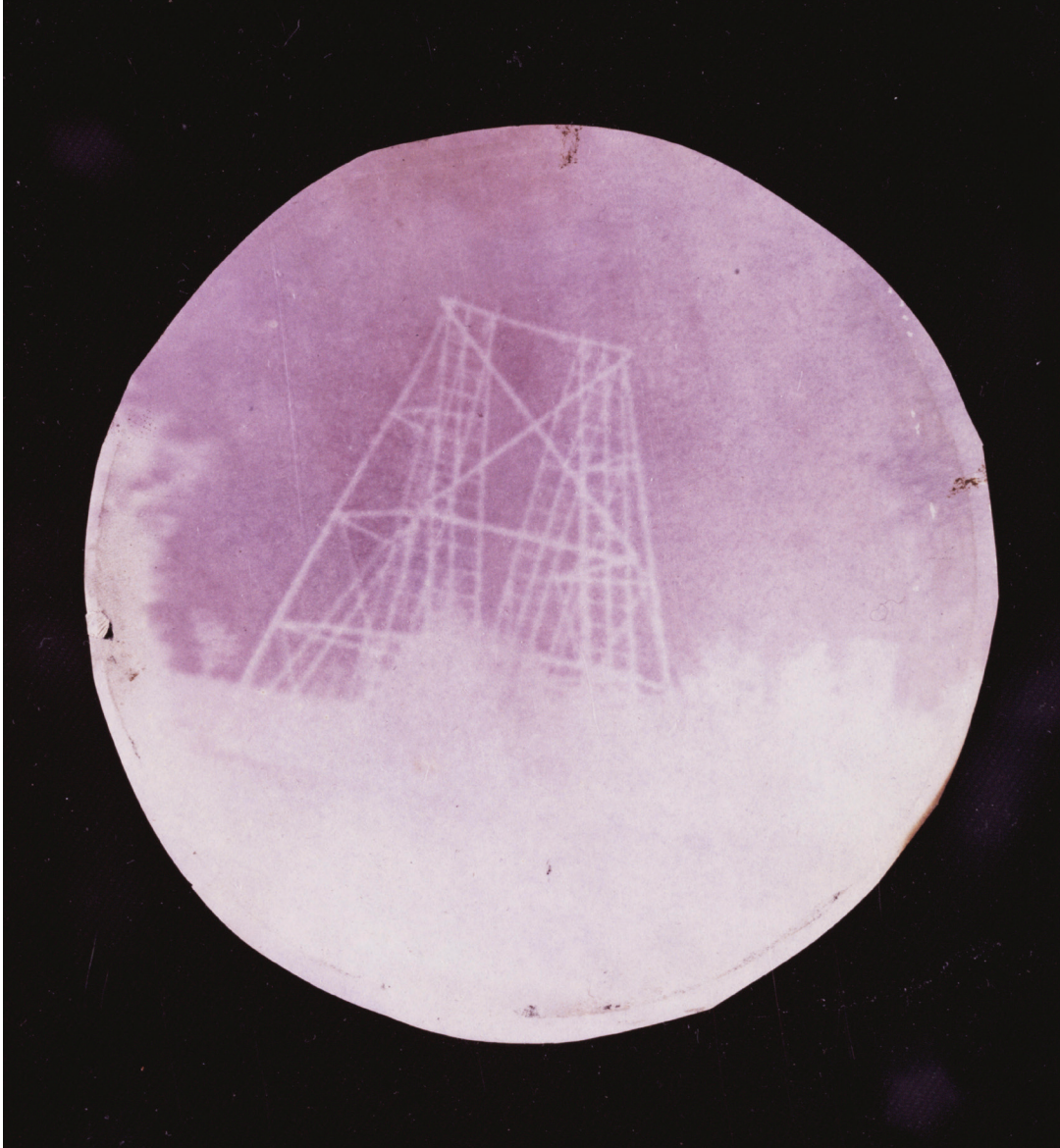


Figure 2. An experimental photograph on paper printed from the original glass negative (see Figure 1) taken by Sir John Herschel in about 1839, SMG 1943-38.

