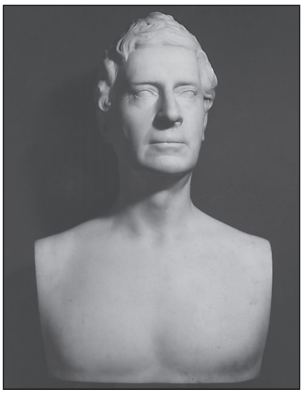
The Contribution of John Parker Jr. to American Mathematics

Steve Batterson

John Parker Jr. was a wealthy Boston merchant who died in 1844. There is no record of Parker having had any training in mathematics. Nor is there any reason to believe that Parker had any special interest in the subject. Yet a bequest written into his will in 1841 played a crucial role in enabling the advanced education of many pioneers of American mathematics.

The rise of American mathematics, begun in the last decade of the nineteenth century, was led by Americans who were profoundly influenced by their study of the subject in Europe [Parshall and Rowe, 1994]. After their return to the United States, these scholars became established at universities, where they launched their own research programs and proselytized the concepts learned in Europe. As higher mathematics diffused across the United States, the country moved toward self-sufficiency and some distinction in the subject.



John Parker Jr.

The first American graduate programs to turn out strong mathematicians were at the University of Chicago and Harvard. Chicago was led by E. H. Moore [Parshall and Rowe, 1994] and Harvard by Maxime Bôcher and W. F. Osgood [Batterson, 2009]. Each of these men had studied in Germany, where the annual expense of about $800 posed a severe challenge to ordinary families. Moore obtained his Ph.D. under H. A. Newton at Yale in 1885. Newton then loaned Moore money to continue his studies in Berlin. Bôcher and Osgood were even more fortunate. As Harvard students, they were eligible to compete for a Harvard traveling fellowship (Htf) that supported study abroad. Both received awards to pursue doctoral degrees at Göttingen.

Bôcher and Osgood returned from Germany to begin distinguished careers at Harvard. Other Htf recipients went on to lead departments at Berkeley, Rice, UCLA, and elsewhere. One striking aspect of the *vitae* of the pioneers of American mathematics is indeed the prevalence there of Htfs. For example, the four nineteenth-century American Mathematical Society (AMS) Colloquium Lecturers included the Htf holders Bôcher, Osgood, and physicist Arthur Webster. Table 1 lists all Htf awardees in mathematics (plus Webster and mathematical physicist B. O. Peirce) through 1910. The last column indicates membership in the National Academy of Sciences (NAS) and the AMS distinctions of colloquium speaker and executive office.

The Htfs were supported by various endowments. The penultimate column of Table 1 indicates the particular Htf held by each individual. Note that the Parker Fellowship was especially important to mathematics. Harvard obtained the funds to endow the Parker Fellowship in 1873 following the death of Anna Parker. The will of Ms. Parker's late husband, John Parker Jr., stipulated that the fellowships were to support the education, at home or abroad, of exceptional students. Harvard programmed the awards for use by their graduates as traveling fellowships. Holders of the Parker Fellowship went on to study under Felix Klein, Sophus Lie, David Hilbert, and Hermann Minkowski. This paper tracks the impact of the Htfs on American mathematics and investigates several underlying questions: Who was John Parker Jr., and what was the motivation behind his munificence to Harvard and his support for advanced study? Why did Harvard, which had just begun its own graduate program in 1872, direct so many resources to study abroad rather than at home?

Forerunners of the Htf

In the time of John Parker Jr., United States scholarship, in all subjects, was inferior to that in Europe. American doctoral education only began in 1860 with the creation of a program at Yale. The absence of indigenous Ph.D. programs made it difficult for early nineteenth-century American universities to obtain competently trained faculty. One solution was to assist promising instructors to make the arduous trip across the Atlantic. In

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Name (began Htf)	Bachelor	Ph.D.	Postdoc	Faculty	Htf	NAS, AMS Position
W. E. Story (1874)	Harv 1871	Leipzig 1875		Hopkins, Clark	Parker	NAS, VP
B. O. Peirce (1877)	Harv 1876	Leipzig 1879	Berlin	Harv	Parker	NAS, VP
W. I. Stringham (1880)	Harv 1877	Hopkins 1880	Leipzig	Berkeley	Parker	VP
F. N. Cole (1882)	Harv 1882	Harv 1886	Göttingen	Mich, Columb	Parker	Sec, VP
M. W. Haskell (1885)	Harv 1883	Göttingen 1889		Berkeley	Parker	VP
A. G. Webster (1886)	Harv 1885	Berlin 1890		Clark	Parker	NAS, Clq
W. F. Osgood (1887)	Harv 1886	Erlangen 1890		Harv	Harris, Parker	NAS, Clq, Pres, VP
M. Bôcher (1888)	Harv 1888	Göttingen 1891		Harv	Harris, Parker	NAS, Clq, Pres, VP
J. B. Chittenden (1891)	Harv 1889	Königsberg 1893		Brook Poly	Kirkland, Parker	
C. L. Bouton (1896)		Leipzig 1898		Harv	Parker	
E. R. Hedrick (1899)	Mich 1896	Göttingen 1891		Misso, UCLA	Parker	Pres, VP
C. N. Haskins (1901)	MIT 1897	Harv 1901	Göttingen	Dartmouth	Harris	VP
J. W. Bradshaw (1902)	Mich 1900	Strasburg 1904		Mich	Parker, Kirkland	
D. R. Curtis (1903)	Berk 1899	Harv 1903	Paris	Northwestern	Parker	VP
E. Swift (1904)	Harv 1903	Göttingen 1907		Princ, Vermont	Parker	
L. A. Howland (1906)	Wesl 1900	Munich 1908		Wesleyan	Parker	
W. A. Hurwitz (1908)	Misso 1906	Göttingen 1910		Cornell	Parker, Harris	
D. Jackson (1909)	Harv 1908	Göttingen 1911		Harv, Minn	Rogers, Hooper	NAS, Clq, VP
G. C. Evans (1910)	Harv 1907	Harv 1910	Rome	Rice, Berkeley	Sheldon	NAS, Clq, Pres, VP

Table 1. Harvard traveling fellowship (Htf) in, or related to, mathematics through 1910.

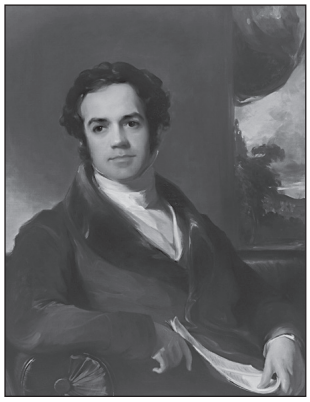
1805 Yale began these study-abroad opportunities when it supported the education in Edinburgh of its science professor, Benjamin Silliman. Ten years later Harvard first availed itself of the superior educational resources abroad when a new chair in Greek Literature was accepted by Edward Everett [Morison, 1936, 224]. To upgrade the young professor's preparation, the offer came with a special provision for Everett to study in Europe for two years on full salary.

