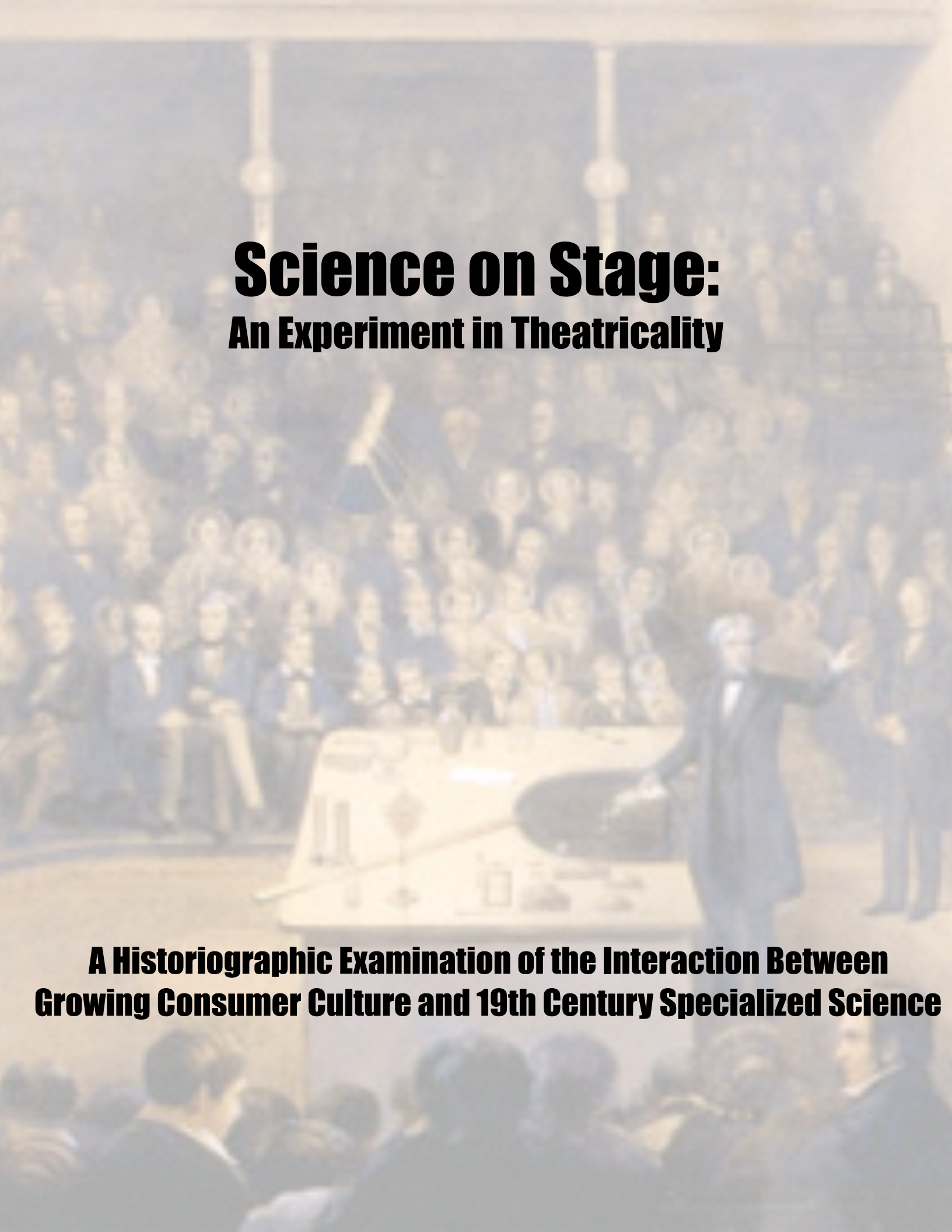

Science on Stage:
An Experiment in Theatricality

A Historiographic Examination of the Interaction Between Growing Consumer Culture and 19th Century Specialized Science

Science on Stage:
An Experiment of Theatricality

One cannot fully explore scientific advancement without studying the impact science had on society.[1] While abstract ideas were helpful to those in the ivory towers of academia, it was the visual show of practical science that grasped the public's attention. Science became more specialized in the nineteenth century.[2] Thus, a historian studying the intersection of science and society may approach change with a common question relevant to several scientific fields of study. The rise of what may be described as "theatrical science" in Victorian society provides such an opportunity. New ideas about electricity, chemistry, and medicine were presented to the public not just through publications, but also through performances. Science was put on stage, which began an experiment with theatricality.

