The Mathematical Miscellany and The Cambridge Miscellany of Mathematics: Closely connected attempts to introduce research-level mathematics in America, 1836–1843

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Abstract

No publication for research mathematics was sustained in the United States until the American Journal of Mathematics in 1878. Among early sputtering journal attempts, The Mathematical Miscellany and The Cambridge Miscellany of Mathematics, Physics, and Astronomy stand out with their hope of elevating the status of their readership, engaging them in a research program, and communicating European mathematical work to them. This article explores the conditions facing those who wanted to facilitate mathematical research in mid-19th-century America, surveys the content designed to provide encouragement and direction for that research, and examines the nature of the connection between these two short-lived journals.

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1. Introduction

The contemporary mathematical community largely takes for granted the importance of journals for communicating new results and influencing career development. As late as 1876, however, the American astronomer Simon Newcomb expressed his frustration that “the facilities for the publication of any kind [of scientific literature in America] are extremely restricted, and have increased but little during the last fifty years” [Newcomb, 1876, 110]. In fact,

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the United States could not claim a journal that specifically targeted a mathematical audience until the 1878 foundation of *The American Journal of Mathematics*. A pattern of sputtering attempts to found a mathematical journal in 19th-century America nonetheless offers insight on the developing scientific community and illustrates the obstacles to sustaining a mathematics publication in the United States. A particular investigation of two closely linked publications—*The Mathematical Miscellany* and *The Cambridge Miscellany of Mathematics, Physics, and Astronomy*—showcases the growing desire for mathematical community in light of the tensions affecting the development of American science.

Throughout the first three quarters of the 19th century, which has been termed the “scientific structure-building” period of mathematics in America, mathematical practitioners in the United States worked within the context of general scientific structure-building [Parshall and Rowe, 1994; Timmons, 2004]. With few exceptions, technical scientific or advanced mathematical training was rare and many among the educated American elite remained both dubious about the status of such education and skeptical about science as a profession. While a vocal minority maintained a strong interest in doing American science the American way, even they still worked to formulate an understanding of what that might mean. Who would do what kind of science? What did they need, and where? And how would it be funded? No real identity existed for an American *scientist*, much less an American *mathematician*.

In a recent article about the early British publication the *Cambridge Mathematical Journal*, Tony Crilly explores one editor’s intent to found a publication in 1837 to encourage younger, less accomplished mathematicians and so to enlarge the potential readership for a specialized journal. Crilly specifies that “[a]mateurs and professionals are . . . realistically separated by attitudes to mathematical research, including awareness of the general drift of current mathematics” and how their own work published in mathematical journals would “fit into broad themes” [Crilly, 2004, 458]. The editors of *The Mathematical Miscellany* and, especially, *The Cambridge Miscellany* upheld a goal of elevating Americans’ mathematical attitudes. These two journals aimed to nudge some practitioners beyond their amateur status, or at least to acquaint them with the idea of pursuing higher mathematics. Although the publications were short-lived, they nonetheless offer a glimpse into the process of scientific—and particularly mathematical—professionalization in the United States.

The development and sustenance of an American scientific community particularly concerned a group of mid-19th-century American men of science who called themselves the Scientific Lazzaroni. This handful of American scientists self-consciously felt a need “to raise their own scientific character,” as Princeton physicist Joseph Henry had written to geodesist Alexander Dallas Bache in 1838 [Henry in Reingold, 1964, 85]. Although the Lazzaroni were probably not plotting for scientific domination (as they have sometimes been portrayed), they do embody 19th-century efforts to “specialize the pursuit of scientific knowledge” in America.1 These efforts created some friction between their desire to assert national scientific autonomy and their habit of deferring to European counterparts. The Lazzaroni objective to establish a home-grown scientific elite and increase support for science nonetheless included ambitious plans to reform scientific education, to secure funding, and to bolster research. They also hoped that scientific research publications would help establish and foster the pursuit of science as a legitimate profession in America. The absence of high-level journals, though, made it difficult for many Americans to read about recent scientific advancements and rendered the possibility of publishing in foreign journals virtually out of the question.

The editors of both *The Mathematical Miscellany* and *The Cambridge Miscellany of Mathematics* nonetheless aimed to facilitate advanced mathematical practice in America through their specialized journals. Benjamin Peirce, coeditor with Joseph Lovering of *The Cambridge Miscellany*, was personally affiliated with the Lazzaroni and clearly embraced and articulated their vision for his journal [Hogan, 2001; Grattan-Guinness, 1997; Pycior, 1979]. Charles Gill likewise aimed to encourage mathematical development through his earlier publication, *The Mathematical Miscellany*. Unlike previous editors of American journals, these three aimed to elevate the level of American mathematics through their publications. This would be no small task.

Although amateur enthusiasts did exist in mid-19th-century America, their mathematical expertise was severely limited. The few widely scattered professors of mathematics primarily affiliated with high schools or fledgling rural colleges and had little formal mathematical training themselves. Their students, meanwhile, had an inconsistent and often rudimentary mathematical education consisting mostly of Euclid and some Newtonian mechanics [Cajori, 1890].

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1 The term Lazzaroni first appears in the context of American science in late 1850. This loose organization of eight individuals eager to secure funding and advance science only gathered in the winters of 1857, 1858, and 1863, although they often exchanged correspondence. The term Lazzaroni originally referred to lower-class beggars of Naples [Beach, 1972, 117–118].
These people—once estimated to number less than 100 and more recently counted at over 360 [Hogan, 1985, 251; Zitarelli, 2005, 3]—constituted the potential audience for a mathematical periodical in the United States.

Given this audience, the brief publication runs of most early American specialized mathematical journals may be unsurprising to us,2 but it is unrealistic to expect a mathematics periodical in the antebellum United States to resemble a specialized mathematical journal of today very closely. A measure of success for an early mathematics journal in the United States may simply mean even short-term survival as a publication devoted to mathematics broadly defined or one that helped introduce practitioners to the idea of a specialized mathematics periodical while cultivating a larger American audience for a future mathematics journal. The short but connected lives of The Mathematical Miscellany and The Cambridge Miscellany of Mathematics illustrate how the end of one early American mathematics journal could directly influence the prospects for the next such publication effort.

An investigation of these two journals additionally highlights many of the obstacles encountered by early mathematical editors such as Gill, Peirce, and Lovering, who struggled to solicit substantial contributions. They also lived with the challenges of geographically dispersed mid-19th-century American mathematical practitioners. Most of the contributors were located on the east coast, but, even so, hundreds of miles, from Massachusetts to Georgia, separated them. This small and far-flung lot of interested and sometimes hotly patriotic, but largely amateur, mathematical practitioners could not long sustain a specialized mathematical journal, especially one with a research focus unprecedented in American mathematical publication. While the survival of specialized journals in Europe at the time similarly depended on the dicey business of finding subscribers and finagling finances, these practical issues of publication and subscription more severely plagued early efforts to start a periodical mathematical publication in America, where scientists still struggled to sustain even general science journals [Ausejo and Hormigón, 1993; Despeaux, 2002a; Eccarius, 1976; Gascoigne, 1985; Grattan-Guinness, 1985]. Early editors nonetheless remained hopeful about fostering mathematical greatness in America through journals.

2. Some early 19th-century outlets for mathematical publication

Given the precarious nature of early scientific periodical publication, where could one publish mathematical work—including mixed mathematics such as astronomy, surveying, or mechanics—in early to mid-19th-century America? The specifically mathematical American Journal of Mathematics did not appear until 1878, but a few general science journals in the United States did circulate some mathematics earlier in the century. The Transactions of the American Philosophical Society, the Memoirs of the American Academy of Arts and Sciences, and the American Journal of Science and Arts provide examples of journals that especially influenced the development of American science [Timmons, 2002, 79].

Both the Transactions of the American Philosophical Society and the Memoirs of the American Academy of Arts and Sciences were founded, in 1771 and 1785, respectively, by learned societies that ostensibly emphasized applied science and promoted useful knowledge. This practical bent naturally affected the nature of the papers published. In the Transactions of the American Philosophical Society, for example, most of the mathematical papers involved surveying or astronomy,3 while the mathematics featured in the Memoirs of the American Academy of Arts and Sciences mainly involved its applications to geography and navigation [Parshall and Rowe, 1994, 44–46; Peirce, 1846; Strong, 1836; 1843; Timmons, 2002, 85]. Although both the Memoirs and the Transactions included some mathematics, neither focused specifically on the subject. The societies also published irregularly, so the sporadic appearance of some mathematics was the best they could offer to hopeful mathematicians in America.