In this article, I address the question of what counts as ‘scientific’ in the NSMM by offering a framework for thinking about the relationship between the histories of photography, histories of science and photography, and institutional collecting practices. This approach pays particular attention to the ways in which photographs accrue or change their meaning when they are placed in different reproductive and institutional contexts, and is rooted in my experience as NSMM’s head curator and as a historian of science interested in the relationship between photography and scientific practice in the nineteenth and twentieth centuries. I offer this as a reflexive comment, because my choices and arguments as a manager of photographic collections in a museum are part of the story of how the photographic collections themselves are shaped by professional staff and changed through institutional contexts.

The photographic collections at the NSMM have gained different meanings and situational contexts throughout the almost 40-year history of the museum. The changing identity of the museum has meant, in some instances, that parts of our photographic collections acquired at one stage in our history no longer sit squarely with the identity and purpose of the museum at another. The move of the Royal Photographic Society (RPS) collection in 2017 from NSMM to the Victoria & Albert Museum (V&A), for instance, is a good example of how the changing identity of the museum directly influenced the decisions the museum made around its collections.⁷ Equally, we might ask why NSMM still holds the Daily Herald Archive (DHA), the single largest photographic collection in the entire SMG, which will be discussed later in this article. What, some readers might ask, does the photographic archive of one of the largest mid-twentieth-century British newspapers have to do with science?

Photographic archives are much more than accumulations of visual images.⁸ An archive is a unique organizational structure of knowledge and information that offers a window into the records that mattered to historically situated audiences. Archives are shaped by the material, social, and epistemological structures in which they were assembled and through the institutional contexts of their storage.⁹ For NSMM, a photographic archive such as the DHA still fits squarely within its newest collecting remit because it offers a window into the way visual information was organized and encoded with meaning. In this way, while the archive might not be exclusively about science, the practices of its organization and use can be considered scientific because they reflect a unique knowledge system that is contained not only in the photographs, but in the archive itself.

At NSMM, any attempt to define the scope and boundaries of scientific photography creates problems. If we define a photograph as W. H. F. Talbot did in his introduction to *The Pencil of Nature* as ‘the action of light upon sensitive paper’¹⁰ but expand this to include other materials such as glass, metal or digital sensors, then all photographs are scientific objects, at least in their making if not in their content. Moreover, as historians of photography have long argued, photographic images accrue meaning(s) over time from the ways in which they are made, stored, used, shared, and reproduced in various contexts.¹¹ If we combine the meanings for photography defined by both Talbot and photographic historians, photographs are material scientific objects in their construction whose meaning is constantly shifting based on the situational contexts of where they are stored, who is using them and how, and with what other images—or texts—they are juxtaposed, circulated, and viewed.

To understand the scale of influence that photography has on our lives, we need to explore photographs as multiples.¹² As Elizabeth Edwards and Christopher Morton point out, “the ‘originality’ of the photograph has always been in question. Its lack of object singularity (with the exception of the daguerreotype and a handful of other early forms) and its very ubiquity and reproducibility mitigated against its status as the unique, the wondrous or the important.”¹³ For scholars who are interested in the history of science and technology, photography offers particularly useful source material and subject matter. Photography represents the production and communication of scientific activity as visual source material: furthermore, photographs are epistemic objects of

science themselves that can be interrogated using methodologies of spatial and material analysis among other non-visual forms of investigation.