The traditional approach to scientific history emphasized the scientific accomplishments and experimental process[3] but overlooked the role of theatrical science, a reference to the performances of lecturers and showman, which was an integral part of public science.[4] Theatrical science was an important part of the adaptation of science to the changing society of nineteenth century Europe because the history of science is not

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[1] Jan Golinski, *Science as Public Culture: Chemistry and Enlightenment in Britain, 1760-1820* (Cambridge: Cambridge University Press, 1992).

[2] R.C. Olby et al., eds. Companion to the History of Modern Science, (London: Routledge, 1990), xix.

[3] For an Example of the Traditional approach see Ivor B. Hart, *The Great Physicists* (1927; reprint, Freeport, New York: Books for Libraries Press, 1970), 108.

[4] For an example of history focused on the perspective of this intersection see René Taton, ed., *History of Science: Science in the Nineteenth Century*, trans. A.J. Pomerans, (London: Thames and Hudson Limited, 1965).

fully explored without researching society's acceptance of scientific ideas.[5] Science cannot exist without a society to influence and motivate it.[6] Examining the nineteenth century from the perspective of theatrical science allows a greater synthesis of the cultural history and scientific history of the time period.

The consumerist society prevalent in the later part of nineteenth century Europe was extremely influential on the careers of scientists, their discoveries, and the presentation of discoveries.[7] In Britain especially, scientific institutions needed to compete for patrons who sought public entertainment and were swayed by advertisements.

The connection of science and society is the essence of this essay; however, within this broad topic, the focus is primarily on how historians have examined theatrical science. Theatrical science played an important role in both controversial public debates and studies of experimentation with electricity. In regard to the overall study of public science in nineteenth century Europe, successful performance lectures of this period reveal the dual nature of nineteenth century science as a transport into modernity and a mode for social mobility and popularity. The term theatrical science is most appropriate because, while the science and experimentation is of the utmost importance, successful lecturers, such as Michael Faraday, realized the potential of performing lectures in such a

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[5] Roger Cooter, *The Cultural Meaning of Popular Science: Phrenology and the Organization of Consent in Nineteenth-Century Britain* (London: Cambridge University Press, 1984).

[6] Jan Golinski, *Science as Public Culture: Chemistry and Enlightenment in Britain, 1760-1820* (Cambridge: Cambridge University Press, 1992).

[7] Iwan Rhys Morus, *Frankenstein's Children: Electricity, Exhibition, and Experiment in Early-Nineteenth-Century London* (Princeton: Princeton University Press, 1998).

way that the science was presented clearly and interestingly to those outside the scientific community.

The theatrics that one employed in a debate profoundly affected the position taken by society, and in turn the time and finances provided to a research topic. Public discourse, therefore, should also be studied as part of theatrical science. In a performance lecture, the speaker persuaded the audience through a series of experiments that both dazzled and educated them. In some cases, such as the controversies concerning mesmerism or anesthesiology, the performance lectures and public debates took place simultaneously.

As noted earlier, scientist who experimented with electricity easily adapted theatricality into their presentations. Social mobility was a reason for Michael Faraday's career choice as well as others.[8] Faraday moved into elite society by gaining a favorable reputation within the scientific community.[9] In researching the impact of theatrical science, one should not attempt to diminish the scientific achievements of great scientists**,** but incorporate the role of public science into an investigation of science in the nineteenth century. Early authors focused on the use of science for social mobility without exploring how this was accomplished. Recent scholarly works explained how the presentation of science, its acceptance in society, and ultimately, its correctness, all impacted the historical and contemporary view of scientists and scientific ideas. Historians James Secord and Iwan Morus have acknowledged the role of theatrical science as a way to gain

[8] Hart, 108.

[9] Ibid.

popularity within the scientific community and society as a whole.[10] They built their arguments on the works of previous historians like Ivor B. Hart and D.K.C. MacDonald who explored more narrowly the accomplishments of those in the physical sciences,[11] although their works were divergent from the traditional approach.

