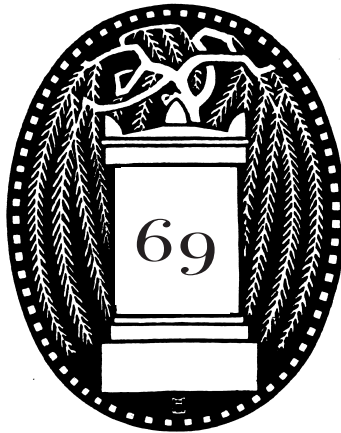


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“The Practical Value of Science”¹: Philanthropy, Capitalism, and the Origin of Public Science Education in the Nineteenth-Century United States

Kasey M. Sease, The College of William & Mary

Despite the established body of literature on philanthropy and nonprofit corporations, scholars largely neglect the connection between early, U.S., public-serving institutions and public, science education’s origin. Similarly, historians of science museums and science publications rarely contextualize their findings within American capitalism’s² history. By exploring documents chronicling the founding of the little-studied Boston Society of Natural History (BSNH), the Massachusetts Institute of Technology (MIT), and *Science* magazine, I address both these oversights. I argue nineteenth-century, public-serving, not-for-profit organizations dedicated to public, science education originated, operated, and institutionalized public, science education within the evolving, U.S., capitalist economy. I trace these organizations’ path to success by illuminating how their members emphasized an intimate relation between scientific innovations and economic progress thereby attracting much-needed, financial support from philanthropists and state representatives willing to invest in projects supporting public, science education. I begin by contextualizing the nineteenth-century rise of public science education in the U.S. within the nation’s evolving capitalism highlighting P. T. Barnum and his American Museum and James Smithson’s endowment that became the Smithsonian Institution. Next, I examine science societies’, American capitalism’s, and public, science education’s intertwined stories using the BSNH’s attempt to establish a public museum and *Science* magazine’s early history as illustrative examples. I then explore nineteenth-century scientists’ flexible roles in and philanthropists’ informal financing of public, science education before such twentieth-century capitalists as the Carnegies and Rockefellers endowed long-term, public projects demonstrating how the BSNH and MIT emphasized public, science education’s value to the gradually industrializing U.S. economy. Finally, I consider how for-profit popularizers inspired the content and form science societies distributed

in their journals when attempting to marry science literacy's popular appeal and economic justifications with expert-driven information and authority.

P. T. Barnum's and James Smithson's Contributions to Public Science Education

In July 1865, flames ripped through P. T. Barnum's American Museum in New York.³ Several of his collections, including natural history exhibits, live animals, and spectacular sideshow attractions, were lost, singed, or burned to ash. Since its erection in the 1850s, the museum welcomed a wide variety of guests through its doors ranging from local children to travelling naturalists.⁴ Because the public attention afforded the museum in press coverage and ticket sales was not lost on Barnum, he soon endeavored to bring the operation back to life.

By 1866, Barnum and the Van Amburgh Menagerie Company opened the second American Museum in a new venue on Broadway.⁵ The famous entertainer had lofty goals for his budding establishment branding "Barnum & Van Amburgh's Museum and Menagerie Combination" as a much-needed educational "Institute."⁶ In an illustrated guide to the animals on display, Barnum proclaimed an American "should study the history of animated nature, [and] make himself master of a science on which his own happiness depended;" such edification "could not fail to advance the great causes of civilization and learning."⁷ Lamenting the state of U.S. public education, Barnum explained that "all the enlightened states of Europe...have, at vast labor and expense established institutes, made up of the animal world, for the purpose of aiding the propagation and advancement of science and useful knowledge."⁸ His native country, in contrast, had done "nothing...and probably nothing ever w[ould] be done."⁹ According to Barnum, the federal government failed the public by not supporting natural history and science institutions; therefore, if states also withheld financial support, museums, educational institutes, and print publications could not flourish.

Not only did Barnum do more in his illustrated guide than write about the animals on display, he was more accurate in his account of the U.S.' natural history and science education than he likely intended in this huckstering pamphlet. In the mid-nineteenth century, few opportunities existed for those in the U.S. casually to learn about science; nearly all venues for learning about natural history and science were on the east coast and primarily for researchers and specialists. For example, U.S. Congress did not originally create the Smithsonian Institution for the public. In fact, not only did Congress take more than a decade to transform James Smithson's founding gift into the Smithsonian

Institution, largely because congressmen disagreed over how to use Smithsonian's money,¹⁰ but first considered options supporting researchers and specialists rather than the public-at-large. While several senators maintained Smithsonian intended the funds to establish a university with graduate programs in new scientific fields,¹¹ John Quincy Adams lobbied to erect an astronomical observatory where experts apply astronomers' research to naval operations.¹² Meanwhile, although the public rarely entered these politicians' debates except to agree that whatever research the institute yielded should benefit U.S. society in a myriad of ways,¹³ Congress ultimately reserved this iconic, red-bricked, castle's square footage primarily for laboratories and a library rather than public exhibits that would directly benefit U.S. citizens.¹⁴ By the 1860s, the United States had no shortage of science societies and politicians interested in the practical uses of both amateur and newly credentialed scholars' scientific observations; it did, however, lack anything resembling the plethora of public science resources those in the U.S. can easily access today—often without cost.

