Introduction: Lay Participation in the History of Scientific Observation

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Why and how have lay people participated in scientific observation? And on what terms have they collaborated with experts and professionals? We have become accustomed to the involvement of lay observers in the practice of many branches of science, including both the natural and human sciences, usually as subordinates to experts.¹ The current surge of interest in this phenomenon, as well as in the closely related topic of how expertise has been constructed, suggests that historians of science can offer a valuable contribution to these vital questions. A historical approach to lay participation allows us to better understand the making of expert-lay relations in science, and it offers a broader, long-term perspective on contemporary debates about that boundary.

This topical issue on lay participation in science, which derives from a workshop held at the Max Planck Institute for the History of Science in 2007, focuses attention on observation. Recently, historians have begun to explore more fully the significance of observational practices of all kinds in science (Daston 2008; Daston and Lunbeck 2011). Lay people have a long and varied history of participation in scientific observation, some contributing their skills and experiences to help produce knowledge, others engaging with science in public settings. Not only can the exploration of the historical development of lay participation in scientific observation help us better understand the past, it can also help us make sense of present-day debates about the roles of lay people in science.² Moreover, placing the growing collection of recent examples of lay-expert interactions among a diverse set of historical examples spanning the past three centuries allows us to understand what is peculiar or distinctive about present-day configurations of how lay people are involved in scientific observation.

¹ The steady stream of stories in newspapers and magazines about the extraordinary variety of ways lay people are participating in science suggests that such collaborations are unlikely to abate anytime soon.
² For a selection of work in science and technology studies on the lay-expert boundary line as it has been constructed and contested during the past few decades, see Collins and Evans 2002; Ellis and Waterton 2004 and 2005; Endersby 2001; Evans and Plows 2007; Kleinman 1998; and Wynne 1992 and 1996. One arena of especially vibrant debate has been in the social studies of health and medicine, with several book-length studies, including Allen 2003; Brown 2007; Corburn 2005; and Epstein 1996.
Much of what is known about lay participation in past science has concerned the collection and circulation of material objects, such as plant and animal specimens. But what about the communication, translation, and verification of observational data from lay people? Sometimes such observations have accompanied material specimens, and sometimes they have circulated alone. How have scientific researchers incorporated lay observations into their knowledge making? And how have lay observations influenced or been influenced by the presentation and circulation of scientific knowledge? The present issue aims to provide historical context for addressing such questions through a wide range of case studies from the eighteenth to the twentieth centuries based in diverse geographical locations in North America and Europe.

The examples of lay participation in science presented here are analyzed in several national contexts, which will naturally interest scholars and other readers maintaining interests in the history of science within each country. But the further aim of this topical issue is to suggest how lay participation in scientific observation has developed more generally during the past several centuries. By bringing together historical cases from a diverse range of countries and time periods, it aims to illuminate key sites where lay participation in scientific observation has mattered. This issue has not been assembled with the idea of providing strictly comparative case studies – pairing an article on French schools with one on American schools, for example. Instead, by analyzing as wide a range of sites as possible, it provides a broader set of exemplars of how to think about lay observation in many of its diverse manifestations. In other words, it aims to expand scholarly thinking about lay participation in science by sampling a variety of scholarly research rather than offering a single unified, but more narrowly focused, transnational project.

As historians, the contributors to this issue might expect readers to focus especially on the temporal dimension of change in thinking about lay participation in scientific observation. Accordingly, the essays are arranged roughly in chronological order. Readers are quite welcome, of course, to read them individually and in any order they wish, but they may also be read in sequence as an episodic yet suggestive selection of representative moments of interaction between lay people with science as the lay-expert boundary line has emerged over the past few centuries. In this way, one can begin to grasp the outlines of a historical trajectory in which the lay participant gradually emerged from its somewhat inchoate appearance in the early modern period to a relatively hardened (though not uncontested) category by the twentieth century.

Who is a Lay Observer?

In reflecting on the title of this topical issue and the introduction thus far, it has perhaps occurred to readers that determining who counts as a lay observer has not

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3 For one especially broad-based collecting network, see Goldstein 1994. For a general overview of collecting practices in the history of science, see Kohler 2007.
been a simple matter. Just as Graeme Gooday has argued that the category of “expert” must be historicized, examining the evolution of the category of lay observer will help scholars “fruitfully reflect on how such power-knowledge categories ... were understood in other periods and contexts, and indeed how deployment of these notions has changed over time” (Gooday 2008, 449). In general, the demarcation between expert and lay seems to have hardened by the end of the nineteenth century, but even in the twentieth century the distinction could be complicated and contested.

