“Called From the Calm Retreats of Science:”
Science, Community, and the
Scientific Community in America, 1840-1870

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Abstract

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The history of American science has largely been based on an “incremental progress” model. These histories have sought to explain how the American scientific community, through a progressive series of developments, started from practically nothing in 1815 to become a scientific powerhouse in the twentieth century. The means through which the scientific community achieved this development was a process called “professionalization,” through which scientists created new standards of inquiry, exploration, and conclusion (i.e. norms of suitable questions and answers), propagated through a system of graduate education and national organization. Most historians of American science have equated the “birth of American science” in the 19th century with the “birth of professional science.”

This thesis is an attempt to explore 19th century American science in cultural rather than scientific terms. Adopting a sociological approach to the history of science, I studied how the American scientific community had been informed by different cultural values in the 19th century. Through this lens, professional science emerged as an expression of a paradigm of liberal individualism that became dominant in America by mid-century. This thesis then studies the Cincinnati Observatory, the first prominent national observatory, founded in 1842, as an example of science in the pre-professional age. The scientific work conducted by the Cincinnati Observatory was, like professionalism, informed by a broader cultural paradigm- the strains of republicanism that been present in American life in the first decades of the 19th century. Thus, this thesis explores American science not as a history of scientific development, but as a history of two competing traditions in 19th century American science-the republican tradition versus the professional/liberal tradition.

The Cincinnati Observatory was founded upon a strong commitment to community, civic engagement, and voluntary association. Through its director, Ormsby MacKnight Mitchel, the Observatory encouraged an ideal of “scientist as public educator.” In addition, the Observatory engaged in significant religious work, and attempted to harness scientific knowledge to serve the evangelical Protestant community. Professionalism, by contrast, created an exclusionary scientific community. Professional scientists placed importance on pursuing a career as a scientist and cultivating their own inner genius, rather than educating others. In addition, professional science emerged by the end of the century as a distinctly secular branch of knowledge. In all three areas explored throughout the thesis, the Cincinnati Observatory and the professional organizations reflect the broader ideas of republicanism and liberalism in American life.
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Introduction
Rethinking Modern Science

Long after Cincinnati astronomer Ormsby Mitchel had died, Simon Newcomb, an astronomer at the Nautical Almanac Office, commemorated him as a seminal figure in American science: “It is not unlikely that he sowed much of the seed from which the American astronomy of the present has developed,” he wrote.¹ Though Newcomb later became famous as a refiner and modernizer of scientific knowledge (Albert Einstein later called him the “last of the great masters” of Newtonian physics), he nonetheless remained fully aware of his debt to those before him, and thus his reverence for Mitchel, who was among the first American physicists to be internationally famous.² In 1860, though, Newcomb’s reverence for Mitchel was noticeably lacking when he reviewed Mitchel’s latest book, Popular Astronomy, in the magazine Atlantic Monthly. His review criticized, sometimes aggressively, what he found to be errors in logic, conclusion, and simple facts, many of which are “so grave, that they are difficult to be accounted for, except on the supposition that some portions of the work were written in great haste.”³ Ultimately, however, Newcomb conceded that “we have criticized this work from a scientific rather than from a popular point of view,” and that, from a popular point of view, the book may still be acceptable. This concession, far from legitimating Mitchel’s work, actually reveals Newcomb’s underlying dissatisfaction with it: that, though Mitchel was an astronomer of significant prestige, his work was merely “popular” and didn’t cohere with what Newcomb believed to be “scientific.”

¹ quoted in Bruce 1987, 117
² Einstein quotation from Moyer 1992, xi
³ Newcomb, Atlantic Monthly 6 (1860), 117
Mitchel was, in fact, far from unscientific, and was quite respected in the international scientific community. In 1843 he had founded the Cincinnati Observatory, the first large observatory in the nation, and in 1850, he was inducted into the Royal Astronomical Society, a recognition of which some American astronomers could only dream. He corresponded regularly with European scientists such as Astronomer Royal G.B. Airy and hosted other prominent scientists such as the Harvard mathematician Benjamin Peirce. It would therefore be inaccurate to interpret Newcomb’s dissatisfaction with Mitchel’s work as an example of an educated scientist chastising an ignorant amateur. Rather, Newcomb’s dissatisfaction signifies that, between Mitchel’s time and Newcomb’s time, the American scientific community had undergone significant changes. It had professionalized; that is to say, it had organized nationally under specifically delineated standards of study and practice, which were reinforced through the conferring of graduate-level degrees as well as through awards and honors within the scientific community. The pre-professional context of Mitchel’s career, and the professional context of Newcomb’s career, impacted the ways in which each defined themselves as scientists. These differing contexts also caused Mitchel and Newcomb to define “proper science” in different ways.

In Mitchel’s time, scientific institutions served broad social goals, unrelated to the acquisition of scientific knowledge, by attempting to improve the nation and the citizenry, intellectually and morally. Though Mitchel exhibited some professional characteristics, his approach to science is still nonetheless largely pre-professional; however, in order to avoid treating Mitchel as simply a preliminary step towards something believed to be more progressive (in this case, professionalism), this thesis will instead designate him as a republican scientist. Professional scientists like Newcomb rejected the value Republicans
such as Mitchel placed on social improvement, and valued the acquisition of scientific knowledge as the primary aim of any scientific institution. This thesis will explore the marked differences between republican and professional science through the study of three relationships: between scientific institutions and society, between scientists and the non-scientific public, and between science and religion. Mitchel and Newcomb are useful subjects because they defined all three relationships in diametrically opposite ways and are such ideal symbols of their respective types of science. Exploring their incompatibility will provide insight on the nature of scientific communities and the mechanisms driving their transitions.

Newcomb’s conception of science, the way in which he defined those three relationships, is familiar to modern scientists; it is almost exactly the same form in which science exists today. Mitchel’s conception comes across as foreign, quaint, and premodern. This thesis will demonstrate that Newcomb’s professional science, or “modern science,” is a recent invention, and is the product of the notions of liberal individualism that emerged in the mid-nineteenth century. For that matter, Mitchel’s science was also the product of different cultural attitudes, expressing distinctly republican values, that lost relevance in American life as the nineteenth century progressed. Contrasting the two demonstrates the process by which science was redefined and reveals the cultural considerations underlying the structure of modern science.
Stephen G. Brush has argued “that there is no such thing as American science.”\textsuperscript{4} For Brush, all science is, by definition, international and universal. However, I will argue that, for the early half of the nineteenth century, a unique brand of American science did in fact exist, and was manifested in institutions like the Cincinnati Observatory and through scientists like Ormsby Mitchel. The first decades of the American republic witnessed the creation of new cultural syntheses as different forms of cultural expression adopted a republican framework.\textsuperscript{5} The field of science and learning was no exception, and the nature of the nineteenth century’s “republican science” hybrid is the primary focus of this work. Americans, acting through popular scientific institutions and engaging in the cultivation of scientific knowledge, sought not so much to enrich the universal well of scientific knowledge, but rather sought to maintain a social ideal of equality and cohesive public community.

Historians of scientific professionalism have dwelled upon the shortcomings of scientific institutions that opened themselves to the community. By the mid-nineteenth century, these historians argued, scientific knowledge had progressed beyond the understanding of most Americans, who were therefore left behind as the scientific community became exclusively a coterie of the specially educated. Howard S. Miller, for one, noted that “as science became more complex and expensive, it also became increasingly remote from the experience of those laymen who were asked to finance it.”\textsuperscript{6} Nathan Reingold, as well, has described professionalism as the process by which scientists

\textsuperscript{4} Brush 1988, 466
\textsuperscript{5} Mark Noll, for example, outlines a shift in American religious thought “away from European theological traditions…toward a Protestant evangelical theology decisively shaped by its engagement with Revolutionary and post-Revolutionary America.” See Noll 2002, 3-5, 9-13
\textsuperscript{6} Miller, “The Political Economy of Science,” in Daniels 1972, 101
“necessarily and inevitably” responded to the “increasing complexity of scientific knowledge” to bring American science into a period of “maturity.” To Reingold and others, scientists needed to professionalize and restructure the scientific community to give it the sophistication required to perform the research that needed to be conducted in order for science to “progress.” While this interpretation of professionalism no doubt has validity, the professional scientific community also resulted from a general decline of republicanism in American life and the concomitant rise of liberalism. Liberalism, bringing with it new ideas of individualism and the goals of an individual’s life, altered scientists’ conceptions of who they were and what role they should play in society. These newly dominant sociocultural paradigms informed professional science, and the scientific community that Simon Newcomb represented is a manifestation of liberal values in much the same way that Ormsby Mitchel and the scientific community of the early nineteenth century were representations of republican values.

Earlier studies of the growth of professional science have also focused on elites and institutions. Historians of American science such as A. Hunter Dupree, Sally Gregory Kohlstedt, Nathan Reingold, and Robert V. Bruce have constructed narratives centered upon a small group of Eastern intellectuals around Harvard University and Yale University who came to dominate the scientific arena through their control of national organizations such as the American Association for the Advancement of Science (AAAS) and the US Coast Survey. Mary Ann James, in her 1987 study of the Dudley Observatory (founded in Albany in 1857) explored professionalism as a highly contentious issue between scientists with professional aspirations and local elites who conceived of scientific institutions as public

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7 Reingold 1991, 25; Reingold, “American Indifference to Basic Research: A Reappraisal” in Daniels 1972, 54
venues of culture and enlightenment. My work follows within this tradition, but attempts to bring the study of professional science outside the realm of institutional studies and into the realm of cultural studies. Those historians listed above have already superbly documented how professional scientists constructed their own scientific community. I am therefore more interested in explaining that professionalization process that others have already documented as a product of changing cultural values and ideals. The title of this work, taken from an address saluting John Quincy Adams as a patron of science, is meant to convey this question of republican versus liberal values that lies at the heart of nineteenth century science. When Adams traveled to Cincinnati in 1843 to lay the cornerstone of the new Cincinnati Observatory, the Cincinnati Astronomical Society’s president, Judge Jacob Burnet, lauded Adams for the way in which he was “called from the calm retreats of science” and “uninfluenced by private or selfish consideration in the discharge of official duty.” Adams, in other words, combined scientific activity with his public obligation to the nation as a whole. Others, by 1850, began to debate how socially integrated and how nationally oriented science ought to be. If scientists were called from their calm retreats and asked to serve their nation and its people, must they respond? Must they make the sacrifice that Adams himself made? Would there be virtue in doing so?

My case studies for exploring these issues are the Cincinnati Observatory, the Cincinnati Astronomical Society, and their founder, Ormsby Mitchel. The judges, merchants, clerks, and common laborers who contributed to its creation shaped its character as much as any astronomer, Mitchel included. The discourse surrounding the Observatory, including public addresses, published pamphlets, and popular biographies of Mitchel, reveals that the

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8 Burnet/Adams 6 (reprinted in Cohen 1980)
Observatory had a cultural importance that went beyond scientific discovery. The Observatory and Astronomical Society were forums through which Cincinnatians defined the inclusive nature of their community, the proper role of prominent individuals within that community, and even the modes of proper religious experience within their local religious community. At the same time, strains of the new cultural order defined by professionalism emerged within the Observatory, especially after its first ten years as a public institution. While the Observatory exemplifies the nature of republican science, it also exemplifies some of the limits of doing science within a republican framework. Simon Newcomb and, to a lesser extent, other astronomers of Mitchel’s generation such as Benjamin A. Gould and Benjamin Peirce will be studied as symbols of how strains of liberalism reshaped the scientific community. Through their constructions of their selves and their careers, these professional scientists redefined the American scientific community along the ideals of liberalism, individualism, and modern capitalism. Ultimately, an understanding will emerge of American science as a product of the era’s specific cultural context, rather than of a phase in the linear and incremental progress of scientific knowledge.
When Mt. Adams was chosen as the site for the Cincinnati Observatory in 1843, no one in Cincinnati could go there. For practical purposes, the Observatory would have to be built outside the city, away from any smoke and pollution, and above any optical obstacles. Thus, five hundred feet above the level of the Ohio River, the Observatory commanded a view from which "the entire city of Cincinnati is spread out before the beholder, as upon a map. There is scarcely a building in the whole city which may not be distinguished from this elevated position," in the words of one contemporary Cincinnatian. By virtue of its lofty elevation, the Observatory assumed an almost Godlike presence in the city; all people and activities are subject to its scientific scrutiny. In addition, the Observatory became a refuge from the smoke and noise and general tumult of the "Queen City of Mobs," as Cincinnati was sometimes known in the 1840s.