In 1927, Ivor B. Hart published a book titled The Great Physicists in which he explored the careers and accomplishments of scientists from Pythagoras and Archimedes to Lord Kelvin and James Joule. According to Hart, Michael Faraday exemplified how social mobility was achieved through scientific endeavor. Faraday's early life was one of poverty, but his apprenticeship as a bookbinder "opened out for him visions of a larger world."[12] Hart contributed Michael Faraday's love for science to a book entitled *Conversations in Chemistry* as well as small experiments at home. It was "the attending of popular science lectures [that] served both to fan his hopes and ambitions and to increase his distaste for bookbinding."[13] Nearly all historians who have written about Faraday's early life noted the influence of the lectures of the Royal Society on the young Michael Faraday.[14] He took notes at one of Sir Humphrey Davy's lectures and sent them to Davy with a note that asked for consideration if a scientific opportunity presented

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[10] James Secord, *Victorian Sensation: The Extraordinary Publication, Reception, and Secret Authorship of Vestiges of the Natural History of Creation*, (Chicago: University of Chicago Press, 2000); Iwan Rhys Morus, *Frankenstein's Children: Electricity, Exhibition, and Experiment in Early-Nineteenth-Century London* (Princeton: Princeton University Press, 1998).

[11] Hart, 108.; D.K.C. MacDonald, *Faraday, Maxwell, and Kelvin* (Garden City, New York: Anchor Books, 1964).

[12] Hart,108.

[13] Ibid.

[14] Hart, 108.; Taton, 194.; MacDonald, 18.

itself.[15] Hart identified performance lectures specifically, and public science in general, as influential on Faraday, but he did not delve into the performances of Faraday which would have allowed for a more clear understanding of Faraday's reputation as an ideal performer of theatrical science.

D.K.C. MacDonald provided an abridged biography of Michael Faraday, James Clerk Maxwell, and Lord Kelvin in his book, Faraday, Maxwell, and Kelvin.[16] MacDonald, who published his book over thirty years after Hart's The Great Physicists, was an early acknowledger of the influence of theatrical science. Reputation was an important motivator of scientific discovery, according to MacDonald. An example of this frame of mind was shown when he stated, "It is often assumed that scientists generally are unemotional…but the very urge that will make men devote long hours to work that is demanding and exhausting…is bound to be emotional."[17] MacDonald continued, "It seems a very natural and normal consequence of the fact that it is men who are doing the science, were it not for the emotional urge to lay bare something which no one else has done before, there might be no psychological drive to make men do science at all. …If men did not care deeply about being credited for their discoveries, they might well have no desire to make any at all."[18] Therefore, he asserted that scientific discoveries were the result of people seeking fame and popularity and not simply science for the sake of science. MacDonald argued that fame was an important factor in the choice of science as

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[15] Ibid.

[16] MacDonald, 33.

[17] Ibid.

[18] Ibid.

a career. Fame may come in two forms. The first form of fame was the acknowledgment from history that one's achievements were in fact profound. The second form, one that was directly concerned with the area of public science and performance lectures, was the fame cast upon one by his/her contemporaries. A scientific achievement displayed theatrically in a performance lecture was an attempt to accomplish both forms of fame.

MacDonald, though not directly making theatrical science part of his thesis, was one of the earliest authors, within the historiography of nineteenth century science, to explore the intersection of society and science through the lens of theatrical science. In regards to performance lectures, MacDonald suggested that Faraday was a "very attentive" listener to the lectures and a student of the "art of lecturing."[19] Faraday acknowledged the opportunity performance lectures provided to educate society, as well as for the scientist to illustrate his accomplishments. Faraday wrote about the way in which a scientist evolved from experimenter to educator. He was a leader in initiating the "Friday Evening 'Discourses'" as well as the "Christmas Lectures for Children," which were public lectures that have continued through today.[20] Scientific achievements as well as understandable lectures for society were important to the process of becoming a recognized scientific leader. Faraday understood the importance of popular acceptance of scientific theories; therefore, he believed that making the lecture relevant to the people observing was an important aspect of lecturing.[21] Thus, society and science, according to MacDonald and Michael Faraday, intersected in the arena of theatrical science.