The foundations for the U.S.' present-day, science museums, educational programming, and print publications were laid in the mid-to-late nineteenth century. During that time, philanthropic societies and not-for-profit corporations institutionalized public, science education, or the mass communication of scientific information to audiences beyond the academy. However, initially, these societies and corporations faced financial difficulties and, on occasion, outright failures. Only after these groups took advantage of the industrializing economy—and the social, political, and professional changes that accompanied it—did they succeed in creating museums and publications capable of reaching audiences other than researchers and emerging specialists. Not-for-profit scientific societies offered U.S. citizens resources distinct from such popularizers and entertainers as P. T. Barnum by: relying on private donors and welcoming businessmen into their societies; adapting the content of science instruction explicitly to link scientific knowledge with economic progress; and taking over failing, for-profit infrastructures to sustain educational projects. Touting philanthropic goals for bettering U.S. society, not-for-profit, scientific societies originated, operated, and dissolved within contemporary, capitalist structures resulting in a new kind of public, science instruction.

Historiography

Until the 1970s, little of the considerable scholarship on U.S. educational, public institutions and nonprofit corporations addresses the evolution of public science resources.¹⁵ Even less of that literature focuses on the origins of public science research in light of the exploding scholarship on American capitalism's history.¹⁶ Some scholars

have examined the links between the United States' capitalism and philanthropy, but their work disproportionately focuses on the late twentieth and early twenty-first centuries' service-based and financial capitalism.¹⁷ Through my project, I urge historians to examine the U.S.' gradual industrialization in the mid-to-late nineteenth century as a critical moment in public science education.¹⁸

Telling the intertwined stories of science societies, American capitalism, and public, science education requires historians to embrace the varying roles contemporary scientists assumed when designing new institutions and publications—especially since university personnel, self-proclaimed specialists, and the U.S. public gradually drew and contested the line between amateur and professional across several decades.¹⁹ Typically, scholars make important distinctions between scientists and their more public, journalist and philanthropist peers to emphasize the former's expertise while highlighting the latter's ability to communicate clearly or proficiently to manage a business. For example, in his 1967 book, *Science and the Mass Media*, journalism professor Hillier Kriehbaum claimed science news reporters "had to be alert enough—and this implies an understanding of the basics of 'pure' science, technology, and medicine—to ask intelligent questions and to comprehend the answers."²⁰ Yet, if reporters learned too much, perhaps by obtaining a degree in a scientific field, their articles would fill with jargon, rendering their writing "incomprehensible to all except the specialists."²¹ Kriehbaum gave his readers valuable advice on the importance of clear journalism. However, he did so without acknowledging critical overlap between journalists' and scientists' professional identities when the two worked together to report science news. Where one begins and the other ends is more complicated than achieving a degree. Indeed, nineteenth-century, science professionals could be journalists and scientists, among other things, as they sought recognition and funding for their scholarly work from newly minted university professors, well-known European academics, and such nonspecialists as businessmen and politicians. Furthermore, as figures like Barnum reveal, when U.S. specialized and credentialed scientific education was beginning, many were questioning the distinctions between scientist and popularizer.

By examining two illustrative examples—the Boston Society of Natural History's attempt to establish a public museum and the early history of *Science* magazine—I demonstrate how several scientists and self-proclaimed students of science in the mid-to-late nineteenth century acted as journalists, philanthropists, activists, and businessmen to sell their ideas to the U.S. public. To keep their educational ventures afloat, they constructed and embodied scientific expertise to distinguish

themselves from such popular outlets as *Popular Science Monthly* and *Scientific American*. Scientists who grappled with their competing professional identities defined popularism and public education as related, but ultimately different, pursuits.

Philanthropy, Capitalism, and Nineteenth-Century, Science Societies

Historians frequently cite U.S. philanthropy as beginning at the turn of the twentieth century when a new generation of industrialists and capitalists proceeded to invest their excesses in libraries, universities, museums, and other public works' projects in the name of the common good.²² Nevertheless, philanthropy existed well before the Carnegies and Rockefellers though not on the same scale or with the same ideological motives. Gifts of ten- or twenty-thousand dollars could help begin or temporarily sustain a project, but such gifts could not ensure the long-term projects twentieth-century endowments begot. Nineteenth-century, science societies often depended upon a series of small donations to maintain financial solvency. Indeed, societies dedicated to public, science education branded themselves as philanthropic operations committing their members to a variety of roles including expert, educator, and advocate.

The Boston Society of Natural History (BSNH) is indicative of this early period of informal financing and flexible roles nineteenth-century scientists assumed. As early as the 1810s, the BSNH's membership, a conglomerate of physicians, clergymen, and small, interested businessmen, believed in "the rapid increase and value of [a] Museum" in natural history; however, their finances crippled any plan of action until philanthropy transformed the BSNH from society to public museum.²³ After two failed attempts to get the organization off the ground, the Commonwealth of Massachusetts incorporated the BSNH in 1831.²⁴ At the time, members hoped to dedicate its activities "to public patronage" and communicate "the importance of literature and science" to "the inhabitants of New England."²⁵ According to a brief history the society published in 1869, the BSNH teetered on the edge of dissolution throughout the 1830s, crushed under "the heavy expense attending the formation of a cabinet, and the attempt to establish a scientific journal, when natural history was not so popular."²⁶ During this time, the society experimented with a variety of funding methods. First, the BSNH assigned "every donation, whether to the museum or library, to some member" who would then "make it the basis of an essay"²⁷ publicized to advertise and spark "zeal or interest" in first-time donors.²⁸ When this strategy proved insufficient, the BSNH offered "a number of short popular lectures...[to] the public."²⁹ While these lectures did not engender the educational experience members intended

to offer New Englanders in a physical museum, they introduced curious parties to the society's potential to offer New Englanders intellectual stimulation and educational growth. Nonetheless, the lectures were not enough to secure financial solvency.