Everett was a gifted scholar who had received his Harvard A.B. in 1811 at the age of seventeen [Frothingham, 1925]. He remained at the university for the next two years, preparing for the ministry and teaching Latin. Everett was then selected to assume the prestigious pulpit of the Brattle Street Church. Despite the security and standing of his position, the opportunity for European study and an academic life held considerable appeal to Everett. He resigned from the Brattle Street ministry.

Joining Everett on the four-week transatlantic voyage was his friend George Ticknor. Ticknor was the son of a prosperous Boston grocer [Tyack, 1967]. George had obtained a degree from his father's alma mater, Dartmouth, and then returned to Boston, where he received tutoring in the classics. A subsequent career in law proved less stimulating for him than literature. With his

father's support, in 1815 Ticknor set out to study at Göttingen [Ticknor, 1909, 49].

Everett and Ticknor landed in Liverpool and learned that their continental travel plans were in jeopardy [Frothingham, 1925, 36–38]. Napoleon had just returned to power, and war seemed imminent. The young Americans sat out the uncertainty in London, where they met Lord Byron and other distinguished British figures. After Napoleon was defeated at Waterloo, Everett and Ticknor made their way to Göttingen. The journey transported them into an intellectual environment vastly superior to Harvard and Dartmouth.



George Ticknor

To compare resources, the 200,000 volumes in the Göttingen library were more than ten times the holdings of Harvard [Long, 1935, 12]. The difference in erudition of the faculties was unquantifiable. In a letter to his father on November 15, 1815, Ticknor thus discussed his Greek professor Ernst Schultze:

> Every day I am filled with new astonishment at the variety and accuracy, the minuteness and readiness, of his learning. Every day I feel anew, under the oppressive weight of his admirable acquirements, what a mortifying distance there is between a European and an American scholar! We do not yet know what a Greek scholar is; we do not even know the process by which a man is to be made one. I am sure, if there is any faith to be given to the signs of the times, two or three generations at least must pass before we make the discovery and succeed in the experiment. Dr. Schultze is hardly older than I am.... It never entered into my imagination to conceive that any expense of time or talent could make a man so accomplished in this forgotten language as he is [Ticknor, 1909, 73].

The learned Göttingen faculty, headlined by Carl Friedrich Gauss and Johann Friedrich Blumenbach, covered a broad spectrum of scholarship. Both Everett and Ticknor immersed themselves in study while taking courses and receiving individual instruction. Most of their work involved philology, but the Americans delved into related topics and attended lectures by Blumenbach on natural history [Ticknor, 1909, 79–80], [Long, 1935, 65–66]. On vacations they traveled, carrying letters of introduction from their professors. In Weimar, Everett and Ticknor had discussions with Goethe [Long, 1935, 27].

The descriptions by Everett and Ticknor of their educational experiences made profound impressions on the American recipients of their letters. Among the Harvard correspondents were President John Thornton Kirkland and former Latin tutor Joseph Cogswell. Cogswell, a close friend of Ticknor's, was inspired to travel to Göttingen for study the following year [Ticknor, 1874]. When a new Harvard chair was endowed in French and Spanish, the call went to Ticknor, who was not trained in either subject [Tyack, 1967, 62].

Everett received his Ph.D. in 1817 and was granted two additional years of leave for travel in Europe [Morison, 1936, 226]. He proposed to Kirkland that Harvard cultivate its philology faculty by sending a recent graduate to Göttingen for further study. Kirkland approved the plan, arranging an ad hoc scholarship for George Bancroft [Howe, 1908], who lacked the wherewithal of Ticknor and Cogswell [Howe, 1908, 32–33].

Over the period 1819–1822, Everett, Ticknor, Cogswell, and Bancroft returned to Harvard [Morison, 1936, 226–228]. Each hoped to pass on his newfound learning. The results were at best mixed. As an ambitious instructor of Greek, Bancroft was ridiculed for the European airs he affected. Cogswell fared little better. At Göttingen he had acquired an interest in library science. Harvard hired him as college librarian. Cogswell's efforts to implement German library methods and values met with resistance from the Harvard administration [Ticknor, 1874].

Frustrated by Harvard's intransigence, Cogswell and Bancroft concluded that movement on their agenda required a new institution [Long, 1935, 92–95], [Ticknor, 1874, 134–137]. Together they established a secondary school, the Round Hill School, with the objective of introducing European methods of learning to upper-class New England teenagers. The noble experiment lasted eight years. Then, going their separate ways, Cogswell and Bancroft both went on to noteworthy accomplishments.

Cogswell persuaded John Jacob Astor to fund what became the New York Public Library. As its first librarian, Cogswell acquired its collection and prepared the catalogue. Bancroft entered politics and served in the cabinet of President James Polk and later as minister to Great Britain and to Germany. His books on colonial history were highly regarded in the nineteenth century. Despite his disastrous teaching stint at Harvard, Bancroft would remain forever grateful for the Göttingen study opportunity made possible for him by President Kirkland.

With endowed chairs, Everett and Ticknor were better positioned to bring new ideas to Harvard. Their European experiences animated scholarship never before available on the campus [Morison, 1936, 227–230]. Everett's course on the history of Greek literature impressed at least one young junior in the college. Ralph Waldo Emerson wrote

"There was an influence on young people from the genius of Everett which was almost comparable to that of Pericles in Athens" [Frothingham, 1925, 63].

Everett's brilliance, eloquence, and connections caused his name to arise for other prestigious positions. Something about his makeup made it difficult for Everett to find contentment. He remained a Harvard professor for five years. Subsequent titles included United States congressman, Massachusetts governor, minister to Great Britain, Harvard president, United States secretary of state, and United States senator. In 1860 Everett was the candidate for vice president on the Constitutional Union Party ticket headed by John Bell.

Of the four students who ventured abroad, Ticknor had the longest and greatest impact on Harvard [Morison, 1936, 230–238]. His extensively researched courses on Spanish and French literature brought new areas of learning to the college. Over his sixteen years on the faculty, Ticknor agitated for educational reforms to serve strong students. His success in this endeavor, although limited, advanced the study of modern languages at Harvard.

Both Ticknor and Everett married into families of considerable wealth. Everett's wife, Charlotte, was the daughter of Peter Brooks, the richest person in Boston. Ticknor's father-in-law, Samuel Eliot, endowed the chair that brought Everett to Harvard. In Jacksonian Boston abundant endowments of wealth, learning, and refinement combined to confer lofty status. With personal friendships that included Thomas Jefferson, the Adamses, Daniel Webster, and Lafayette, Ticknor and Everett were two of the most respected figures in the city. Both lived in the fashionable area northeast of the Boston Common. Regular gatherings in Ticknor's home at Park and Beacon Streets were prestigious social events [Tyack, 1967].

The Bequest of John Parker Jr.