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[19] Ibid, 46, 48.

[20] Ibid.

[21] Ibid, 47.

Crosbie Smith did not follow MacDonald's initial inquiry into the world of public science. Crosbie Smith's essay concerning energy in Companion to the History of Modern Science stated the "energy revolution" or the "replacement of the concept of force with the concept of work" was the greatest development in physics between Isaac Newton and Albert Einstein.[22] Smith argued, the "'Energeticist' school of physics… aimed to replace mechanics as the fundamental science" during the nineteenth century.[23] Smith suggested the role of public lectures to be a forum for scientific discussion. James Joule's disappointment with electromagnetic engines was expressed at a public lecture in 1881.[24] The role of the lecture was suggested by Smith to be a forum by and for scientists and not an important part of the history of science.

Smith's article followed Hart's and MacDonald's traditional approach by exploring only minimally the role of theatrics and popular science. However, in the same book, Steven Shapan argued that public science was crucial to society's acceptance of controversial ideas. The editors of Companion to the History of Modern Science chose Smith's article to represent the age of experiments with electricity, even though its 1990 publication was twenty-five years after editor René Taton's Science in the Nineteenth Century. Taton attributed the intersection of science and society in Europe as main reason that European science led the rest of the world in the nineteenth century. To him, the

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[22] Crosbie Smith, "Energy" in *Companion to the History of Modern Science*, ed. R.C. Olby, et. al. (London: Routledge, 1990), 326.

[23] Ibid, 339.

[24] Ibid.

second industrial revolution, as well as the government financing of scientific endeavors, was crucial to the progression of science in Europe.[25]

Taton recognized that a critical part of the intersection between science and a growing and industrializing society was the art of theatrical science. While Taton did not go into great detail about the performance lectures, he did devote a portion of the section titled "Society and Science" to popular science. Like MacDonald, Hart, and others, Taton referred to popular science as the study of how a society adopted scientific information. Taton, unlike other historians discussed, briefly wrote about scientific societies outside of England and France. The Swiss Natural Science Society and the Gesellschaft deutscher Naturforscher und Artze in Germany held lectures that were "extremely well attended and played an important part in the scientific revival of the German-speaking world."[26] Taton argued that popular science in general and the performance lectures held by the societies were used to "arouse public interest in current scientific problems and research, and hence, to gain government and private support of science."[27]

Taton suggested that the conservatives within the establishment opposed the scientific revolution of the nineteenth century. It was the impact of scientific societies and public lectures that swayed public opinion to the side of reformers of scientific societies and universities.[28] Unlike MacDonald, Taton focused more broadly on the role of public science in general, as opposed to the specific nature of performance lectures, as a tool to

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[25] Taton, 549.

[26] Ibid, 550.

[27] Ibid.

[28] Ibid, 552.

promote an individual's career. In fact, E. Bauer, the author of "Electricity and Magnetism," in chapter four of Science and the Nineteenth Century, detailed the accomplishments of Michael Faraday without an examination of his lectures, the effect of these performances on society, or the theatrical science that influenced him as a young man.[29] Taton's editorial additions to the essays in Science in the Nineteenth Century, however, clearly showed that he believed that the intersection of society and science, in general, was of great importance for a historian to understand nineteenth century science or society. He stated "the main cause of Europe's scientific supremacy in the nineteenth century was her continued political and economic superiority over the rest of the world."[30] The support given by European societies and governments was crucial to their position of world domination in the area of nineteenth century science.

In her 1998 book Mesmerized: Powers of the Mind in Victorian Britain, Alison Winter argued that the historiography of Victorian science had been narrowly defined. Winter sought to move the study of the practice of mesmerism, which historians have seen "at the fringes of society,"[31] to a position of greater importance within the historiography of nineteenth century science. Mesmerism, to Winter, occupied a "central place among the preoccupations of Victorian culture."[32] The debate over mesmerism's place within science, according to Winter, was "pivotal" in the change of authority for medicine and science. According to Winter, the mesmeric debates, experiments, and

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[29] Ibid, 194.

[30] Ibid, 548.