Members of the BSNH were delighted and surprised when, in 1834, a wealthy Boston merchant, Ambrose S. Courtis, relatively unknown to the BSNH's members, "forwarded a copy of his will" to the society.³⁰ In its pages, he "bequeathed to the Society several sums for specific purposes—amounting in all to fifteen thousand dollars—and an order for the immediate payment of" two thousand dollars.³¹ This gift—the society's "first permanent endowment"—introduced hope and uncertainty into the organization's coffers.³² According to a society publication, Courtis was partner to a firm that shipped and sold "wholesale dry goods."³³ While Courtis confined his professional pursuits to the business district, he had "early acquired a taste for literature and science...devoting much spare time...in reading works upon his favorite pursuits."³⁴ Although the society preferred the membership of white, male, scientific professionals, its bottom line begged an exception be made for such philanthropic laymen as Courtis.

Celebration for the donation ended abruptly three years later when the fits and throes of early, U.S. capitalism wreaked havoc on Courtis' initial two-thousand-dollar gift. The "money was unfortunately lost" due to "the failure of [a] bank" amid the Panic of 1837,³⁵ an economic crisis of currency brought on by British speculation on U.S. cotton. When the bubble burst, U.S. banks failed in the hundreds as specie dried up, and British banks refused to accept payment in paper currency.³⁶ An unregulated banking system caught in the web of global speculation threatened the BSNH's funds desperately needed for survival, but the society managed to renegotiate the deal with an ailing Courtis ensuring a gift of ten thousand dollars upon his death.³⁷

The original Massachusetts legislation that incorporated the BSNH also prevented the society from acquiring an annual income exceeding three thousand dollars.³⁸ The evolving U.S. economy was gradually producing more wealthy families in the 1830s and '40s, but there was no comprehensive, legislative infrastructure governing charitable donations.³⁹ Before World War II, no legal designation existed for nonprofits akin to the 501(c) system in place today.⁴⁰ Instead, states placed individualized restrictions on organizations' property and income that differed in form from that of their explicitly for-profit peers. Thus, such groups as the BSNH had to appeal to state legislatures when requesting amendments to their corporate charters. Like most administrative procedures, these amendments took time. Indeed, almost

thirty years passed before the Massachusetts' governor signed a bill allowing the BSNH to hold an "annual income whereof shall not exceed the sum of ten thousand dollars."⁴¹ By 1865, the legislature upped the amount to twenty thousand dollars.

Once the BSNH salvaged Curtis' gift from the recession and rigid corporate law, the society was one step closer to offering a public, educational institution of natural history. However, with civil war on the horizon, science societies needed more than a businessman's fleeting interest in their fields to stock treasuries and transform the idea of a museum into a brick-and-mortar institution. In 1857, BSNH members, a horticultural society, and the budding Massachusetts Institute of Technology banded together to convince the state to grant them land upon which to erect a series of public educational institutions.⁴² Over the course of four years, they drafted, revised, and wrote publicized letters in support of a plan to establish "a society of arts, a museum of arts, and a school of industrial science" in Back Bay, Boston.⁴³ The BSNH was promised one third of the land if it were willing to contribute its intellectual resources to the proposed educational district.⁴⁴ By attaching itself to MIT's initiatives, the BSNH began explicitly to justify its activities in terms of economic benefits.

The committee responsible for promoting MIT, headed by the Institute's founder, William B. Rogers, forged a direct link between science education and the U.S.' economic progress. In *Objects and Plan of an Institute of Technology*, its members argued: "in the recent progress of the Industrial Arts,—including commerce and agriculture, as well as the manufacturing, and, more strictly, mechanical pursuits,—we meet with daily increasing proofs of the happy influence of scientific culture on the industry and the civilization of nations."⁴⁵ From their perspective, the "practical nature of the discoveries in chemistry, mechanics, geology, and other branches of scientific inquiry" accelerated the growth of U.S. industry.⁴⁶ However, the U.S. public's access to that knowledge was limited. Like Barnum's claims in 1866, the committee argued that "most enlightened communities of Europe h[ad] endeavored to provide for the practical co-operation of Education and the [manufacturing] Arts, by the establishment of Museums, Societies, and Colleges of Technologies."⁴⁷ The United States, in contrast, lacked institutions dedicated to communicating the "connection between industrial progress and an enlarged acquaintance with the objects and phenomena of nature and with physical laws."⁴⁸ Massachusetts could begin to fill the nation's gap in public, science education if state government agreed to grant land to the Institute.

This connection between the natural world and industry provided the BSNH an opportunity to join its initiatives with MIT's. Committee

members intended to make MIT's resources, including a "Museum of Industrial Art and Science, Or Conservatory of Arts," opened and accessible to all "fellow citizens."⁴⁹ MIT's museum was slated to house exhibits on "mineral materials" and "organic materials" to display "the whole history of each leading object, from its origin to its appropriation by the more advanced industrial processes."⁵⁰ Information on the sources of such profitable crops and animal products as cotton and wool was necessary if museum patrons were to understand their economy and its relation to science. Who better to inform MIT and Boston's local citizenry about New England's plants and animals than the BSNH? In 1861, the Massachusetts legislature agreed that locating the society's museum next to MIT in Back Bay would benefit the Institute and a general public increasingly searching for scientific information amid its industrializing economy.⁵¹ MIT obtained its charter, and the BSNH secured land for its museum.