Take, for instance, the photographs produced by John Herschel of his telescope at Slough (**Figs. 1 and 2**). The image is certainly an important visual object in the history of astronomy—it gives an insight into the size, scope and scale of the iconic 40-foot reflective telescope that had been in use by Herschel for well over 50 years by the time this photograph was taken. The image in the two figures could be investigated as an object of scientific communication – used to demonstrate to the wider astronomical community the importance of one of the most significant observational innovations of the period. However, this image—and two other such glass-plate negatives in Herschel’s collection—are also experimental objects in their own right. Herschel, who was already well known as an experimenter in early photo-chemistry, was using the telescope as a test subject for his photographic experiments. Herschel was particularly interested in demonstrating the potential of fixing a photographic image on glass, rather than other materials such as leather, paper or metal. This photograph, therefore, offers multiple possibilities of historical analysis—and it is in this multiplicity of potential meanings, that photographic sources take on their greatest significance.¹⁴

Both ‘photography’ and ‘science’ are capacious terms that encompass broad and overlapping meanings for how we understand, interpret, and define the world around us. We can never know enough about the objects in our care. The rest of this paper details how NSMM is exploring the boundaries between photography, media, and science and how we place meaning in the multiplicity of visual imagery.

Situating the Meaning of Photography

At NSMM, we want to tell compelling stories about how photographs as images, and photography as a technology, affect our lives, but we also need to acknowledge that we can’t tell every story. So we have continued the longstanding curatorial practice of defining and redefining what, how, and why we collect, document, and present our holdings. Over the last several decades, scholars have argued that photographs have a wide spectrum of value and meaning.¹⁵ You can think of photographs as a series of different mechanical and material processes, from the very earliest photographs made from salt and silver, to digital images produced by sensors and bits of information. But photographs are also valued as the product of such processes—both image and object, and their visual content—whether a family portrait, or an image of a place we have never been, or an interpretation of the world through the eyes of an artist. Linking these two is practice and a whole range of meaning for photography based on how we understand and apply the technology for a variety of purposes: scientific, commercial, informational or aesthetic. This is photographic practice.¹⁶

How photography is made meaningful, whether historically or right now, we argue is based on whether a photograph is viewed in terms of or in relation to processes, products, or practices. This is particularly useful for helping us think about the emphasis we place upon the collections of photography and photographic technology that we currently have, and those that we will collect in the future. This is a process of rethinking our collections, taking seriously the history of how and why we, as an institution, have collec-

ted photography, and how these histories reflect what we collect now. We can't collect everything on this spectrum, nor should we. One of photography's great strengths is that it influences so many parts of our lives. The same is true for collections – photography already exists in almost every museum, gallery, library, archive or private collection. At NSMM, we use this idea of a photographic spectrum in our approach to our collections. While we already have, and will continue to hold, an internationally significant collection of photographs and photographic technology that emphasises the many sides of photography, our new focus emphasises the areas of photographic process and practice. This means we are particularly interested in the stories of how material images and technology (whether analogue or digital) were made and used. This is a choice, about how we frame photography in our institutional contexts. By talking about these choices, we demonstrate that photography is not a static medium and that the photographs in our care are framed by the ways in which they are defined and redefined as institutional contexts change over time.

This understanding of photography also helps us define NSMM's position on the relationship between science, photography, and media technologies. Science, as a term, has multiple meanings, which can be difficult for NSMM audiences to grasp, especially because photography, film, television, and digital media are not immediately understood by the public as being scientific. For a visitor to our museum, science might mean a discipline of science (e.g. chemistry), a mode of enquiry (the scientific method), or a famous scientist (e.g. Einstein). What, a visitor might ask, does Einstein have to do with photography, film, or TV?

Science, however, can also be understood or conceptualized as a set of activities and products. Working in a lab or field, or developing a new tool, are scientific activities, while producing a piece of data or new method for encoding or discovering knowledge is a scientific product. According to Andrew Pickering, science is not just a system of knowledge, but is encapsulated in the making of knowledge—in the 'practices' of science. For Pickering, "'practice' refers to the acts of making (and unmaking) that they [scientists] perform in that field."¹⁷ Practice, for the museum, is not limited to the work of scientists, but also includes the act of making or using a photographic image performed by anyone, regardless of their title or status.