It was a suitable position for a scientific institution. British Astronomer Royal George Airy conceptualized observatories as "the headquarters of the science of the country in which it stands"; they represented the figurative and literal zeniths of the society which produced them. The Cincinnati Observatory, however, hoped to be an institution open to the public. Its position apart from and above the rest of the city, therefore, was problematic. The voyage uphill posed practical difficulties and threatened the ability of most Cincinnatians to easily access the Observatory. Before any progress could be made in

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9Cist 1851, 107
10FA Mitchel 1887, 176
building the Observatory, its founder and director Ormsby Mitchel was accordingly "obliged to make a road up the steep side of the hill, in itself no small undertaking." This extra effort to build a road is symbolic of the ways in which the Cincinnati Observatory defied the traditional notions of a scientific institution and how the Directors of the Observatory struggled to maintain a tangible link between the institution and the citizens they hoped to benefit. While building a road effectively settled the Observatory's first problems with public accessibility, questions of to whom the Observatory would remain available and under what circumstances persisted through much of its early history.

The Cincinnati Observatory, and the Cincinnati Astronomical Society which provided its institutional foundation, typify what I call “Republican science,” the form of science that prevailed in America’s early national period. Republican science was a pursuit of scientific knowledge meant not to further man’s understanding of the natural world, but rather to contribute to the prosperity of America’s new republican society. The Observatory and the Society were unique. Conceived as popular institutions with a broad and socially diverse support base, they typify the ways in which pre-professional scientific institutions fostered a republican sense of community. Through its relatively open membership, the Society sustained an ideal of voluntary association closely tied to the prosperity of American society. In addition, both contributed to the new ways in which citizens defined themselves as participants in a republican society and as Christians within a new evangelical religious model (these ideas will be explored in depth in chapters two and three). Secondly, as vehicles of local and regional identity, the Observatory and Society created a strong sense of

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11Ibid, 146
unified local community, which ensured that the Observatory could be a meaningful institution to most, even if it eventually turned into a de facto elite organization.

The advent of professional science in the last half of the century revised these Republican notions of science and community in two important ways. First, through exclusionary membership practices and more rigid conceptions of who belonged in the scientific community, professionalism removed science from its popular base and isolated it among a select class. Secondly, professional scientists inverted the Republican ideal in which science was instrumental to social progress. Rather than using science to further the aims of society, professional scientists hoped to use society to further the aims of science. Professionals abandoned American science’s preoccupation with cultivation of virtue and civic engagement and replaced them with a system that placed highest value on individual advancement. In 1840, French observer Alexis de Tocqueville noticed this “new idea” of individualism, and characterized it as a “feeling which disposes each citizen to isolate himself from the mass of his fellows and withdraw into the circle of family friends; with this little society formed to his taste, he gladly leaves the greater society to look after itself.”

This propensity towards individualism drove professionalism. Pursuing the new individualism, professional scientists closed their institutions to the greater public; participation in scientific societies, such as the newly formed American Association for the Advancement of Science, was limited to those who met the new professional standards. Redefined by liberal individualism, science in the mid-nineteenth century became isolated, exclusionary, and detached from civic purpose.

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12 de Tocqueville, trans. George Lawrence 1966, 506
In the first few decades after the age of Federalism, Americans actively forged a new identity as Republicans and as members of a new form of social and political organization. For the first generation of Americans, "[i]ndependence made possible the creation of a distinctive American society that honored individual initiative, institutional restraint, and popular public participation."\(^{13}\) Not only individual identities but societies and communities, entire states and cities, were newly rebuilt and reconstructed.\(^{14}\) Republican reconstruction entailed infrastructural improvements, such as new streets, parks, buildings, and public spaces, as well as new cultural and educational institutions such as theaters, museums, libraries, or universities, as community leaders "strove to promote the informed, enlightened public that was crucial to the vitality of the American republic and to the progress of humanity" through the dissemination of information. Diffusion of culture and information had tangible benefits as well; ideally, enlightened citizens created better self-government and a more prosperous, more moral nation.\(^{15}\) As the century progressed, this information culture grew into a complex marketplace of ideas, as a broader base of Americans consumed information and sought enlightenment through voluntary associations, popular newspapers and books, and lecture circuits.\(^{16}\) The enlightened ideal was at its peak in Cincinnati in the 1840s, and it was this culture that gave rise to the Cincinnati Astronomical Society and the Observatory.\(^{17}\)

\(^{13}\)Appleby 2000, 2-5
\(^{14}\)Richard D. Brown provides an example of local rebuilding in Salem, Mass., in response to increased local wealth and pursuit of "rational and progressive principles." The changes described in Salem are similar to those which occurred in Cincinnati in the first half of the nineteenth century. See Brown 1989, 199
\(^{15}\)Ibid 213, 199, 216
\(^{16}\)Ibid 218-9
\(^{17}\)Vitz 1989, 16; Vitz outlines how prominent Cincinnatians, beginning in the 1820s, used scientific/intellectual organizations to redefine their city as a refined cultural center rather than a provincial backwater. The spirit of public science that culminated in the creation of an Observatory began in 1820, when Daniel Drake founded the Western Museum
The idea to build an observatory came to Ormsby Mitchel in the winter of 1841-2. The Cincinnati Society for the Diffusion of Useful Knowledge, founded in 1838 to promote “higher culture” in Cincinnati, had asked Mitchel to deliver a series of lectures on astronomy. Mitchel’s audience, substantial to begin with, continued to grow, and he struggled to find ways to present to his listeners the grandeur and beauty of the cosmos. He succeeded in creating a piece of machinery by which he could exhibit illuminated illustrations, a sort of proto-slide projector, but the idea of bringing an actual telescope to the people of Cincinnati gradually took root in his mind. Mitchel concluded his last lecture of the series by presenting to his audience a plan, to raise seventy-five hundred dollars, travel to Europe, buy a telescope, and establish in Cincinnati the nation’s first astronomical observatory.

The European observatories Mitchel hoped to emulate were backed by aristocratic patronage. As a republican, though, Mitchel believed he must turn to the citizens. In Mitchel’s plan, if three hundred people would buy a share, he could raise enough money to provide the entire city with the nation’s first sophisticated scientific institution. He called this “the beginning of a great revolution,” hoping it would usher in a new age of popularly-supported American science.18 Mitchel and the first members of the Society were aware of the burden they carried as scientific revolutionaries. They began their constitution by recognizing, first and foremost, "the claims which the world has on the several republics of the United States, to contribute to the promotion of science," and puts upon the Society the task of validating the special mission of the United States in relation to the rest of the world.19

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The Observatory was a popular organization created for the benefit of the citizens and the building of a strong Republican society. To Mitchel, popular participation was both an ideal and a necessity. As he often noted, "In Europe, imperial treasure and princely munificence could build the temples of science; under a free government no such means existed, and to accomplish the erection of these great scientific institutions, the intelligent liberality of the whole community was the only resource." Mitchel, in a whole-hearted belief that science and democracy were not mutually exclusive, was confident that the people of Cincinnati could not only sustain an observatory themselves, but that it could rival the best observatories of the world. From his perspective, going to the people was "easy and simple," and he was certain that he could "show the autocrat of all the Russias that an obscure individual in this wilderness city in a republican country can raise here more money by voluntary gift in behalf of science than his majesty can raise in the same way throughout his whole dominions." Within this culture of information, science acquired meaning beyond the acquisition of abstract knowledge, and it too was deeply interwoven into the growth and prosperity of American society.

Balancing Mitchel's democratic rhetoric with the reality of the time is a challenging task. Disregarding Mitchel's admirable ambitions, the questions remain of what kinds of people truly participated in the Observatory, and what kind of role different people played in the Society. In addition, if the Observatory was undoubtedly an institution "of the people," to what extent was it truly "for the people?" Throughout its earliest days, the Observatory struggled to answer these questions and define its own limits of inclusiveness and open

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20 quoted in biographical preface to Mitchel The Astronomy of the Bible, 19
21 FA Mitchel 52-3
community access. Ultimately, Mitchel would be forced to choose between democratic involvement and scientific development. In the beginning, Mitchel sought to approach thousands of citizens and enlist subscriptions, of twenty-five dollars each, from at least three hundred citizens, ranging from common laborers to the city's wealthiest citizens. Under this initial plan, each subscriber then became a member of the Astronomical Society, to "forever enjoy the privilege" of using the Observatory's telescope. As a result, a socially diverse cross-section of the community would enjoy uninhibited access to the Observatory facilities.

An examination of the list of stockholders reveals that the Society could make a legitimate claim to diverse popular support. Names of prominent local elites such as Daniel Drake (local intellectual and patron of public science), Salmon Chase (local politician and future Treasury Secretary under Lincoln), and Lyman Beecher (the famous preacher and abolitionist) are noticeable. Mitchel himself broke the membership into occupational categories, and identified members from several different backgrounds and professions, among which were grocers, lawyers, dry goods merchants, blacksmiths, steamboat owners, stonemasons, and butchers. The membership of some laborers resulted from Mitchel's decision to offer stocks in the Society to all who worked in the Observatory's construction. According to an 1844 report of the Board of Directors, one sixth of the initial shares

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22 Daniel Kevles has noted the flaws in attributing broad social support to scientific institutions at a time when less than four percent of the population had as much as a high school education, and that a significant portion of African-Americans, immigrants, and other impoverished groups "were naturally unconcerned with scientific research, as were the native whites who were struggling against agricultural depression on the farms and high unemployment rates in the cities," see Kevles, “On the Flaws of American Physics,” in Daniels 1972, 134; While an analysis of the Cincinnati Observatory or any similar institution must take this fact into account, it will also be demonstrated that the Cincinnati Observatory could lay a valid claim to a relatively diverse social base.

23 FA Mitchel 53

24 Shoemaker, Stellar Impact, Appendix III, 307-311
purchased were purchased through labor or materials.\textsuperscript{25} Mitchel, in his first annual report, noted that "Almost every day adds a new name to the list of stockholders- a list which, in extent, in the variety of occupation of the subscribers... stands unparalleled in the history of science."\textsuperscript{26} In terms of material support, the Observatory was, to a significant degree, a popular institution.

Women also found opportunity to participate in the Observatory, albeit in a limited way. As one historian of science has observed, women did in fact play prominent roles in nineteenth century science, but because of social conventions and restrictions "remained on the periphery of the scientific community."\textsuperscript{27} In Cincinnati, at least one woman, Mrs. Eliza Wright, is listed on the first published list of stockholders, and Mitchel lists a Mrs. Donaldson among the "thirty four wealthy and liberal citizens" who contributed the most to the Observatory.\textsuperscript{28} Even more women possibly owned stock; if so, they are not specifically labeled as women on the list of stockholders. Other local women found ways to direct their conventional social roles towards support for science. The 1844 report of the Board of Control makes note, at the end, of the "generous donation of five hundred dollars, received from the ladies of the city," a donation raised at a community soirée held for the Observatory’s benefit.\textsuperscript{29} Accordingly, "Lady's soiree" is also listed among Mitchel's "wealthy and liberal citizens." The report, though, makes no mention of membership privileges, or any other privileges, extended to this group.