The American Journal of Science and Arts, another general science journal, differed from both the Transactions and the Memoirs, since it was not affiliated with any learned society. Benjamin Silliman had started this journal in 1819 with hopes that his publication would be a national undertaking with “its leading object . . . to advance the

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2 Early American mathematical publications were The Analyst or Mathematical Museum (1808); The Monthly Scientific Journal (1818); The Lady’s and Gentleman’s Diary or United States Almanac (1820–1822); The Mathematical Diary (1825–1832); The Mathematical Companion (1828–1831); The Mathematical Miscellany (1836–1839); The Cambridge Miscellany of Mathematics, Physics, and Astronomy (1842); and the Mathematical Monthly (1858–1860). In 1874, J.E. Hendricks founded The Analyst: A Monthly Journal of Pure and Applied Mathematics, which ran for 10 years [Cajori, 1890, 94–97 and 277–286; Smith and Ginsburg, 1934, 32; Parshall and Rowe, 1994, 51].

3 Mathematics comprised 42% of the total pages in the first volume. This high point for percentage of mathematical pages in the journal is largely due to 10 articles about the transit of Venus [Hindle, 1956].
interests of the rising empire, by exciting and concentrating original American effort, both in the sciences, and in the arts” [Silliman, 1820]. To excite and focus American energy, Silliman furthermore aimed to include excerpts from foreign journals to provide updates of current scientific developments [Silliman, 1819]. Silliman’s journal, like both the Transactions and the Memoirs, emphasized patriotic motivations for American scientific work and concentrated on the practical utility of science. It did, however, surpass the other two by both its breadth of geographic distribution and its regularity of publication. Silliman also included mathematics in his journal, but it was by no means the central focus.

The first American periodical dedicated to mathematics was a quarterly publication edited by George Baron, called The Mathematical Correspondent, which appeared in 1804 [Zitarelli, 2005]. In his opening preface, Baron observed “the great exertions of learned men to disseminate mathematical information in other countries” and expressed chagrin that “this kind of knowledge is most shamefully neglected in the United States of America [Baron, 1804; quoted in Smith and Ginsburg, 1934, 86]. Baron earnestly hoped his journal would elevate mathematical skills in his American readers, but he did not envision a mathematics research journal. Jealousy, quarrels, illness, and other woes sabotaged Baron’s low-level mathematical publication in less than 2 years [Parshall and Rowe, 1994, 42–43; Smith and Ginsburg, 1934, 85; Zitarelli, 2005, 6]. After a 1-year hiatus, a single late volume of The Mathematical Correspondent appeared under the editorship of Robert Adrain, who elevated the mathematics, but did not continue the work [Zitarelli, 2005, 6]. Two subsequent attempts to reintroduce a mathematical periodical in America failed, too, after brief publication runs. Both the Analyst or Mathematical Museum (1808) and The Monthly Scientific Journal (1818) lasted only one year [Parshall and Rowe, 1994, 51].

Specialized mathematical publication devoted to research began in earnest in Europe in 1810. Joseph Gergonne started the first such journal, the Annales des mathématiques pures et appliquées, in Paris that year [Gerini, 2002]. In 1826, August Leopold Crelle founded the Journal für die reine und angewandte Mathematik, which soon became the most prestigious 19th-century publication for specialist mathematical audiences. It later shared this honor with Joseph Liouville’s Journal de mathématiques pures et appliquées, which debuted in 1836 with papers from a star-studded lineup including mathematicians such as Gabriel Lamé, Charles-François Sturm, Michel Chasles, André-Marie Ampère, Julius Plücker, and C.J.G. Jacobi. The journal maintained this high caliber, later including groundbreaking papers from F.G.M. Eisenstein, Augustin-Louis Cauchy, and Évariste Galois. Only a handful of British submissions were ever accepted—mostly from Arthur Cayley and William Thomson (later Lord Kelvin)—and there is no evidence that any American contributions were even submitted to Liouville’s journal in the middle decades of the nineteenth century [Crilly, 2004, 476; Lützen, 1990; Lützen, 2002, 91–93].

Americans—challenged both to obtain and to read foreign language journals—mainly had access to British journals. The Philosophical Magazine, for example, was founded in 1798 in London as a general science journal and eventually became The London and Edinburgh Philosophical Magazine and Journal of Science. It did accept mathematical papers, although they were meant to be accessible to a nonspecialist audience and, in any event, short. The publisher specifically limited the editors’ intake of pure mathematics and predicted that “the Magazine would soon cease to exist if it were more than sparingly supplied with articles on lofty mathematical subjects.” He did, however, allow that such mathematics might find a receptive audience elsewhere and specifically suggested the Philosophical Transactions or the Memoirs of the Royal Irish Academy as “much fitter vehicles for extensive mathematical discussion” [Brock and Meadows, 1984, 87; quoted in Crilly, 2004, 475]. These did publish mathematical papers, but technical mathematics nonetheless shared their pages with a variety of other subjects. Recreational mathematics similarly appeared in The Ladies’ Diary and The Gentleman’s Diary (which later joined forces as The Lady’s and Gentleman’s Diary) alongside literary articles and scientific notices.

Publications dedicated to mathematics in Great Britain before 1837 generally took the form of puzzle journals. Leybourne’s Mathematical Repository, for example, printed questions with answers submitted by subscribers on topics such as conic sections, logarithms, and riddles. Despite the fact that British mathematicians fell short of continental research output, these problem-solving journals plus the mathematical work of a few accomplished ones—such as Charles Babbage, John Herschel, George Peacock, William Rowan Hamilton, Augustus De Morgan, James Joseph Sylvester, and Arthur Cayley—over time did create an environment in which a specialized mathematical periodical, the Cambridge Mathematical Journal, could coexist with these amateur publications [Crilly, 2004]. Early 19th-century America offered even less infrastructure for research mathematics than did England at the same time.

All nine mathematical journals attempted in America before 1874 exhibited a sizable component of problem solving. In fact, several of these early amateur publications self-consciously modeled themselves on the well-known...
British puzzle journal *The Lady’s and Gentleman’s Diary*, which was both relatively easy to locate and most accessible mathematically [Despeaux, 2002a, 2002b]. In 1825, Robert Adrain founded *The Mathematical Diary*, which continued publication for seven years, the longest of any early mathematical periodical. The *Diary* aimed neither to communicate new results nor to further mathematical research, even though Adrain possessed respectable mathematical aptitude and had conducted investigations of elliptic integrals. The content of *The Mathematical Diary* nonetheless remained elementary. One representative problem, for instance, called simply for the simultaneous solution of the equations \(x(x + y + z) = 6\), \(y(x + y + z) = 12\), and \(z(x + y + z) = 18\). Perhaps Adrain realized that he needed to educate his audience before he could engage it in a mathematical dialogue; thus the elementary level of the publication may partially explain its longevity [Hogan, 1977, 157–172; Parshall and Rowe, 1994, 43–44].

The cause of mathematics in the United States arguably needed a publication similar to the *Cambridge Mathematical Journal* as a resource for aspiring mathematicians, but early 19th-century efforts to publish any specialized mathematical periodicals—even at an amateur level—in America had generally failed due to internal squabbles, insufficient subscriptions, and related financial difficulties. Although *The Mathematical Miscellany* and *The Cambridge Miscellany of Mathematics* met fates similar to their predecessors’, these publications together worked to acquaint American mathematical practitioners with the idea of a native research publication. These closely connected attempts to found specialized mathematical journals furthermore indicate a growing receptivity to mathematical publication in mid-19th-century America.

3. Charles Gill and *The Mathematical Miscellany*

Editor Charles Gill early embraced the idea that publication could advance mathematics in America and consequently made significant attempts to elevate the level of mathematical content in his periodical. In 1836, just a few years after Adrain’s *Mathematical Diary* had fizzled, Gill, who had contributed regularly to that publication, established *The Mathematical Miscellany* “for the advantage of those who are desirous to progress in the important study of mathematics” [Gill in Hogan, 1985, 246].

Gill first recognized his aptitude in mathematics at an early age and soon became a country school teacher in his native England. There, he spent his spare time working on mathematics, which he frequently submitted solutions to various British journals such as *The Lady’s Diary*, *The Gentleman’s Mathematical Companion*, or *The Educational Times* [Smith and Ginsburg, 1934, 99]. Gill’s pure mathematical work consisted mainly of number theory problems in these publications, although actuarial work later became his primary mathematical interest. In 1830, Gill emigrated to the United States, where he continued teaching at various academies and regularly contributed solutions to *The Mathematical Diary*. Through this publication, Gill earned a reputation in America as an exceptional problem solver. It is likely that this landed him a job in 1834 at the Flushing Institute on Long Island, a school founded by educational reformer William Augustus Muhlenberg [McClintock, 1913a, 1913b; Newton, 1891; Skardon, 1971]. In addition to teaching mathematics there, Gill also became an editor for the *Journal of the Institute at Flushing*, a publication particularly aimed to “stimulate academic achievement among secondary school students” [Hogan, 1985, 246]. The periodical’s mathematical section—which posed problems for the students to answer—enjoyed a warm reception under Gill’s direction. This success, combined with his own problem-solving prowess, perhaps motivated Gill to start publishing a new mathematical journal in America in May of 1836.