This historically specific and shifting treatment of the lay observer is laudable as a corrective to the simple projection of present-day categories back in time, but it may threaten to lead us to a kind of nominalistic particularism about lay participation, making it seem to be nothing more than a situationally defined category – or maybe something that does not even exist at all. Yet, to varying degrees, all the authors in the issue have detected hierarchically defined status boundaries. Indeed, social hierarchies have arguably been constitutive of a wide variety of collaborations in scientific observation, however variable the terminology and contested the boundary lines have been over the past several centuries. While few historical actors were quite so explicit about the hierarchy entailed as British physical scientist William Whewell was about his local tide calculators, whom he called “subordinate labourers” (Reidy 2008, 200), the case studies examined here all involve some form of social status hierarchy that structures the production and circulation of knowledge.

To be sure, the crucial boundary lines demarcating diverse participants’ status in knowledge production and consumption has been constructed in various periods and domains in a variety of ways, such as amateur vs. professional, mechanic vs. gentleman, artisan vs. scientist, or even student vs. teacher. These shifting usages track important changes in social categories. While casual observers today often think of the “amateur” and the “lay person” as the same thing, they need not be and, indeed, have not always been. As historians of the period before the rise of scientific professionalization in the late nineteenth century point out, the amateur – particularly the gentleman amateur – was often viewed as more credible than the professional because of his independence from interest, made possible by not having to work for a living (Porter 1978; see also Rudwick 1985). Not only that, but observers of nature were often divided at least as much by social status – artisan vs. gentleman, for example – as they were by professional status or lack thereof (Secord 1994a; see also Alberti 2001; and Secord 1994b). Moreover, amateurs could be, and often were, the leading experts. By the twentieth century, of course, the amateur was becoming a less elite category, one increasingly subordinated to professionals in positions of authority (Barrow 1998; Keeney 1992; Lankford 1981; Rothenberg 1981). Yet amateurs have persisted and flourished, especially in fields such as astronomy and archaeology (Stebbins 1979 and 1980; Ferris 2002). Despite the increasing limits placed upon their status in the twentieth century, many amateurs even today can maintain
varying levels of expertise, so that the term of “amateur expert” is not necessarily an oxymoron.4

Whatever the terminology used in any given period, and however these social categories have shifted over time, historical analysts can still ask: what criteria in different periods have led to drawing a distinction between experts and lay people? The essays in this issue offer fruitful starting points for thinking about the complexity of the demarcation between lay and expert, even before the nineteenth century. Brita Brenna’s essay, for example, suggests an interesting irony in the earlier history of lay participation: the members of the network she discusses were in fact members of the clergy under a Bishop’s supervision. In a literal sense, then, they were not “lay” at all, but rather the opposite. Yet even in this case, Brenna shows how distinctions regarding status were constructed around the ability to turn natural objects and observations into scientific objects and observations. The Bishop and the clergy at distant outposts were far from equal in their expert status with respect to natural history. On the contrary, their formal clergy status did not prevent them from being regarded by Gunnerus and others as subordinate and lacking in the ability to produce credible knowledge. Does it perhaps then make sense to speak of the clergy as “lay people” in such natural history networks in the history of scientific observation? Readers will have to read Brenna’s article and judge for themselves. But the example seems to strongly suggest the utility of extending an incipient, if not universally accepted, status distinction corresponding to the lay-expert dichotomy (or continuum) back into the eighteenth century. Other readers may decide otherwise and prefer to remain with actors’ clearly articulated categories alone; but no one can evade the problem of how to trace shifting categories that show both change and continuity.

The other pre-nineteenth century case study in this issue, Simon Werrett’s analysis of “audience epistemology” in fireworks displays, presents an equal, if not greater, dilemma. Werrett argues that there was far from any consensus in the early modern period on who counted as “expert.” Rival groups might not recognize each other’s expertise, and thus the corresponding category of who was “lay” also remained unresolved. Moreover, he might well resist an attempt to make his essay fit into a set of analytical categories extending throughout the entire early to late modern period. It may be that his essay addresses a set of social distinctions that does not map onto the lay-expert continuum at all. Or, as one could well argue, it may be that observers of this period were witnessing the beginnings of attempts to articulate what features of training or skill might qualify someone to greater authority over knowledge of nature – what would later come be called “expertise”; while the observations of others lacking such attributes would have less authority – a status that would later be called “lay.” While such an example resists interpretation that would recognize the current lay-expert distinction in any definite sense, it offers a compelling example in

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4 Some scholars, in analyzing how lay activists have gone as far as to develop extensive knowledge of a scientific field of interest, identify them with the even more paradoxical label of “lay experts” (e.g., Epstein 1995).
the historical lineage of the debate about whose observations should be regarded as authoritative.