NSMM is not alone in telling this story of scientific practice.¹⁸ In 2017, the museum realigned itself with the Science Museum Group (SMG) which consists of five UK museums which contain some of the most important objects of scientific heritage. We also act within a network of museums with scientific collections around the world, from the National Museums Scotland, Deutsches Museum (Germany), Museu do Amanhã (Brazil), Hong Kong Science Museum (China) to the Canada Science and Technology Museum, to name a few). SMG's collections range across astrophysics, medicine, transport technologies, media and communications technologies—and everything in between. All these collections represent the products of science and the practices of a wide range of famous and forgotten individuals. Some of these objects are products of scientific data—a photograph of an electron diffraction pattern, for example. For the Science Museum (London) and Science and Industry Museum (Manchester), the multiple meanings of science have value—because they reflect the broad range of

scientific activities and products represented by these museums.¹⁹ For the National Railway Museum (York), equally, it is more straightforward to understand where the science is in their collections and exhibitions as their collections are visibly concerned with locomotion technologies.²⁰ For NSMM, however, what we mean by science in our collections needs to be narrower, but also connected to the rest of the SMG. For this reason, science for the NSMM, is defined by its relationship to photography and other media as technologies that have transformed the way we experience the world.

Much like ‘science’, ‘media’ is also a broad term with various meanings from newsprint to Instagram. Almost 60 years ago, Canadian media theorist Marshall McLuhan famously argued that ‘the medium is the message’—that the context of making and communicating a message is more important or influential than the message itself.²¹ In other words, it is the technologies—and the circumstances of their application—that make media (the medium) rather than their content of critical importance. While there is still work to be done in developing this approach at NSMM, our starting point is to speak of ‘media’ in terms of the impact made by the technologies of photography, film, television, and sound on how we see and hear the world.

To illustrate how this approach might be applied to our current and future collecting and research around photography, let us take the example of W.H.F. Talbot’s photography collection at NSMM, one of the most important collections of the museum. It consists of approximately 5,000 positives and negatives, printing plates and proofs, and technology used by Talbot. Originally acquired by the Science Museum’s Curator of Chemistry, Alexander Barclay in 1937, the Talbot material became a founding collection for NSMM when it opened in 1983 and has since had a continual presence in our permanent public displays and temporary exhibitions.²² The way we have displayed and catalogued the collection, however, has focused on Talbot’s place as the inventor of the positive/negative process.²³

Adopting technological impact as our approach to science in NSMM collections, however, lets us shift focus to the broader implications of Talbot’s work as a scientist, inventor, and artist. In many ways, our ability to do this work at NSMM rests upon the critical work of Larry Schaaf, not only his scholarship, but also his essential cataloguing work that underpins the ground-breaking Talbot Catalogue Raisonné.²⁴ By looking at how Talbot made and used photographs, rather than at the aesthetic appeal of their surface appearance or the factual information in their visual content, we can concentrate our attention on underutilized aspects of the Talbot collection—for example, his photographic printing work (**Fig. 3**), which has yet to be fully catalogued or regularly displayed in the museum’s permanent exhibitions. For a long period of time, the ink-based printing of photographs was not traditionally considered ‘photographic’ in scholarly debate, the art market, or museum practice.²⁵

Moreover, by focusing on Talbot’s broader interests in science when interpreting our collections for exhibition purposes, we can break away from the emphasis on a single individual in the invention of photography. Rather, in telling the story of the invention of photography, we can look at how a broad range of actors competed to come up with a way to ‘fix’ darkening silver halides and stop an exposed photograph from fading away. This approach lets us use our world-class collections to speak to larger questions about how historical actors made or used these objects and connect these scientific acts with activities that matter to our audiences now.²⁶



Figure 3. 'Mount Guajara' Photoglyphic engraving plate made by William Henry Fox Talbot from glass plate positive produced by Charles Piazzi Smyth, SMG 1937-526