The advertisement announcing the first issue of *The Mathematical Miscellany* reflected Gill’s uncertainty about the nature and role of his proposed publication. Gill knew of “[t]he high estimation in which such works are held by the European mathematicians” and viewed the introduction of his mathematical journal as a positive imitative step. Gill wanted his journal to be used “as an index to mark the taste in science, and the progress in discovery,” with an eye toward steering American efforts in the direction of European mathematical trends. He explained that *The Mathematical Miscellany* would advantageously provide “a medium for valuable communications that might otherwise be lost to the public” and thus invite further mathematical investigations. Gill hoped that his journal would direct American mathematical energy as it became a place “where the talent of the country, of which there is certainly no want, concentrated in its aid” [Gill, 1836, 1]. Despite his enthusiasm for cultivating mathematical talent, Gill seemed unclear about exactly who his audience would be. To sustain a mathematical publication would clearly require interest beyond the few advanced practitioners Gill knew. Would *The Mathematical Miscellany* target students, the public, or both?
Gill promised that he would shape the publication according to its initial reception. If the forthcoming periodical provided college mathematics instructors with “a useful auxiliary in cherishing a spirit of science in their classes” and found a niche with the student audience, then “a distinct department will be adapted to this purpose; and pains will be taken to make this part of the work interesting.” Gill observed that mathematics was “daily becoming of more practical importance in the country” and especially wanted his journal to assist fellow Americans in expanding their mathematical capabilities [Gill, 1836, 1]. He hoped The Mathematical Miscellany would provide a venue in which “the aspirant to mathematical distinction may try his strength with those of established reputation.” To create such a meeting ground for known and unknown (but promising) mathematical minds, Gill secured the support and participation of the highest-caliber American mathematicians—like Peirce, Theodore Strong, and Orren Root, principal of the Syracuse Academy—who would lend credibility and expertise to the publication. The point, then, was to test one’s mathematical mettle against the best of the country. What ambitious young mathematician would turn away from a challenge like that? Gill and his sympathizers hoped this incentive for participation would raise up a generation to carry the torch of American mathematics into competition with Europe [Gill, 1836, 2].

The level of mathematics included in Gill’s Mathematical Miscellany surpassed that published in earlier American journals. Where Baron’s Mathematical Correspondent included currency conversion problems and a preference for outdated British methods, Gill’s Miscellany posed Diophantine problems and reflected familiarity with the mathematics of Laplace, Lagrange, Legendre, and Gauss. Baron’s early journal reprinted a 1759 essay by Baron Maseres that objected to negative numbers. By contrast, Gill later published a translated excerpt about the theory of negative quantities from Cauchy’s Analyse algébrique [Hogan, 1985, 246–248].

Fewer than a dozen principal contributors actively engaged with The Mathematical Miscellany at this level [Hogan, 1985, 248], and Gill’s journal began to face financial challenges just months after the appearance of the first volume. The existing receipts from printing and advertising for the Miscellany indicate that approximately 120 subscriptions at the quoted rate of five dollars per year would have been necessary to sustain the journal [JOL, GillP.1444, 21 June 1836, 18 Oct. 1836, 3 Nov. 1836, 28 Apr. 1837, 3 Oct. 1837, 1 Nov. 1838, 30 Apr. 1839]. Circulation probably never reached that level, although Gill did send letters around the country, soliciting subscribers and financial support for his fledgling publication.

Correspondence from John Fletcher—who had published in London’s scientific journals before moving, in 1810, to Quebec, Canada, to become a judge—gives the flavor of Gill’s fundraising efforts. Fletcher wrote to express regret, but not surprise, at Gill’s inability to collect enough subscribers “as may afford a prospect of adequate remuneration for the expenses which will be necessarily incurred by the continuance of the publication.” Fletcher claimed no acquaintances who would be interested in the journal, but suggested Gill send samples to several libraries and societies in Quebec. Fletcher also agreed with Gill’s apparent suggestion to organize “a society of gentlemen agreeing to defray, by joint contribution, the extra expense of the work above the amount of the proceeds.” The letter commended Gill for his venture, the outcome of which Fletcher believed would determine “the future progress of the mathematical sciences throughout the union [and] the scientific character of the country amongst other nations.” Convinced that Gill’s journal should “excite the attention of every American patriot and philanthropist,” Fletcher confidently asserted that there must be hundreds of Americans who would rise to fill the need. With this ultimately unfulfilled optimism about American generosity, Fletcher sent five dollars from his outpost in Lower Canada [JOL, GillP.1444, 30 July 1836].

In the fall of 1838—about two years after Fletcher’s donation—The Miscellany printed 250 copies of each quarterly volume [JOL, GillP.1444, 1 Nov. 1838]. News of the periodical had spread, and isolated individuals with mathematical interests were eager to obtain it. For example, an engineer named John A. Might wrote to Gill in July of 1839 from Allatonia Cass Company in Georgia. Might, who studied mathematics with Professor McClintock at Dickinson College, requested immediate subscription “to your valuable Periodical.” Might also loftily projected that “[i]f the Maths can be perfected it must be in this country and” he affirmed Gill’s ideals by declaring “no means better calculated to produce a desire for their acquisition than the one you have commenced” [JOL, GillP.1444, ? July 1839].

Such good wishes came not only from subscribers, but also from the popular press. In October of 1839, after six volumes of the Miscellany, the North American Review assessed the journal in hopes of honoring “the learned and ingenious contributors … in the most abstract department of science.” The reviewer clearly thought mathematical accomplishment merited prestige and thus decried its lack of recognition and reward in North America. The author bemoaned the Miscellany’s small circulation, remarked that America was “lamentably deficient” in mathematical discovery, and consequently embraced the prospect of a journal designed to raise up a group of competent American mathematicians. In conclusion, it pronounced “the publication of the Miscellany … one of the most efficient means
which can be devised for promoting the cultivation and advancement of the science to which it is devoted” [Anon., 1839, 484–485]. In the end, though, neither Fletcher’s buoyancy, nor the hopeful expectation of American subscribers, nor positive press would be enough to sustain The Mathematical Miscellany.

Most of the Miscellany’s readers were not equal to Might’s lofty challenge of perfecting mathematics, nor were they able much to advance mathematical learning. A letter from one subscriber, Lawrence Abbott, Jr., to Gill illustrates the disparity between a desired degree of mathematical elegance and the actual ability of most Miscellany contributors. Gill pointed out in remarks about Abbot’s proposed problem that he “did not state the hypothesis upon which [he] gave [his] solution.” Abbott swallowed Gill’s brusque reply and allowed that “[p]erhaps the solution was unintelligible.” Abbott admitted to knowing “it was very badly written” and concluded with an illuminating postscript: “Perhaps I need not inform you that I am but a young learner in the mathematics. I am without instruction and almost without books and do not feel competent to make a figure in the Miscellany.” He entreated Gill, “if you receive anything from me worth a publication, and will be kind enough to correct whatever errors either in style or otherwise, may result from my inexperience, you will truly oblige” [JOL, GillP.1444, 25 Jan. 1838]. Many Miscellany subscribers fell into this category of those unfamiliar with formal mathematical instruction.

Scattered subscribers shared a hope that the Miscellany would furnish them with a bit of higher mathematical education rather like correspondence learning from experienced mathematicians. For individual comments on and corrections to their submissions, they depended on Gill, who periodically commiserated with Peirce on the abysmal quality of these submissions. Gill wrote to Peirce during the first year of the Miscellany to say, “I received your solutions last night—and they were as usual very welcome. After the stuff I have crammed down my throat—for in my unenviable [capacity?] of Editor I have all kinds of crude conjectures thrust upon me which I am obliged to wade through—bring into order, and ‘lick into shape’—you can have no idea of the absolute pleasure conveyed to me by the perusal of your solutions. They are like the oasis in the desert.” Gill relished his competent correspondent and thanked Peirce for submitting a beautiful solution, which, unfortunately, would not be included in the Miscellany [HL, CG to BP, 1 Aug. 1836]. Gill and Peirce agreed that they could not print all their own mathematically superior solutions [HL, CG to BP, 13 Mar. 1842, 9 July 1842]. From a business angle, they were “anxious that the other solutions should appear,” yet editing others’ solutions to be fit to print eventually proved too burdensome [HL, CG to BP, 1 Aug. 1836].