The increasing authority of scientific experts during the nineteenth century, even when that authority preceded its linkage with professional status, makes it much easier to see an emerging distinction between lay and expert. Yet even in the past two centuries, the case studies presented in this issue reveal widely varying levels of clarity or murkiness about these categories. Reading through the essays should stimulate thinking about the varying ways that lay and expert have been defined. Most of them present definite dichotomies: museum preparators and scientific curators (Cain), school students and curriculum designers (Beckman), citizen surveyors or weather observers and the government bureaucrats who directed their networks to produce knowledge (Didier, Vetter). Even the diverse range of zoo observers discussed in Oliver Hochadel’s essay were entangled in a series of intermediate and shifting categories, and they were still defined at least in part according to a hierarchy of expertise. These essays are intended to stimulate thinking about how historians can deploy such categories as “lay” and “expert,” since they provide a wide range of examples that a more general historical account should be able to explain.

**Experiential and Cosmopolitan Knowledge**

However the boundary between expert and lay has been defined or contested over the years, it has revolved fundamentally around the possession or cultivation of specialized knowledge of one sort or another. Yet, as many of the essays in this issue make clear, lay people also could possess knowledge based on their own experiences. In his history of field collecting for natural history museums, historian of science Robert E. Kohler has distinguished between what he calls “cosmopolitan knowledge” and “residential knowledge” (Kohler 2006, 184; see also Kohler 2008). “Cosmopolitan knowledge” consisted of “museum and library skills: knowing what previous collectors had found, what kinds of habitats different species preferred, and their normal ranges and abundances,” while “residential knowledge” involved “a local knowledge of where animals live here and now.” Kohler’s distinction is a useful analytical tool for the history of science, and indeed for the history of knowledge in comparative cultural contexts more broadly. It is perhaps most readily applicable to the history of a wide range of field sciences, but with some stretching can be made to do useful conceptual work in the analysis of other sciences as well, when those subjects are considered in their own contexts, such as the shop floor, the artisanal workshop, or the health of the body.\(^5\)

\(^5\) The focus of the present issue is the history of observation in science rather than in medicine, but some of the best work on experiential knowledge and its interactions with cosmopolitan scientific knowledge in an historical context has been in the history of health and the environment, including Valencius 2002; Mitman 2005; Murphy 2006; and Nash 2006.
Scientific knowledge can be readily recognized as cosmopolitan in the sense that it travels and is extended to other places by its purveyors. “Residential,” on the other hand, may not be quite general enough as a category, since many lay people gain experience of nature elsewhere than where they reside, such as at work or through travel. (It also seems to exclude nomads, whose “residence” changes seasonally or more often.) Instead of “residential,” one might label this alternative form of knowledge, which often overlaps with scientific knowledge yet is distinct from it, more broadly as “experiential” knowledge, for it derives from the everyday experiences of lay people in particular contexts, whatever they may be.6

The term “experiential” may help scholars overcome problems with previous categories that are often contrasted with the general and universal in scientific knowledge, such as local, folk, traditional, or indigenous. Such terms have been criticized for their tendency to privilege science over other knowledge systems. Typical responses have been to repudiate the hierarchy inherent in the divide or to consider science itself as a form of local or indigenous knowledge (Agrawal 1995; Turnbull 1997; Watson-Verran and Turnbull 1995). In essence, “local” is increasingly understood to be a category created by cosmopolitan knowledge, rather than being inherent in the very different “local” as experienced by people on the ground. The terms “experiential” and “cosmopolitan,” on the other hand, make it possible to distinguish different types of knowledge not by their geographical position within the structure of cosmopolitan knowledge, but by the fundamentally different character of such knowledge based on its relation to personal experience and practice, which can overlap in time and space.7

In many arenas of scientific observation, investigators have sought to record, synthesize, and reinterpret the accumulated experiential knowledge of particular individuals or social groups. Some of these lay observers have been intimately engaged with different parts of the natural world for their livelihoods, such as miners, prospectors, farmers, fishermen, and artisans – including members of particular ethnic or geographical groups who have accumulated shared knowledge of the natural objects around them (Dym 2008; Lewis 2005; Schneider 2000; Smith 2004). Others, such as merchants, missionaries, and colonial officials, have had the opportunity to experience

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6 Interestingly, experiential knowledge also has played a crucial role in the production of (cosmopolitan) scientific knowledge in both lab and field, through the practical skills that are required to make experiments work or to make proper observations, both by scientists themselves and their technicians or field assistants. Such uses of experiential knowledge are beyond the scope here but have become widely recognized in the history and sociology of science.

