Hilbert in Missouri
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No, David Hilbert never visited Missouri. In fact, he never crossed the Atlantic. Yet doctoral students he produced at Göttingen played important roles in the development of mathematics during the first quarter of the twentieth century in what was then the southwestern part of the United States, particularly in that state.

It is well known that Felix Klein exerted a primary influence on the emerging American mathematical research community at the end of the nineteenth century by mentoring students and educating professors in Germany as well as lecturing in the U.S. on two occasions (see [16] for details) but less is known about those American-born mathematicians who studied under Hilbert. E. T. Bell observed that in the late 1890s “Hilbert was still on his way to the top and absorbed in his own researches. Moreover, he seems to have been somewhat unapproachable, especially to Americans” [6, p. 184]. Yet David Hilbert produced more American doctoral students than Klein, most (13) from the period 1899–1910. According to the late Constance Reid (1918–2010), “The Americans at the University [Göttingen] were sufficient in number and wealth to have their own letterhead: The American Colony of Göttingen” [17, p. 48]. This colony even included Hilbert’s first female student of any nationality—Anne Lucy (Bosworth) Focke.

This essay introduces three Hilbert colonists who formed the nucleus of the vibrant mathematics department at the University of Missouri (Mizzou) during the first two decades of the twentieth century. Moreover, it examines the high-level program this trio constructed that produced several notable figures without benefit of a doctoral program. Colleagues hired during the critical period 1903–1907 are also introduced because their professional careers illustrate various aspects of academic life in America a century ago—such as the necessity of obtaining a Ph.D. for university positions, the role that Chicago played in satisfying that demand, and nepotism rules. The essay also shows the influence exerted by Felix Klein (through advisors Fine, Maschke, Böcher, and Osgood) and the Chicago school under E. H. Moore on the next generation of American mathematicians.

**Hilbert outpost**

The University of Missouri was the prime beneficiary of the Hilbert colony during the first part of the twentieth century, when three of his students—O. D Kellogg, E. R. Hedrick, and W. D. A. Westfall—formed the nucleus of its emergent mathematics department. Kellogg and Hedrick are generally identified with Harvard and UCLA, respectively, where they made their marks, yet both got their start at Mizzou. Mathematicians are often identified that way; G. A. Bliss, for instance, is strongly associated with Chicago even though he too began his professional career at Missouri. Since universities where mathematicians launched their careers are often overlooked, it seems appropriate to examine this institution in this period.

The 1891–1908 term of university president Richard H. Jesse (1853–1921) is described in glowing terms in the authoritative book by F. F. Stephens on Missouri’s history. According to Stephens, ‘President Jesse’s discrimination in the recruiting of new members of the faculty so as to secure men of intellectual competency as well as teaching and administrative ability became so well known that in future years people looked back upon his presidency as the Golden Age of the University’ [20, p. 355]. Our analysis will isolate the period 1903–1918 as the appropriate Golden Age for the Department of Mathematics.

![Figure 1](image-url)  
**Figure 1**  Richard Henry Jesse, President 1891–1908

**TABLE 1** displays the tenure at the University of Missouri for the ten appointments made during 1903–1907. In this section we describe the three Hilbertians—Hedrick, Kellogg, and Westfall.

<table>
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<th>Name</th>
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<tr>
<td>Hedrick</td>
<td>1903–1924</td>
<td>Haynes</td>
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<td>Ames</td>
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<td>Kellogg</td>
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<td>Bliss</td>
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<td>Ingold</td>
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<td>Westfall</td>
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<td>Börger</td>
<td>1905–1907</td>
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President Jesse appointed Earle Raymond Hedrick (1876–1943) as chair in 1903. Hedrick had received an A.B. from the University of Michigan in 1896 and had taught high school for a year in Wisconsin before enrolling in the graduate program at Harvard, where he excelled under Maxime Bôcher and William Osgood. As a result, he was awarded a Parker Fellowship for study abroad 1899–1901, when he attended lectures by Felix Klein and David Hilbert. He completed his dissertation on differential equations under Hilbert titled *Über den analytischen Charakter der Lösungen von Differentialgleichungen* and then stayed in Europe a third year on a Harvard scholarship, this time studying with Émile Picard, Édouard Goursat, and Jacques Hadamard, among others, in Paris.
Upon returning to the U.S. Hedrick put in a brief stint at the Sheffield Scientific School at Yale before moving to Missouri in 1903 as professor and head of the mathematics department. Except for serving as director of the mathematical educational corps with the American expeditionary force in France for six months during World War I, he retained these positions until 1924. During this 21-year tenure, Hedrick helped found the Southwestern Section of the AMS in 1906 and was a guiding light in its activities for almost two decades. He was also one of the founders of the Mathematical Association of America (MAA) in 1915 and served as its first president. His contributions to the MAA are commemorated today by the Hedrick Lecture Series because “he had an important part in moulding [MAA] policies, and he has ever since then been a most zealous promoter of [MAA] interests, and one of [the MAA’s] most valued counselors” [3, p. 224]. Hedrick was also elected president of the AMS for two years, 1938–1939. He translated two classic works, Édouard Goursat’s famous *Cours d’Analyse* (with Otto Dunkel) and Felix Klein’s *Elementarmathematik vom höheren Standpunkte aus* (with C. A. Noble).