\textsuperscript{25}"Report of the Board of Control, June 3, 1844," in \textit{The Annual Address Delivered Before the Cincinnati Astronomical Society, June 3, 1844...}, 35-6
\textsuperscript{26}Ibid, 38
\textsuperscript{27}Kohlstedt, "In the Periphery: American Women in Science, 1830-1880," \textit{Signs} vol. 4 no. 1, 81
\textsuperscript{28}Shoemaker, \textit{Stellar Impact}, Appendix II, 305
\textsuperscript{29}"Report of the Board of Control," 35-6
Beyond material support and stock ownership, however, the active role played by different persons within the Society was an entirely different matter. As established in article four of the Society's constitution, all decisions and actions of the Society were solely within the domain of the elected Board of Directors. Article eight, however, allows for access to the telescope for all Society members, and mandates that the Astronomer provide a series of lectures each year, to which Society members are admitted without charge. Though the Observatory rested on a hill high above the city, the Society made active efforts to keep a vital link of information flow between the Observatory, the citizens it sought to serve, and the community it sought to improve.

In a way, this information link was the only access many people had to the Observatory. Women were the most conspicuous group whose access privileges were limited. Article ten of the Society's constitution, regarding who is permitted to visit the Observatory, uses gender-specific language; visiting privileges were given to men, who could then be accompanied by their wife, if married, or by a female guest if not. Thus, the Observatory's access rules perpetuated a patriarchal scientific structure, in which women were minimally permitted to engage in scientific cultivation, but only on the terms of a husband or patron. Despite the difficulty of physically reaching the Observatory atop Mt. Adams, mentioned above, the Observatory was nonetheless frequently visited, to the point that it later significantly interfered with Mitchel's observations. When this day came, Mitchel would be forced to redefine how open and populist his observatory, or any scientific institution, should be. For the time being, though, the doors to the Observatory were open.

30For the first two years of the Observatory's existence, "Astronomer" was Ormsby Mitchel's elected position. The title was later dropped, the significance of which will be discussed in chapter 3.
Mitchel and the Society raised enough money by June of 1842 that he was able to leave for Europe, for the purposes of procuring a telescope and making acquaintances with various European astronomers. After traveling through London and Paris, he found his way to Munich, and the telescope makers Merz and Mahler. Though he had hoped to traverse the entire continent, Mitchel stopped at Munich, as he had found his ideal telescope: a seventeen foot long refractor with a lens twelve inches in diameter that, until Harvard bought a larger one in 1847, would be the most powerful telescope in the nation and the second most powerful telescope in the world. From Munich Mitchel returned to London in August, 1842, hoping to learn from Royal Astronomer George Biddle Airy at the Royal Astronomer the operation of such advanced scientific equipment. Unfortunately, his biographer noted, his duties as a professor at Cincinnati College limited the amount of time he could spend in London, and consequently “the rest he must work out for himself after his observatory should be established and his instruments mounted.”32

In a cornerstone-laying ceremony on November 9, 1843, construction commenced on the Observatory atop Mt. Ida. Former president John Quincy Adams, who as president had fought, unsuccessfully, to establish a national observatory, traveled from Boston to Cincinnati in failing health to deliver an oration. A military procession escorted him to the site of the Observatory, where, in a freezing November rain, he gave an address and laid the cornerstone, in which members of the Astronomical Society had encased several important documents, among them copies of the Constitution, the Declaration of Independence, Washington’s Fairwell Address, the Northwest Ordinance, and, alongside these important

32 FA Mitchel, 139
national documents, the Society’s constitution and list of members. In honor of the
Society’s guest lecturer, Mt. Ida was renamed Mt. Adams.

Adams’s address and the cornerstone deposit both signify the republican, rather than
scientific, value of scientific institutions in the early nineteenth century. Both conceived of
the founding of the Cincinnati Observatory as an important step in the nation’s progress.
Adams commended the people of Cincinnati for the way they “have converted the wilderness
into a garden, and opened a paradise upon the wild” and announced Ohio’s entry into
American civilization. In doing so, Adams placed the Observatory firmly into the
nineteenth-century trend of Westward progress. More overtly symbolic of the
Observatory’s role in American progress was the cornerstone deposit. That the Society
would place their own founding documents alongside these other documents reflects the
tradition and cultural context among which the members perceived themselves. The Society
wanted to literally built the Observatory upon social and political principles of a free
Republic, with little or no reference to the European tradition of scientific revolution and
intellectual progress. To Cincinnatians, the founding of the Observatory was an event in the
national/political tradition of the creation of a stable, harmonious American republic, rather
than an event in a universal-scientific tradition of astronomical study.

This perceived foundation for the Observatory is not meant to suggest, however, that
Mitchel wished to completely abandon the idea of scientific progress or that he thought of
science as purely instrumental in a republican society. From the beginning, he wished to
combine sophisticated science and republican access, and in 1846 he even began publishing

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33 Minutes of the Cincinnati Astronomical Society, 28 November 1843
an astronomical journal, the *Sidereal Messenger*, in which he hoped to present material for both popular and scientific audiences.\textsuperscript{35} Ultimately, though, Mitchel faced the decision of permitting the widespread public use to continue, or instead pursuing his own professional research ambitions. In 1852, he came down strongly in support for the latter, and declared to the Directors "that the 'interests of Astronomical Science would be greatly promoted by making the Cincin. Observatory more exclusively a scientific, and less a popular, institution."\textsuperscript{36} In 1854, the issue went before the Society. Mitchel, at a general meeting on February 18, 1854, spoke to those present about "some of the difficulties attending the present state of things in relation to the scientific researches which ought to be the principle objects of the Observatory." In order to "best promote the interests of astronomical sciences," he proposed to close off public access to the telescope.\textsuperscript{37} In keeping with the Society's democratic ethos, the Board of Control put the decision up to the general society.

Ironically, while members were more than willing to take advantage of the Observatory's offerings, the Board of Control had had difficulty convening Society meetings. By the early 1850s, Society secretary John Foote was having trouble maintaining a quorum at meetings.\textsuperscript{38} In 1854, the Directors mailed a letter to the stockholders, reiterating Mitchel's argument for closing public access that the Observatory's sophisticated observation efforts "can not be employed so long as the equatorial telescope remains a popular instrument." Stockholders were asked to sign a statement that they "hereby relinquish... right to visit the Observatory and use the telescope for the period of ten years... on condition that the instruments are exclusively devoted to scientific use and without cost or expense to the

\textsuperscript{35} see Mitchel, *Sidereal Messenger*, vol. 1, no. 1, p.2
\textsuperscript{36}"Minutes of the Cincinnati Astronomical Society," March 23, 1852
\textsuperscript{37}"Minutes of the Cincinnati Astronomical Society," 18 Feb 1854
\textsuperscript{38}Shoemaker, *Stellar Impact* 209
Members could also choose an alternate option, to attend the meeting on February 18 (when Mitchel made his statement to the Society) to discuss and vote on the issue. At the February 18 meeting, those present voted, and the decision to close public access passed unanimously. What had started out as an institution integrally linked to the cultural life of the community surrounding it had become, after only ten years, closed and isolated, almost wholly divorced from the community at large.

The Observatory thereby embodies the essential conflict between science and traditional Republican ideals that emerged in the mid nineteenth century. The Observatory eventually sought to advance the body of scientific knowledge and define itself as a research institution in conformity with nascent professional standards, while attempting to retain its popular base. Over the next ten to fifteen years, Mitchel and the Board of Directors found that a professional institution could not also be a popular community institution; the two values were mutually exclusive. Changing notions of public access and use of the Observatory reveal that, as professionalism increasingly dominated the course of science, the former ideal of science as a function of a community's cultural growth gradually withered away. Mitchel, torn between a desire to create a uniquely republican institution and a desire to advance scientific research, ultimately chose the latter. The result was that participation in the Observatory, once so open and public, became more limited. At the same time, other scientists throughout the nation were making similar decisions, and the scientific community as a whole began an individualistic withdrawal from society.

40Such, at least, is the traditional interpretation arrived at by others who have studied the Observatory. See Goldfarb, "Science and Democracy: A History of the Cincinnati Observatory, 1842-1872" in Ohio History 78 (1969): 178
Beginning in the 1840s, the scientific community began to form a more socially isolated, "cohesive self-identity," and efforts to organize scientists on a national scale began in earnest. Implicit in this national organization was "an insistence on the self-government of the scientific enterprise under standards arising from within the scientific community." The scientific community sought to govern itself, releasing itself from the burdens of republican self-improvement that many, like Mitchel, perceived were holding it back.

Increasingly, "proper" professional science became the domain of a select group - those with the necessary schooling who were able to meet the heightened standards of the professional community. Implicit in this restriction of scientific access was a redefinition of who belonged in the scientific community as scientists drew boundaries and created hierarchies among themselves.

As one historian of science has pointed out, the development of the scientific community necessitated that boundaries be drawn, and by the late 1850s the astronomical community was so narrowly defined that a typical astronomer might be characterized as “a white male, born in a small town in New England. His father would be a clergyman, doctor, lawyer, or teacher. The individual would hold a bachelor's degree. This composite figure would work at a government research facility. He would probably have entered into a scientific career in the late 1840s.” Professional scientists, in other words, were men, from a specific socio-economic background and from a specific geographic region. They were Eastern and from established families rather than provincial and self-made. As the century progressed, the idea that a lawyer/math professor/railroad engineer from Cincinnati could

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41 Kohlstedt 1976, x-xi
42 Reingold 1991, 25; emphasis added
43 Lankford 1997, 4, 22; see also Kevles in Daniels 1972, 140-1: “The physics community [of the late 19th century] was in fact drawn from a narrow fragment of American society…The pursuit of physics was effectively restricted to the well-to-do.”
receive an appointment as astronomical lecturer and establish a research institution presided over by a local judge (Jacob Burnet) and boasting stonemasons or merchants as active participants became more and more of a fading Republican ideal.

The Republican scientific community consisted of a class identified by Nathan Reingold as "cultivators." Cultivators, according to Reingold, were Americans who "were not professional scientists but who had a sincere interest in the knowledge of science, and who somehow or other participated meaningfully in the scientific endeavor."\(^{44}\) The Directors of the Cincinnati Astronomical Society likely fall into this class. Mitchel himself began his career as merely an exceptionally ambitious cultivator, though he later gained credibility as a scientist in his own right. As the scientific community changed, however, professionals were separated from the cultivators; cultivators were now often excluded from the scientific societies they had once formed such a large part of, and a hierarchy emerged distinguishing professional scientists, amateurs or cultivators, and mere "interested onlookers."\(^{45}\) Sally Kohlstedt has detailed how, in the early years of the American Association for the Advancement of Science, this new national organization "became the arena for a debate over the amateur tradition versus professionalism."\(^{46}\) The prominent scientists who controlled the AAAS, and sought to use it to enforce their new ideas of professional standards, used their positions of power within the organization to censure works by amateur scientists, sometimes in a directly confrontational manner. Professionals censured others for a variety of reasons: faulty methods of research, poor logic in reaching conclusions, or attempts to apply science

\(^{44}\) Reingold 1991 31
\(^{45}\) Kohlstedt 1976 xi
\(^{46}\) Ibid 138
in "improper" ways, such as in the case of one presentation on a recent criminal case.\textsuperscript{47}

Through censure, professionals constructed a new conception of the proper way in which science was done. Only certain methods could be followed, only certain types of conclusions could be drawn, and only certain kinds of application of scientific knowledge were acceptable. This new construction became especially important for the ways in which science would relate to religion in the professional age, which will be discussed in chapter three.