The family fortune that made possible John Parker Jr.'s surprising bequest began with his father, wholesale merchant John Parker. Following the Revolutionary War the port of Boston pulsed with commercial opportunities. Peter Brooks, for example, made his fortune in marine insurance. Operating out of a store on Long Wharf, the elder Parker built a lucrative commission business. Early in the nineteenth century he brought his first two sons—John Jr. and Peter—into the business. The next child was a daughter, and three more Parker boys were born in the 1790s. The younger sons attended Harvard.

The Brooks and Parkers were among a few dozen elite families whose privileged economic circumstances gave them considerable control over early nineteenth-century Boston. Amid this deeply religious culture, the first obligations were to God and family. A secondary consideration was to assist the less fortunate. In 1810 a call went out to Boston's "wealthiest and most influential citizens" to contribute funds for a hospital [Bowditch, 1972, 3]. John Parker's $500 donation, while substantial, did not rank in the top twenty-five. By 1818 sufficient money had been raised to begin construction of Massachusetts General Hospital. To provide for annual operating expenses, a novel plan was devised. Leading citizens bought shares to start up an insurance company that committed one-third of its profits to the hospital.

Large investors included John Parker, Peter Brooks, and Josiah Quincy, each purchasing a $10,000 piece of the Massachusetts Hospital Life Insurance Company [White, 1955, 12–13]. Smaller shareholders included George Ticknor and the mathematically learned Nathaniel Bowditch, who served as the company actuary. Parker, Brooks, Quincy, Ticknor, and Bowditch were vice presidents and directors of the corporation. Each of these men had ties to Harvard, where Bowditch served as a fellow and where Quincy became president in 1829. In the interlocking affairs of the Boston upper class, about one-half of the governing Harvard fellows were officers of Massachusetts Hospital Life. Social and intellectual encounters among these men were further facilitated by the Boston Athenaeum library, where the $300 fee restricted membership to an exclusive clientele.

Not much is known about John Parker Jr., the benefactor of Harvard's Parker Fellowship. He was born on June 4, 1783. Growing up, he followed after his father in many respects. The Parkers' religion was Unitarian, and their political allegiance focused on John Quincy Adams. At the age of twenty-two John Jr. became a partner in his father's business. Four years later he married Anna Sargent. Although John Jr. was connected to Harvard through his family, friends, and business associates, there is no evidence that he had direct ties to the university during his lifetime.[1]

John and Anna lived in the heart of the Boston neighborhoods favored by the upper class. Their home was in Colonnade Row on Tremont Street, overlooking the Boston Common. Colonnade Row was a stylish development of nineteen four-story brick town homes designed by the prominent architect Charles Bulfinch. Among the other occupants were members of the Lawrence and Lowell families. From the Parkers' location, the two-block walk along the Common to George Ticknor's house passed the home of Josiah Quincy. Colonnade Row was just a few blocks in a different direction, along Sumner Street, from the residences of Edward Everett, Daniel Webster, and Nathaniel Bowditch.

The John Parkers' mercantile success positioned them to join other wealthy men in various ventures.

[1] *A posthumous connection is that his great-niece, Anna Parker, married Abbott Lawrence Lowell, who became president of Harvard in 1909.*

Both Parkers served as directors of major banks. When the elder John Parker died in 1840, his estate was valued at over $2,200,000. One of the beneficiaries, John Parker Jr., then drafted his own will. Without any children of his own, Parker Jr. generously left up to $5,000 each to numerous relatives, friends, and charities. The largest immediate legatees were his wife, siblings, and minister. Anna was to receive $80,000 and the income from a $100,000 trust fund. Parker Jr. was very explicit as to the ultimate disposition of the money from this fund:

> Also at my wife's decease it is my will that the sum of fifty thousand dollars… shall be paid to the President and Fellows of Harvard College in Cambridge to perform this my will…. To the instruction, education, and maintenance of one or more individuals as they may successively arise, of eminent natural talent or genius for some one or more of the sciences taught in said College… at home or in foreign countries, for his or their most perfect education…whose possessors, whether strictly poor or not, are not blessed with pecuniary means adequate to effecting the high state of improvement and advance in science for which they seem to be destined by nature…[Eliot, 1872–1873, Appendix II].

Out of the dissolved fund for his wife, John Parker Jr. directed that $10,000 remain in a separate trust, with the income to support five new beds in Massachusetts General Hospital. The remaining $40,000 was designated for his heirs. Parker signed the will on February 22, 1841. He and Anna then embarked on eighteen months of travel through Europe [Transcript, 1842, 2].

The Parkers spent the following winter in Italy, enjoying the art during extended stays at Florence, Rome, and Naples. In Florence, Parker commissioned his bust to be sculpted by the American Hiram Powers (see image on page 262). With daguerrotype portraits just emerging in the 1840s, Powers's marble sculptures had found a niche a few years earlier among rich and famous Americans. Among Powers's clients was the wealthy Boston industrialist Abbott Lawrence, whose brothers, Amos and William, were Colonnade Row neighbors of Parker's.

Edward Everett was another recent Powers model. Possibly there was some interaction in Florence between Everett and Parker. One month prior to Parker's sitting, Everett departed from a long Florence residence to assume the post of United States Minister to the Court of St. James. Evidence suggests that Everett and Parker did meet in London prior to the latter's return home. Everett's appointment book recorded, without any further details, a meeting for May 31, 1842, with a "Mr. Parker" [Everett, 1930, reel 41A]. The Parkers boarded a steamship in Liverpool on August 19. A newspaper reported that John arrived in Boston carrying dispatches for Washington [Transcript, 1842, 2].

John Parker Jr. died on December 29, 1844. Although Harvard did not receive the $50,000 until after Anna's death nearly thirty years later, the bequest deserves analysis in the context of the 1841–1844 period in which it was made. Harvard and Massachusetts General were then the preferred charities of the Boston elite. The donation by Parker was the third largest commitment received by Harvard up to this point (1844) in its history.

To appreciate the contemporary magnitude of $50,000, consider a gift of the same amount made by Abbott Lawrence in 1847. Lawrence's donation was then the biggest by any living person to the university. It led to the consequential hiring of Louis Agassiz and the establishment of what became the Lawrence School of Science. Lawrence, who made subsequent donations, is remembered as a prominent Harvard patron.

One can only speculate on what lay behind the carefully customized stipulations in the will of John Parker Jr. With respect to the provisions for talented Harvard individuals for study in foreign countries, Everett, Ticknor, and/or Bancroft may have had some influence. They were the Boston exemplars of gifted students studying abroad. The Whig politics and family background of John Parker placed him among the small, closely connected group of Bostonians that included Everett and Ticknor. Bancroft, although aligned with the opposition Jacksonian Democrats, served as the Collector of Customs for the Port of Boston from 1837 to 1844. Bancroft would later acknowledge his long-held desire "to requite benefits" he received from President Kirkland that made possible his own study at Göttingen [Bancroft, 1871]. Did the customs collector impress these sentiments upon one of Boston's most prosperous maritime merchants as he was formulating his will? Bancroft's papers contain no mention of John Parker during this period. Still there is a likelihood that their mutual business interests led to personal interactions.