[31] Alison Winter, *Mesmerized: Powers of Mind In Victorian Britain* (Chicago: University of Chicago Press, 1998), 4-5.

[32] Ibid, 4.

performances reflected several aspects of Victorian society from race relations to class distinctions to the role of science and the authority of medical practitioners.[33]

Because the practitioners of the mesmeric debates varied, and the places in which the debates took place were numerous, the debates over mesmerism and the use of anesthesiology illustrated the intersection of science and society. Mesmerism was practiced and debated "in universities and mechanics' institutes, country houses and cottages, vicarages and town halls, pubs and hospitals…[and among] the aristocracy to their servants, the industrial middle classes and the 'operatives' who worked in the factories, the preachers and their congregations, the doctors and their patients."[34] The performance lecture was an essential place of debate. Winter noted, "During the 1840s itinerant lecturers fanned out across the country."[35] One may argue that mesmerism should not be classified under the category of theatrical science since it was the very acceptance of mesmerism as science that was debated; however, as Winter's central thesis outlines, not only was a large portion of society involved in the debates, but the scientific community was also interested in the argument.[36] Doctors attended the public performances. Lecturers who performed at public demonstrations often engaged their skeptics who sat in the audience.[37]

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[33] Ibid, 16.

[34] Ibid, 4.

[35] Ibid, 5.

[36] Ibid, 16.

[37] Ibid, 167.

Mesmerism and the controversy over the use of anesthesiology lent itself to performance lectures nearly as easily as the nineteenth century experiments with electricity and magnetism. The central question that the mesmeric debates attempted to answer became, "What shall be considered science?" The theatrics involved were a central part of the debate to Winter. Thus, science and society collided in the central question of authority over scientific matters, and this collision took place on the stage of theatrical science.

In Uneven Developments: The Ideological Work of Gender in Mid-Victorian England, Mary Poovey explored the use of anesthesia in the nineteenth century. Poovey studied how the outcome of the debate reinforced gender roles in Victorian society. Poovey noted the lecture as a forum for discussion but placed far less emphasis than Alison Winter on the role the performances played in influencing society's opinions. The professionalization of medicine and the declining role of midwifery were explored. Women were the subject of the arguments in regards to childbearing but were excluded from the ability to "represent themselves" in written literature.[38] Poovey suggested that science and society were in fact intersecting but women were mere observers. Women were subjects in the demonstrations but were not demonstrators. Women were in the audience of performance lectures but not performing on the stage of theatrical science.

It is not that historians have completely overlooked the performance lectures or theatrical science in the historiography of nineteenth century science, but that they have only given minimal attention to the subject. Hart and MacDonald acknowledged the

[38] Mary Poovey, *Uneven Developments: The Ideological Work of Gender in Mid-Victorian England* (Chicago: University of Chicago Press, 1988), 43.

lectures as influential in a young scientist career choice. Taton recognized the importance of popular science in the battle between the conservative authorities and the revolutionaries of science in the nineteenth century. Winter's thesis rested on the idea that performances in debates over mesmerism were responsible for society's interest in the debate. Historians of science acknowledged the performances as a way to elaborate on scientific achievements, but few have studied the performance itself as a factor in the popularity of a scientist, or the acceptance of a scientific idea. One may argue that this was because the science itself has since been proven correct.

Early authors in the historiography of nineteenth century science, such as Hart, seemed to believe that science and experimentation were more important historically. However, James Secord, Iwan Morus, and Jan Golinski, all writing within the last twenty years, have fully embraced the role of community in the study of the history of science by encompassing the role theatrical science played in the interaction between the masses and the scientific community. Their arguments followed the lead of others who began to criticize the gulf within the history of science "between the sociology of collective behavior and the history of scientific ideas."[39]

In The Cultural Meaning of Popular Science, Roger Cooter suggested that historians began to reevaluate the societal context in which the history of science had been written. Science does not exist without the culture's perception of it. Cooter's interest was the way in which the culture assimilated and disseminated the knowledge of phrenology. He considered phrenology to be more scientific than mesmerism and more

[39] Roger Cooter, *The Cultural Meaning of Popular Science: Phrenology and the Organization of Consent in Nineteenth-Century Britain* (London: Cambridge University Press, 1984), 2.