The exclusion of cultivators from the scientific community threatened more than their existence as a class of scientists. Professionalism also put an end to the ideals of social improvement that had motivated scientific cultivators for the first half of the century. For professional scientists, scientific knowledge was an end in its own right, and professionals exhibited little interest in cultivating science among the multitude for the sake of a stronger or more prosperous Republic. In fact, professionalism sometimes entailed quite the opposite. As the Observatory's professional research ambitions led it to close public access to the telescope, for example, Cincinnatians lost any sense of improvement that came from their active involvement in the Observatory (in the form of physically visiting and observing through the telescope themselves or attending one of Mitchel's lectures), and instead became passive consumers of information, cultivating scientific knowledge only to the extent that they purchased and read a book of Mitchel's lectures published in the late 1850s and 1860s. Professional scientists likewise had lesser interest in improving society, feeling that attempts to educate or inform the public only detracted from time spent researching; appealing to the

\textsuperscript{47}Ibid 140-1; see also Reingold 1991 p.47. Reingold outlines how, generally speaking, professionals began to use research awards, honors, and university degrees to erase any egalitarian aspects of the practice of science and actively distinguish themselves from amateurs.
public interested professionals primarily as a means of gaining public support for research endeavors. Professional scientists, in other words, willfully isolated themselves from the public and embarked on new scientific endeavors independent of any social aims.

In the late nineteenth century, conceptions of how science related to the general community evolved further, particularly in the thinking of astronomer Simon Newcomb. Newcomb, a government astronomer and, for a time, president of the American Association of the Advancement of Science, became one of the most preeminent professional scientists of the last half of the nineteenth century. Newcomb did in fact believe that science could be used to improve society and government. By adopting the scientific method, Newcomb argued, Americans could judge political or economic matters more objectively. Contentious issues, such as import tariffs, could be decided on the basis of rationality, leading to "the increase of the national wealth and prosperity." As a corollary to this reform program, Newcomb wanted Americans to accept the authority of the professional method, and thereby bestow legitimacy upon the scientific system.

For Newcomb, acceptance of professionalism could be achieved easily: "The remedy is to educate the intelligent public into an appreciation of the importance of scientific investigation," he wrote in an 1874 essay titled "Exact Science in America." Acceptance by the "intelligent public" was, Newcomb further argued, the essential element for advancing American science. The reason American science lagged behind Europe was not through lack

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48 Kohlstedt 1976 19-20
49 Moyer 1992, 91
50 More scientists than Newcomb succumbed to this desire; George Daniels has noted how the professional community as a whole sought to justify itself through appeals to their science’s utilitarian applications, and “even scientists whose private statements and research interests were wholly unconnected with immediate utility were nevertheless anxious to publicly represent themselves as utilitarians,” Daniels 1968, 41-2
51 Moyer 1992, 84
of proper research institutions, nor through lack of capable scientists. Rather, it was because "the scientists were being inadequately rewarded by society." Public appreciation, along with commensurate wealth and social status, was what was ultimately needed for scientists to be capable of original, sophisticated research.\textsuperscript{52} In essence, Newcomb argued that the Republican system, in which the public used science to better itself, should be replaced by a new system in which science used the public to better itself. In addition, Newcomb sought a new status for scientists in American society (which will be explored in the next chapter). He therefore represents a construction of science as the ultimate social end in America. Even his plans to connect science with political improvement are formulated strictly on scientific, rather than Republican, terms. He wanted to improve the nation not by making it more culturally enlightened or more self-governing, but by making it more "scientific," as defined by himself as a matter of one definitive and objective method. Even when trying to use science to better society, Newcomb's primary goal was that Americans would accept and defer to professional science.

While Mitchel and the Cincinnati Astronomical Society had taken special efforts to ensure that the Observatory, though apart from and above the city, was nonetheless integrally linked to it, Newcomb and other professionals were content to let science remain simply apart from the rest of the country. Significantly revealing is Newcomb's demand that the public must be taught to accept science, in which he subtly rejected the earlier tradition of science as primarily a popular cultural endeavor. Professional scientists sought to create an entirely new system of scientific practice which drastically revised the relationships among

\textsuperscript{52}Ibid 86-87. Newcomb had further developed this argument in an 1876 article "Abstract Science in America, 1776-1876"
scientists, scientific institutions, and the non-scientific public. The professional goal was to construct science as an autonomous institution, rather than an institution used as a tool for achieving another goal, in this case the building of a cultured, self-governing Republican community. While the professionals achieved this, the net result was the end of science as a meaningful pursuit for those Americans, of average status and/or non-scientific educations, who had made up the cultivator class a few decades earlier. In the professional age, Americans would accept science, defer to it, and passively consume it through books, newspapers, and popular magazines; they would not, however, significantly engage in it as patrons of institutions or members of societies. As the nineteenth century progressed, science increasingly separated itself from those who didn't meet the new professional standards, and from the decline of the Republican system of voluntary association emerged a system in which the lofty "temples of science" claimed a new position, distinctly separated from the non-scientific community.
Chapter II
"And thereby he laid waste his powers": Evolving Concepts of a Scientist’s Role in Society

In the basement of the Cincinnati Observatory, hidden among meteorological reports from the past century and drawers full of old newspaper clippings, is a plaster bust of its venerated founder, Ormsby Mitchel. The bust is simple and unadorned; noticeably missing are laurel wreaths or other signs of nobility that had been given to representations of the heroes of a much older Republic. But the look of strength and fierce determination that the sculptor gave Mitchel still suggests that he was a figure in the same tradition as a Cicero or a Caesar. Upstairs, painted portraits serve the same purpose as the bust: to honor and heroize the venerated astronomer.

The bust is a perfect symbol of the respect and status for astronomers that Newcomb perceived was so desperately lacking from American society. The citizens of Cincinnati identified a scientist of singular genius, and chose to raise him onto a pedestal, quite literally. Newcomb’s complaint that scientists weren’t afforded adequate status in American society was misguided. Scientists were always highly respected, but for different reasons at different times. In the middle decades of the century, a shift occurred in the perception of a scientist’s social value. In 1840, British philosopher William Whewell first coined the term “scientist.” With the new designation came a new opportunity to define the role that men of science would play in American society. In the ensuing decades, the scientific community began to formulate a precise definition of what it meant to be a “scientist.” In the end, a scientist became defined as a man, of superior and unusual intellectual ability, who focused this ability exclusively on the study of the natural world, in pursuit of new or more complex
natural gained through original research. Implicit in this new definition were several dimensions of mid-century liberalism. The emphasis on intellectual ability was born of a preoccupation with one’s “inner self,” and the emphasis on a narrow, focused career as a scientist was a product of the recently invented modern, capitalist career.

As outlined in chapter one, Americans of the early Republic actively sought to reconstruct their communities based on Republican terms. A principle component of this reconstruction was to create a public sphere through free association with others in organizations such as the Cincinnati Observatory. Professionalism changed this by conceiving of a self in isolation of others; community was thus simply an aggregate of atomized individuals whose primary concern was personal growth and ambition. Implicit in the professional ethic, according to one study of the nineteenth century “culture of professionalism,” was a "self-governing individual exercising his trained judgment in an open society." This new professional self dominated the post-Civil War industrial age and has since defined the "thoughts, habits, and responses most Americans have taken for granted." Professional conceptions of the self, therefore, went beyond the scientific community, and reformatted the entire notion of community in America.

In 1842, the Cincinnati Observatory provided the key to Ormsby Mitchel’s career as a scientist. When he had first arrived in Cincinnati ten years earlier, however, the thought of so narrowly tailoring himself as a scientist was far from his mind. At the time, he recorded in a journal entry, he had been “deeply engaged for the last three years of my life in trying to

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53 Bledstein 1976, 87-88
54 Ibid. p.80-81
discover the particular course out of thousands which shall be adopted and pursued by myself."55 Ahead of the young Mitchel lay countless opportunities for self-advancement. In recognizing the freedom with which he could pursue any of thousands of such opportunities, he expressed one of the promise of the republican period, which Joyce Appleby has identified as an ability to engage in an "opportunistic mix of occupations."56 Furthermore, "occupation" was loosely defined, with very few limits to entering into one. In the early Republic, independence and personal liberty were defined broadly enough to allow most males to freely construct their identity in any way they choose. This freedom to construct, deconstruct, and reconstruct one’s identity in myriad ways resulted in what one study has identified as an "extraordinarily rich and varied experimentation by the people of the new nation with new, voluntarily chosen identities."57 Ways of redefining one's identity were so open that one could even go so far as to "turn[ ] himself into a science lecturer after someone presented him with a copy of Lavoisier's *Chemistry,*" which almost exactly describes what Ormsby Mitchel would soon do, as he transformed himself into a pre-eminent astronomer, relying only on the education in math he received at West Point.58

Before focusing on science, though, Mitchel turned to the law, and established a practice with E.D. Mansfield, who later became a local journalist as well as president of the Cincinnati Astronomical Society. In his memoirs, Mansfield recounted how Mitchel, as a lawyer, was preoccupied less with appearances before the court and more with reading Quintilian, the Roman writer on oratory, and other classics. His literary bent seems indicative of his broader endeavor to join Cincinnati’s cultural elite, a task he accomplished

55 quoted in FA Mitchel, 1887, 43
56 Appleby 2000, 95
57 Howe 1997, 108
58 Appleby 2000, 108
primarily through association with the Semi-Colon Club. In doing so, he was engaging in a general propensity of early Americans to redefine their identities and social roles. 59 A "purely intellectual society," the Semi-Colon Club represented a tangible link between the still-developing frontier city and the more refined culture of New England. The Club provided an ideal opportunity for men and women in Cincinnati to escape their status as provincials and begin to think of themselves as at the center of national, or even international, intellectual culture.60 Mitchel also sought greater balance and refinement of character through participation in a local temperance organization and the Society for the Diffusion of Useful Knowledge, the organization that would later contract him as an astronomical lecturer. It was perhaps through such association that Mitchel became acquainted with prominent locals such as Judge Jacob Burnet, who not only facilitated his admission to the bar but later became instrumental in creating and promoting the Cincinnati Observatory.

For his first ten years in Cincinnati, Mitchel worked, at various times, as a professor of mathematics and French at Cincinnati College, an engineer for the Little Miami Railroad, a commander of the Citizens Guard (a local militia), and, by the late 1830s, a lecturer on astronomy. In 1841, the Society for the Diffusion of Useful Knowledge hired him to deliver a series of lectures on “The Stability of the Solar System.” It was this job, as discussed in the first chapter, from which he launched his campaign for the Observatory and fully came into a vocation as an astronomer, which he held for the next twenty years. With the outbreak of the Civil War in 1860, Mitchel changed his vocational path once again, and this time for the final

59Daniel Walker Howe, in his study of self-identity in early America, identified voluntary association, in organizations such as the Semi-Colon Club, as the most “straightforward” way to redefine one’s identity and role in society; see Howe 1997, 110
60Vitz 1989, 19-20
time. When Mitchel died in 1862, of a fever contracted in South Carolina, he ended his life as a prominent general, the sixth vocation he had undertaken in the course of his life.