Multiplicity: Opportunity and Challenge

One of the essential characteristics of photographs is their replicability and multiplicity, with their ubiquity representing both an opportunity and a challenge.²⁷ How can we represent the rich histories of photography—whether technology or image—when the numbers of photographs in the world exist on a scale beyond reckoning. This question is nicely demonstrated by one of the largest and most significant collections of photographs at NSMM: the Daily Herald Archive (DHA). This constitutes the picture archive of one of the most popular mid-20th-century national UK newspapers, *The Daily Herald*, published daily in London from 1912 to 1964, except in wartime when it was produced weekly. This collection, which numbers in the millions of individual photographs, and includes prints with editorial mark-up, negatives, contact sheets, and notebooks is arranged and preserved in a series of cabinets and metal folders used by *The Daily Herald* staff photographers to organize their visual archive (**Fig. 4**). Each of the containers is filled with photographic prints detailing events, people and places that were considered newsworthy in the period between 1920 and 1965.

Considering its size, how do we interrogate the meaning of this collection which offers a broad range of cultural, political, scientific and biographical historical narratives



Figure 4. *Daily Herald Archive, Insight Research Centre - National Science and Media Museum*

throughout the twentieth century. This is both a practical and epistemological question, as an archive of this size and breadth is not easily stored, documented, and made accessible, and without description or digitization. It is therefore difficult to discern the role these images played in the visual landscape of the twentieth century. Looking at 1, 10, or 100 images in this collection isn't enough; to understand the DHA as a whole and its place in the NSMM, we need to know how these images were valued, stored, categorized, and used by the newspaper and received by its readers.

For example, for anyone with an interest in cold-war science, particularly the development of long-distance rocket development over the period of the mid-twentieth century, the DHA is an excellent starting point. The photographic editors of *The Daily Herald* stored and indexed photographic material related to the development of interplanetary rockets over the course of more than two decades. To look at images related to rockets in this collection, you would need to investigate the hundreds of images stored in two filing cabinet drawers, and subdivided into separate file folders, relating to the development of rocket science in countries such as Russia, France, USA, Great Britain and Japan. You would also need to explore the DHA folders that are not directly related to rocket science, but fall under either the thematic structure of the archive—industry, for example, or biography (e.g. the J.F. Kennedy folders). In this way, the archive doesn't just offer visual material to study scientific histories, such as the development of rocket science, but it also tells a story of how this kind of information was categorized and stored by a UK national newspaper. At NSMM, the archive exists in the exact same organizational structure (and original filing cabinets) as it did when it was used by the newspaper. Thus, the structure of the DHA is a direct reflection of how the staff photographers organized scientific (as well as cultural or political) information

To use photographs as source material is, therefore, as much about the individual images and the visual information they contain, as it is about the systems of organization within which they sit. Collecting institutions that hold such images also change the value and meaning of photographic archives, and the histories that they can tell. To point out a comparable Canadian example, the visual information in *The Globe and Mail* photographic archive (GMA, which is broadly equivalent in scope and scale to the DHA) is organized by subject, theme, and biography. To explore 'rockets' in this archive, you could look at the set of photographs indexed under this theme.²⁸ However, unlike the DHA, the GMA is split across multiple institutions. Library and Archives Canada, the Archives of Ontario, the City of Toronto Archives, the Toronto Public Library, the National Gallery of Canada, and *The Globe and Mail* all hold different parts of this dispersed collection.²⁹ As a result, photographs of 'rockets' from this newspaper photo archive may be found across different institutions, which store, value and give access to their holdings in different ways. Thus, to explore the changing value and meaning of a photographic image as a historical object through the GMA is equally — and simultaneously — to confront the different institutional structures that give meaning and value to these images in different situational contexts.