4. An uncertain interlude of editorial transition

Gill worked, as any editor of a mathematical journal might, to recruit colleagues to help him generate problems and evaluate submissions for publication. The late 1830s, however, appear to have been a busy time for Americans willing and mathematically able to help Gill. Peirce did as much as he could, but he was fully occupied by writing textbooks, teaching mathematics, introducing the elective system at Harvard, caring for his recently widowed mother, and experiencing poor health [JOL, GillP.1444, 23 Mar. 1839, 21 June 1838]. Professor Catlin at Hamilton College similarly suffered ill health and wrote that “I received [Gill’s] letter while I was sick, so that I have not been able to do anything at all in the way you suggest for the Mis” [JOL, GillP.1444, 15 Mar. 1839]. Theodore Strong, another professor at Hamilton College, was occupied with a large building project that tied up both his money and his time [JOL, GillP.1444, 25 Jan. 1839]. This left the bulk of work to Gill.

To compound the problem, the pending closure of the Flushing Institute rendered Gill’s employment tenuous, even from the inception of the Miscellany. William Muhlenberg, director of the school, in 1836 contemplated suspending his operations at the Flushing Institute for several years “on account of severe domestic infliction” [HL, CG to BP, 1 Aug. 1836]. This uncertainty prompted Gill to seek contingency plans for both his job and his brand-new periodical. Already in 1836, he contacted Peirce to ask for employment advice. Duty to continue the Miscellany encumbered Gill as he considered hypothetical job options. Gill insisted that “we must have a consultation as to where and by whom it may be published” in the event that other employment prevented him from continuing the work. Gill hoped Peirce would take over the Miscellany and specifically asked him to “conferr a favour on me, and on the world of Science by superintending its publication?” [HL, CG to BP, 1 Aug. 1836]. The question, however, was premature. The Institute remained open, Gill kept his job, and Peirce did not yet face this decision. The journal managed to continue its semiannual publication, although pecuniary concerns weighed heavily on Gill.

In January of 1839, murmurs began circulating about a possible delay of the next volume due to a funding shortage. Strong wrote to Gill that winter in appreciation of those who were “making exertions to continue the work.” Despite monetary woes, the journal would appear as planned in May and November of 1839. Strong nonetheless proposed that
publishing the *Miscellany* only annually would alleviate further financial strain. Taking up John Fletcher’s earlier idea, Strong again suggested “that the work could be sustained without difficulty if . . . a sufficient number of individuals can be found who will be willing to divide the cost of publication among themselves, and to pay you at such times as you shall appoint.” Strong volunteered himself and asserted with “no doubt that Professors Avery, Catlin, Peirce, and Mr. Root are equally willing” [JOL, GillP.1444, 25 Jan. 1839]. This suggestion indicates that the group shared some understanding about the importance of sustaining a mathematical journal. In committing others’ financial resources, though, Strong appears to have assumed too much.

Avery drafted a letter to Gill in March of 1840, to say that his colleague from Hamilton College, Professor Catlin, had discontinued his subscription, although Avery would continue to pay despite prevalent “doubt [about] when the next No. would appear” [JOL, GillP.1444, ? March 1840]. Avery optimistically wrote some solutions and hoped that the journal would survive and be published at least once per year. The usual schedule saw *The Miscellany* appearing each May and November. Avery, though, conceded to Gill’s apparent recovery plan to “omit publishing the next No till November,” and shared his belief that, ultimately, “the work will become successful.” Avery’s uncertainty about “whether the Misc. would be an unprofitable business” nonetheless prevented him from mailing this March letter until July of 1840 when he added a postscript pointedly asking Gill about the *Miscellany*’s “future so far as known to you” [JOL, GillP.1444, 11 July 1840].

The future of *The Miscellany* doubtless did not take first priority with Gill in late March of 1840. A note in Gill’s diary reveals that angst-ridden deliberations plagued him in the weeks leading up to 10 April 1840, when he finally told Muhlenberg about plans to bring his wife and daughter to the United States. Both Eliza Gill and her daughter Eliza Ann had apparently been living in England, where Charles periodically visited them, since January of 1831. Eliza and Eliza Ann finally arrived in New York on 20 August 1840, just three weeks before the birth of another child, William Charles Gill. The responsibilities of a growing family coupled with increasing job insecurity subsequently occupied Gill completely [McClintock, 1914, 232–234]. As Gill prepared for his family’s arrival in the summer of 1840, news of *The Miscellany*’s certain delay and possible cessation reached a wider circle of subscribers.

The variety of responses to the journal’s difficulties illustrate a mixture of dismay and resignation among practitioners for whom *The Miscellany* represented the hope of American mathematical improvement. At Pennsylvania’s York County Academy, mathematics instructor Daniel Kirkwood heard the publication had stalled and wrote Gill to offer an annual five dollar contribution if that would prevent *The Miscellany* from being stopped [JOL, GillP.1444, 17 June 1840]. Late in the fall of 1840, Arthur D. Stanley wrote from Yale to conclude that “[t]he publication of the Miscellany must have been an unprofitable business at the best” because “[i]t could not be otherwise among us with a mathematical work of its kind.” Stanley, too, promised his ongoing support and subscription if the journal continued [JOL, GillP.1444, 31 Oct. 1840]. One hopeful subscriber in Ohio, J. Blickensderfer, contacted Gill in the summer of 1840 only to learn “that owing to circumstances of a peculiar kind the Miscellany would not appear for one term, but would be delayed until November.” Gill hoped that through time, problems of inadequate funding and excessive editorial duties could both be remedied. In December, though, an impatient Blickensderfer wrote again to say that “[s]ince the first of November I have been anxiously expecting its arrival, but have not yet received the number . . . what causes its delay?” Distressed by the possibility that perhaps “the journal is so little patronized, that it cannot be continued,” Blickensderfer wished for “merely a miscarriage of the mail” [JOL, GillP.1444, 11 Dec. 1840]. Others, too, were anxious for the journal to continue, especially since they had already endured over a year without a new volume.

In addition to concern and apprehension, a group of subscribers in Utica, New York also sent contingency plans to ensure the continuation of the *Miscellany*. One B. Birdswell wrote from the Clinton Liberal Institute in Fort Plain, New York, in December of 1841 to express his “regret at the unavoidable delay of the publication of the work and wish very much that you would commence again in the spring.” He, like other mathematically isolated individuals, found the journal to bring a welcome infusion of mathematical dialogue and intellectual challenge. If the rumors proved true and Gill’s journal ceased publication permanently, Birdswell and his colleagues would be cut off from regular access to outside mathematical discourse. They were “very anxious that the work should continue without interruption,” although Gill had evidently promised to resume publication in the spring of 1843. Birdswell and others wanted to know in the meantime “what would be the harm in letting Mr. Perkins take charge of the editorial department?” Under this proposal, George Perkins, principal of the Academy in Utica, would serve as interim editor, since he had all equipment necessary for setting mathematical type. Perkins did not have “the advantages of foreign publications” and would need to rely on Gill and others to keep him informed. Yet they welcomed an editor with Perkins’ shortcomings.
if it meant the publication could continue [JOL, GillP.1444, 6 Dec. 1841]. Birdswell spoke for them all by saying “it is hard to wait until the Spring of 1843 while in the mean time we amuse ourselves agreeably with various problems both interesting and instructive.”

When the eighth number of The Mathematical Miscellany appeared in November of 1839, no one had expected that to be the final volume. Subscribers viewed the lapse merely as a hiccup in publication. Gill’s outlook, too, was optimistic enough to propose problems for volumes nine and ten in volume eight. At the time, potential subscribers were still discovering the publication and embracing its possibilities. Like the subscribers in Utica, they believed that fresh information—preferably from current foreign publications—would best improve them mathematically. They yearned for more than agreeably amusing problems and some also shared a concern about monitoring mathematical advancements in Europe. Yet unfamiliar with the concept of a specialized mathematical publication focused primarily on research rather than puzzle-cracking, they did want to communicate with established mathematical practitioners in America. Gill’s journal had promised them at least this.

Mathematical amateurs in the United States wanted a mathematical journal with an editor motivated to advance and develop American mathematics. After Gill’s continuation appeared uncertain, the scramble to find another editor highlights priorities of those desiring a mathematical journal in mid-19th-century America. Most subscribers were still minimally trained recreational practitioners, but they shared the notion that the editor of the journal should have above average mathematical abilities, in addition to a desire to elevate the subject. The proximity to mathematical printing facilities posed another concern, as illustrated by the suggestion of Perkins. Perkins never did take on the journal, and neither did Gill resume the project in 1843. The next effort to sustain an American mathematical periodical would come from Benjamin Peirce. Although Gill once asked Peirce in 1836 to consider assuming editorship of The Mathematical Miscellany, he continued to edit the journal until 1839 and perhaps temporarily shelved the idea of Peirce as the ideal replacement editor.