Even in his position as astronomer and director of the Cincinnati Observatory, however, Mitchel could never fully define himself as a “scientist.” One roadblock to doing so was that the Astronomical Society could not, by terms of its own constitution, provide him a salary for his work at the Observatory. The best it would do was to provide him an income through ticket sales, sold only to non-members, for his astronomical lectures.61 He was thus obliged, to support himself and his family, to take a job in 1852 as Consulting Engineer of the Ohio and Mississippi Railroad. He had also found it necessary to spend his winter months traveling the national lecture circuit. In addition, he hoped his astronomical journal, the *Sidereal Messenger*, would provide yet another source of income. This branching out into new occupational paths, while providing him with adequate income, detracted from his work as a scientist. On one occasion, the Russian astronomer Johann Maedler had requested information from Mitchel, but then lamented that "you are obliged to divide your time among so many different occupations."62 Similarly, Elias Loomis, an astronomer at Yale, bemoaned in an 1856 article for *Harper’s New Monthly Magazine* that “For the last two or three years the energies of Professor Mitchel have been devoted almost exclusively to railroad engineering, and the observatory has consequently been neglected.”63 For professional scientists to concentrate on original scientific research, therefore, they would need to construct a new social system in which devotion to one narrow occupation was not

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only acceptable, but was the social norm. From this need grew the new late century conception of the career.

The Oxford English Dictionary identifies the earliest use of the modern definition of "career," as "A course of professional life or employment, which affords opportunity for progress or advancement in the world," in the early nineteenth century. A career was typically spoken of in a political sense, as the progress of a nation or a statesman's public life. By the late 1860s, the OED recognizes use of the word in terms of someone going out and "making a career" for oneself. The aim of a modern career, furthermore, was not necessarily fame or prosperity, but "scheduled mobility," in which one followed the example of successful professionals within their own field in hopes of ascending to one's own preeminence. Ascendancy, more than anything else, defined one's career and, by extension, one's identity.

In the late 1850s, Simon Newcomb began his scientific life, though as a member of professional circles his experiences more clearly demonstrate the form of the modern career. First of all, a strict dichotomy of choices replaced the occupational fluidity of Mitchel’s day: there was one suitable place in society for each person, and forays into different realms were to be avoided. In fact, escape from such situations was glorified, as Newcomb revealed at the beginning of his autobiography: "I date my birth into the world of sweetness and light on one frosty morning in January, 1857, when I took my seat between two well-known mathematicians, before a blazing fire in the office of the 'Nautical Almanac' at Cambridge, Mass." With this language he revealed a method of thinking about life and work in which

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65 Bledstein 1976, 111
66 Newcomb 1903, 1
one's “true self” is found in a rigidly delineated "World of Sweetness and Light." To leave this world was to re-enter a realm of "cold and darkness." Newcomb's choice of words even went so far as to suggest that his humanity originated from one source, and was lost among other people and places. In addition, Newcomb's "world of sweetness and light" was significantly not defined by himself, but rather was decided by one's position and relation to occupational superiors. In one sentence, Newcomb managed to articulate the two most significant values of the professional, career-oriented age: narrowed conceptions of occupations and personal development as defined by one's superiors in a hierarchical career structure. Such was the nature of Newcomb’s professional career, a novel fabrication that allowed him to avoid the ambiguity of Mitchel’s scientific life.

The creation of science as a career emphasized an intellectually focused construction of the self. For the professional, the mix of occupations that characterized the early Republic didn’t provide an adequate base for self-identity. Mitchel and others had defined self-identity by the degree to which one was integrated into a broad spectrum of community services and community associations. Identity was therefore externally defined as a matter of social character and activity in the public sphere. Professionals changed this situation by focusing on an inwardly defined self, following a trend that had permeated American society in general by mid-century. 67 Though, as in Newcomb's case, one's very humanity was still judged in relation to career superiors, that judgment was still initially based on the development of inner qualities. Newcomb's identity wasn't given to him by the well-known mathematicians, but rather arose within him as a result of their recognition of his advanced

67 Scott Casper, through an analysis of biographies in the nineteenth century, identified within them a growing trend to focus on the character and nature of the “inner man” in assessing one’s life; see Casper 1999, 202-3
intellectual development. His path towards a new identity was predicated upon his progression towards a level of genius in his scientific ability.

Like "career," "genius" was another concept that took on new meanings in the professional era. Traditionally, the word carried connotations of a natural inclination sometimes related to the influence of a spiritual or demonic being on a human's actions. It was not until the late eighteenth century, according to the Oxford English Dictionary, that it took on its modern meaning as "native intellectual power of an exalted type, such as is attributed to those who are esteemed greatest in any department of art, speculation, or practice." The OED also notes that the word’s use, even in its modern sense, suggests "intellectual power which has the appearance of proceeding from a supernatural inspiration or possession."68

For Mitchel, as a Republican scientist, genius was a democratic concept. Practically everyone, scientist and non-scientist alike, had the potential for scientific genius within them. Furthermore, genius within a republican construct was best used in the service of the community; the ultimate role of a scientist was to impart his wisdom, the fruits of his genius, to others, rather than isolate it within himself. Professional scientists, on the other hand, used a construction of themselves as geniuses in this sense to argue that they possessed exceptional intellectual ability which placed them apart from and above the rest of society, including those who wished to learn from them.69 Newcomb’s attitude toward the non-scientific world could at times verge on the anti-social. Benjamin Peirce, Newcomb’s teacher at Harvard, often reveled in his esoteric knowledge. However, the ways in which

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69 Doing so sometimes sparked the ire of cultivators and other “amateur” scientists, such as the Boston physician and chemist John Ware, who complained of the way professionals, quite voluntarily, turned to “a state of science so unsettled and so obscure.” see Daniels 1968, 36
Mitchel was remembered after his death in the Civil War provide a counterpoint to this celebration of genius. Biographies of Mitchel emphasize his intellect but, above all, his civic virtue in sharing that intellect with the citizens of Cincinnati. Such remembrances reflect an evolving discourse that sought to define the proper way for a scientist to relate to the rest of the community.

While Mitchel served as director of the Cincinnati Observatory, the members of the Cincinnati Astronomical Society struggled to properly define his position in the Society. The first printed list of directors, published with the constitution in 1842, listed Mitchel among the officers, with the special title "Astronomer." In the next elections of the Board of Directors in June, 1844, Mitchel was again elected to the Board, but this time was listed without his title. Thus, the Society originally accepted the nascent professional notion that Mitchel, as a man with greater scientific knowledge, ought to be afforded a unique and specialized niche among the society of cultivators surrounding him. Though he was granted no greater status than the president, treasurer, or secretary, he was at least separated from the bureaucratic or administrative roles of the other officers, with the understanding that he would solely pursue the scientific tasks reserved for him in article eight of the constitution.70 That his title was quickly dropped from formal use, though, expresses an ambivalence.

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70 The full text of article eight reads: "It shall be the duty of the Astronomer to take charge of the Observatory, and all books, instruments, and apparatus therein, belonging to the society, and preserve them, as far as possible, in complete order. He shall conduct a series of scientific investigations, such as may, in conjunction with other similar observations, conduce to new discoveries, and perfect those already made in the Heavens. It shall further be his duty by himself, or such assistants as he may from time to time appoint, to aid in gratifying the curiosity of such members of the Society as may desire to examine the Heavens through the telescope. He shall also deliver each year, a course of lectures, before such members of the Society, and such other citizens as may purchase a ticket to the same; the sale of these tickets to constitute his only compensation for the services rendered to the Society; provided, that the owner of two or more shares be entitled free admittance to all such lectures." "Constitution of the Cincinnati Astronomical Society," p.7
towards accepting that Mitchel, because of his work and knowledge, should be distinguished from others.

If the Society seemed at least partially willing to grant him a distinct title, it seemed nonetheless unwilling to grant him the wealth or autonomy of action that later marked a professional research scientist. As mentioned previously, article eight specifically mandated that sale of lecture tickets would be Mitchel's only source of income from the Society or the Observatory. Furthermore, while demanding that he make observations that "conduce to new discoveries," an ambition typical of professionals and absent from the actions of mere popularizers, the article also sets him up as servant of the Society members, with the duty to "gratify[] the curiosity" of any member. While such a subservient position later became anathema to professionals seeking freedom from social constraints on their research, it was Mitchel's willingness to assume this position, and share his scientific genius with others, that earned him the most acclaim after his death.

To those who heard him lecture, Mitchel was undeniably a genius. One highly laudatory popular biography, *The Astronomer and Soldier: The Illustrated Story Life of General Mitchel*, by the Reverend P.C. Headley, offered a clear expression of his heroization. Headley first established that Mitchel's passion for astronomical research made him exceptional; it almost necessarily and inevitably placed him apart from others: "He could devise no plan to get the ear and awaken the interest of the people, unless he could excite enthusiasm through the high themes which filled and delighted his soul."71 Undaunted by this obstacle, Headley's construction of Mitchel pushed ahead with "energy and hopeful perseverance" and "resolute will" in his eagerness to share his gift of astronomical

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71Headley 1870, 48
knowledge with others. More than anything, Headley admires Mitchel as a democratizer of knowledge and as one who took the initiative in leading the common mass of men forward with himself. Mitchel's utmost virtue comes in the way he "never said go simply, in a good enterprise, but 'come with me.' It was his rule to lead, as well as point the way."\textsuperscript{72} Headley's biography was intended to do more than celebrate Mitchel, however. It served a didactic purpose, hoping to encourage young men to emulate Mitchel by taking others with them as they embarked down sophisticated intellectual paths. This notion of an ideal scientist contradicted the growing trend among scientists, however. By the late nineteenth and early twentieth century, scientists were lauded, or reproved, based on an entirely different set of values.

Accordingly, Mitchel’s commitment to the public did not long remain a reason to venerate him. In 1944, after professional values had become firmly rooted in American society, Mitchel was again remembered and evaluated during the Observatory's centennial celebration. In an attempt to recast the Republican hero into modern terms, Mitchel is at this time commemorated as "this little giant of Scotch-Irish ancestry who applied his exceptional powers of intellect, personality and character to fulfillment of St. Paul's dictum, 'This one thing I do.'"\textsuperscript{73} Though still celebrated for his democratic approach to science and the way he brought advanced science to the "common folk of Cincinnati," the commemoration also mourns the fact that "his contributions to the science of Astronomy were not outstanding... [H]e was not of the exalted who have widened the boundaries of human knowledge." In fact, the commemoration argues, Mitchel was in fact a genius in the modern sense, with

\textsuperscript{72}\textit{Ibid}, 79-80
\textsuperscript{73}\textit{Walters, "Anniversary Address,"} 1944, 15; reprinted in Cohen 1980
"exceptional powers of intellect," but the demands for popular access made upon him by the citizens of Cincinnati, and the burden of enlightening them before expanding his own knowledge, prohibited him from living up to his personal potential, "and thereby he laid waste his powers."74 In the professional era, recognizing and developing one's inner genius was a virtue, and sacrificing one's own development for the development of others was a vice. Headley's hero of 1870 therefore became, by 1944, the epitome of scientific tragedy.

Professional virtues of character were, like Headley's conception of virtue, developed through biography and commemoration. In remembering the lives of prominent professional scientists, other professionals constructed a new set of values wholly different, if not contradictory, to republican conceptions of the ideal man of science. In direct contrast to Mitchel, who felt compelled to lead, the Harvard mathematician and astronomer Benjamin Peirce was remembered fondly for his eagerness to leave others behind. One student of his, Charles Eliot, praised the way he “dealt with great subjects and pursued abstract themes before his students in a way they could not grasp or follow, but nonetheless filled them with admiration and reverence.” Additionally, Peirce cared little for the fact that no one could understand him. Eliot also notes how, in lecture, Peirce’s “scanty talk was hardly addressed to the students who sat below trying to take notes of what he said…No question ever went out to the class, the majority of whom apprehended imperfectly what Professor Peirce was saying.”75 Peirce willfully put himself above others; where Mitchel sought to uplift those below him in learning, Peirce sought only to lift himself in the opinion of those below him by inspiring within them a level of awe and deference bordering on worship. A woman in

attendance at one of his public lectures later remarked “I could not not understand much that he said, but it was splendid.” Another student, W.E. Byerly, respected him as “a real life genius, who had a touch of the prophet in his make-up.”