Another area for speculation concerns the provision by Parker that extended eligibility not just to the needy but also to individuals of moderate means. Both Osgood and Bôcher qualified under these liberal terms. Parker may have been influenced by the way educational opportunities had expanded for his younger siblings as their father's wealth increased.

Harvard Establishes Traveling Fellowships

Although studying at European universities had been life-altering experiences for Everett, Ticknor, and Bancroft, few of their countrymen followed them before the last quarter of the century. Meanwhile, graduate-level education did not then exist in the United States, although master's degrees had long been available at Harvard and Yale. The criteria for these degrees followed the long-standing British model: simply pay a fee and wait a few years beyond the bachelor's degree. During this interval the candidate, rather than engaging in scholarship, was expected to demonstrate satisfactory moral behavior.

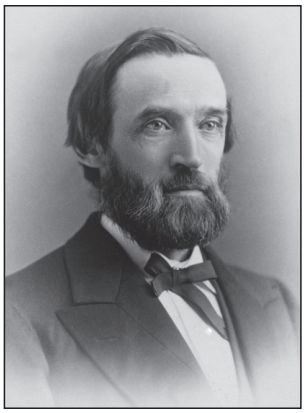
In the late 1840s some advanced-study opportunities opened in the United States. At Harvard, Benjamin Peirce offered analytical and celestial mechanics to the few students who elected to brave his abstruse lectures [Cajori, 1890, 137–138]. Agassiz and others taught substantial courses in the Lawrence School of Science. Yale began a program of higher-level instruction in philology, applied chemistry, and mathematics. The courses were intended for Yale graduates and were not, at first, linked to any degree.

Thirteen years later, in 1860, Yale announced the first Ph.D. degree in the United States. The modest course and thesis requirements for the two-year program compare today to those of a master's or undergraduate honors degree. Anything more ambitious was precluded by the limited personnel at Yale, where no subject was staffed by more than two professors and low-level faculty (tutors).

The sole mathematics professor, H. A. Newton [Batterson, 2008], continued to have responsibility for teaching sophomores and upperclassmen. Newton himself had received his B.A. ten years earlier. He then studied independently and served as a tutor. With his promotion to professor in 1855, Newton received a one-year leave of absence, with salary, to study in Europe. Newton divided his time abroad between travel and auditing classes in Paris. As the Ph.D. program began, Newton was attempting to establish his own research program in two areas. One was a short-lived foray into projective geometry, which he had studied at the Sorbonne. The second was the mechanics of meteor orbits, a subject that fascinated a number of New Haven intellectuals. With somewhat meager attainments in these directions, Newton would be one of four mathematicians in the soon-to-be incorporated National Academy of Sciences.

Three students were awarded Ph.D.s at Yale in 1861, including Arthur W. Wright, under the guidance of Newton [Batterson, 2008, 360]. Although Wright and J. Willard Gibbs, who finished two years later, would go on to become distinguished scientists, both benefited from subsequent study in Europe. As doctoral students trickled out of Yale in the 1860s, other American institutions observed with interest. None was immediately moved to offer its own advanced degree.

Harvard's decision, in 1872, to begin a Ph.D. program generated controversy among its faculty [Morison, 1936, 334–335]. Some professors were unqualified to teach advanced courses. Others worried that resources would be siphoned from the inadequately funded undergraduate college. Finally there were questions as to whether an audience existed for the new program. The young Harvard president, Charles Eliot, adamantly defended the higher degree. The gradual buildup of the Ph.D. program would be one of the several threads that Eliot wove to establish Harvard as a first-class university.



H. A. Newton

When the Parker bequest became available in 1873, the graduate school was in its infancy. Devoting the funds to graduate scholarships would have given an impetus to the program and been a lure to students. Although no campus Ph.D. had existed during the donor's lifetime, usage for this purpose was fully consistent with his stipulations. A faculty committee was thus charged with formulating procedures for distributing the income. The implementation, as presented to the Harvard fellows by Eliot, established three Parker Fellowships with annual stipends of $1,000 for up to three years. Eligibility was restricted to graduates of the university pursuing nonprofessional studies.

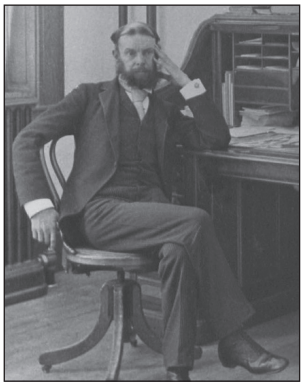
None of the formal provisions addressed whether the work was to be carried out abroad or within the new Harvard graduate school. The silence was not out of a lack of consideration. Eliot was a shrewd planner. He wished not only to grow the graduate school but also to upgrade faculty scholarship. Moreover, other endowments for student support became available at the time the Parker funds did.

In 1868 Harvard received $10,000 from the estate of Henry Harris to aid students in continuing their education after graduation. The following year alumnus Henry Rogers donated $20,000 for a similar purpose. As both the Harris and Rogers endowments were intended for nonprofessional studies in the city of Cambridge, they were ideally suited for graduate school stipends.

And, fortuitously, another donor articulated the concept of a traveling fellowship and completed his gift as arrangements for the Parker Fellowships were being formulated. George Bancroft was then the United States Minister to Germany. Over half a century earlier, President Kirkland had approved an initiative to cultivate Harvard faculty by sending a young graduate to study at Göttingen. Bancroft recalled that "his choice for

this travelling scholarship fell upon me" [Bancroft, 1871]. The experiment was in some sense a failure, as Bancroft was not selected for a Harvard professorship. Nevertheless, Bancroft appreciated that his otherwise successful career had been enriched by the opportunity abroad. Now he wanted to give back. "I wish therefore to found a Scholarship on the idea of President Kirkland, that the incumbent should have leave to repair to a foreign country for instruction." Bancroft also suggested that the recipients "may perhaps be afterwards drawn into the corps of professors of the University". Bancroft's endowment for the Kirkland Fellowship amounted to about $11,000.

Eliot adopted the Bancroft-Kirkland vision for the Parker Fellowships. In the president's annual report to the overseers, Eliot wrote "these Fellowships will be attractive prizes, and…, if rightly managed, they will be a means of recruiting the university's body of teachers with young men of good parts and the best possible training" [Eliot, 1872–1873, 23–24]. The four Parker and Kirkland Fellowships were bracketed for study "in this country or in Europe". Despite this flexibility, they were targeted from the beginning at the latter.



William Story

In rapid succession the Parker provisions were ratified, Edward Stevens Sheldon was named the first Parker Fellow, and he departed to study modern languages in Europe [Parker]. Sheldon had graduated third in the class of 1872. He was serving as a proctor and instructor of Italian and Spanish. According to plan, Sheldon returned in 1877 to teach at Harvard. About this time the conditions of the Harris and Rogers Fellowships were adjusted to permit study abroad. Sheldon rose through the ranks and remained a professor to retirement in 1921. Other traveling fellows would follow. What Eliot did not foresee, or felt it immodest to predict, was the impact that the traveling fellowships would have on scholarship beyond Harvard.