In early 1842, though, word began buzzing around about Peirce’s plans to assume editorship of a new mathematical journal that would, in part, resume Gill’s project. Theodore Strong wrote to Peirce in February 1842 to mention a notice from the Boston Daily Advertiser, which announced “that you propose to edit a mathematical periodical, to be entitled the Cambridge Miscellany of Mathematics, &c. the mathematical part of which is to be considered as the continuation of Prof Gill’s Miscellany” [HL, TS to BP, 15 Feb. 1842]. Throughout the winter of 1842, Peirce received a flurry of correspondence—from university professors and unknown enthusiasts from White Plains, New York, to Middletown Connecticut—similarly praising the “laudable enterprise” and sending best wishes “that the work may be instrumental in developing the mathematical genius of our countrymen, and in extending the boundaries of science” [HL, GWS to BP, ? Jan. 1842; HL, HBL to BP, 28 Feb. 1842]. Peirce’s exceptional mathematical aptitude, urban location in an academic center, and nationalistic sentiments appealed to supporters as excellent editorial qualities. Some who embraced the news of Peirce’s forthcoming publication also included subscription money and schemes for promoting the journal.

Until the first number of Peirce’s journal appeared in April of 1842, Gill received similar mail from former Mathematical Miscellany subscribers clamoring for another volume of his publication. James Nooney, for example, wrote from Yale in late March to articulate his impatience. Nooney clearly had not received word that Gill had stopped publishing his Miscellany. In particular, Lane understood that, “instead of occupying nearly the whole work with solutions of questions,” the new periodical would “admit memoirs on different subjects in Math. Science, somewhat, I suppose, after the manner of Liouville or Crelle.” Peirce’s plan to emulate these European research journals indicates his intention to move toward specialized dialogue on a more advanced level than that for which a puzzle-journal like Gill’s was designed. Lane eagerly anticipated the influx of foreign mathematical material that certainly would be

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4 The advantages of foreign publications could refer simply to access, or to the ability to read articles written in French or German. There is evidence that Gill could read French.
included in such a publication. He explained to Peirce how, “[o]n a recent visit to N.Y. I saw by the invoices of several of the Foreign Booksellers that many individuals in different parts of our country were importing works on the higher mathematics—this is encouraging.” Lane perceived Peirce’s efforts in the same light and had no doubt that his “Journal will do much to extend the spirit of enquiry in these elevated pursuits” [HL, HBL to BP, 4 Oct. 1842].

Peirce indeed would aim to elevate American mathematical inquiry through his journal. Although he did intend his journal to be in some way a continuation of Gill’s, Peirce also envisioned a more self-conscious research focus for the forthcoming periodical. Gill remained in correspondence with Peirce “uncertain of the character you wish to stamp on this part of your work” [HL, CG to BP, 13 Mar. 184[2?]]. Their pursuant discussions about the most beneficial research to give American science do, however, provide evidence of Peirce’s particular desire to determine the nature of a journal that would subsequently endeavor to direct a national research agenda.

5. Benjamin Peirce and the Cambridge Miscellany of Mathematics, Physics, and Astronomy

Peirce thoughtfully and deliberately undertook the project of starting a serious American mathematical journal. He first contacted the Harvard Corporation in February of 1842 with a library purchase request. Peirce sent a list of “the four best mathematical journals which are published in Europe,” and asked the college to order Liouville’s journal, the Comptes Rendus from the Paris Academy of Sciences, Crelle’s journal, and Schumacher’s Astronomische Nachrichten [HUA, UAI.5.131.10, BP to JQ, 8 Feb. 1842]. He planned to use these to fulfill the apparent expectation of American mathematical practitioners that editors of mathematical journals would be abreast of European mathematics [HL, CA to CG, 11 July 1840]. Peirce insisted that these publications would “be of great importance to me in the preparation of a scientific journal which I have just undertaken to edit” and requested that if the college indeed subscribed that he “be allowed the first use of them immediately upon their receipt.” Peirce was, in fact, “so desirous that they should all be taken in the college library,” that he volunteered personally to contribute half the combined subscription cost [HUA, UAI.5.131.10, BP to JQ, 8 Feb. 1842].

Peirce meanwhile recruited Gill to scan European mathematical journals for appropriate material. For the worthy project of a serious American mathematical journal, Gill agreed to divert some of his energies away from other responsibilities to prepare an article for The Cambridge Miscellany. He responded to say, “I have looked through Liouville, and the only thing that I perceive which could be immediately fitted for you, is an integration of the equation, giving the distribution of heat in a sphere.” This integration, wrote Gill, was “founded on general methods of integration given by Liouville and by Sturm in the Journal and may serve to mark the progress of the science in the interval between Poisson’s work and the publication in question.” He offered to translate Liouville’s integration and reminded Peirce to “judge what a sacrifice I make,” but promised his aid to the editor. Gill also mentioned that Liouville’s journal contained several articles on light, but suggested that “it would be better to go at once to the fountain-head—Cauchy—a series of sketches from his articles in the ‘Exercices d’Analyse et de physique Mathematique’ would be an important present to American Science” [HL, CG to BP, 13 Mar. 184[2?]]. This discussion retrospectively reveals unrealistic ambitions. Cauchy’s optics was likely to be too advanced an introduction to European mathematics for many American scientists.

Beyond featuring European work, Peirce also wanted to showcase some American science in his journal. He specifically asked Gill to contribute an article explaining James Espy’s convection theory of storms, which had been developed by the Smithsonian employee in response to the rotary storm theory of another American, the recreational meteorologist William Redfield. In Redfield’s kinematic theory, temperature, moisture, and pressure depended on wind patterns that were dictated by gravitational forces. Espy, on the other hand, attributed atmospheric activity to thermally induced vertical convection; as hot columns of air rose, wind rushed in to fill the void [Fleming, 1990, 25–39]. Espy presented this work to the American Philosophical Society, to the French Academy of Sciences, and to the British Association for the Advancement of Science and it appeared in Philosophy of Storms in 1841. Gill declined Peirce’s request for an article on Espy’s hotly debated theory because he claimed insufficient knowledge of the topic. He nonetheless agreed that such an article would be valuable [HL, CG to BP, 13 Mar. 184[2?]]. That the storm controversy involved two American scientists is likely to have added value to the journal.

The first volume of The Cambridge Miscellany of Mathematics, Physics, and Astronomy appeared in April of 1842. It both heralded research interests in broadly defined mathematical sciences and established the publication’s basic four-section structure. First came the Junior Department of Mathematics, which presented five problems and solutions aimed at high school or college students. Many of the Junior Department questions and solutions printed in Peirce’s
first volume were actually left over from Gill’s *Miscellany* files [HL, TS to BP, 12 April 1842]. The Senior Department of Mathematics followed with six questions at a more challenging level, including a question “from a class of which the last will be in each number, viz. a physico-mathematical question of which the editor has received no solution, and of which a complete solution is not usually expected.” These challenge questions, for example, included a dynamics problem based on Espy’s theory of storms, a top-spinning problem, and a probability problem posed by Poisson [Peirce, 1842a]. These served not only to acquaint the readership with the idea of an open mathematical problem, but also to introduce them to new lines of inquiry. The third and fourth sections—Astronomy and Physics and Meteors and Meteorology, respectively—shared these aims, too. The editors especially emphasized the powerful potential of mathematical inquiry and wrote articles focused on educating Americans about mathematical developments, such as the magnetic crusade or the storm theory controversy, and recommending it as a means to national achievement [Anon., 1842a; Dove, 1842; Dutrochet, 1842]. Peirce and Lovering knew that for the United States to join with Europe in modern scientific undertakings, the American scientists needed to be aware of overseas research currents. Although the first volume of the *Cambridge Miscellany* contained articles written almost exclusively by the editors, the second volume did contain excerpts from several international sources, as shown in Table 1. These selections reflect a vision for the journal to direct American mathematical efforts towards work in optics, astronomy, and mechanics. A sizeable gap nonetheless existed between this kind of mathematical sophistication and the problems the *Cambridge Miscellany* readership could solve.

To help bridge this distance, the journal included editorial commentary and didactic notes in both the Junior and Senior Departments. One example Junior Department problem asked readers to find some roots of a cubic equation, which are in geometric progression [Anon., 1842b]. Of the four different solutions submitted by six problematists, Peirce isolated one for special commentary because it used a slightly different approach to finding the mean root. An editorial comment praised the submission from Mr. P. Barton, Jr., of Orange, Massachusetts because its “solution is free from the doubt, to which the other solutions are subject in the outset, whether the mean root of the equation may not be one of the imaginary cube roots of the absolute term with its sign changed.” This comment sounds superfluous to us—because if one root in real geometric progression is real, then they all must be—but Peirce seems to be singling out Barton to remind the readers to consider a variety of cases and adopt the solution with the broadest possible scope.