Republicans and professionals also manifested their contrary approaches to genius and the non-scientific community in the popular textbooks they wrote. Within republican science, the scientist assumed that his popular audience possessed a capacity to perform the same reasoning and intellectual exercises as any trained scientist. Mitchel’s *Popular Astronomy* (1860) explains to the reader “I have endeavored…in every instance to present the facts and phenomena so as to afford to the reader and student an opportunity to exercise his own genius in their discussion and resolution, before offering the explanation reached by ancient or modern science.” Newcomb criticized Mitchel in part for appealing to such a popular audience, but found himself undertaking the same task forty years later in *Astronomy for Everybody* (1902). Ironically, Newcomb, who had impugned Mitchel’s lack of intellectual rigor, found that he was able to only go so far in explaining astronomy to the general audience. He therefore warned in a preface “The writer who attempts to set forth the facts of astronomy without any use of technical language finds himself in the dilemma of being obliged either to convey only a very imperfect idea of the subject, or to enter upon explanations of force and motion which his reader may find tedious.” The condescension implicit in Newcomb’s treatment of his non-scientific audience reflects a belief that professional science had reached an advanced point which others could neither understand

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76 Ibid, 3, 5
77 Mitchel 1860, iii-iv
78 Newcomb 1902, ix
nor be interested in. In doing so, Newcomb also adds another dimension to the professional detachment from society.

To complement and enrich this detachment, professional scientists constructed themselves as a rare breed of particularly unusual people, whose exceptional intellectual ability made them incompatible with the rest of society. Newcomb attributed his unhappy childhood to this fact: “I looked upon myself as a *lusus naturae* whom Nature had cruelly formed to suffer from an abnormal constitution, and lamented that somehow I never could be like other boys.”

Newcomb, though, believed he could find salvation from his unwanted ostracization. He had “gradually formed, from reading, a vague conception of a different kind of world,- a world of light,- where dwelt men who wrote books and people who knew the men who wrote books,- where lived boys who went to college and devoted themselves to learning, instead of driving oxen.”

For him, an isolated intellectual community, where overly intelligent *lusus naturae* were not only accepted but revered, was a dream that became reality when he made his way to Harvard and began studies with Peirce himself.

Implicit in this discourse about the virtue of inner genius was a new construction of industrialist, capitalist masculinity. The modern capitalist construction of masculinity rested upon man an environment of “ceaseless competitive striving, the uncertain fortunes, and the assertions of self” that the work world created. Man was at his zenith as a creator, a role that necessitated individual isolation and was only impeded when tempered with the will of others. While Mitchel's contemporaries found his masculinity in his valiant service to his country, most notably in his military service in the Civil War, his twentieth century

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79 Newcomb 1903, 20
80 Ibid, 21
81 Rotundo 1990, 195
appraisers viewed him as a failed man who had sacrificed his power to create original knowledge and had acquiesced to the corrupting demands made upon him by a sense of social obligation. In the professional age, the diffusion of knowledge through popular lecture and demonstration that had marked science earlier in the century became marked as feminine science, suitable for teaching in a women's seminary but not suitable for the academy. Instead, professionals focused on the power of a scientist to create new knowledge, and be adequately respected and compensated by society for their creations.

Scott Casper, in his study of nineteenth century biography, points out that this trend of emphasizing genius went beyond science and permeated the rest of American culture, redefining the ways in which Americans thought about the self. Biography of the mid to late nineteenth century was concerned with Romanticism rather than Republicanism. Studies of great lives ceased to didactically treat them as civic role models and instead were based upon a "romantic theory of the genius" which emphasized the "inner man." The important aspects of the inner man, according to American Monthly Magazine, were "the budding and blossoming and maturation of the intellect, the dawn of the moral being... the mode of disciplining the intellectual forces, and marshalling them for combat."82 Thus, a man's character was based on the level of his inner development. Again, this inner development was tied to notions of masculinity through the use of a combat metaphor.

The significant shift brought about by professionalism, therefore, was the change from defining the self externally to defining the self internally. In early Republican society, an individual was valued for his relations to others and the ways he acted towards and served others. Professional scientists, however, in seeking to separate themselves from popular

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82Casper 1999, 209-10
constraints and pursue science on their own terms, attached greater value to intellectual development and inner growth. This shift in emphasis in effect meant the end of civic society as it had been defined in the early Republic through association and cultural improvement.
When Ormsby Mitchel returned from Europe in October of 1842, the citizens of Cincinnati were eager to hear him report on the observatories he had visited, the astronomers with whom he had become acquainted, and, most importantly, the kind of telescope he had purchased. Mitchel’s oral report was so popular that the Board of Directors asked him to deliver it again, this time at the church of the famous Cincinnati minister, Lyman Beecher. Beecher, a prominent theologian and abolitionist, had come to Cincinnati from New England in 1832 to lead the Lane Theological Seminary. As a leader of the “New School” of Calvinist theologians in New England, Beecher had rejected the importance of religious experience via internal reflection and intellectual processes that had characterized conventional Calvinism. He wrote in his autobiography:

Some people...keep their magnifying glass ready, and the minute a religious emotion puts out its head, they catch it and kill it, to look at it through their microscope, and see if it is of the right kind. Do you not know, my friends, that you can not love, and be examining your love at the same time?  

For Beecher and other evangelical scientists, true religious experience was incompatible with the very types of procedures that characterize the scientific method. It is therefore strange that Beecher’s church would be the site for a scientific report.

Despite Beecher’s stated feelings on science, the religious and scientific communities in the early to mid-nineteenth century were far from antagonistic. Beecher was himself a stockholder in the Astronomical Society, and Mitchel was undeniably an evangelical

83 Rabinowitz 1989, 108
Christian, having at one point “promised to full determination to give up all further resistance and resolved to yield myself up to God.” Thus, before secularism became the rule, rather than the exception, among professional scientists, it was not at all uncommon for a prominent scientist to also be an active Christian, and for an active Christian to take an interest in science. Not until late in the professionalization process did scientists such as Simon Newcomb begin to advocate a separation of science and religion, and even at that point the idea encountered significant opposition. For much of the nineteenth century, American scientists and theologians worked towards the same ends; in the early Republic, science and Protestantism formed two legs of a triangle, in which science, religion, and Republicanism all complemented each other.

Protestant Christian theologians entered the nineteenth century with a feeling that many of the religion’s most important concepts, such as the irrefutability of the Bible, had been severely compromised by the attacks of the Enlightenment’s rationalists and Deists. To adapt to such attacks, theologians created a new synthesis of rational scientific study of nature and Scripture, called natural theology. Natural theology was founded upon the “premise that nature contains clear, compelling evidence of God’s existence and perfection,” and that attaining greater understanding of the physical world through a rigorous analytical method of fact-finding also led to greater knowledge about God. To this end, Protestants adopted the Baconian method of empiricism, and interpreted scientific discoveries as proof of God’s presence in the world. Natural theologians looked at the discoveries of the day in chemistry, biology, and astronomy and “found nature filled with pattern and regularity and

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84 Mitchel, letter to Joseph Ripley, 14 May 1858, Mitchel Papers, Cincinnati, Box I Folder I
85 Hovenkamp 1978, ix, 22-3
therefore with intelligence.”

Thus, science and religion were closely integrated: scientists could be Christians without equivocation, and leaders of the Christian community became proponents of scientific progress.

Integrated as science and religion may have been, the exact relationship between them is unclear. Modern scholars are inclined to discount natural theology as a pre-modern method of scientific thinking that became gradually more irrelevant as scientific knowledge increased, especially after the rise of Darwinism. To Robert Bruce, for instance, natural theology was merely “an attempt in effect to make religion a branch of science.” Though it had become quite popular by mid-century, “[a]s it became more scientific in subject and method, its applicability to theology became more attenuated; and meanwhile its dwindling theological content became less relevant to science or even consistent with it.” Bruce therefore attributes a cultural and intellectual dominance to science, and interprets the integration of science with theology as an inevitable conformity to science. This argument, however, stems from an inaccurate frame of reference, and projects modern rationalist values onto the society of the nineteenth century. In antebellum America, theology was the dominant branch of knowledge. With such a strength and command of intellectual and cultural life, religious thinkers would have felt little need to seek legitimacy through conformity to scientific thought. The integration of scientific and religious thought served

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86 Holifield 2003, 174-82
87 Marsden, “Everyone One’s Own Interpreter?: The Bible, Science, and Authority in Mid-Nineteenth Century America,” in Nolly and Hatch 1982, 84
88 Bruce 1987, 122
89 George Daniels, for one, has noted that “scholars have failed to understand that natural theology, in terms of the science of its day, was a perfectly respectable scientific discipline, and furthermore that it’s chief proponents were scientists.” Daniels 1968, 53
90 Holifield 2003, 1; Holifield points out that theology “ruled the realm of ideas” for much of the colonial period in America. Though it lost strength after the Revolution, it continued throughout the nineteenth century to “command respect in American intellectual circles.”
other purposes, related to the consolidation and advancement of the evangelical religious community.

For many antebellum evangelicals, science provided a forum for devotional experiences as well as a means of confirming and strengthening their faith. Evangelicalism rested upon three main pillars: conversion, Biblicism (i.e. adherence to Biblical precepts), and moral behavior within an active, public community. 91 Within the paradigm of Republican science, scientists and institutions worked to strengthen each pillar. That Mitchel’s report from Europe was delivered in Lyman Beecher’s church reflects the degree to which science and religion shared cultural space in the mid-nineteenth century. The case of the Cincinnati Observatory reveals a belief that scientific study could facilitate conversion, guide Biblical interpretation, and provide a forum for public moral activism.

Evangelical conversion entailed a rebirth into a new religious life. Mitchel described his conversion in terms of finally realizing “the answer, given to the ‘question of questions.’ Believe, and be baptized!” As Mitchel advised in a letter to Joseph Ripley, conversion was purely a matter of belief and of a spiritual change “wrought in your mind and your heart” through God’s grace. 92 Mitchel’s work as an astronomer and lecturer contributed to his own spiritual development, but he also endeavored to effect the same development in the minds and hearts of the people of Cincinnati. Reverend P.C. Headley, Mitchel’s popular biographer, believed that Mitchel could sometimes “forget that he was on earth, in dwelling on the boundless grandeur of the universe, which he had viewed during the ‘night watches,’ and talked as if he were among the resplendent worlds and discoursing from the skies.”

91 Noll 2002, 11
92 Mitchel to Ripley, 24 April 1858, Mitchel Papers, Cincinnati, Box I Folder I
Headley also discussed the potential for astronomers, through study, to witness “overwhelming visions of Jehovah’s power, wisdom, and omniscience in the celestial vault,” bringing about a rapturous communion and integration with God. For Mitchel in particular, and for other evangelical astronomers in general, science was itself a devotional act that brought one closer to God and facilitated the internal developments that precipitated a conversion experience.

That Mitchel, through his studies, could experience religious sentiments would be good news for scientists, who would thereby have special access to conversion. Evangelicals hoped, however, to deconstruct the elitism of a church of the specially elected. Mitchel therefore needed to take his spiritual opportunities via astronomy to a broader community, by bringing the second most powerful telescope in the world to the citizens of Cincinnati. In a lecture titled “The God of the Universe is Jehovah,” Mitchel unequivocally stated that “No one can rise to a full comprehension of the majesty of the kingdom of God, who has not had some opportunity of employing in his researches high optical power.” Headley concurred, writing in Mitchel’s biography “You cannot look up to the observatory without being reminded of the wonders of the firmament…Much less can you ascend its stair way and look through its telescope…without purer, wiser thoughts.” Mitchel’s campaign to give Cincinnati the world’s second most powerful telescope thereby took on a spiritual as well as scientific import.