The Htf and American Mathematics[2]

The year 1873 marked the beginning of the Htf, as well as the first mathematics Ph.D. at Harvard. That year William Byerly completed the two-year degree under Benjamin Peirce, who never had another doctoral student. Peirce was then the leading mathematician in the United States. The other prominent American scholars in the field were H. A. Newton, George William Hill, and Simon Newcomb. Hill and Newcomb were associated with the Nautical Almanac Office and, like Newton's, their work was in celestial mechanics. Outside of Harvard and Yale, mathematical research barely existed on American campuses.

Byerly was not the most promising mathematician in the Harvard class of 1871. William Story, the only graduate with honors in the subject, was also interested in pursuing his studies further [Cooke and Rickey]. Rather than remaining at Harvard or beginning the more established program at Yale, Story traveled to Germany without a fellowship. In Berlin he attended lectures in mathematics and physics by Karl Weierstrass, Ernst Kummer, and Hermann von Helmholtz. Story's teachers in Leipzig included Carl Neumann and Adolf Mayer. Story returned home without a degree in early 1874. As a Harvard graduate, he was eligible to apply for a traveling fellowship. The two remaining Parker Fellowships were awarded to Story and Ernest Francisco Fenollosa [Parker].

Fenollosa studied philosophy at Cambridge University. He later became an influential authority on East Asian art. Story obtained his Ph.D. in mathematics with another year of study at Leipzig. Returning to a Harvard tutorship in 1875, he became the first traveling fellow to join the faculty.

At this time Harvard's mathematics professors were the sixty-six-year-old Benjamin Peirce and his son James, whose contributions were to teaching and administration. Story was keen to continue his research. Given the high esteem in which he was held by both Peirces, he was positioned to succeed the elder Peirce. Then another opportunity presented itself. The Johns Hopkins University was to open in 1876. Its president, Daniel Coit Gilman, aspired to establish the first American university dedicated to graduate study and research. To lead the program in mathematics Gilman selected Benjamin Peirce's friend, the British mathematician J. J. Sylvester [Parshall and Rowe, 1994]. Sylvester needed a lieutenant to share in the instruction and contribute to scholarship. He sought advice from the Peirces. They recommended Story over Byerly, who was then at Cornell [Cooke and Rickey, 1989, 34–35], [Parshall and Rowe, 1994, 76].

Story moved to Johns Hopkins and was replaced at Harvard by Byerly. The new university marked the beginning of substantial graduate education in the United States. Mathematics was immediately successful. Sylvester inspired an unprecedented number of American students to engage in research. In addition, Johns Hopkins sponsored the first important mathematics journal in the United States. As managing editor of the *American Journal of Mathematics* and instructor in a variety of topics, Story made contributions that, while subordinate to those of Sylvester, were indispensable to this pioneer undertaking.

Johns Hopkins' $500 fellowships added to the desirability of the new program. The Harvard

[2] *The discussion of the development of American mathematics 1876–1900 draws substantially from [Parshall and Rowe].*

graduate school was overshadowed by its younger domestic competitor.

Yet the Htf remained an attraction for the mathematically talented student who, every year or two, graduated from Harvard. In 1876 B. O. Peirce received highest honors in physics. The following year Washington Irving Stringham earned the same distinction in mathematics. Both had taken courses from Benjamin Peirce, a distant relative of B. O. Peirce.

The younger Peirce published experimental physics research as a junior, continuing his laboratory work for a year after graduation. In 1877 one of the Parker Fellowships was renewed, and two were available. There were eighteen applicants for these coveted awards, and B. O. Peirce was one of the winners [Parker].

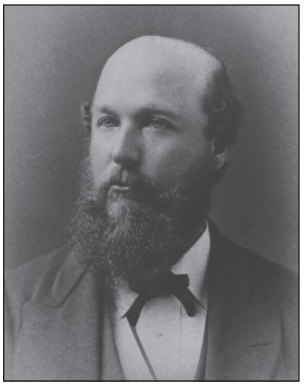
The Harvard administration then reviewed and revised the Parker Fellowship stipend, concluding

> that $800 a year will enable a young man to live comfortably, though plainly, at any foreign university, and pay for the journeys to and from home, provided that he hold the fellowship at least two years. As it is not the policy of the Council to recommend for appointment to fellowships persons who are not likely to hold them for at least two years, it will seldom happen that an incumbent is forced to pay for two voyages across the Atlantic out of the income of a single year. To increase the number of these fellowships to four seemed more desirable than to give three an income which would permit to the incumbents some not indispensable expenditures. For several years past, the Kirkland Fellowship, with an income of only $750 has maintained its incumbents at European universities. Five hundred dollars will support a student at any American university [Eliot, 1877–1878].

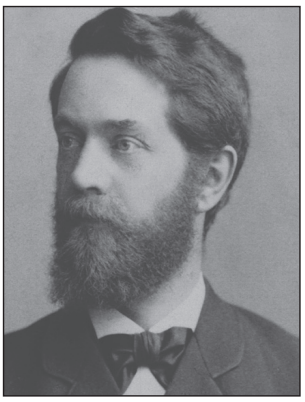
B. O. Peirce obtained his Ph.D. at Leipzig and then did postdoctoral work in Helmholtz's Berlin laboratory. Soon after returning to America, he began teaching mathematics and physics at Harvard. In the decade after Benjamin Peirce's death in 1880, Harvard mathematics was dominated by James Peirce, Byerly, and B. O. Peirce, none of whom produced research in the subject. B. O. Peirce later published work in experimental physics. He served as a vice president of the AMS and president of the American Physical Society.

Stringham took a more circuitous route to Europe. Accepting a Hopkins fellowship, he came under the influence of Story in Baltimore [Parshall and Rowe, 1994, 112]. Stringham received his Ph.D. in 1880. With a Harvard A.B., he still met the eligibility requirement for an Htf. Stringham was awarded a Parker Fellowship for postdoctoral study in Leipzig [Parker]. The timing was propitious in that Felix Klein was beginning his Leipzig tenure in the same year. The thirty-one-year-old Klein was a gifted teacher with a profound view of the deep connections in mathematics [Parshall and Rowe, 1994]. By participating in Klein's seminars, Stringham absorbed mathematical developments that were unknown in the United States.

With a Hopkins Ph.D. and two years of postdoctoral study under Klein, Stringham was the best trained American mathematician yet to appear on the job market. The University of California had just fired its professor of mathematics and was looking to upgrade its expertise in the subject [Moore, 2007, 25–40]. In 1882 Stringham became the first mathematics Ph.D. on the Berkeley faculty. He immediately modernized the curriculum and introduced courses beyond calculus. Later, Stringham instituted a Ph.D. program and supervised the first Berkeley mathematics thesis. Beyond his own department, Stringham was a leading figure in university affairs, becoming dean of the faculty.