Moreover, the meanings communicated by these photographs, in both the DHA and the GMA, are connected to their ultimate use in relation to text within the printed publication of the two newspapers. While prints and negatives, regardless of location, are physical objects that can be held, turned over, inspected for the marks of the editor or the traces of their organization in an archive, when they are printed in a newspaper, intermingled and set within text, they become bounded by the words that surround them and take on another life and a new set of meanings and historical implications specific to their location within a periodical.³⁰ Photographic images as historical sources are as much about what they show, as where they are circulated, viewed, preserved, and displayed.³¹

Conclusion

So, ultimately, what counts as 'scientific' in a museum dedicated to the history of photography? The answer to that question will depend on how capacious we consider the definition and implications of 'scientific' on the one hand and photography on the other. If we focus on the aesthetic and representational aspects of a photograph, then the scope of scientific photography is limited. If, however, we include the ways in which photographic images were made, their placement and identification within organizational systems, and the material and epistemological consequences of their use in multiple contexts, then every photograph can be interpreted as scientific in origin or intention or effect. At NSMM, we believe that by focusing on how photographs were made and how photographic technologies were used, we can start to unpack some of the many ways in which photography has become integrated into our lives, and how images operate as scientific objects. Moreover, the history of photography is not just about the past; it is very much about understanding our visually rich world, now and in the future.

The question of what counts as a photographic image and how we can define it in relation to science have assumed new importance and unforeseen dimensions following

the advent and widespread adoption of digital photography. The speed, scale, and integration of photography into our lives exploded when images began to be made with ones and zeros rather than on chemically sensitized paper. Collecting photography in the digital age is a key area for exploring the implications of photography and science in our lives, but it also represents a big challenge that poses a significant problem for researchers interested in contemporary history, and requires new curatorial approaches to institutional acquisition, storage, and care, well beyond the scope of the current essay.³²

The task of historians of science and technology interested in photographs as primary sources is, I would argue, similar to that required of photographic historians sensitive to the shifting meanings of science and technology. Both photography and science are tools for interrogating and making sense of the world. To trace the many trajectories and meanings of photography is to follow their biographies across space, time, and institutional contexts. By thinking in this way about the relationship between photography and science at NSMM, we are able to open up our collections to new connections, and to make sense of what photography means to us at this moment in time, to our ever growing and changing collections, and to our many and varied audiences.

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Endnotes

- 1 <https://platestacks.cfa.harvard.edu/dasch-project>
- 2 <https://www.spri.cam.ac.uk/picturelibrary/catalogue/are1902-04/>
- 3 Kelley Wilder, *Science and Photography*, Reaktion Books: London, 2008. <https://collection.sciencemuseumgroup.org.uk/objects/co17022/original-negative-photograph-on-glass-of-the-40-telescope-glass-negative>
- 4 <https://www.eastman.org/collection-highlights-technology>
- 5 <http://ao.minisisinc.com/LISTS/F%204695-1.pdf>, p. 388.
- 6 Michael Terwey, "Contexts for photography collections at the National Media Museum," *Science Museum Group Journal*, 7 (Spring 2017), <http://journal.sciencemuseum.ac.uk/browse/issue-07/contexts-for-photography-collections/>
- 7 See the response to Terwey, 'Contexts for photography collections' from Elizabeth Edwards around the importance of location when thinking about photographic archives, with specific relevance to the RPS collection move. Elizabeth Edwards, "Location, Location: a polemic on photographs and institutional practices," *Science Museum Group Journal*, 7 (Spring 2017) (<http://journal.sciencemuseum.ac.uk/browse/issue-07/location-location/>)
- 8 See for example the 2009-2022 conferences on Photo-Archives organized by by Costanza Caraffa, the Director of the Photothek des Kunsthistorischen Instituts in Florenz- Max-Planck-Institut. <https://www.khi.fi.it/en/forschung/photothek/photo-archives.php>