The outbreak of civil war ultimately crippled MIT's efforts to establish its own museum and delayed the opening of the Institute. However, the BSNH gained enough public attention and support from the initiative to erect its cabinet.⁵² The Museum of the Boston Society of Natural History officially opened its doors in 1867. The BSNH achieved success by explicitly justifying their mission of public, science education in terms of its value to the industrializing U.S. economy.⁵³ Although MIT's and the BSNH's concept of economic progress preceded scientific management theories and social Darwinism unique to the Progressive Era, public educational resources in Europe informed their advocating science as "useful," an idea central to U.S. Progressivism.⁵⁴ Scientific discoveries promised nineteenth-century, U.S. residents more than personal enlightenment. These discoveries could yield new equipment, raw materials, and profits.

Science Societies, For-Profit Ventures, and Public Education

The effects of American capitalism on nineteenth-century, public, science education were not limited to fundraising. For-profit popularizers inspired the content and form of information science societies distributed. While organizations like the BSNH wished to distinguish themselves from such capitalist ventures as Barnum's museums, they still needed to sell a product to earn attention: accurate and comprehensible information. In this section, I present the tumultuous founding of *Science*, the preeminent journal of the nonprofit, American Association for the Advancement of Science (AAAS). After private owners bought and sold *Science* for decades, the AAAS adopted it in 1900 attempting to marry science literacy's popular appeal and economic justifications with expert-driven information and authority.⁵⁵

Science journals and magazines were notoriously difficult to sustain in the nineteenth-century U.S.⁵⁶ One scholar determined that “a new journal had about a 50–50 chance of lasting five years.”⁵⁷ As BSNH members recognized in 1869, no widespread, public audience for scientific information existed before mid-century.⁵⁸ By the late nineteenth century, such popular magazines as *Scientific American* had gradually built a stable readership, but their long-term solvency was due more to such side-businesses as patent agencies that absorbed print costs in times of financial uncertainty.⁵⁹ By the 1880s, some, high-profile scientists established their own journals to compete with the popular outlets of their day—but without the aid of those commercial side ventures.

After entertaining New York-journalist and experienced writer for *Popular Science Monthly* John Michels’ proposal to offer *Science’s* readers something different, Thomas Edison hired Michels as editor and invested his own capital into *Science: A Weekly Journal of Scientific Progress*.⁶⁰ For years, Edison had hoped to witness the creation of a U.S. publication similar to Britain’s *Nature*; he now seized the opportunity to fund and control its content.⁶¹ In the 1880 inaugural issue’s salutatory address, Michels explained the journal would “afford scientific works in the United States the opportunity of promptly recording the fruits of their researchers, and facilities for communication between one another and the world.”⁶² Furthermore, “a distinctive feature in the conduct of this journal will be that each department of science will be supervised by some recognized authority in that field of research.”⁶³ Unlike the “many excellent weekly journals restricted to special branches of science, or allied to trade interests,” the experts writing for and supervising *Science* “would guarantee that accuracy be maintained so far as possible.”⁶⁴ In subsequent issues, Michels further distinguished *Science* from popular magazines by emphasizing that “no editorial bias has been given to any particular set of views.”⁶⁵ He asserted the importance of sticking to scientific facts and shying away from opinion-based controversies, especially those revolving around questions of science and religion.

Michels’ hesitancy to press his pen too firmly to paper should not imply that *Science* abstained from adopting any overarching narratives. The journal’s content directly linked scientific research to economic progress, this time defined by new standards of efficiency and productivity. In *Science*, Michels foregrounded articles whose authors stressed scientific information’s usefulness in a rapidly changing economy. For example, in the first issue, Michels included famed, English, biologist, Thomas Henry Huxley’s short, pointed piece: “The Practical Value of Science.”⁶⁶ Huxley explained to readers that “there are hardly any of our trades, except the merely huckstering ones, in which

some knowledge of science may not be directly profitable to the pursuer of that occupation.”⁶⁷ Huxley communicated to scientists and laymen alike science literacy’s literal worth in industrializing societies. Like the science societies that supported MIT, *Science’s* readers, especially members of the academy, responded positively to this narrative. Impressed by “the numbers” of copies distributed in its first year, a former president of the AAAS wrote the editor in 1880 congratulating him on the journal’s success.⁶⁸

Edison, in contrast, was unhappy with the journal’s profit margins.⁶⁹ He pressured Michels to increase subscriptions. By 1881, academics dominated *Science’s* readership—Michels had to make significant changes to the journal to attract laymen.⁷⁰ He expanded the content readers enjoyed pledging to devote “four extra pages” to “the most recent application of scientific principles to the arts and manufactures.”⁷¹ He introduced reviews of popular books detailing the accurate history of scientific minds and discoveries.⁷² The second volume of *Science* even had pictures; the title page branded the journal an “illustrated” publication.⁷³ Yet, the editor’s efforts could not lift *Science’s* bottom line high enough for Edison’s approval.

Alexander Graham Bell bought the publication in 1883.⁷⁴ His editorial board evolved Michels’ journal to exemplify a similar—and more successful—form of public, science education. The Board kept the message of science’s impact on the economy. The new series kicked off with “The Future of American Science,” an article which informed readers

...there are in our country able investigators working in scientific fields which do not offer the promise of material reward; but notwithstanding this, it remains still true that those sciences whose principles are capable of useful application are the most zealously cultivated among us.⁷⁵

The editors concluded: “Nor is this to be at all regretted.”⁷⁶ They also continued to distinguish their accessible, educational journal from popular magazines by emphasizing the role of scientific experts in its publication. The editors added new sections devoted to general news on “The Progress of Science” and “American Scientific Stations.”⁷⁷ Intending further to increase readership by targeting both scientists and laymen, editors added book reviews to these general news pages.