In 1924 Hedrick left Missouri to become professor and head of the department at UCLA, known before 1928 as the Southern Branch of the University of California, Los Angeles. He retained this position for 13 years until being appointed vice president and provost for the University of California system, making him the highest administrative officer at UCLA. He retired from that position in 1942, whereupon he returned to mathematics as a visiting professor at Brown with the aim of inaugurating the *Quarterly of Applied Mathematics*. However, no sooner did he reach Providence than providence intervened and he died in February 1943, two months before the first issue appeared.

![Earle R. Hedrick, Chair of Mathematics, 1903–1924](image)

Bliss and Kellogg are probably the most recognizable names in TABLE 1, but Gilbert Ames Bliss (1876–1951) stayed only one year at Missouri before being recruited by Princeton President Woodrow Wilson for his initial class of preceptors. After spending three years at Princeton 1905–1908, Bliss returned to his alma mater, the University of Chicago, where he became one of the world’s leading experts on the calculus of variations.

Kellogg’s father was an Episcopalian priest who also taught English literature at the University of Kansas. His son Oliver Dimon Kellogg (1878–1932) was inspired to pursue mathematics at Princeton by the Klein protégé, Henry B. Fine. Kellogg earned an A.B. in 1899 and an M.A. the next year before traveling to Germany on a John S. Kennedy Fellowship. After a year in Berlin, he moved to Göttingen, where he received
a Ph.D. under David Hilbert in January 1903 for the dissertation “Zur Theorie der Integralgleichungen und des Dirichlet’schen Prinzips.” Upon graduation he returned to Princeton for two years before accepting an assistant professorship at Missouri. He thus joined Earle Hedrick as the second member of the Hilbert colony on campus.

Kellogg published several impressive papers on potential theory over the next few years. G. D. Birkhoff stated that for Kellogg “the scientific environment proved happy and stimulating despite a considerable amount of teaching and administrative duties” [7, p. 172]. Kellogg was promoted to full professor in 1910, the first time Missouri ever housed more than one full professor of mathematics. In 1909 Kellogg coauthored a textbook with Hedrick, Applications of the calculus to mechanics. Yet it was Kellogg’s 1912 paper “Harmonic functions and Green’s integral” that established his reputation as a first-class researcher. He continued to turn out impressive papers, mainly on orthogonal functions, over the next few years until his research program was interrupted by World War I when he served as scientific advisor to the U.S. Coast Guard Academy in Connecticut from June 1918 to June 1919.

At the end of the war O. D. Kellogg was appointed lecturer at Harvard to succeed Maxime Bôcher, who had recently passed away. Buffeted by joint works with G. D. Birkhoff, especially a paper in 1922 that generalized the Brouwer fixed point theorem, Kellogg rose through the ranks to become full professor in 1927. Two years later his book Foundations of Potential Theory became the first by an American in the famous Springer “Yellow Series.” He was about to assume the chair at Harvard when he died in August 1932 at age 54 from a heart attack while mountain climbing in Maine.

The other Hilbert student whom President Jesse appointed in 1905 was Wilhelmus David Allen Westfall (1879–1951), a natural attraction for Earle Hedrick for two reasons. First, Westfall and Hedrick had been at Yale together. Westfall received his A.B. in 1901 and Hedrick joined the faculty that fall, with Westfall staying on campus the next two years. The second reason was that Westfall, probably inspired by Hedrick, joined the American colony in Göttingen and completed his doctorate under David Hilbert in 1905 for the dissertation, “Zur Theorie der Integralgleichungen.”

Thus Westfall was a fresh Ph.D. when he came to Missouri. During the years 1905–1918 he combined with Hedrick and Kellogg to form the Hilbert outpost in the westward expansion of mathematics in the U.S.

Unlike Kellogg and Hedrick, W. D. A. Westfall found the Mizzou surroundings compatible enough to remain on that campus for the rest of his life, retiring in 1949 after 44 years on the faculty. His first few years show how important the German research milieu was for his career. After publishing no papers during his first three years at Missouri, he traveled to Rome in April 1908 with a small group of Americans led by E. H. Moore to attend the International Congress of Mathematicians. Westfall remained in Europe that summer, recharging his research batteries in Göttingen, and producing several papers. Within six months he published one on generalized Fourier coefficients, another on a generalized Green’s function, and two short notes extending results of Erhard Schmidt (who had received his Göttingen Ph.D. under Hilbert the same year as Westfall). Moreover, he submitted three others that soon appeared.

In 1906 the three Hilbertians played central roles in establishing the Southwestern Section of the AMS. Hedrick was elected chair; Kellogg and Westfall presented papers. When the Section met officially for the first time the next November, Kellogg was elected secretary, a post he held until his entry into WWI. The Southwestern Section was the third in the AMS, following Chicago in 1897 and San Francisco in 1902; today the four AMS Sections are defined geographically.