controversial than the later debates over Darwinism.[40] Cooter argued that his study of phrenology's historical value was rooted in the assumption that "the knowledge and the society it inhabited," were one in the same and that neither can be studied alone.[41]

Eight years after the publication of Cooter's book, Jan Golinski published Science as Public Culture. Golinksi, like Cooter, credited articles from Steven Shapan as a starting point for questions concerning the place of science in the public arena.[42] Golinski viewed theatrical science as a fundamental component in the acceptance of scientific ideas. She argued, "The persuasiveness of particular claims is not a result of what was said, but also of how it was said, where, and by whom….Rhetoric is one of the requirements for the construction of science in the public domain."[43] Golinski examined late eighteenth and early nineteenth century chemistry with this insight in mind. She explored the career of Sir Humphrey Davy, the mentor to Michael Faraday, and called Davy "the public face of genius" while exploring how he was able to "create" an audience.[44]

Davy's popularity was discussed in chapter seven of Science as Popular Culture, and it was a key portion of Golinski's overall argument. However, Davy was followed by his successor Michael Faraday, and many agree that Faraday surpassed his teacher in the laboratory and in the eyes of Victorian society. Before the circumstances of Davy or

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[40] Ibid, 10.

[41] Ibid, 8.

[42] Ibid.; Jan Golinski, *Science as Public Culture: Chemistry and Enlightenment in Britain, 1760-1820* (Cambridge: Cambridge University Press, 1992), 1.; See Steven Shapan, "Science and the Public" in *Companion to the History of Modern Science*, ed. R.C. Olby, et. al. (London: Routledge, 1990), 990-1007.

[43] Golinski, 3.

[44] Ibid, 990.

Faraday's rise in popularity may be discussed, it is important to note the way in which the historiography of nineteenth century science has incorporated Golinski's ideas and methodology.

James A. Secord explored the intersection of science and society in much the same way as Golinski.[45] Secord studied the public reception of a pre-Darwinian naturalistic book with an eye focused on the way in which things were presented to and assimilated by society. The intersection of society and science came from more than public lectures, according to Secord in Victorian Sensation: The Extraordinary Publication, Reception and Secret Authorship of *Vestiges of the Natural History of Creation*. "Lecture demonstrations" were only a small part of the overall intersection of society and science that also included journalism, panoramas, museums, "and in the evolutionary narrative of *Vestiges*."[46] Advancements in travel and communication were responsible for "transforming opportunities for making money from the display of knowledge."[47] Secord used the term "commercial science" for showmanship and performance lectures, as well as, "authorship, editing, reviewing, specimen dealing, industrial consultation, instrument making, [and] museum curating."[48] The author agreed with Golinski and others that the Royal Intuition was a preeminent institution in urban social life, and Secord noted that the lecture in particular was "a mainstay for those who

[45] Secord, 437.

[46] Ibid.

[47] Ibid.

[48] Ibid.

pursued science for pay."[49] Further illustrating the intermingling of science and society, Secord declared that during the week of Easter "theaters were open only for science shows."[50] Scientific knowledge for the populous was a sign of respectability, thus the theaters did not show frivolous events but instead showed theatrical scientific exhibitions.

The performance lecture was not a venue only used by the great scientists like Faraday and Sir Humphrey Davy. Secord examined the lecture circuit traveled by far less notable men. It was those ordinary, and less remembered, scientific men who made the display of theatrical science a more controversial factor. Secord explained, "The distance between pulpit and platform was short, and the audiences were often identical."[51] John Wallis was one such performer; he fought scientific reformers by using theatrical scientific lectures to appeal to public opinion in order to gain support. His only publication "had a limited circulation."[52] His reputation was dependent on his ability to perform and not on his academic works. Thus, unprofessional scientists employed the same theatrical approach in order to popularize their works, as did the notable men of science. Those amateur scientists, who historians may classify only as showmen and not scientists, truly brought a theatricality to the public because their work was not as well accepted within the elite scientific community. The difficult question to answer was whether or not it was the great lecturers, such as Faraday and Davy, who influenced the

[49] Ibid, 438.

[50] Ibid, 450.

[51] Ibid, 450-451.