The Senior Department of the journal likewise aimed to facilitate correct problem-solving approaches and to encourage broader mathematical thinking. That the *Cambridge Miscellany* printed two similar solutions to a probability problem posed by Poisson demonstrates this. The problem described three contestants playing, in pairs, a series of games and required the determination of each player’s chance of victory, given his chance of winning a game from either opponent [Poisson, 1842]. Theodore Strong’s original solution to this problem began by assigning variables to the skill of the three players and used those to define the chance each had of winning two successive games and “the chance that in three successive games each player may beat in turn” [Strong, 1842]. Without loss of generality, he first calculated the probabilities of various situations for the first player and concluded the first player’s chance of winning in $3n$ games. Strong even commented on the case where $n$ is infinite. Immediately following this discussion, though, came a solution extracted from Poisson’s own contribution to Liouville’s Journal [Poisson, 1837]. The note in the *Miscellany* explained that, although Poisson’s “method of solution is not fundamentally different from Dr. Strong’s,” it “is somewhat more general,” because it had successfully arrived at a solution with no assumption about a player’s skill [Gill, 1842]. Reducing the number of assumptions to arrive at a more general result is thus portrayed as an imitable mathematical endeavor.

In addition to making the most of opportunities for pedagogical exposition or mathematical clarification, the journal also recommended the observation of research trends [Cambridge Miscellany, 1842, 1, 9, 24; Stern, 1842]. The case of a physico-mathematical problem about analyzing the difference between spinning a sharp or blunt top vertically on a hard steel floor illustrates this. No reader submitted a printable solution to that challenge problem, so Peirce took the opportunity to print his own solution with an exposition indicating the process of research expanding around a particular mathematical problem. His solution introduced 23 variables and several equations of motion before continuing at length to explain by analysis the difference between spinning a top on a sharp or blunt point. After this detailed mathematical discussion, Peirce chronicled a short history of the problem. He reported how Daniel Treadwell, Harvard’s first Rumford Professor, had initially experimented with the sharp-pointed top at Harvard. Peirce then mentioned how his and Lovering’s later investigations confirmed Treadwell’s results and agreed with the mathematical analysis: a “top with a perfectly sharp point cannot be made to rise up and assume a vertical position” [Peirce, 1842c]. Peirce furthermore explained interesting experiments conducted by Thomas Hill, then a junior at Harvard, to determine the
velocity of such a spinning top. He even included some ingenious specifics of Hill’s method to illustrate the creativity and care required in such experimentation.

The gentle hints toward improved mathematical practice in the Junior and Senior Departments found full voice in the third and fourth sections of the journal. While the problem sections quietly encouraged correct mathematical reasoning and subtly stimulated promising lines of research, both the Astronomy and Physics section and the
Meteorology section offered full-fledged articulation of the editors’ vision for mathematical sciences in the United States. Peirce’s first Cambridge Miscellany article surveyed astronomical observatories in the United States and mentioned the accomplishments—as well as the potential for greatness—of various American observers. In the opening paragraph of this patriotically charged article, Peirce clearly articulated his angle on the role of astronomy and the imperativeness of professionalizing the discipline in America. He wrote that

The impossibility of great national progress in astronomy, while the materials are for the most part imported, can hardly need to be impressed upon the patrons of science in this country. Without practical astronomers, America can have no astronomy; and the few observers which she now has, and of which she has good reason to be proud, must leave the field or become martyrs to their perseverance, if their midnight toil is not to supply them their daily bread. The observer, who withdraws from all society, in order to devote his nights to watching the stars, is enervated by his loss of sleep, and unfit for the labors of the day. He cannot live two lives; and if he works while others sleep, he must sleep while others work. While he sustains science, we must sustain him. . . . We ask only whether America will do her part for astronomy; whether justice shall be done to American astronomical genius, by giving it opportunity to gain strength, exhibit its powers, and advance the knowledge of the celestial motions. [Peirce, 1842b, 25]

The Miscellany editors aimed to facilitate this strengthening of American science and exhibition of its powers. The journal’s subsequent pages furthermore reflected Peirce and Lovering’s enthusiasm for supporting and directing American scientific efforts so that mathematical talent could excel in the advancement of knowledge.

Lovering’s first article, “On the Internal Equilibrium and Motion of Bodies,” ostensibly related to astronomy and physics, but practically manifested the aims of the journal. It began with grandiose statements about advances in mechanics brought about through the law of gravitation which resulted in formulas that produced “the general furnishing of the mind for analytical investigations.” The consequent “body of disciplined and expert mathematicians” constituted for Lovering “a kind of reserved fund, upon which any science may draw in time of need, and before which all theories must be tried and judged” [Lovering, 1842a, 31]. Mathematicians served as arbitrators of science for Lovering, so the United States needed to train some to participate in the rushing progress of the discipline. Lovering, in fact, suggested that “[a]s the grand mechanical problem of the planetary motions . . . begins to be cleared up,” experienced analysts direct their curiosity towards “other departments of science with refined processes, that have been so potent in the management of the astronomical theory.” He predicted that the theory of electricity and magnetism, laws of equilibrium and motion, and “the analytical efforts of Fresnel, Cauchy, and Hamilton upon that most intangible agent, Light, the electro-dynamical theory of Ampere [sic] and Demonferrand, Ohm upon the galvanic circuit, and Poisson, Crelle, and Liouville upon heat, however singular and beautiful in themselves” would be “only the first fruits of this scientific leisure” [Lovering, 1842a, 32–38]. Lovering saw further scientific accomplishments dependent on the development of mathematics in magnetism, light, and, dynamics. As the great equalizer, mathematics would provide for all these investigations “power to look into the relations of matter, never before felt” and supply “the capacity for taking up and handling all theories in the same stern way.” He entertained a “conviction . . . that no reasonings, however acute and plausible, that no speculations, however delicate and enticing, will protect the theory which they support from being called to a strict mathematical account in its minutest details.” Lovering “hardly dare[d] to anticipate this second glory of science!”

The triumph he envisioned involved the spirit inherent in abstract mathematics infusing all physical inquiries. Lovering predicted the reduction of the chemical question to a mechanical problem that would call for the simplification of existing theories of internal structure. He moreover anticipated that mathematical investigations would yield profound insights about the tenacity, elasticity, compressibility, luminosity, and conductivity of matter. Mixed mathematical work, like that of Laplace, Davy, Faraday, Oersted, Ampère, and Dalton, received special notice from Lovering, who anticipated revolutionary results from applying mathematical analysis to the divisibility of matter. Lovering also posed “[t]he determination of the internal equilibrium and motion of bodies [as] the grand mechanical problem, which is presented to mathematicians of the 19th century.” The physico-mathematical questions selected for The Miscellany suggest premeditated interdependence between challenge problems and articles. The meteor problem, the top-spinning problem, the probability problem and others—involving constant flows of aqueous vapor in atmosphere-height tubes or investigating limits on average direction and velocity of meteors moving around the sun or finding the equations of motion and the oscillations of a sphere placed inside a hemispherical shell—combined several issues central to mechanical investigations: Poisson equations, centers of gravity, and equations of motion. Peirce
and Lovering hoped to equip their readership with foundational mathematical material for the pursuit of important mechanical problems.

Other editorial choices indicate that Lovering and Peirce also aimed to nudge American mathematical energies in the direction of investigating light, as well as mechanics. The journal included several carefully chosen foreign articles to investigate the theory of light. For example, the editors chose Goethe’s “Theory of Colors” from 1810 to print in translation. A brief annotation specified that the publication of the preface in the fourth volume served as preparation for future development the theory itself [Goethe, 1843, 182, n. *]. The Miscellany also printed Gabriel Lamé’s “Memoir on the General Principle of Natural Philosophy,” from the Comptes Rendus, which summarized and discussed discoveries of Arago and Fresnel and their impact on the theory of light [Lamé 1842, 1843]. These choices indicate an effort to build a foundation from which American practitioners might engage and advance the subject.

The Cambridge Miscellany additionally emphasized the place of astronomy at the forefront of American research, since it “is more within the compass of human calculation than any other science” [Lovering, 1842b, 76]. Both the mathematical and observational components of astronomy seemed to be more easily accessible for American practitioners than other areas of mathematics. Lovering especially applauded the installation of Harvard’s new telescope because it “shall enable America to join with Europe in completing the great system of Modern Astronomy” [Lovering, 1842d, 92]. Proper instruments were important for American astronomical improvement, but mathematical training was equally valuable. Lovering explained how even observational astronomy “sometimes requires the assistance of the transcendental mathematics” and underlined “how many steps there are in the astronomical progress which are alike independent of physical theory and observation” [Lovering, 1842b, 75]. New results in mathematics, he thought, would drive astronomy, and probability particularly promised great progress. While Lovering marveled at the potential power of probability anywhere “the direct application of mathematical analysis becomes impossible,” astronomy stood to gain the most from the application of probability because it had “experienced a temporary delay from the growing complexities of the problem” and “required the invention of a more elaborate and searching analysis, for the addition of new artifices and modes of grappling with questions, before it could go forward” [Lovering, 1842b, 73–81; 1842c, 122; 1842b, 75, 80]. An increased number of astronomical observations could best be handled by the theory of probability, which “is always serviceable wherever the most accurate balance is to be cast between the numerical results of a large number of observations and experiments” [Lovering, 1842d, 129]. Advancements in probability theory would thus open doors to progress in astronomy. Lovering predicted that the combination of astronomical observations with the “power and versatility of mathematical investigations” would secure the “glory and the triumph” of modern astronomy [Lovering, 1842c, 126]. The Cambridge Miscellany called for Americans to participate and its editors anticipated a bright future for their young journal.