Bell’s publication lasted eleven years before he decided to sell *Science* to psychologist James McKeen Cattell.⁷⁸ *Science* returned to circulation in 1895 boasting a new-and-improved version of its predecessor. The chief editor informed readers that “there is room for a journal devoted to the promotion of intercourse among those interested in the study of

nature.”⁷⁹ Yet, the editorial board faced “difficulty in adapting it to the wants of all classes of subscribers.”⁸⁰ While the U.S. was home to “numerous local scientific societies[,]...these bodies cannot supply the want of national cooperation and communication.”⁸¹ Interest beyond the academy was necessary to sustain the publication; yet, scientists could only simplify their findings so much before losing the interest of other experts in related fields. As a result, the editor promised *Science* would “have little space for technicalities which interest only the specialist of each class.”⁸² However, the journal would privilege “those broader aspects of thought and culture which are of interest not only to scientific investigators, but to educated men of every profession.”⁸³ The public audience *Science* defined under Cattell’s leadership was therefore more restricted than in the journal’s earlier iterations. In Cattell’s view, merely curious, uneducated readers lacked the intellectual acumen necessary to comprehend in-depth, if jargon-light, explanations of scientific topics. Effectively, Cattell wished to market *Science* to the intelligent readers who made up the United States’ middle and upper classes.

This new focus, as well as the increasing number of pages devoted to science societies’ activities, attracted the attention of the AAAS. The association partnered with Cattell in 1900 to rebrand *Science* as the official journal of the AAAS. While the audience was more limited, much of the content and organization Edison and Bell established remained. Scientists’ and popular scholars’ book reviews received their own permanent section. General news on scientific discoveries, universities, and educational institutions occupied every issue’s final pages. The AAAS regularly published articles devoted to research with practical applications including studies of valuable minerals, new inventions, and federal reports on economic industries.⁸⁴ Decades of for-profit tinkering shaped *Science*. When Cattell merged the publication with the AAAS, the journal moved the society another step toward becoming the United States’ largest science society. Today, the association credits this “alliance” with an “increase [in] the association’s membership” and a “boost [in] the magazine’s revenues.”⁸⁵ By allying with an unstable, for-profit venture and adopting a format designed to maximize profit, the AAAS gave birth to a publication that has served scientists and the educated public for over 100 years.

Conclusion

Throughout decades of trial and error, not-for-profit, science societies and corporations delivered nineteenth-century U.S. citizens their versions of public, science education. The unstable and evolving, industrial economy generated opportunities and threats to educational institutions and publications. Acting as philanthropists and advocates for

their professional fields, emerging scientists partnered with businessmen to bring U.S. citizens useful knowledge. Societies created new, fundraising tactics to invigorate limping museums. Economic panics dissolved critical donations and distracted potential revenue sources. In sum, one cannot divorce public, science education's origin in the nineteenth-century U.S. from capitalism's ever-changing environment. Even among the educated classes, new economic realities and hope that an increase in science literacy would lead to greater economic progress shaped the very information scientists communicated to the public. In his autobiography, *Struggles and Triumphs*, P. T. Barnum asserted: "the history of money getting, which is commerce, is a history of civilization, and whenever trade has flourished most, there, too, have art and science produced the noblest fruits."⁸⁶ Through their tireless efforts, marred by bouts of failure, science societies adapted to meet the waves of gradual industrialization head-on. To educate U.S. citizens in science, they learned the art of money getting.

Endnotes

- 1 [Thomas Henry] Huxley, "The Practical Value of Science," *Science* 1, no. 1 (July 1880): 3.
- 2 While I agree historians should move away from using "America" and "American" when referring to the United States and its citizens since those in Canada and Latin America are also Americans, scholars of capitalism use "American capitalism" purposefully throughout the literature. I use the term occasionally in this article to gesture and connect my research to those scholars and that literature. For a recent example of preeminent scholars using the term "American Capitalism," see Sven Beckert and Christine Desan, eds., *American Capitalism: New Histories* (New York, NY: Columbia University Press, 2018).
- 3 John Rickards Betts, "P. T. Barnum and the Popularization of Natural History," *Journal of the History of Ideas* 20, no. 3 (1959): 353–368, 356–357; Steven C. Levi, "P. T. Barnum and the Feejee Mermaid," *Western Folklore* 36, no. 2 (1977): 149–154, 153–154.
- 4 Betts, "P. T. Barnum and the Popularization of Natural History," 355.
- 5 *Ibid.*, 358.
- 6 Barnum & Van Amburgh's Museum and Menagerie, *Illustrated and Descriptive History of the Animals Contained in Barnum and Van Amburgh's Museum and Menagerie Combination* (New York, NY: S. Booth, 1866), vi–viii.