[52] Ibid.

amateur scientists to use theatricality to explain their ideas, or if amateurs influenced the scientific elite.

The title of Secord's book clearly stated his intention to discuss the book *Vestiges of the Natural History of Creation* in regards to Victorian society, but Secord also gave an interesting and original view of the intersection of science and society. Secord gave considerable attention to theatrical science or what Secord referred to as "commercial science." The popularity of *Vestiges* in Victorian society was due to the fact that the book was not only read, but by using *Vestiges* as a starting point for performances, panorama, and pictorial presentations, its ideas were "seen as a museum of creation."[53] Secord cautioned, "We are used to seeing the Victorian world through the printed word, but the visual field of contemporaries was dominated by shows, exhibitions and pictorial representations."[54] Books and other printed publications were not sufficient sources for a study of that era. Victorian society learned about new scientific ideas through theatrical scientific displays, just as the ideas in *Vestiges* were popularized by theatrical means and not just the printed book.

Iwan Morus, perhaps more than any other author discussed, contributed a more general view of the intersection of society and theatrical science to the historiography of nineteenth century science. Morus's 1998 book, Frankenstein's Children, explored the world of electrical experimentation and public performances with far greater accuracy than previous works. He built on the framework begun by Cooter and Golinski. Morus's

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[53] Ibid, 440.

[54] Ibid.

goal was to "provide a sensitive cultural history of electricity's place in the first half of the nineteenth century…[and] carry out an experiment in the sociology of scientific knowledge."[55] In fact, James Secord acknowledged Morus as one of the best scientific historians because Morus recognized the connection of exhibitions and science in Victorian society.[56] Morus argued that the history of science is best understood through a "detailed understanding of the complexities of the local culture."[57] Morus pointed out, "Experiments in early nineteenth century London were performed in every sense of the word. Electricians needed to define themselves…they had to fashion themselves in such a manner as to conform to or even construct their potential constituencies' notions of the kind of person an experimenter should be."[58] Thus, theatricality became a part of the scientific process, at least in the acceptance of new ideas, for both masses and the scientific community.

Morus formed a synthesis between Secord, Winter, and Cooter's view of the practitioner of theatrical science and the view of D.K.C. MacDonald and Jan Golinski. Secord and Winter both attributed the place of theatrical science to be the main profession of those involved in pseudoscience. Golinski and MacDonald saw the performance lecture as an important aspect in the career of a scientist who was to be remembered. Morus thus explored the "two distinct trends of experimentation, emerging in conflict

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[55] Iwan Rhys Morus, *Frankenstein's Children: Electricity, Exhibition, and Experiment in Early-Nineteenth-Century London* (Princeton: Princeton University Press, 1998), ix.

[56] Secord, 440.

[57] Morus, *Frankenstein's Children,* xi.

[58] Ibid.

with each other."[59] The two competing views of popular science, to Morus, resulted from the conflict between the artisan and middle classes. Those from the Royal Institution viewed the lecture for elite audiences to be distinct and separate from the laboratory experiments. Lower class mechanics or instrument makers performed lectures and experimented with "considerably less clear-cut" distinctions.[60]

Morus, like other historians of nineteenth century science, argued that no study of electricity and experimentation could be done without a look at Michael Faraday. D.K.C. MacDonald's brief look at the "art of lecturing" in the life of Michael Faraday paled in comparison to Morus's examination. Morus suggested that Faraday "self-fashioned" and "carved out for himself" a position by which others were measured. "Faraday used his resources to make experiments, to make an audience for his work, to make himself such that he could capture that audience's interest."[61] Comparing Faraday's career with his mentor Sir Humphrey Davy, Morus agreed with fellow historian of science Jan Golinski that each man "employed strategies" to develop his career.[62] Morus suggested that laboratory genius would not have been sufficient for Faraday to rise into high society, and the author highlighted several occasions when Faraday honed his skills at performance.[63] Morus devoted considerable time in his study of Faraday's career to how he performed a

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[59] Ibid.

[60] Ibid.

[61] Ibid, 13.

[62] Ibid, 15.; See Golinski, chapter 7.

[63] Morus, *Frankenstein's Children,* 19.

lecture in order to emphasize the importance Faraday himself placed upon the art of theatrical science.