Accordingly, public access to the Observatory and its telescope effectively removed conversion experience from the very private realm and placed it directly into the public

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93 Headley 1870, 70
94 Mitchel, 1867, 112
95 Headley 1870, 139-40
sphere. Mitchel’s popular lectures served the same purpose, many of them reportedly “originally delivered before large audiences in many of our principle cities, with the happiest effect; confirming the faith of many, and arousing the devotion of all.” Headley also noticed that, in a typical lecture Mitchel delivered, “the throne seemed carried beyond the stars to the dazzling throne of the Deity. Whoever listened will tell you how like an inspired prophet, or an angel, [Mitchel] sometimes appeared.”

Such feelings, aroused in a public lecture or a public visit to the Observatory, transformed communion with God into a communal event, unifying and strengthening the bonds among individual Christian worshipers, and contributing to the evangelical goals of creating an open religious community with a decidedly public character.

The expansion of Christianity beyond the privileged community and into the public community did not entail doctrinal fluidity. More people may have experienced conversion and joined the congregation of believers, but evangelicals nonetheless wished to maintain uniformity of belief. Doing so proved exceedingly difficult in the early Republic. The early nineteenth century saw increased diversity in theological approaches, each claiming authority from the Bible. The first fifty years after the Declaration of Independence was a period of “tumultuous, energetic, contentious innovation” that “reversed the downward slide of Protestantism.” Out of this situation of revivalist fervor grew new religious movements such as the Adventists, following William Miller, or the Mormons, following Joseph Smith, who pushed new Scriptural interpretations or even, in Smith’s case, canonical additions. Even those not leading spiritual communities made attempts at Biblical interpretation, as figures

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96 Mitchel 1867, viii
97 Headley 1870, 117
98 Noll 2002, 182-4
ranging from Nat Turner to Ralph Waldo Emerson claimed Biblical authority for their actions. There was a contradiction, though, in that evangelical Christians still wished to believe that the Bible had only one clearly evident and unequivocal meaning. The theological free-for-all would therefore have to be settled by establishing one firm, objectively rooted interpretation Scripture. The fulfillment of this need is where science played its most significant role for the religious community.\footnote{99 Marsden, “Everyone One’s Own Interpreter,” in Noll and Hatch 1982, 79-81} By virtue of their learning, scientists were considered bastions of special religious knowledge that became increasingly important in the battles against deviant religious beliefs. The preface to The Astronomy of the Bible, a book of Mitchel’s lectures, notes that, astronomers like Mitchel had the ability to confront threatening or questionable Scriptural interpretations “with a chastened, instructed, and devout belief, and to answer his shallow learning with words of ‘truth and soberness.’”\footnote{100 Mitchel 1867, ix; the preface discusses in particular an astronomer’s power in confronting skeptics} Implicit in this statement of confidence is that astronomers, by virtue of their work, have access to a special truth that trumps the “shallow learning” of all other intellectuals and objectively affirms the rightness of one type of Christian belief. As such, the delineation of correct Christian belief became, under a Republican scientific model, a primary concern for astronomy and astronomers.

In the context of Cincinnati in the 1840s in particular, was instrumental in discrediting and stopping the spread of the millenarian beliefs of the Millerites—followers of William Miller, a licensed Baptist minister who, in 1831, began preaching that the end of the world was imminent. The Millerite movement became quite widespread; estimates for the number of Millerites in America range from ten thousand to over one million,
largely in the Northeast and Midwest. Millenialism was a common component nineteenth
century evangelicism, but mainstream Protestants nonetheless took issue with Miller’s
prediction that Christ’s Second Coming would occur in 1843, which he arrived at through
his own interpretation of Scripture. This interpretation shocked mainstream Protestants,
who questioned “How could [the Millerites], after all, be properly reading the
evangelicals’ Bible and still come up with visions of Christ bursting through the clouds on
a particular fast-approaching day?”

The Millerite movement upset the Protestant order
as it raised important issues in the struggle to determine the correct meaning and correct
way of reading Scripture.

The year 1843 brought with it a millenarian panic, especially in Cincinnati, where
the appearance of a “strange light” - later discovered to be a comet - seemingly presaged the
fulfillment of Miller’s prophecy. The Daily Cincinnati Gazette, on March 16, 1843,
expressed the uncertainty felt by many Cincinnatians in an article titled “The New Light-
What Is It?”: “No one seems as yet able to determine what the strange light in the heavens
which now attracts general attention is. Messrs. Sears C. Walker of Philadelphia, and
Professor Alexander of Princeton, agree in the opinion that the stranger is not Saguier’s
Comet.” An aberration in the stability of the physical universe had appeared, which
even the most prominent scientists could not fully explain. Within this vacuum of
knowledge, Cincinnatians feared the worst. A poem by “Phazma,” printed in the Daily
Cincinnati Enquirer, reflected the fear many people felt in response to the strange lights:

101 Doan, “Millerism and Evangelical Culture,” in Numbers 1987, 120-7
Man in Ante-bellum America,” Isis (65): 449-51
As fear and speculation abounded, others hoped to stem the Millerite tide by explaining the comet in scientific or "common sense" terms, and providing a natural interpretation of the comet to discredit any prophetic interpretations. In an editorial titled "A Common Sense View of Millerism," the *Enquirer* noted that, given recent scientific, technological, and cultural developments, it was illogical to think that God would "annihilate the whole, just when its uses had become known," and impugns Miller as a man "who makes no pretensions to learning," but rather only blatantly contradicts the interpretation of Scripture "given to it by all the good and learned men in the land." This assault on Millerism reveals a tendency towards one concretely true interpretation of the Bible, provided by the most learned men using logical, scientific, and "common sense" means.

Thus, while fear of the comet led many to accept Miller’s prophecies, it prompted others to seek out scientific knowledge. The *Enquirer* on March 28 printed a report from Noah Webster in an attempt to prove that the comet, along with other reported celestial visions, “though strange and perhaps unaccountable… are neither new nor alarming.” Webster’s report concluded with a statement directly aimed at discrediting Millerism: “In a late paper, published by the Millerites, I saw an article stating that the northern lights foretell something terrible. The writer seems not to know that in the high northern latitudes in the 16th degree northward, northern lights are a daily occurrence, and so have

104 “To the Comet,” *Daily Cincinnati Enquirer*, Vol. II #307, 6 April 1843
been from time immemorial.” The *Daily Gazette*, similarly, pulled material from the Encyclopaedia Americana, observations made in Philadelphia and at Brown University, and interpretations from astronomer Elias Loomis to provide technical explanations of the comet. Ormsby Mitchel, at the time lecturing to gather support for the Observatory, incorporated into his lectures explanations of the comet, and promised that “‘nothing’ in the cosmos ‘indicates in the slightest degree an approach to self destruction or change.’” Demand for knowledge about the comet stimulated the campaign for the Cincinnati Observatory. In the east, too, Bostonians looked to Harvard University to assuage their fears, providing a stimulus to creating the Harvard Observatory several years later.

Scientific knowledge, in the end, was the most effective antidote to Millerism, as natural explanations prevailed over millenial speculations. The poet “Phazma” could therefore conclude his poem by negating his previous uncertainty with confidence that the comet provided no danger: “We have got some two hundred million chances,/ Setting us safe against your near advances./ It is n’t time, in spite of Miller’s learning,/ For you to come and set the world a burning.”

In the end, therefore, technical scientific knowledge proved an effective tool to disprove controversial or offensive Scriptural claims. The case of Millerism in Cincinnati shows that as long as scientific explanations existed to contradict such interpretations, their popularity among Christians would be shortlived. At the same time that science

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107 White, “Natural Law and National Science,” 125-7
108 “To the Comet,” *Daily Cincinnati Enquirer*, Vol II #307, 6 April 1843
109 see Numbers, “Millerism and Madness,” in Numbers 1987, 92-7; Numbers discusses how scientific classifications of insanity and “religious anxiety” were used to institutionalize Millerites. However, Numbers also points out that institutionalized Millerites were often admitted for melancholy, anxiety, or “enthusiasm,” but that no one was admitted simply for holding Millerite beliefs. Other studies of “religious
was discrediting fringe beliefs, theologians were applying a scientific Baconian method of fact-gathering to argue that Biblical truth was inflexible. Once theologians could determine the “facts” of Scripture, i.e. what the words meant, then Scripture “could be known as surely as the facts discovered by a natural scientist.”

Theologians thereby sought to eliminate new, radical Biblical interpretations such as that advanced by the Millerites, because there would only be one scientifically established, truly factual way of reading the Bible. The demand for scientific observatories that followed the crisis of the comet of 1843 reveals a growing public need for higher, more sophisticated forms of science based on original research. This kind of popularly-demanded science is, incidentally, the same form that professional science sought. To this extent, the development of professional science was firmly rooted in popular will. However, the general populace didn’t necessarily demand a higher form of science because they valued science in and of itself, but because in many instances it was the best alternative to accepting disturbing religious ideas.

Nineteenth century evangelicals differed from other forms of Protestantism in their reliance on activism. Conversion and dedication to Biblical standards were insufficient; Christians also needed to play a strong moral role in society. While conversion was still a necessary element of belief for the evangelicals, it alone was not sufficient. As a result, the nineteenth century saw widespread participation in temperance societies, abolition societies, and various other reform movements as evangelicals worked to recreate society along moral lines. Mainstream Christian religion became more externally and socially

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insanity” have argued, however, that in many cases throughout history evolving concepts of insanity have been used by elites to “discredit socially disruptive religious dissidents.” See Numbers p.94

oriented, as befits a new Republic built upon a strong social sphere. In fact, the religious atmosphere of the early national period has been described as a unique synthesis of both Christian and republican values, the likes of which had never before been witnessed.\textsuperscript{111} The new notion of religious character emphasized one’s moral behavior and “usefulness in Christian service.” The ability to participate in the spiritual community was thereby left up to one’s own personal effort.\textsuperscript{112} Accordingly, “the center of religious life shifted…from the immortal souls of the parishioners to their moral character.”\textsuperscript{113}

Voluntary association in scientific societies served the same purpose in cultivating moral character. For example, a pamphlet published by the Cincinnati Astronomical Society after Mitchel’s death in 1862 reveals a belief, at least in the mind of the author, that the popular scientific work done by Mitchel and those like him was essential to creating a reformed, Christian nation. In the midst of the Civil War, the author blamed the South’s corruption and slavery on its lack of public scientific institutions:

For had the ignorant, half savage masses, used by the traitors as instruments for the suppression of freedom, been themselves an enlightened, educated people like those of New England, and the other free States of the North and West, the conspirators against the “rights of man,” who originated and controlled this rebellion, would have been rendered powerless for evil…Even a small portion of education and intelligence among the millions of non-slaveholders of the South, would have made it impossible for the three hundred thousand slave owners to use them as tools for the perpetration of the highest crime known to human laws.\textsuperscript{114}

Through this discourse, the Cincinnati Astronomical Society drew a direct connection between lack of education and the immorality of both owning slaves and rebelling against the

\textsuperscript{111} Noll 2002, 64, 73
\textsuperscript{112} Rabinowitz 1989, 104
\textsuperscript{113} Ibid 80-3
\textsuperscript{114} Cincinnati Astronomical Society, “Proceedings of the Cincinnati Astronomical Society, in Commemoration of Prof. Ormsby M. Mitchel, Late Director of the Cincinnati Observatory,” 6-7
Union. Institutions like the Astronomical Society or the Observatory thereby had a holy mission: Mitchel’s popular scientific career was also a career as a leader of the moral community, pursued in part for “laboring to raise a despised, degraded, and ignorant race to the dignity and the duties of manhood and the light of Christianity.” As a moral leader, Mitchel also sought to use his scientific lectures to instill belief in others. The preface to The Astronomy of the Bible notes how Mitchel “lent his energies to such a work as should extort the confession once more from all who heard, or should read him.” In these ways, Mitchel’s scientific work was actually merely an instrument to fulfill religious duties perceived as more important. While the centennial address at the Observatory, discussed in chapter two, lamented that he added very little that was original to the body of scientific thought, such was likely not Mitchel’s main objective. Rather than advancing science, Mitchel, along with the rest of the Astronomical Society, wished to enrich the moral and spiritual life of the nation, and chose to use astronomy to do so.