Washington Irving Stringham



Felix Klein

The impetus that Johns Hopkins gave to American mathematical scholarship was largely short-lived [Parshall and Rowe, 1994, 145–146]. Sylvester's students did not go on to distinguish themselves as researchers. In 1883 Sylvester returned to England. Efforts to replace him with Klein and Arthur Cayley were unsuccessful. Eventually, astronomer Simon Newcomb assumed Sylvester's chair on a part-time basis, continuing his work in Washington for the Nautical Almanac Office. Instruction in mathematics devolved to Story and two of Sylvester's Ph.D. students. Without the charisma and mathematical direction of Sylvester, the program lost the special features on which its success had been based [Parshall and Rowe, 1994, 144].

Nor could Byerly and the Peirces pick up the slack at Harvard. Yale was better positioned with Newton and Willard Gibbs. Newton held a high profile, serving as president of the American Association for the Advancement of Science in 1885. His research was on meteors and comets. Gibbs had done groundbreaking work in physical chemistry and possessed a profound understanding of mathematics. However, it would take time for his ideas to be understood and appreciated in the United States. As a reclusive professor of mathematical

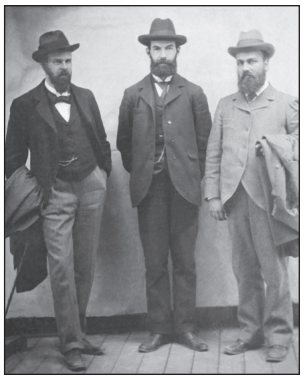
physics, he saw few students. Perhaps the best American mathematician was George William Hill, who worked on celestial mechanics at the Nautical Almanac Office.

Thus the state of American mathematical scholarship in the mid-1880s was not unlike what it had been prior to the creation of Johns Hopkins. There were a few outstanding applied workers, meager pure research, and no domestic graduate program near the level of European programs.

Frank Nelson Cole

Several mathematically inclined students nevertheless passed through Harvard during this period. They then went to Germany on traveling fellowships and returned to play crucial roles in upgrading mathematical research and graduate study in the United States.

Frank Nelson Cole finished second in the Harvard class of 1882 with highest honors in mathematics. He remained in Cambridge for the first year of his Parker Fellowship to do graduate work in mathematics. Cole then went to Leipzig with the intention of studying the mathematical side of physics [Parker]. During the summer of 1884 he came under the spell of Felix Klein [Parshall and Rowe, 1994, 192, 196–197]. One year later his Htf expired. Cole returned to Harvard with a lectureship and a thesis problem on sixth-degree equations.



Left to right: James Pierpont, W. F. Osgood, Maxime Bôcher, 1899.

Despite his hard work, Cole was unable to make much progress doing research in the mathematical isolation of the United States [Cole, 1886]. Even so, Harvard awarded him a Ph.D. In the classroom Cole lectured on Klein's approach to substitution groups and function theory. More important, Cole opened a channel between Harvard and Klein that would endure after Klein's move to Göttingen in 1886. This connection would prove to be of great significance to American mathematics.

However, with just one or two Parker Fellowships vacated each year, the competition was intense for new scholarships. Some candidates may have queued into the Harvard graduate school, where they could prove their worth for a subsequent offering. In 1885 mathematics graduate student Mellen Haskell, who had received his A.B. two years earlier, was awarded a Parker Fellowship. Haskell went to Leipzig to study with Klein.

In 1886 only one new Parker was available. The Harvard graduating class that year included future distinguished scholars George Santayana, Theodore Richards, and William Fogg Osgood. Santayana received another Htf earmarked for students in his field of philosophy. The Parker was assigned to mathematics instructor Arthur Gordon Webster, who had graduated the previous year with highest honors in mathematics. Webster would earn his Ph.D. in physics at Berlin. Richards and Osgood remained at Harvard for graduate study in chemistry and mathematics, respectively.

Osgood had graduated second in his class with highest honors in mathematics. In 1887 he received his A.M. Inspired by Cole's course on function theory, Osgood applied for an Htf to study with Klein at Göttingen. Having lost his father two years earlier, Osgood was in need of financial support to pursue a Ph.D. abroad. Once again, just a single new Parker Fellowship was available. It was awarded to law school graduate Julian William Mack. Osgood received the Harris Fellowship, which carried a lower stipend than the Parker. He went to Göttingen, and the following year his fellowship was upgraded to a Parker, opening the Harris.

One additional Parker was available in 1888. Mathematics had a strong candidate, Maxime Bôcher, who was graduating with highest honors. Bôcher met the means criteria for a Parker Fellowship. His father, Ferdinand, was a Harvard French professor on a salary of $4,000. If Maxime were unsuccessful in his application for an Htf, he planned to remain at Harvard for an additional year of course work and independent study. The recipient of the Parker was Theodore Richards, from Osgood's class, who had just completed his Ph.D. Richards would do postdoctoral work in Berlin and go on to win the Nobel Prize in chemistry. Bôcher received the Harris. Like Osgood, Bôcher traveled to Göttingen to study with Klein and was promoted to the Parker in his second year.

Haskell, Osgood, and Bôcher each completed his Ph.D. in Germany. Haskell received his degree in 1889 and took a job at Michigan. From there Haskell was hired by Stringham in 1890 to become the second mathematics Ph.D. on the Berkeley faculty [Moore, 2007, 33]. Osgood and Bôcher returned to Harvard in 1890 and 1891, respectively, as instructors of mathematics.

Cole's story was less happy. He had resigned his Harvard position a few years earlier after experiencing a breakdown from overwork [Cole, 1887]. No longer able to concentrate, Cole took a job as an assistant to a railroad engineer. Working in the outdoor air, he slowly regained his health. In 1888 Cole had sufficiently recovered to become the first mathematics Ph.D. on the Michigan faculty. By the second semester he was reprising his course on function theory for faculty and advanced students [Cole, 1889].

Over the 1880s Parker Fellows Stringham, Cole, and Haskell brought Klein's mathematics to Berkeley, Harvard, and Michigan. No new significant

American mathematics Ph.D. program was initiated, however, until 1889 with the opening of Clark University. The president of Clark, G. Stanley Hall, was a psychologist from Johns Hopkins. Hall set out to emulate German scholarship by establishing strong graduate departments in the sciences. When overtures to Klein failed, Hall selected his Hopkins colleague Story to lead mathematics [Cooke and Rickey, 1989].

Among those joining Story in the new department were two Klein students. First came the recent German emigré Oskar Bolza. In the second year the mathematics roster added American Henry Seely White, who had been contemporaneous with Osgood at Göttingen. In that same year Arthur Webster received a postdoctoral appointment in physics.

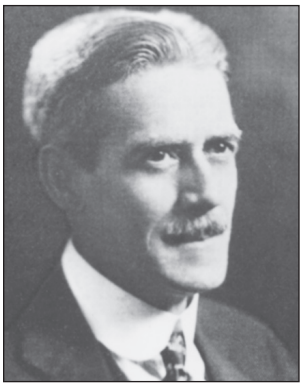
The course offerings at Clark provided the broadest array of European-level mathematics available in the United States. Unfortunately, the university was insufficiently funded to meet its obligations. Over its third year the founder, president, and faculty became embroiled in devastating disputes. In 1892 many faculty members departed for other institutions. The university lost White and Bolza but retained Story and Webster. The second promising American mathematics graduate program left little mark.