- ⁷ Ibid., v–vi.
- ⁸ Ibid., vi.
- ⁹ Ibid., vi–vii.
- ¹⁰ George Brown Goode, “The Founding of the Institution, 1835–1846,” in *The Smithsonian Institution, 1846–1896*, ed. George Brown Goode (Washington, DC: The Smithsonian Institution, 1897), 26–28.
- ¹¹ Ibid., 32.
- ¹² Ibid., 33.
- ¹³ Ibid., 26–28.
- ¹⁴ “History of the Smithsonian Institution,” in *The Albion: A Journal of News, Politics and Literature* (December 30, 1854).
- ¹⁵ For the development of such U. S., public, education, institutions as museums, please see Steven Conn, *Museums and American Intellectual Life, 1876–1926* (Chicago, IL: The University of Chicago Press, 2000); Jeffrey Trask, *Things American: Art Museums and Civic Culture in the Progressive Era* (Philadelphia, PA: University of Pennsylvania Press, 2011). For scholarship on the development of nonprofit corporations in the United States, please see Oliver Zunz, “Chapter 1: For the Improvement of Mankind,” in *Philanthropy in America: A History* (Princeton, NJ: Princeton University Press, 2012), 8–43; Peter Dobkin Hall, “A Historical Overview of Philanthropy, Voluntary Associations, and Nonprofit Organizations in the United States, 1600–2000,” in *The Nonprofit Sector*, eds. W. W. Powell and R. Steinberg (New Haven, CT: Yale University Press, 2006), 32–65; Paul Arnsberger, Melissa Ludlum, Margaret Riley, and Mark Stanton, “A History of the Tax-Exempt Sector: An SOI Perspective,” *Statistics of Income Bulletin* (Winter 2008): 105–135; Oliver Zunz, *Philanthropy: A History* (Princeton, NJ: Princeton University Press, 2012). Recent examples of scholarship on public science education include Marcel C. LaFollette, *Science on American Television: A History* (Chicago, IL: The University of Chicago Press, 2013); Victoria E. M. Cain and Karen Rader, *Life on Display: Revolutionizing U.S. Museums of Science and Natural History in the Twentieth Century* (Chicago, IL: The University of Chicago Press, 2014); Rebecca Onion, *Innocent Experiments: Childhood and the Culture of Public Science in the United States* (Chapel Hill, NC: The University of North Carolina Press, 2016).
- ¹⁶ Examples of scholars who examine nineteenth-century relationships between scientists and predominantly *laissez-faire* politicians include: Howard S. Miller, “The Political Economy of Science,” in *Nineteenth-Century American Science: A Reappraisal*, ed. George H. Daniels (Evanston, IL: Northwestern University Press, 1972), 95–112; John Rae, “The Application of Science to Industry,” in *The Organization of*

Knowledge in Modern America, 1860–1920, eds. Alexandria Oleson and John Voss (Baltimore, MD: The Johns Hopkins University Press, 1979): 249–268. One of the few scholars who explicitly discusses the development of science museums alongside capitalism is Lukas Rieppel. Rieppel explores the business of buying and selling dinosaur casts for natural history museums in “Bringing Dinosaurs Back to Life: Exhibiting Prehistory at the American Museum of Natural History,” *Isis* 103 (2012): 460–490. His book, *Assembling the Dinosaur: Science, Museums, and American Capitalism, 1870–1930*, is currently under contract with Harvard University Press.

¹⁷ Scholarship on the connection between capitalism and nonprofits exploded in the 1980s with such studies as Dennis R. Young’s *If Not for Profit, For What?: A Behavioral Theory of the Nonprofit Sector Based on Entrepreneurship* (Lexington, MA: Lexington Books, 1983). Since then, historians, sociologists, and economists have chronicled the phenomenon associated with the evolution of finance capitalism in *The Nonprofit Sector in the Mixed Economy*, eds. Avner Ben-Ner and Benedetto Gui (Ann Arbor, MI: The University of Michigan Press, 1993); Theo N. M. Schuyt, *Philanthropy and the Philanthropy Sector: An Introduction* (Farnham, Surrey: Ashgate, 2013); and Kyle Westaway, *Profit & Purpose: How Social Innovation is Transforming Business for Good* (Hoboken, NJ: Wiley, 2014).

¹⁸ Historians currently attribute George Brown Goode, Assistant Secretary of the Smithsonian from 1887–1896, and his associates with the “New Museum Idea,” or the revelation that “museums’ obligations [were] to the public,” and “museums’ new missions were best carried out by a well-trained, professionalized work force.” These ideas originated in the 1890s as Goode and the newly founded American Association of Museums spread the concept “across the country and communicated with each other to perfect their profession.” Their work was a success, but failed institutions and limping publications that taught powerful lessons preceded it. By examining science societies’ early attempts to establish museums and save failing, for-profit publications, I argue that these groups used philanthropy to begin developing public, science education. As early as the 1830s, science societies reacted to changes in the U.S. economy by crafting their business models and educational resources to survive and thrive in a long, gradual era of industrialization. The quotations in this note come from Cain and Rader, *Life on Display*, 17–18.

¹⁹ For an examination of the popularization of science in the United States, see Donald M. Scott, “The Popular Lecture and the Creation of a Public in Mid-Nineteenth-Century America,” *The Journal of American History* 66, no. 4 (1980): 791–809; Matthew D. Whalen and

Mary F. Tobin, "Periodicals and the Popularization of Science in America, 1860–1910," *Journal of American Culture* 3, no. 1 (1980): 195–200; Hyman Kuritz, "The Popularization of Science in Nineteenth-Century America," *History of Education Quarterly* 21, no. 3 (1981): 259–274; Marcel C. LaFollette, *Making Science Our Own: Public Images of Science, 1910–1955* (Chicago, IL: The University of Chicago Press, 1990); Louise Henson, et. al., eds., *Culture and Science in the Nineteenth-Century Media* (Burlington, VT: Ashgate, 2004); John Bruni, *Scientific Americans: The Making of Popular Science and Evolution in Early, Twentieth-Century, U.S. Literature and Culture* (Cardiff, Wales: University of Wales Press, 2014).