Professional science developed in such a way, however, that to use science for any kind of religious purpose eventually became unacceptable. One developing hallmark of professional science, an increase in religious skepticism and in some cases outright atheism, was partly an attempt to separate science from its religious ends and to liberate science from any impositions or limitations. Professional scientists who sought wider or more sophisticated scientific understandings of the world would only be held back by a constant necessity to make science and theology cohere. The attempts to separate science from religion, however, also reflect significant attempts on the part of modern, professional

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115 Ibid, 8
116 Mitchel 1867, viii
scientists to redefine the standards and qualifications of scientific study. As men like Simon Newcomb argued that religion had no place within scientific thought, they more narrowly defined what the newly professionalized scientific community should accept as legitimate inquiry, method, and solution. These arguments set off debates over the form and character of what should constitute “proper” science that have never truly been settled.

This notion of “proper” science, absent of religious thought or purpose, developed slowly, however, and was not always uniformly accepted by the professional community. For instance, Harvard astronomer Benjamin Peirce (undoubtedly one of the foremost figures in early professional example), incorporated religious thoughts and conclusions into his scientific work. One of Peirce’s students, W.E. Byerly, remembered a lecture on celestial mechanics in which Peirce unexpectedly digressed: “I remember his turning to us in the middle of a lecture on celestial mechanics and saying very impressively, ‘Gentlemen, as we study the universe we see everywhere the most tremendous manifestations of force. In our own experience we know of but one source of force, namely will. How then can we help regarding the forces we see in nature as due to the will of some omnipresent, omnipotent being? Gentlemen, there must be a GOD.’” Peirce’s religion-science model differed from that of Mitchel’s, however. Peirce replaced the experience of sublimity with rational induction, and mystical communion with the Divine with a logical, deterministic acceptance of God’s existence. Nonetheless, Peirce’s theological leanings demonstrate that, among professionals, even the most mathematical and professional form of science was not necessarily incompatible with religious belief.

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Simon Newcomb led the advocacy for a secular approach to science. Newcomb called for a form of scientific reasoning along the lines of that followed by prominent European scientists such as the evolutionist Thomas Huxley and physicist John Tyndall, both of whom were religious skeptics or agnostics, and both of whom sought to “challenge the cultural dominance of the clergy…and to forge a genuinely self-conscious professional scientific community based on science pursued according to strictly naturalistic premises.” Thus, in the same way that cultivators and amateurs were censured from the AAAS, Newcomb sought to remove natural theologians and religious scientists from the professional community. Acting towards this goal, he drew sharper boundaries within the professional community to exclude religious thought from all notions of what could be considered acceptable scientific practice.

Lying at the heart of this new attempt to redefine the scientific community was a debate over what falls into the realm of scientific truth. Newcomb argued that scientific truth could only be probabilistic. In an 1878 speech in Saint Louis, delivered to the AAAS, Newcomb advanced his idea that “when a scientist says that a ‘proposition is worthy of being received as true, he means, not that it bears any recognized seal of truth, but that the evidence in favor of it entirely preponderates over all that can be brought to bear against it.” Scientists could no longer legitimately make pretensions to knowledge about the “final causes,” divine or otherwise, that governed natural phenomenon. Theologians were free, Newcomb conceded, to form their own conclusions about God and his role in nature, but such conclusions could never be valid results of scientific methodology and could never be

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118 Moyer 1992, 129
considered scientific truth. In other words, two types of truth, scientific and religious, could exist within their own domains, but could never complement each other.\textsuperscript{119}

Newcomb’s probabilistic methods eventually became the standard, though not without significant conflict. While Newcomb argued that proper science could not make religious conclusions, and that scientific investigation could not be used to argue for God’s presence in nature, other prominent scientists saw nothing unprofessional or improper about drawing such conclusions. Newcomb encountered resistance from the well-known botanist Asa Gray, Yale president Noah Porter, and James McCosh, president of the College of New Jersey (later Princeton University). Porter’s conflicting view of the aims of science, for example, was that scientists could reach “exhaustive understanding of a natural phenomenon” only when “a ‘teleological explanation’ was added to the mechanical.”\textsuperscript{120} In other words, two methodologies, both with equal claims to scientific legitimacy, rivalled each other for acceptance. At the time, the most accepted form of science was that represented by Gray, McCosh, and Porter. Religion was still so widespread in science that Newcomb felt it necessary to publish certain articles, expressing his personal religious skepticism, anonymously.

In analyzing the split between science and religion, the most attention is understandably paid to the advent of Darwinism and the impact it had on conventional belief. Darwinism’s impact was so pervasive that it broadly revised the definition of acceptable scientific thought, and undoubtedly Newcomb’s approach to astronomy was a reflection of

\textsuperscript{119} Ibid, 133-4; also, Paul Jerome Croce outlines the rise of uncertainty in both scientific and theological thought in \textit{Science and Religion in the Era of William James}. According to Croce, science, affected by both professional standards and the Darwinian revolution, became characterized by “probabilism, relativity, and hypothetical methodologies,” and professional scientists increasingly rejected Baconian empiricism, in which fact-gathering led to conclusive analyses. See Croce 1995, 3-4, 87-91

\textsuperscript{120} Moyer 1992, 136
according to philosopher and historian of science Thomas Kuhn, Darwinism was an exceptional scientific revolution, "in which a scientific community abandons one time-honored way of regarding the world and of pursuing science in favor of some other, usually incompatible, approach to its discipline." Kuhn termed a new scientific paradigm, and all new paradigms have the effect of reshaping what the scientific community accepts as a worthwhile subject of study, while "[o]ther problems, including many that had previously been standard, are rejected as metaphysical, as the concern of another discipline, or sometimes as just too problematic to be worth the time." In this case, Darwinism required the cessation of all God-oriented study of "final causes" in the universe. Henry Adams, for example, described Darwinism’s effect on the way his generation thought about the universe, describing himself as a man who “cared nothing about Selection, unless perhaps for the indirect amusement of upsetting curates. He felt, like nine men in ten, an instinctive belief in Evolution.” Adams captures the sentiment of a new generation that rejected the pervasive evangelicalism of earlier decades, and embraced science not because they found it personally meaningful but because “The ideas were new and seemed to lead somewhere.” Adams’s embrace of science without religion reflected a new order of values for a new generation founded upon nineteenth century liberalism. Technological and intellectual progress, things that gave the feeling of “leading somewhere,” trumped the aggrandizement of Republican society and its concomitant form of evangelical Protestantism. As a result, science was free, if not popularly encouraged, to break away from its service to the religious community.

121 Kuhn 1977, 226
122 Kuhn 1996, 37
123 Adams 1999, 224-5
In the post-Darwinian atmosphere of the late nineteenth (and on into the twentieth) century, the standard model of religion-science interaction was that the two were incompatible. Within this standard model, new scientific theories, such as Darwin’s theory of evolution, or the more recent astrophysical theory of the Big Bang, openly contradicted traditional religious teachings in such a way that it seemed one could accept science or accept religion, but never truly accept both together. This division between the two is commonly regarded as the necessary outcome of linear scientific progress; as scientists learn and discover more, theology either becomes irrelevant or will be forced to adapt. This conception treats the division as a matter of the substance of each school of thought, which it very likely is to a degree, yet it is also a matter of how scientists in the late nineteenth century wished to construct their newly formed and autonomous scientific community. Professionals like Simon Newcomb sought to remove all religious elements from scientific study not only because they found contradictions between their study and religious theology but because they wanted freedom to pursue scientific knowledge for its own sake, rather than to serve any interests of the religious community. If, in the early nineteenth century, a triangle structure existed in which Republicanism, evangelical Protestantism, and science all complemented and supported each other, then science’s usefulness could only be measured in terms of the degree to which it supported Republicanism and religion. Therefore, in order for professionals to pursue other objectives, namely significant contributions to universal knowledge of the world and the universe on par with what Europeans had been producing, they needed to “liberate” science from its social duties. They could then pursue scientific knowledge with what could be called a “quasi-religious” passion.\textsuperscript{124} Only by redefining the

\textsuperscript{124} James 1987, 239-40
nature of American science itself to exclude religious thought from accepted forms and methods could professionals accomplish this objective.
Conclusion

Republican science lost relevance as professionalism permeated American society in the late nineteenth century. As Mary Ann James accurately notes in her study of the Dudley Observatory (with which Mitchel himself was briefly involved), “If today the local gentry of some community decided to build their own six-meter telescope by circulating petitions and gathering donations, the effort would seem ludicrous.” At some point in the mid nineteenth century, the mass of Americans ceased to involve themselves with creating voluntary scientific associations, and instead left scientific work to the educated specialists. A distinction between popular and professional science emerged, the former characterized by simplified, non-mathematical accounts of the work done by the latter and printed in newspapers or new popular science magazines such as *Popular Mechanics*. This transition was the product of a cultural shift that affected all aspects of American life, as modernism, capitalism, and liberalism replaced civic association and social improvement as the foremost American values.

The historiography of American science is predominantly concerned with the how and the why of professional science. A few accounts add to this discussion with a comparative analysis of professional and popular forms. Professionalism is the focus because it provided for significant advances of American knowledge. Pre-professional (or what I have termed Republican) science was concerned less with the development of new knowledge and more with the prosperity and strength of the Republic. That historians would only study those forms of science that facilitated the development of new knowledge is almost an integral characteristic of the study of the history of science. As the historian and

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125 James 1987, 233
philosopher of science Thomas Kuhn notes in the beginning of his landmark work, *The Structure of Scientific Revolutions*, history of science is largely based upon an “incremental progress” model:

Concerned with scientific development, the historian then appears to have two main tasks. On the one hand, he must determine by what man and at what point in time each contemporary scientific fact, law, and theory was discovered or invented. On the other, he must describe and explain the congeries of error, myth, and superstition that have inhibited the more rapid accumulation of the constituents of the modern science text.126

Republican science is therefore emphasized less because it doesn’t fit into this model. However, breaking away from this standard approach to history of science, one finds that Republican science, while not essential to understanding modern science, is nonetheless essential to understanding American culture. The issues of membership and public participation, of the changing notions of the role of intellectuals within society, and changing notions of the role of Protestant religion in non-theological fields of knowledge that this paper has explored shed a great deal of light on the meanings of republicanism and social order in the nineteenth century. Study of science in this time period reveals much of how Americans attempted to construct themselves and their new nation along new socio-political principles. Furthermore, studying the transition from Republican to professional science raises questions about the continuing vitality of those same principles as the century progressed and American society continued to change. A study of science in the early nineteenth century provides a understanding of the ways in which republican ideologies inherited from the revolutionary generation shaped and continued to shape the makeup of American cultural character. Similarly, the study of scientific professionalism reveals the

126 Kuhn 1996, 2
cultural patterns underlying the birth of “modern science” that, to this day, shape the
American scientific community and its paradigms of scientific thought. While study of
science reveals much about the culture of a particular place and time, it is also true that study
of the culture of a place and time reveals much about science. Ultimately, science cannot be
understood solely as an entity existing purely within itself and affected only by its own
processes (of reason, induction, or method). Rather, science must be viewed as
fundamentally shaped by the cultural order that gave rise to it.
Bibliography

Secondary


**Primary**


*Cincinnati Daily Enquirer.* Vol. II. 1843.

*Cincinnati Daily Gazette.* #4855-#4862. 1843.