Beyond stimulating astronomy, statistical analysis would be “a guiding star to discovery” in the determination of elements in the earth’s magnetism [Cawood, 1979; Lovering, 1842c, 130; O’Hara, 1983]. To emphasize this point, the next article was a history of the magnetic crusade by Humphrey Lloyd, a professor of Natural Philosophy at the University of Dublin [Lloyd, 1842]. Lloyd’s article surveyed the research done in terrestrial magnetism and summarized European efforts in magnetic observations. He mentioned particular observations being conducted by scientists at observatories around the world and indicated how American astronomers could aspire to be on a par with their European counterparts. The litany of observatories produced exactly what Lovering mentioned as “a large number of observations and experiments” ready to benefit from statistical analysis as part of his grand vision for American mathematics [Lloyd, 1842, 134].

The meteorological discussion in the third volume furthermore indicates Peirce and Lovering’s serious intention to sustain an analysis of current work in articles and problems throughout multiple volumes of the Cambridge Miscellany. This analysis of Espy’s theory in 1842 came at the height of the international controversy over the nature and cause of storms [Fleming, 1990; Kutzbach, 1979; Middleton, 1966]. Peirce strongly favored Espy’s theory because of its attractive simplicity and, in keeping with the agenda Lovering had articulated, highlighted Espy’s application of “the quantitative analysis to his observations with unsparing vigor” as a remarkable feature of the work [Peirce, 1842d, 141]. He encouraged the Miscellany readership generously to come forward “and aid [Espy] to the utmost in the execution of this most valuable national enterprise” [Peirce, 1842d, 142]. To prepare them for this, Peirce asked his readers to consider a problem involving Espy’s uprising cloud [Peirce, 1843, 168] and promised that future articles would analyze other aspects of the theory and “his other proofs of the uprising columns will be carefully examined” [Peirce, 1842d, 144]. The journal, though, would not survive to see this fulfilled.
Through the pages of *The Cambridge Miscellany*, Peirce and Lovering worked to improve the mathematical practice of their readers while indicating research directions in which Americans might hope to contribute. The combination of problems posed, editorial notes, and foreign article selections primarily reveal the editors choosing articles based on the vision that Lovering had articulated for their journal. They expected the areas of optics, astronomy, and probability to be fruitful for American mathematicians and they also anticipated the opportunity to expand on these topics in many future volumes of the *Cambridge Miscellany*. They never realized this final expectation.

### 6. Why did the Cambridge Miscellany fail?

Two months after the fifth volume of the *Cambridge Miscellany* was due to have been published, Gill wrote to Peirce to ask “[w]hat of the Miscellany? I am afraid you have given it up—since I am now convinced you are the only one who could conduct it with any prospect of success” [HL, CG to BP, 18 June 1843]. Gill knew too well the challenges Peirce and Lovering faced in collecting suitable contributions and in securing a sufficient number of subscriptions. A combination of reasons similar to those that likely led to the end of Gill’s *Mathematical Miscellany* probably contributed to the demise of the *Cambridge Miscellany*.

Like Gill at the end of his editorship, Peirce, too, encountered a busy patch of life around the time the *Cambridge Miscellany* waned. The final volume appeared in January of 1843, a few months before Peirce’s oldest child James would turn seven in the same year the prodigy Charles would become four. Peirce personally undertook the education of his children, and the training of these two rapidly developing young minds likely became a priority for him in the early 1840s [Brent, 1993, 36]. Not only that, but Peirce began a fruitful and lifelong friendship with Alexander Dallas Bache in 1841. Their frequent, lengthy, and intense correspondence suggests a substantial time investment. Peirce similarly began to exchange letters with another new contact, Joseph Henry, who would become a powerful scientific ally.

Peirce furthermore experienced growth and change in his professional life as he continued on the faculty at Harvard. In the fall of 1842, he received a new title as Perkins Professor of Mathematics and Astronomy. This new name may have included added responsibilities unconnected to his former role as University Professor of Mathematics and Natural Philosophy. Although Peirce had by then completed writing his series of textbooks, he frequently revised these for new editions throughout the 1840s. Peirce’s major role in negotiating for the elective system continued, too, even as the Harvard administration steadily reigned in the unprecedented curricular flexibility reached in 1843. Time-consuming and dedicated advocacy from Peirce and others nonetheless continued.

In 1842, Peirce also began to oversee the publication of the *American Almanac and Repository of Useful Knowledge*. The first part of this almanac gave a calendar and celestial phenomena for the year. It included tables for tides, celestial phenomena, and hours of daylight, as well as movable festivals of the Christian, Jewish, and Islamic calendars. It also contained latitudes and longitudes for observatories, stellar locations, solar parallax, and meteorological information. Peirce had been making astronomical calculations for the volume for several years, but newly undertook direction of the *Almanac’s* Astronomical Department and was held responsible for the completeness and accuracy of the computations. Also that year, Peirce prepared and delivered a series of fundraising lectures for a new telescope at Harvard.

To be an editor capable of sustaining a specialized mid-19th-century American mathematical periodical demanded a substantial devotion of time and energy, in addition to the required combination of mathematical expertise and good marketing skills. As it had been for Gill, the number of able and available helpers remained small. Both the *Mathematical Miscellany* and the *Cambridge Miscellany* aimed, in part, to expand the study of mathematics in America. The research-minded approach of the *Cambridge Miscellany*, in particular, was unprecedented in American mathematical publication. The kinds of problems previously posed in the American mathematical journals had required cleverness and tenacity from prospective solvers, but not mathematical advancement. This may have limited the appeal and the longevity of the publication.

In fact, nearly 70% of the individuals who responded to the *Cambridge Miscellany* contributed exclusively to the Junior Department. The first volume had slightly fewer submissions to the Junior Department than the Senior Department, but in the second and third volumes contributors to the junior problems about doubled the number who responded to the senior problems. In the fourth volume, over five times as many contributors sent solutions to the Junior Department. The increase in contributors to the Junior Department owed possibly to the fact that students did not initially realize that part of this journal was aimed at them. All of the contributions to the Junior Department in
Table 2
Geographical concentration of Miscellany contributors

<table>
<thead>
<tr>
<th>State</th>
<th>School</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>Connecticut</td>
<td>Wesleyan University</td>
<td>16%</td>
</tr>
<tr>
<td></td>
<td>New Haven (Only 1 specified Yale)</td>
<td>4%</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>Harvard University</td>
<td>14 3/4%</td>
</tr>
<tr>
<td></td>
<td>Miscellaneous</td>
<td>3%</td>
</tr>
<tr>
<td>New York</td>
<td>Clinton Liberal Institute</td>
<td>32%</td>
</tr>
<tr>
<td></td>
<td>Hamilton College</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>St. Paul's College</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>Syracuse Academy</td>
<td>3%</td>
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<tr>
<td></td>
<td>Miscellaneous</td>
<td>3%</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>Central High School</td>
<td>26 2/3%</td>
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<tr>
<td></td>
<td>McConnellsburg Academy</td>
<td>4%</td>
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<td></td>
<td>U.S. Naval Asylum</td>
<td>3%</td>
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<tr>
<td></td>
<td>York County Academy</td>
<td>3%</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>10 1/3%</td>
</tr>
</tbody>
</table>

* The listed numbers give the percentage of contributors affiliated with each given institution out of seventy-five who submitted solutions to either the Junior or Senior Department of Mathematics in any of the four volumes of the Cambridge Miscellany. Three contributors had unknown locations. Only five other submitted solutions from states besides these four: two from Frederick, Maryland; one from Upperville, Virginia; one from Brown University in Providence, Rhode Island; and one from New Brunswick, New Jersey.

the first volume of the Cambridge Miscellany came either from Peirce’s students at Harvard or from Gill’s students at St. Paul’s College in New York State, while the number of junior solutions from these places over the life of the journal was only 24% of the total.