- ²⁰ Hillier Kriehbaum, *Science and the Mass Media* (New York, NY: New York University Press, 1967), 21.
- ²¹ Kriehbaum, *Science and the Mass Media*, 22.
- ²² See Zunz, *Philanthropy in America*, 1–7.
- ²³ Sally Gregory Kohlstedt argues that the BSNH evolved as scientific professions changed in the nineteenth century in "From Learned Society to Public Museum: The Boston Society of Natural History," in *The Organization of Knowledge in America, 1860–1920*, eds. Alexandra Oleson and John Voss (Baltimore, MD: The Johns Hopkins University Press, 1976), 386–406. In contrast, in this article, I wish to emphasize the importance of the BSNH's financial sources and strategies to its eventually establishing a museum. Furthermore, Kohlstedt contends the society began "as a voluntary association of active amateurs" who endeavored to serve individuals, like themselves, who could not study science full time, see Sally Gregory Kohlstedt, "The Nineteenth-Century Amateur Tradition: The Case of the Boston Society of Natural History," in *Science and Its Public: The Changing Relationship*, eds. Gerald Holton and William A. Blanpied (Dordrecht, Holland: D. Reidel Publishing Company, 1976), 173–190 (quotation on page 173). She points out the term "scientist" was coined in the 1840s and, as decades passed, the BSNH began courting newly minted professionals to hold leadership positions in the society, as opposed to the physicians, clergymen, and other "gentlemen" who originally made up its membership. Kohlstedt rightly identifies the tension between amateurism and professionalization as one catalyst for change in the history of the BSNH. However, she underestimates the messiness of scientific professionalization before the 1850s and how that environment imbued the society's founding members with a confidence in their expertise that rendered them uncomfortable with the title, "amateur," from the beginning. Indeed, "amateur" neither appears in any of the Society's journals, published from 1837 to 1863, nor in the first ten volumes of its *Proceedings*, covering the years 1844

to 1866. As a result, I use the term “self-proclaimed students of science” in this article to refer to those nonscientists who maintained membership in the BSNH and studied the natural world.

²⁴ “Act of Incorporation,” in *Annual of the Boston Society of Natural History, 1868–69* (Boston, MA: Boston Society of Natural History, 1868), 7–9.

²⁵ “Sketch of Past History and Present Operations,” in *Annual of the Boston Society of Natural History, 1868–69* (Boston, MA: Boston Society of Natural History, 1868), 23.

²⁶ *Ibid.*, 32.

²⁷ *Ibid.*

²⁸ “Sketch of Past History and Present Operations,” 32.

²⁹ *Ibid.*

³⁰ *Ibid.*, 32–33.

³¹ *Ibid.*

³² *Ibid.*

³³ Thomas T. Bouvé, *Historical Sketch of the Boston Society of Natural History; With A Notice of the Linnaean Society Which Preceded It* (Boston, MA: Boston Society of Natural History, 1880), 26.

³⁴ *Ibid.*

³⁵ “Sketch of Past History and Present Operations,” 33.

³⁶ For information on the Panic of 1837, see Scott Reynolds Nelson, *A Nation of Deadbeats: An Uncommon History of America’s Financial Disasters* (New York, NY: Alfred A. Knopf, 2012), 95–125.

³⁷ “Sketch of Past History and Present Operations,” 33.

³⁸ “Act of Incorporation,” 8.

³⁹ Peter Dobkin Hall, “A Historical Overview of Philanthropy, Voluntary Associations, and Nonprofit Organizations in the United States, 1600–2000,” in *The Nonprofit Sector*, eds. W.W. Powell and R. Steinberg (New Haven, CT: Yale University Press, 2006), 32–65, 32.

⁴⁰ *Ibid.*, 36–37.

⁴¹ “An Act Concerning the Boston Society of Natural History,” in *Annual of the Boston Society of Natural History, 1868–69* (Boston, MA: Boston Society of Natural History, 1868), 9.

⁴² Kohlstedt, “From Learned Society to Public Museum,” 391–392.

⁴³ *An Act to Incorporate the Massachusetts Institute of Technology, and to Grant Aid to Said Institute and to the Boston Society of Natural History* (1861), 1–2.