- 9 See for example the foundational work of scholars of photography, museums and the archive: Joan M. Schwartz, "Having New Eyes: Archives: Space and Power," *Archivaria* 61, (Spring 2006): 1-104; Joan M. Schwartz, "The Archival Garden: Photographic Plantings, Interpretive Choices, and Alternative Narratives," in *Controlling the Past: Documenting Society and Institutions: Essays in Honor of Helen Willa Samuels*, ed. Terry Cook (Chicago: Society of American Archivists, 2011) 69-110; Elizabeth Edwards, "Photographs, Mounts, and the Tactile Archive," *Interdisciplinary Studies in the Long Nineteenth Century* 19 (2014); *Photo Archives and the Photographic Memory of Art History* ed. Constanza Caraffa (Berlin: Deutscher Kunstverlag, 2011).
- 10 William Henry Fox Talbot, "Introductory Remarks," *The Pencil of Nature* (London: Longman, Brown, Green, and Longman, 1844).
- 11 See for example canonical texts in the history of photography which address these points: John Berger, "Uses of Photography" in *About Looking* (London: Writers and Readers, 1980); Michel Frizot, *A New History of Photography* (Cologne: Könemann, 1998); Geoffrey Batchen, *Burning with Desire* (Cambridge MA: MIT Press, 1997); Joan M. Schwartz, "Working Objects in their Own Time" in *The Handbook of Photographic Studies*, ed. Gil Pasternak (London: Bloomsbury, 2020) 12. See Joan M. Schwartz, "'We Make Our Tools and Our Tools Make Us': Lessons from Photographs for the Practice, Politics, and Poetics of Diplomats" *Archivaria*, 40 (Fall 1995): 40-74.
- 13 Elizabeth Edwards and Christopher Morton, "Between Art and Information: Towards a Collecting History of Photographs" in *Photographs, Museums, Collections. Between Art and Information*, eds. Elizabeth Edwards and Christopher Morton (London: Bloomsbury Academic, 2016) 8-9. On the point of ubiquity in photography also see Abigail Soloman-Godeau, *Photography at the Dock: Essays on Photographic History, Institutions, and Practices* (Minneapolis: University of Minnesota Press, 1994).
- 14 One of the greatest strengths of photographs as source material are the multiple biographical trajectories that a photograph can take when printed and reproduced in various contexts and media. These trajectories all have their own historical implications that can be traced.
- 15 For example, see the work of John Tagg, *The Burden of Representation, Essays on Photographies and Histories* (Minneapolis: University of Minnesota Press, 1988); Alfred Gell, *Art and Agency: An Anthropological Theory* (Oxford: Clarendon Press, 1998); Robin Kelsey and Blake Stimson eds. *The Meaning of Photography* (Williamstown, MA: Sterling and Francine Clark Art Institute, 2008); Joanna Sassoon, "Photographic Meaning in the Age of Digital Reproduction," *Archives & Social Studies: A Journal of Interdisciplinary Research* 1, no. 0 (March 2007); Geoffrey Belknap, *From a Photograph: Authenticity, Science and the Periodical Press 1870-1890* (London: Bloomsbury Press 2016).
- 16 On photographic practice see Douglas Crimp, "The Photographic Activity of Postmodernism" *October* 15 (Winter 1980): 90-101; Tagg, *The Burden of Representation*; Soloman-Godeau, *Photography at the Dock*.
- 17 Andrew Pickering, "From Science as Knowledge to Science as Practice," in *Science as Practice and Culture*, ed. Andrew Pickering (Chicago: University of Chicago Press, 1992) 1-26.
- 18 <https://www.scienceandmediamuseum.org.uk/>
- 19 <https://www.sciencemuseum.org.uk/>; <https://www.scienceandindustrymuseum.org.uk/>
- 20 <https://www.railwaymuseum.org.uk/>
- 21 Marshall McLuhan, *Understanding Media: The Extensions of Man* (New York: Signet Books, 1964).
- 22 For a discussion of the location and history of institutional collecting around Talbot, see Larry J. Schaaf, "'Do not Burn my History': the Physical Evidence of William Henry Fox Talbot's Creative Mind" in *Presenting Pictures*, ed. Bernard Finn (London: Science Museum, 2004) 129-145.
- 23 See for example the book based on the NSMM exhibition, "Specimens and Marvels," Russel Roberts, Mike Gray and Anthony Burnett-Brown, *Specimens and Marvels: William Henry Fox Talbot and the Invention of Photography* (New York: Aperture, 2000).