It appears likely that by the fourth volume, Junior Department problems related to particular topics being studied in high schools, and were possibly assigned to mathematics classes. Table 2 indicates that the highest concentration of contributors was at Central High School in Philadelphia, where principal Alexander Dallas Bache possibly recommended problems from Peirce’s journal to further his vision of improving scientific education [Larabee, 1988, 12–15]. No one from Central High School submitted problems to the Senior Department, and there is no evidence that any of the contributors from there was an instructor. Of the 14 students from this school who submitted answers to the journal, nine of them answered only the problem requesting a solution to the equation

\[
\frac{a^2 + ax + x^2}{a + x} + \frac{a^2 - ax + x^2}{a - x} = \frac{ab}{3a - 4b + x}.
\]

The three midshipmen who submitted solutions from the United States Naval Asylum in Philadelphia similarly answered exactly one geometry problem—possibly related to classroom work—for which they all sent the same solution. Professor Lane at Wesleyan University probably also encouraged his students to solve Cambridge Miscellany problems. Lane had been eager to implement Peirce’s textbooks at his school, frequently contacted Peirce with mathematical queries, and also submitted solutions to eight of the Senior Department problems [Lane, 1843]. Of the nine contributors from Wesleyan University, only Lane answered questions from the more difficult section, and among them only he submitted problems to be solved. The remaining eight contributors—who were probably his students—sent a total of 53 solutions, or 22% of all Junior Department submissions, including answers to all problems posed by Lane. Birdsall, a mathematics professor at the Clinton Liberal Institute, answered 13 Senior Department problems, while involving seven others from his Institute as regular contributors to the Junior Department. Forty-seven junior
solutions, or 19% of the total, came from the Clinton Liberal Institute. Notably, Birdzell’s coeducational institution had the only contributor identifiably female—one who signed 10 submissions simply “Melissa.” A survey of the remaining contributors suggests that a few other teachers were also encouraging student involvement in the *Cambridge Miscellany*.

After four volumes, students at nearly a dozen colleges and academies had submitted problems and solutions to the *Cambridge Miscellany* with the encouragement of their instructors, who also sometimes contributed to the journal. The interest from recreational mathematicians and high school teachers indicates growing support for a purely mathematical periodical intended to shepherd mathematical talent in America. Still, 87% of contributors only sent solutions once or twice—perhaps because they did not have access to other volumes, or possibly due to either waning interest or eclipsed ability. This trickle of submissions left the bulk of the work to a few. Only 4%, or three contributors, published in all four volumes of the *Cambridge Miscellany*. These frequent contributors—Theodore Strong, Charles Gill, and an unidentified Junior at Harvard “+”—sent 40 solutions, or 29% of all responses to Senior Department problems, and “+” added 15 contributions to the Junior Department. Otherwise, the editors had to fill the remaining journal pages, in addition to revising and editing the amateur submissions.

Opinions differed among American mathematical practitioners about the goal of the journal. While Peirce saw the value of the Junior Department, he hoped the journal would further research and found frustrating the amateur submissions’ consumption of his editorial efforts. Professor Lane at Hamilton College, on the other hand, expressed the view that the Junior Department was the most valuable part of the publication for American science. He wrote that “[t]he Junior department was much wanted and as far as my observations extended, was doing much good. Professors of Mathematics and others who have access to the French and German periodicals and standard works did not so much need the stimulus of the Senior department as the undergraduates in our colleges do that of the Junior department” [HL, HBL to BP, 23 August 1843].

This statement illustrates an understanding of the development, role, and needs of mathematics in America quite different from that of *The Cambridge Miscellany*’s editors. In contrast, Peirce and Lovering not only had mathematical expertise, but also had an understanding of what it meant to generate new mathematical knowledge, coupled with a desire to publish it. They posed Senior Department problems related to themes of articles, but these appear mostly to have been too difficult, although there were a few who accepted the challenge. The excerpts from the foreign journals likewise met with mixed reception. Some recognized either scientific or patriotic necessity to keep up on European work, while others considered elementary problems more beneficial to the advancement of American mathematics. After it became clear that another volume of *The Cambridge Miscellany* would not appear, Peirce received letters that mourned the loss of student simulation, not the potential stagnation of research. The long-term survival of an American journal more narrowly focused on research-level mathematics would partly depend on cultivating an educated audience and creating a more mathematically sophisticated environment.

### 7. Conclusions

The fact that neither Gill nor Peirce and Lovering managed to sustain a specialized mathematical journal illustrates some conditions of mathematical practice in mid-19th-century America. Purely mathematical journals that tried to join the few general scientific periodicals available in early 19th-century America were primarily influenced by a small number of European periodicals locatable by few Americans and mathematically accessible to fewer still. The distances separating hopeful mathematicians were too great, and the number of accomplished mathematicians was simply too small to prevail against the challenges of founding and sustaining a specialized mathematical journal at the time. Not only did the United States lack a critical mass of like-minded and capable mathematicians, but the few individuals hoping to foster development and effect change through specialized publication were overextended. Although *The Mathematical Miscellany* and *The Cambridge Miscellany of Mathematics, Physics, and Astronomy* both folded after relatively short publication runs, the eagerness with which American subscribers received them nonetheless reveals a real desire to elevate mathematical talent in the nation. The aims of the editors to stretch practitioners beyond their amateur status furthermore offer insight into the early professionalization of mathematics in the United States.

From the beginning, Gill hoped his journal would provide a venue for discussion of mathematical results and a resource for improving mathematics skills. *The Mathematical Miscellany* printed more advanced mathematics than other early American publications and included excerpts from European mathematicians. Gill also instituted a junior department to attract a wider range of subscribers, but primarily recruited his circle of friends at Hamilton College.
Lack of support from the broader academic community may have contributed to the journal’s eventual failure [Hogan, 1985, 251, 252]. The editorial load combined with financial concerns and personal circumstances also interfered with Gill’s ability to sustain the cultivation of American mathematical talent through periodical publication. Despite Gill’s combination of mathematical ability, editorial expertise, teaching experience, and problem-solving prowess adequate to manage the journal he envisioned, The Mathematical Miscellany could not continue beyond the eighth volume.

The demise of Gill’s publication segued directly—albeit somewhat delayed—into the start-up of Peirce and Lovering’s mathematical journal The Cambridge Miscellany. Gill’s periodical introduced those who had seen it to the idea of a mathematical publication with more than amusing problems. Among regular subscribers, The Mathematical Miscellany generated hope and expectation of further issues. The outcry from a smattering of college professors, engineers, and interested recreational mathematicians on the conclusion of The Mathematical Miscellany further demonstrates a growing desire for a specialized mathematical publication in the United States.

The Cambridge Miscellany began with a mission not only to encourage these mathematical amateurs, but also to acquaint them with the general currents of mathematics and the idea of research. Gill’s publication familiarized his readers with a specialized periodical, but the idea of creating and communicating new mathematical knowledge nonetheless remained somewhat novel for amateur scientists and mathematicians in America at the time.

The Cambridge Miscellany pushed to elevate the level of American mathematics and to focus attention on topics in light, mechanics, astronomy, and probability. In particular, Peirce and Lovering aimed to foster mathematical advancement through the proposition of challenging physical problems tied to particular areas of mathematical investigation. They pointed mathematicians to European research trends and attempted to equip and encourage them to work on topics of current interest. Peirce and Lovering neither expected their readers necessarily to be able to set up and solve equations of motion, nor fully to master Espy’s theory of storms. They did want them to try. Editorial decisions combined with commentary did, nonetheless, convey a sense of mathematics in action—particularly with the physico-mathematical questions. The editors hoped, ultimately, that their readers would engage in research and dialogue with European mathematicians.5

Peirce and Lovering failed to launch an American mathematical research agenda; their research-minded approach was unprecedented in American mathematical publication. They nonetheless enthusiastically advocated the advancement and professionalization of mathematics in the United States. The termination of The Cambridge Miscellany may have been accelerated by its level of difficulty. Unlike strictly puzzle journals, for which cleverness and tenacity were sufficient, the Cambridge Miscellany required more mathematical sophistication from its readers. And most of the readers just were not up to the challenge. Peirce and Lovering entertained an ambitious vision of directing an American mathematical research program through the pages of the Cambridge Miscellany, but their efforts were just too early to make a long-term impact.

Both The Mathematical Miscellany and The Cambridge Miscellany shared the motivation to improve mathematics in America. Their connected stories demonstrate the difficulties facing those who hoped to facilitate mathematical advancement in mid-19th-century America. These editors—working for professionalization and partially motivated by patriotism in their desire to elevate the level of science in America—had to balance personal demands, financial constraints, and sparse subscribers as they struggled with uneven ideas about mathematical research among a minimally trained cohort of peers. Although this body of American mathematical practitioners had not yet been capable of sustaining a research journal, the combined efforts of The Mathematical Miscellany and The Cambridge Miscellany at least tried to promote the idea of such a publication on American shores.

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5 Although The Cambridge Miscellany readers in general did not adopt these research areas, Peirce’s own work on planetary perturbations and Lovering’s work in terrestrial magnetism with the Royal Society of London both realized the goals of the journal.
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