The collapse of Clark took place during Bôcher's first year on the Harvard faculty. Meanwhile he and Osgood attempted to continue their research in the face of serious obstacles. Both labored under one-year contracts for $1,250 with four-course teaching loads [Batterson, 2009]. Their (senior) colleagues, Byerly and the Peirces, were not engaged in research, nor were they knowledgeable about recent developments. In this respect the Harvard mathematics department was out of step with the rest of the university [Morison, 1936, 378]. During Eliot's presidency, research had become expected of Harvard faculty. Graduate programs in other subjects were advancing.

The time was ripe for mathematical scholarship at Harvard. Despite their heavy teaching loads, Bôcher and Osgood made it happen. Over his first two years Bôcher obtained significant new results and expanded his thesis into a book on potential theory. The German text, with a foreword by Klein, was published in Leipzig. The book became known among the European mathematical community, providing evidence of substantial American scholarship. Bôcher made a number of other notable contributions, particularly to the theory of ordinary differential equations.

In 1896 Osgood proved a version of the bounded convergence theorem for term-by-term integration of series of continuous functions. Unknown to Osgood was an earlier formulation of Arzelà. Even so, Osgood's profound analysis would be important to Lebesgue in his subsequent development of integration [Hawkins, 1970]. But the greatest American mathematical accomplishment of this time was Osgood's 1900 proof of the Riemann Mapping Theorem for simply connected domains. In removing restrictions on the boundary, Osgood succeeded on a problem that had been pursued by Schwarz and Poincaré [Walsh, 1973].

Bôcher and Osgood worked together to elevate the Harvard mathematics curriculum. Both strove to present current ideas in their advanced courses. Although Byerly and the Peirces shared the instructional duties, the Harvard offerings were steadily modernized, course by course. Bôcher, the department's most junior member, took the lead in thesis direction. He was promoted to assistant professor in 1894, and his first Ph.D. student, James Glover, finished the following year.



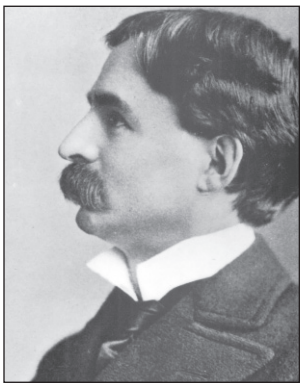
Earle Hedrick

The rate of Harvard mathematics Ph.D. output increased to about one per year, a large number for the time. The school's most promising students, however, continued to go abroad for their doctorates. Charles Bouton and Earle Hedrick came to Harvard for graduate study in the final decade of the nineteenth century. Both earned their master's degrees and then went to Germany on Parker Fellowships. Bouton received his Ph.D. with Sophus Lie at Leipzig and then returned to teach at Harvard. Hedrick took his doctorate under David Hilbert at Göttingen. Following a brief stint at Yale, he became chair at Missouri and then at UCLA. As students of Lie and Hilbert, the traveling fellows had established connections to two of the greatest mathematical thinkers in the world.

Paralleling these developments at Harvard were even more dramatic advances at a new institution [Parshall and Rowe, 1994]. The University of Chicago opened in 1892 with E. H. Moore as acting head of mathematics [Parshall and Rowe, 1994, 283–284]. As already mentioned, Moore had received his Ph.D. under H. A. Newton at Yale seven years earlier. Newton then supported Moore for a year of postdoctoral study in Germany. Returning to the United States, Moore wrote a few papers while holding lower-level teaching positions at Yale and Northwestern. He was one of a handful of Americans committed to mathematical research but had no major results or any experience with thesis direction.

To fill out his team Moore hired Bolza and Heinrich Maschke. Bolza and Maschke had studied together with Klein in their native Germany [Parshall and Rowe, 1994, 289–292]. With this roster Chicago's graduate offerings, from the beginning, were strong and balanced, surpassing the program

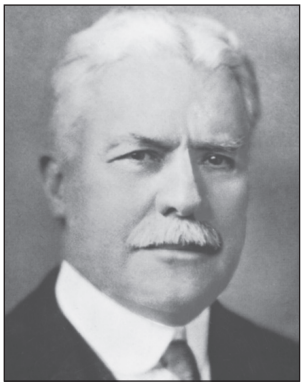
at Harvard. In 1896 Leonard Dickson completed his thesis at Chicago under Moore. Over the next few years, the flow of promising American students to Europe abated but did not halt. Gilbert Bliss and Oswald Veblen would begin study for their doctorates at Chicago, but Bouton, Hedrick, Edward Huntington, and Max Mason went to Europe.



E. H. Moore

Moore's own research blossomed at Chicago. He, Osgood, and Bôcher established themselves as the leading American mathematicians of the rising generation. They worked together and with others to promote mathematical research nationwide through the American Mathematical Society (AMS).

The history of the AMS is itself instructive. Founded in 1888 at Columbia University with the name the New York Mathematical Society, it began through the initiative of a graduate student, Thomas Fiske. Fiske was inspired by the mathematical activity he witnessed during a residence in England. What Fiske began as a campus interest group quickly grew into a national organization that supported meetings, lectures, and publication.



Thomas Fiske

A dozen years after its birth, a generational and cultural change took place in the AMS leadership. All of the nineteenth-century AMS presidents were born in the 1830s and 1840s. Beginning with E. H. Moore in 1901, the next seven presidents[3] were born in the interval 1858–1865. Each had an earned Ph.D., and all but Fiske had studied in Germany during the decade 1884–1893. Cole, from the same demographic, served throughout as secretary. These younger men sought to transplant the European mathematical ethos to the United States. They succeeded in creating an American identity that was worthy of international respect.

Meanwhile, Harvard students continued to take advantage of the Htf. A gradual change began in the use of the fellowships, with C. N. Haskins and D. R. Curtiss taking Ph.D.s at Harvard and then using the Htf for postdoctoral work in Göttingen and Paris, respectively. Haskins and Curtiss spent their professional careers at Dartmouth and Northwestern. Over the same period J. W. Bradshaw, Elijah Swift, and Leroy Howland went abroad on Htfs for their doctorates. They then carried the benefits of their cosmopolitan experiences to the campuses of Michigan, Vermont, and Wesleyan. Swift and Howland had worked with Hermann Minkowski and Ferdinand Lindemann.

It would take a few more years for the Htf to become a mostly postdoctoral fellowship. In 1908 and 1909 W. A. Hurwitz and Dunham Jackson went to Göttingen on Htfs. There they obtained their doctoral degrees from Hilbert and Edmund Landau. Griffith Evans received his A.B. from Harvard and remained there for his Ph.D. under Bôcher in 1910. Evans then was awarded an Htf to do postdoctoral work with Vito Volterra in Rome. Upon his return to the United States, Evans became the first faculty appointment at Rice [Moore, 2007, 51]. With several strong and many developing domestic graduate programs, it became unusual, after 1910, for Americans to pursue a mathematics Ph.D. abroad.