- 24 For key examples of Schaff's scholarship see *Out of the Shadows: Herschel, Talbot and the Invention of Photography* (New Haven: Yale University Press, 1992); *Records at the Dawn of Photography: Talbot's Notebooks P & Q* (Cambridge: Cambridge University Press, 1996); *The Photographic Art of William Henry Fox Talbot* (Princeton, N.J.: Princeton University Press, 2000); Roger Taylor and Larry J. Schaff. *Impressed by Light: British Photographs and Paper Negatives, 1840-1860* (New York: Metropolitan Museum of Modern Art, 2007). For his cataloguing work see <https://talbot.bodleian.ox.ac.uk>. In addition to building the print and digital version of the Talbot Catalogue Raisonné, Schaff also physically catalogued the Talbot collection at NSMM when the collection moved from London to Bradford in the late 1990s.
- 25 For a recent discussion of this issue see Geoffrey Belknap, "The Print after Photography – Talbot and the Invention of the 'Photographic' Print," *Nineteenth-Century Contexts*, 42, no. 2 (2020): 221-242.
- 26 This paper has just brushed the surface of the significant photographic and photographic technology collections at NSMM and across the SMG. For example, within the Science and Industry Museum the collection of early microphotography experimenter, John Benjamin Dancer. See <https://collection.sciencemuseumgroup.org.uk/objects/co8404829/j-b-dancer-microphotographs-microphotographs>
- 27 For a discussion of multiplicity in the era of mass reproduction of and the digital revolution see: Thomas Dvorak & Jussi Parikka eds. *Photography off the Scale: Technologies and Theories of the Mass Image* (Edinburgh: Edinburgh University Press, 2021); Michelle Henning, *Photography: The Unfettered Image* (London: Routledge, 2016); Annebella Pollen, *Mass Photography: Collective Histories of Everyday Life* (London: Routledge, 2015). There is also considerable literature on the multiplicity of photographic meaning such as John Tagg, *The Disciplinary Frame: Photographic Truths and the Capture of Meaning* (Minneapolis: University of Minneapolis Press, 2009); Tanya Sheehan, and Andres Zervignon eds., *Photography and its Origins* (New York: Routledge, 2015). There are also broader cultural histories of object biographies in Arjun Appadurai, ed. *The Social life of Things. Commodities in Cultural Perspective* (Cambridge: Cambridge University Press, 2014).
- 28 <http://ao.minisisinc.com/LISTS/F%204695-1.pdf>, p. 388.
- 29 Archives Ontario: http://ao.minisisinc.com/scripts/mwimain.dll/144/ARCH_DESCRIPTIVE/DESCRIPTION_DET_REP/SISN%2024558?SESSIONSEARCH; City of Toronto Archives: <https://genecat.eloquent-systems.com/city-of-toronto-archives-m-permalink.html?key=463411>; The National Gallery of Canada doesn't currently have its Globe and Mail holdings currently (as of August 2021) accessible on their website. But there is a description of the 2017 exhibition *Cutline: The Photography Archives of The Globe and Mail* online (see: <https://www.gallery.ca/cutline/>)
- 30 Belknap, *From a Photograph*.
- 31 For a further discuss of photographs in their situational contexts, see Schwartz "The Archival Garden," 32. Currently, most digital photographic material is not being retained or collected by memory institutions. To take care of digital collections, let alone interpret them, requires an understanding of data preservation and the hardware and software requirements to support this. It also requires new ways of explaining to museum audiences the physical and environmental consequences of images stored in silicon rather than on glass, metal, or paper. Most gallery, libraries, archives and museums are only now coming to terms with this new landscape of collections, with the realization that much of the recent past won't be saved for the future. See Joanna Sassoon, "Photographic Meaning in the Age of Digital Reproduction" *LASIE: Library Automated Systems Information Exchange*, 29, no. 4 (1998): 5-15 and Tomáš Dvořák and Jussi Parikka eds., *Photography off the Scale: Technologies and Theories of the Mass Image* (Edinburgh: Edinburgh University Press, 2021).