7 Other alternative terms include “métis,” advocated by James C. Scott (1998), and “vernacular,” which is being deployed fruitfully, for example, in the forthcoming work of Convery Bolton Valencius to describe knowledge produced about the 1815 New Madrid earthquake in the central United States. For an interesting study locating the origins of local or indigenous knowledge in early modern Europe, see Cooper 2007. For three recent volumes of case studies exploring interactions between local and global science, see Sillitoe 2007; Santos 2007; Jasanoff and Martello 2004.
new natural phenomena through travel and trade (Barrera-Osorio 2006; Carey 1997; Cook 2007; Fan 2003; Harris 1998; Parrish 2006). Still others have been amateur naturalists who were avid participants in the collection or display of nature but as an avocation or form of leisure rather than as a way to make a living (Alberti 2001; Barrow 1998; Goldstein 1994; Secord 1994a and 1994b). How have they translated experiential categories into scientific categories? What epistemological mechanisms have they devised to guarantee the validity of knowledge produced through lay observations?

To begin addressing these questions requires first confronting how all observations have been shaped by preconceptions and socialization. Sociologists of science have shown that observing practices are not primordial: conceptual frameworks structure scientific observation. Even basic observational categories such as biological species are mediated. “‘Natural kinds,’ are not simply representations of what the eye (or the mind’s eye) sees,” as John Law and Michael Lynch argue in their analysis of field guides (Law and Lynch 1990, 267). From a more philosophical point of view, adopting such a pluralistic perspective may seem to require a rejection of realism. However, a promising alternative would be simply to reject unitary realism in favor of what John Dupré calls “promiscuous realism”: there may be more reality in the world than can be fully captured by any system of knowledge, “scientific” or otherwise (Dupré 1999; see also Dupré 1993). To rephrase this in terms of cosmopolitan and experiential knowledge would imply that neither type is fully reducible to the other, and both can contribute to a better understanding of the natural world – and even then, many things will remain mysterious.

Whatever its larger philosophical or sociological implications, the distinction between cosmopolitan and experiential knowledge may be fruitfully applied across many scientific disciplines. Anne Secord, for example, suggests that historians must overcome seeing artisan naturalists of the early nineteenth century solely in terms of the generalizers’ perspective. Accordingly, her work draws attention to what artisans and guides knew that gentlemen did not (Secord 1994a and 1994b; see also Jones 2002). Similarly, my own recent historical investigation of a paleontological quarry in the American West in the early twentieth century reveals that the resident ranching family, the Cooks, had highly valued experiential knowledge of where to prospect for fossils, knowledge that could not be easily replicated by visiting eastern scientists, who in turn possessed the cosmopolitan knowledge necessary to identify those fossils and situate them in a scientific taxonomy (Vetter 2008). Perspectives on the experiential and the cosmopolitan have been explored more recently in health and medicine, including lay-expert collaborative research on the environmental causes of disease, known as “popular epidemiology” (Brown 1987 and 1992) and in environmental science more generally, through grassroots environmental monitoring and other similar practices (Heiman 1997; Ottinger 2010; see also Fischer 2000). The interaction of experiential and cosmopolitan knowledge can also be readily seen in colonial contexts (Green Musselman 2003; Grove 1996; Leach and Fairhead 2002; Low 2007; Schiebinger and...
Swan 2005). They are categories of analysis with wide-ranging applicability and a special relevance to studies of lay participation in science.

Public Sites

As noted above, lay participation in scientific observation has occurred in a wide variety of settings. This issue surveys examples ranging from British fireworks displays and Norwegian churches in the eighteenth century to German zoos, Swedish schools, and American museums in the nineteenth and twentieth centuries. It also includes examples of lay participation in government data collection, in particular the gathering of labor statistics and weather observations. Together these essays provide an intentionally broad purview of the diverse sites at which lay people have engaged with science. They offer evidence both of how lay people have played a role in the production of science and how the scientific knowledge thus produced, in turn, has influenced the identities, understandings, and practices of lay observers.