Conclusion

A number of factors contributed to the sudden rise of American mathematics at the turn of the twentieth century. Most notable were the individuals who overcame huge teaching loads to establish mathematical research as an essential ingredient of campus scholarship. The common thread distinguishing these agents of change from their predecessors was coming of age mathematically in Europe.

Each pioneer required the financial means to study abroad. In many cases the support was provided by an Htf. Not surprisingly, the greatest institutional beneficiary was Harvard, which made striking mathematical advances following the returns from Germany of Cole, Osgood, and Bôcher. However, the reach of the Harvard fellowships was both pervasive and lasting. Through the Htfs the ideas of Klein, Hilbert, Lie, Minkowski, and Volterra were transmitted to campuses across the United States. From 1882 to 1949 Berkeley was led by Htf recipients Stringham, Haskell, and Evans [Moore, 2007]. During these years the foundation was laid, albeit unevenly, for the department's future distinction. Dunham Jackson went to Minnesota in 1919 and Earle Hedrick to UCLA five years later.

Given the range of financial eligibility for the fellowships, it is unclear which Harvard students would have reached Europe without an Htf. Cole was from a farming family and had nine siblings. A department recommendation for Hurwitz's renewal mentioned that his parents needed his support and that he would probably not accept a loan. It seems likely that some recipients would have managed to study in Europe through a loan or on their own resources, whereas more would have remained in the United States to continue at Harvard or to work.

The development of American mathematics owes much to an unlikely patron. John Parker Jr. grew up in Boston just after the American Revolution. He was from a generation that held a fierce

[3] *The presidents were Moore, Fiske, Osgood, White, Bôcher, H. B. Fine, and Edward Van Vleck, each serving a two-year term.*

pride in the young democracy and considerable uncertainty over the long-term stability of the federation of states. Growing up in this hopeful, patriotic environment, Parker became privileged as his father accumulated fabulous wealth. In his will, Parker provided for his own family and friends. Then he carefully devised provisions to assist the less fortunate through education and health care. Although Parker made no mention of mathematics, he no doubt would have been pleased by the success of his beneficiaries and their role in elevating American mathematics to a level that commanded international respect.

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Photo credits

Bust of John Parker Jr.: courtesy Harvard Art Museums, University Portrait Collection, Bequest of Mrs. Anna Parker, 1873 (photo by Imaging Department, ©President and Fellows of Harvard College); Thomas Fiske, Earle Hedrick, E. H. Moore: AMS Archives; portrait of George Ticknor by Thomas Sully: Hood Museum of Art, Dartmouth College, Hanover New Hampshire, gift of Constance V. R. White, Nathaniel T. Dexter, Philip Dexter, and Mary Ann Streeter; photo of James Pierpont, W. F. Osgood, and Maxime Bôcher: courtesy of Theodore K. Osgood; H. A. Newton: MADID #11811, Photographs of Yale affiliated individuals maintained by the Office of Public Affairs, Yale University, 1879–1989 (RU 686), Manuscripts and Archives, Yale University Library; Washington Irving Stringham: UCB Mathematics Department; Felix Klein: ©Göttingen State and University Library; Frank Nelson Cole: David Eugene Smith Collection, Rare Book and Manuscript Library, Columbia University; William Story: Clark University Archives.

References

[Bancroft, 1871] G. Bancroft, *Letter to the President of Harvard University*, Published in the Harvard University Catalogue 1904–05, Harvard University, Cambridge, MA, pp. 519–521, 1871.

[Batterson, 2008] S. Batterson, The father of the father of American mathematics, *Notices of the American Mathematical Society* **55** (2008), 352–363.

[Batterson, 2009] _____, Bôcher, Osgood, and the ascendance of American mathematics at Harvard, *Notices of the American Mathematical Society* **56** (2009), 916–928.

[Bowditch, 1872] N. I. Bowditch, *A History of the Massachusetts General Hospital*, Trustees from the Bowditch Fund, Boston, MA, 1872.

[Cajori, 1890] F. Cajori, *The Teaching and History of Mathematics in the United States,* Government Printing Office, Washington, DC, 1890.

[Cole] F. N. Cole, *Letter to F. Klein* in Klein Nachlass 8, Niedersächsische Staats- und Universitätsbibliothek, Göttingen 5/26/1886, 10/22/1887, 3/22/1889.

[Cooke and Rickey, 1989] R. Cooke and V. F. Frederick Rickey, W. E. Story of Hopkins and Clark, in *A Century of Mathematics in America Part III* by William Duren, Amer. Math. Soc., Providence, RI, 1989, 29–76.

[Eliot] C. Eliot, *Annual report of the President of Harvard University to the Overseers on the State of the University for the Academic Year 1872–1873, 1877–1878.* Harvard University, Cambridge, MA.

[Everett, 1930] E. Everett, *Edward Everett Papers,* Massachusetts Historical Society, Boston, MA, 1930.

[Frothingham, 1925] P. Frothingham, *Edward Everett: Orator and Statesman*, Houghton Mifflin Company, Boston, MA, 1925.

[Hawkins, 1970] T. Hawkins, *Lebesgue's Theory of Integration*, University of Wisconsin Press, Madison, WI, 1970.

[Howe, 1908] M. Howe, *The Life and Letters of George Bancroft*, Charles Scribner's Sons, New York, 1908.

[Long, 1935] O. Long, *Literary Pioneers: Early American Explorers of European Culture*, Harvard University Press, Cambridge, MA, 1935.

[Moore, 2007] C. Moore, *Mathematics at Berkeley: a History*, AK Peters, Wellesley, MA, 2007.

[Morison, 1936] S. Morison, *Three Centuries of Harvard 1636–1936*, Harvard University Press, Cambridge, MA.

[Parker] *Parker Fellowship Records 1873*, Harvard University Archives, Cambridge, MA, 1936.

[Parshall and Rowe, 1994] K. Parshall and D. Rowe, *The Emergence of the American Mathematical Research Community 1876–1900: J. J. Sylvester, Felix Klein, and E. H. Moore*, American Mathematical Society, Providence, RI, 1994.

[Ticknor, 1874] A. Ticknor, *Life of Joseph Green Cogswell as Sketched in His Letters*, Riverside Press, Cambridge, MA, 1874.

[Ticknor, 1909] G. Ticknor, *Life, Letters, and Journals of George Ticknor*, Houghton Mifflin Company, Boston, MA, 1909.

[Transcript, 1842] *Boston Evening Transcript* newspaper, September 2, 1842.

[Tyack, 1967] D. Tyack, *George Ticknor and Boston Brahmins*, Harvard University Press, Cambridge, MA, 1967.

[Walsh, 1973] J. Walsh, History of the Riemann Mapping Theorem, *American Mathematical Monthly* **80** (1973), 270–276.

[White, 1955] G. White, *A History of the Massachusetts Hospital Life Insurance Company*, Harvard University Press, Cambridge, MA, 1995.