Morus also compared Michael Faraday to William Sturgeon in order to illustrate the different styles and approaches to the theatricality of public science. Sturgeon criticized Faraday's approach to the performance. Faraday used minimal props and instruments in his lectures. Information was "disembodied facts absent from the labor that made them."[64] Sturgeon utilized the inner workings of the apparatus used in an experiment to advance his explanations during a lecture.[65] To Morus, Faraday strategically "went out of his way" not to publicly debate those who argued against his work. Faraday's lectures at the Royal Institution were almost beyond contestation due to the method of performance that he used. Therefore, to the dismay of opponents like Sturgeon, Faraday created for himself a reputation that almost commanded the acceptance of his findings without discussion.[66] Morus's conclusion to the competition between Sturgeon and Faraday reflected the basic ideas for which Morus contributed to the historiography of nineteenth century public science. Morus argued that Sturgeon failed "because the audience he cultivated could not be maintained."[67] His experiments were worthy of consideration. His career, until the end, was a "resounding success," but this scientist's final outcome was determined by the intersection of popular science with

[64] Ibid.

[65] Ibid, 52.

[66] Ibid, 53.

[67] Ibid, 69.

society. His theatrical style did not prove to be as well devised as that of his rival Michael Faraday.[68]

Morus continued his arguments in his 2005 publication When Physics Became King, where he focused on the reasons that theatrical science became so popular. "Exhibitions played a crucial role throughout nineteenth century culture," explained Morus, due to the "rising middle classes [who] flocked to a whole range of public entertainments."[69] A new "world of display" was brought about by advertisers' attempts to draw the customer. Theaters, panoramas, dioramas, and magic shows were all in competition with performance lecturers for an audience.[70] Therefore the most successful and well-known scientists were those who not only contributed new ways of looking at the natural world but also explained those new ideas to middle and upper class socialites. In fact, the heightened sense of commodity and marketplace in the nineteenth century helped secure the scientist's place in society. Inventors sought the stage of performance lectures in order to secure buyers for their new invention. While scientists such as Faraday and those from the Royal Institution saw themselves as educators to the public, the stage of theatrical science was, for Victorian society, a place of exhibition, demonstration, and solicitation.[71]

Scientists and amateurs used theatrical science both formally and informally to showcase new theories and inventions to the public. The formal discourses held on Friday

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[68] Ibid.

[69] Iwan Rhys Morus, *When Physics Became King* (Chicago: University of Chicago Press, 2005), 88.

[70] Ibid.

[71] Morus, *When Physics…*, 113.

evenings showcased the latest discoveries from Michael Faraday and others from the Royal Institution. The "electrical soirees" held by the wealthy amateur electrician John Peter Gassiot "were less formal but almost as prestigious." Least formal of all were the displays of new inventions at the Adelaide Gallery.[72] Morus explained that competition among the various types of performance lectures resulted in the question of whether or not "entrepreneurial activity should be a bar to inclusion in a gentlemanly scientific culture."[73] Morus did not answer the question; however, he suggested that professional scientists did not look favorably upon those who sought wealth through invention. Morus proved that society and science were intertwined during the nineteenth century, and the art of theatrical science played a principle role in this intersection.

Theatricality and showmanship permeated the sciences as Morus, Golinski, and Secord have demonstrated. The debates over anesthesiology provided a trial ground for historians to begin reevaluating the place of theatrical science in the scientific debates. Because the experiments took place in such a wide variety of locations and the debates impacted society on so many levels, future scholarship should note the theatrics involved in the debates and exhibitions as a factor in the outcome of the debates.

The historiography of physical science in the nineteenth century began with the assumption that the scientific discovery and the impact on the future of science were the only important factors to be considered. However, in the last twenty years, the role theatricality played in the process of disseminating information to the public has been

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[72] Ibid, 114.

[73] Morus, *Frankenstein's Children,* 164.

explored more significantly. The rise of great physicists like Davy and Faraday were a direct result of the showmanship associated with performance lectures and theatrical science. The elite scientists of the Royal society considered themselves to be above the influence of society, yet it is the collision of the nineteenth century consumer oriented society with scientific development that created theatrical science which sparked a growing interest in science at the turn of the century.

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