⁴⁴ *Ibid.*

- ⁴⁵ *Objects and Plan of an Institute of Technology; Including a Society of Arts, a Museum of Arts, and a School of Industrial Science*, 2nd ed. (Boston, MA: John Wilson and Son, 1861), 3.
- ⁴⁶ *Ibid.*, 4.
- ⁴⁷ *Ibid.*
- ⁴⁸ *Ibid.*
- ⁴⁹ *Objects and Plan of an Institute of Technology*, 3, 13.
- ⁵⁰ *Ibid.*, 15.
- ⁵¹ *An Act to Incorporate the Massachusetts Institute of Technology*, 1.
- ⁵² Kohlstedt, “From Learned Society to Public Museum,” 391–392.
- ⁵³ Scholars disagree over contemporary understandings of science in the mid-to-late, nineteenth century. Such scholars as A. J. Angulo argue that Americans, especially elite donors, did not recognize value in claims that linked scientific discoveries to economic development. In *William Barton Rogers and the Idea of MIT* (Baltimore, MD: The Johns Hopkins University Press, 2010), Angulo claims that “during the 1850s and 1860s sponsoring education for the ‘industrial’ classes didn’t rank particularly high on the lists of priorities among Boston Brahmins” (92–93). Indeed, he contends donors supported the BSNH’s museum while balking on MIT’s because they were swayed by more-traditional understandings of science education or the idea that knowledge of natural history yielded personal enlightenment. Such historians as Noam Maggor agree elites wished to distinguish “between useful and beautiful;” however, they invested dollars from capitalist ventures into institutions that ultimately communicated both use and beauty to the public (see *Brahmin Capitalism: Frontiers of Wealth and Populism in America’s First Gilded Age* (Boston, MA: Harvard University Press, 2017), 14. The “useful” could not be absent from the public sphere if elites wished to define themselves in opposition to it. In the case of the BSNH, Sally Gregory Kohlstedt demonstrates how the society abandoned “the advancement of natural history itself” (which would fit better with the conception of science that Angulo describes) for an “obligation to educate the general public” in the 1860s (see “From Learned Society to Public Museum,” 391–392). I argue the BSNH achieved this transition in part by linking the study of natural history to the pursuit of practical knowledge. If the primary argument made by the BSNH to the Massachusetts legislature in 1860 hinged on “extending and perpetuating” the society’s “usefulness,” these words must have resonated with, or at least complicated, elites’ understandings of science education (see “Petitions in Aid: Boston Society of Natural History,” *An Account of the Proceedings Preliminary to*

- the Organization of the Massachusetts Institute of Technology* (Boston, MA: John Wilson and Son, 1861), 3.
- ⁵⁴ Ibid. For more information on the mid-nineteenth-century roots of progressive thought, see Jackson Lears, “Chapter One: The Long Shadow of Appomattox,” in *Rebirth of a Nation: The Making of Modern America, 1877–1920* (New York, NY: Harper Collins, 2009), 12–50. While Lears focuses on the political, economic, and cultural effects of civil war on contemporary understandings of reform and progress, I want to enter the history of science societies and capitalism into the conversation.
- ⁵⁵ Mildred S. Dresselhaus, “The AAAS Celebrates its 150th,” *Science* 282, no. 5397 (Dec. 1998): 2186–2190, 2187.
- ⁵⁶ Donald de B. Beaver, “Altruism, Patriotism and Science: Scientific Journals in the Early Republic,” *American Studies* 12, no. 1 (1971): 5–19; D. A. Kronick, *A History of Scientific and Technical Periodicals* (New York, NY: Scarecrow Press, 1962).
- ⁵⁷ Beaver, “Altruism, Patriotism and Science,” 6.
- ⁵⁸ “Sketch of Past History and Present Operations,” 32.
- ⁵⁹ According to Michael Borut, by 1860, *Scientific American* had achieved “a national circulation of almost 30,000 copies per week.” See Michael Borut, “The Scientific American in Nineteenth Century America,” (Ph.D. diss., New York University, 1977), vii–viii.
- ⁶⁰ Neil Baldwin, *Edison: Inventing the Century* (Chicago, IL: The University of Chicago Press, 1995), 120.
- ⁶¹ Ibid.
- ⁶² [John Michels], “Salutatory,” *Science* 1, no. 1 (July 1880): 6.
- ⁶³ Ibid.
- ⁶⁴ Ibid.
- ⁶⁵ [John Michels], “[Editorial],” *Science* 2, no. 79 (Dec. 1881): 617.
- ⁶⁶ Huxley, “The Practical Value of Science,” 3.
- ⁶⁷ Ibid.
- ⁶⁸ [John Michels], “[Editorial],” *Science* 1, no. 27 (Dec. 1880): 321.
- ⁶⁹ Baldwin, *Edison*, 120–121.
- ⁷⁰ [John Michels], “[Editorial],” *Science* 1, no. 27 (Dec. 1880): 321.
- ⁷¹ [John Michels], “[Editorial],” *Science* 2, no. 79 (Dec. 1881): 617.
- ⁷² Ibid.
- ⁷³ Ibid.
- ⁷⁴ Dresselhaus, “The AAAS Celebrates Its 150th,” 2187.

- ⁷⁵ “The Future of American Science,” *Science* 1, no. 1 (Feb. 1883): 1–3, 1.
- ⁷⁶ *Ibid.*
- ⁷⁷ “Weekly Summary of the Progress of Science,” *Science* 1, no. 1 (Feb. 1883): 15–25; “Intelligence from American Scientific Stations,” *Science* 1, no. 1 (Feb. 1883): 25–26.
- ⁷⁸ Dresselhaus, “The AAAS Celebrates Its 150th,” 2187.
- ⁷⁹ S. Newcomb, “To Our Readers,” *Science* 1, no. 1 (Jan. 1895): 1–2, 1.
- ⁸⁰ *Ibid.*
- ⁸¹ *Ibid.*, 2.
- ⁸² *Ibid.*
- ⁸³ *Ibid.*
- ⁸⁴ For examples of such articles, see Oscar H. Hershey, “Granites of the Sierra Costa Mountains in California,” *Science* 11, no. 265 (Jan. 1900): 130–132; J. A. Holmes, “The Deep Well at Wilmington, N.C.,” *Science* 11, no. 265 (Jan. 1900): 128–130; and R. H. T., “Annual Report of the Bureau of Steam Engineering of the Navy Department; 1899,” *Science* 11, no. 267 (Feb. 1900): 223–224.
- ⁸⁵ Dresselhaus, “The AAAS Celebrates its 150th,” 2187.
- ⁸⁶ P. T. Barnum, *Struggles and Triumphs: Forty Years’ Recollections* (Hartford, CT: J. B. Burr and Company, 1869), 499–500.