Since the emergence of the public sphere in the eighteenth century or earlier, science has involved people beyond its specialized practitioners, however they may have been defined at any given time. All of the essays in this issue relate in some way to the lay public, but several of them relate especially closely to specific public settings in which knowledge was constructed, displayed, or contested. Simon Werrett, in his essay on seventeenth- and eighteenth-century fireworks displays, reveals the social contours of participation at a time, as he says, “when clear boundaries between professional and amateur scientific observers did not exist.” By focusing on public audiences at fireworks displays – sites lacking the obvious markers of “scientific” observation but nevertheless engaging with phenomena of nature and artifice – Werrett provides a culturally sophisticated account of the construction of skill and status in the making of expertise at observing and distinguishing nature and artifice. His concept of “audience epistemology” – which might fruitfully be extended to other sites – thereby provides another analytical tool for understanding the lay-expert divide at a time when more familiar categories such as amateur and professional had not yet formed.

Moving into the nineteenth century, Oliver Hochadel explores a key emerging site for lay and expert participation in scientific observation: the zoo. By following several pairs of visitors to the Dresden Zoological Gardens, he outlines an extensive taxonomy of social roles spanning the lay-expert continuum. He places this spectrum of observers in the historical context of the international reform movement that promoted the zoo as a means of bringing people into contact with living animals. By showing how a wide variety of people representing different social groups observed a famous ape, “Mafuka,” Hochadel shows the utility of opening up the historical understanding of zoos to encompass observers on a spectrum of expert and lay characteristics – and in the process also reveals the complications in this distinction.
By the early twentieth century, social categories associated with lay and expert status were becoming more crystallized. Victoria Cain’s essay on American natural history museums reveals the conflict and contestation between the different status levels that had emerged by the early twentieth century. In her case, it was the tension between scientific curators and their fellow museum staff members possessing visual skills. While the scientific staff were ostensibly the experts, the preparators of museum exhibits gained considerable authority (and financial compensation) for their highly valued skills, however “lay” their status may have been with respect to scientific expertise and training. Indeed, as Cain shows, it was the preparators’ claim to authority over visual depictions of the natural world that instigated tensions with scientific curators. Cain’s essay also reminds us that some lay participants in science, such as draftsmen, painters, and museum preparators, possessed special visual or artistic skills that were especially valued in scientific observation. As a family of social groups distinguished by their visual skills, they have posed a challenge to scientific experts’ exclusive authority over observational practices. Other scholars may want to ask, as Cain does: in what ways have the special skills possessed by some lay people, such as artists, overlapped or contested with scientific expertise?

Finally, while lay observers during the past few centuries have encountered nature in a wide variety of public settings, from pyrotechnic displays to zoos and museums, they have also often had opportunities to observe nature during the process of formal education. School children and youth, as undeniably lay social categories, yet also subject to the disciplining forces of educational activities designed by experts, offer an important window into the making of lay participants in scientific observation. Jenny Beckman, in her essay on the place of botany in the school system of Sweden, traces the long-term historical trajectory of how school students were taught to observe, especially during the twentieth century. By paying attention to both educational philosophies and the particular practices that were intended to realize them, Beckman provides us with a way to understand how the pedagogy of observing nature has adjusted to transformations in social life. While her story draws on the specific and even unique botanical tradition of Sweden – based as it was on the legacy of Linnaeus – her essay addresses issues of concern to all modern societies as their educational leaders have attempted to respond to processes of urbanization and industrialization that have removed children and youth from direct observation of nature in the countryside.

Networking and Citizen Science

While many of the studies of lay participation in scientific observation presented in this issue describe specific sites of public interaction with science – fireworks displays, zoos, museums, and schools – others focus on networks of geographically dispersed sites. When modern scientists and their predecessors have attempted to produce knowledge from the observations of lay people, they have often assembled these observations from
disparate sources and locations. In such networks, lay people have the advantage (or disadvantage) of residing in particular places that may be distant from the metropolitan locations of their expert collaborators. Several of the papers in this issue consider how networks of lay observers were assembled, managed, extended, and mobilized.

An early example of networking in this issue is in Brenna’s essay, which concerns a natural history network established in eighteenth-century Norway. Using the authority of the church, Bishop Gunnerus combined his visits to remote northern parishes with correspondence involving the natural objects sent to him. While the main goal of this natural-history network may have been the collection of material objects at a central location, he relied on lay observation in order to determine the appropriate objects to send. Moreover, as Brenna shows, Gunnerus often requested observational information along with the objects collected. She also highlights the pedagogical ambitions and “enlightenment” goals of the Bishop—and more distant expert figures such as Linnaeus—thereby showing how the educational goals discussed by Beckman with an emphasis on the later period might have an analog in the eighteenth century. For an eighteenth-century naturalist like Gunnerus, it would in fact be difficult to separate these enlightened goals from the more obviously instrumental aspects of his natural history network.

Network building may be an old feature of scientific observation in natural history, but by the nineteenth and twentieth centuries it was becoming increasingly intertwined with ideas of citizenship and political participation. Over time, one can recognize the emergence of a new kind of network for scientific observation, which has often gone under the label of “citizen science” (Charvolin 2004; Charvolin et al. 2007; Irwin 1995 and 2001). Since the early twentieth century, the scientific observations of lay people who conceive of themselves as citizens has frequently related the individual in some way to the state—and has often also involved engagement in practices related to the formation or maintenance of national identity (Macdonald 2002). Lay participation in scientific networks could thus be simultaneously functional and symbolic.

In my own essay, the U.S. Weather Bureau in the Department of Agriculture, through its forecasting office in Kansas City, in the heart of the Midwestern grain belt, serves as an example of how lay people in the early twentieth century were enlisted as local observers. The ambition of Kansas meteorologists in the late nineteenth century to recruit and discipline lay weather observers was not realized until the authority (and finances) of the federal government were brought into play around the turn of the century. My paper aims to show how hierarchical control was exerted over the weather observers, in a recognizably “high modern” sense, and the ways that a field network based on telegraphs operated to control resistance, whether human or material. This case study also reminds us that “citizen science” has served not only the state or its scientific researchers (or even the public broadly construed) but has also been instrumental in the expansion of capitalist markets, such as the grain futures markets that thrived on the information provided by the Weather Bureau in its daily forecasts.
If the beginning of the twentieth century was one time of rapid state-funded network expansion by the U.S. government, the New Deal period of the 1930s was another. In his essay, Emmanuel Didier describes how the U.S. Department of Labor attempted to produce statistical knowledge of unemployment rates, hiring white-collar workers who themselves were unemployed to collect this data, even though they were not trained in statistical research. Didier places this network of data gatherers in the context of the political history of the New Deal era. As he shows, statistical data gathering by a network of lay observers emerged out of earlier practical models for gathering agricultural statistics and population census data but was noticeably different for its involvement of unemployed people themselves. It therefore presented a potential problem for the credibility of the data, and Didier’s unusually revealing example allows us a significant glimpse into the actual practices by which statistical data have been gathered. It also provides an example of the production of knowledge in the human sciences, which usefully complements existing studies on the involvement of lay people in fields such as anthropology, whether through questionnaires for travelers (e.g., Urry 1972) or as collaborators in ethnography (e.g., Schumaker 2001).

Clearly, the role of lay people in scientific observation has varied over time and space. The essays in this issue do suggest some patterns, such as the increasing hardening of the distinction and hierarchy between lay and expert by the late nineteenth century. Yet even in the twentieth century, when professional expertise had become more powerful, lay participation in observation was still encouraged in many scientific disciplines. As the diverse essays here show, the status distinctions resulting from these hierarchies were often disputed, revealing both the contours of these distinctions and the often limited ways in which they might be challenged. In Victoria Cain’s essay, for example, the question of whether artists on a museum staff could also be scientific observers was very much at the heart of their conflict with scientific curators. Increasing authority for experts has been a general trend in the history of scientific observation, and few rival lay claimants have managed to dislodge expert power from its lofty perch of authority in modern society. If many of the boundary lines between expert and lay are coming under increasing attack in the past few decades, one can see from these historical examples how such divisions have been constructed and contested in the past (see also McCook 1996; Nyhart 2010).

The role of lay people in science can be expected to remain controversial. By examining the historical development of lay participation in scientific observation, the authors in this issue hope to contribute to a broader discussion of the issues involved, such as the complex identity of the lay observer, the interaction between different types of knowledge based on experience and cosmopolitan science, and the management of status conflicts. A serious engagement with the historical record of lay involvement in science promises to place present-day debates over the lay-expert divide in a deeper context, thus making it possible to better understand their historical roots.
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References

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