A paper that Westfall read at the 1909 sectional meeting was published five years later in the Italian journal Rendiconti del Circolo Matematico di Palermo. And in 1916
he coauthored the paper “Sur l’existence des fonctions implicites” with Earle Hedrick in the *Bulletin de la Société Mathématique de France*. Of particular relevance for this account is a joint paper with Hedrick and their colleague Louis Ingold that appeared in the *Journal de mathématiques* in 1923. This collaborative effort was indicative of the close cooperation that had taken place earlier in the Golden Age of the Missouri mathematics department but by the time its major result was extended from two to three dimensions in a 1925 article by Hedrick and Ingold [13], Hedrick was at UCLA and such collaboration had run its course. In fact, the 1925 paper was the last of six that Hedrick and Ingold coauthored.

**Other appointments**

In this section we describe the remaining figures in *TABLE 1*, beginning with L. D. Ames and Otto Dunkel and then moving to those of less renown, including the above mentioned Louis Ingold. In so doing, we encounter an impressive list of advanced courses, highlight some notable mathematicians who benefited from these offerings, and discuss the delayed implementation of a doctoral program.

As noted, President Jesse brought Hedrick and Ames to campus in 1903. Lewis Darwin Ames (1869–1955) had taken summer courses at the University of Chicago during 1897 and 1898 while teaching at a normal school, but he earned one bachelor’s degree from Missouri in 1899 and another from Harvard two years later. He matriculated in the Harvard graduate program for another two years before returning to the University of Missouri in the fall of 1903. Toward the end of his first year in graduate school he read a paper at an AMS meeting in New York that was published in the *Annals* and was cited in the literature as late as 1966 [4]. During his second year his improvements to a preliminary version of a paper were duly noted by the appreciative author, E. V. Huntington [14, p. 360]. When Ames was awarded his Ph.D. in 1905 he became the first of well-known analyst William Fogg Osgood’s four doctoral students.

L. D. Ames read a paper at the AMS annual meeting in his first December back at Mizzou that was published the following March [1]. Over the next few years he published papers on the emerging field of *analysis situs* (now topology), with the subject’s premier American contributor, Oswald Veblen, referencing his work [21, p. 83]. But it seems that Ames soon became involved in educational matters, being elected secretary of the Missouri Association of Teachers in 1906. Four years later his title was changed from assistant professor of mathematics to assistant professor of the teaching of mathematics, which might explain why his output diminished radically after such an auspicious start. Ames left Missouri one year after Hedrick, accepting a position at Texas Tech (then the Texas State College at Lubbock) for 1925–1926. The following year he moved to the University of Southern California, where he remained until his retirement in 1946.

The remaining notable mathematician hired during Jesse’s presidency was Otto Dunkel (1869–1951). Due to the necessity of working at a young age, Dunkel did not enter college until age 24, so he was 29 when he left the University of Virginia with bachelor’s and master’s degrees. He then matriculated at Harvard, earning his Ph.D. in 1902 for a dissertation written under Böcher. Dunkel then taught at Wesleyan University for two years before spending 1904–1905 at Göttingen (where he met Westfall) and the next year in Paris. Upon returning to the U.S. he taught for a year at the University of Minnesota before accepting the instructorship at Missouri in 1907. He left Mizzou in 1916 for Washington University in St. Louis, where he stayed until retirement in 1939. Dunkel published many papers in several fields but he is best
remembered for serving as editor of the Problems Department of the Monthly from 1918 through 1946.

The remaining four mathematicians in Table 1 are minor figures in the history of mathematics, yet their careers illustrate critical differences between academic life in America today and a century ago. The first, Louis Ingold (1872–1935), earned his Mizzou A.B. in 1901. Because of rapidly increasing numbers of undergraduate students at the turn of the century, many universities found it expedient to appoint student assistants to perform lower-level teaching. Ingold was one such “teaching assistant” during his senior year. He remained on campus for 1901–1902 as a “teaching fellow,” which paid him a small stipend while he earned an A.M. for a thesis titled “Geometry of four dimensions.” He enrolled in the graduate program at the University of Chicago the next year but returned to Missouri as an assistant for 1903–1905.

Ingold played an important role at the summer 1904 AMS meeting held in conjunction with the St. Louis World’s Fair. Although he presented a paper, his most noteworthy contribution was the construction of physical models similar to the ones Felix Klein had demonstrated at Chicago eleven years earlier. The minutes from the meeting record that “an excursion was made to the palace of education, where Professor Hedrick explained the exhibit of the University of Missouri... Of marked interest was a model made by Mr. Ingold [that illustrated] in red and blue wire a large number of lines representing real and imaginary points of a real circle. Other models related to geodesic lines, subgroups of the modular group, and analysis situs” [12, p. 56].

Ingold was granted a leave for 1905–1906 to continue graduate study at Chicago, where he completed his dissertation in 1907 under Klein’s former student Heinrich Maschke. Ingold remained on the Missouri faculty the rest of his life, directing five doctoral dissertations and serving as a cooperating editor of the Transactions of the AMS.

The fall of 1905 saw the largest increase in mathematics faculty with five fresh bodies. A report by the Board of Curators summarized the situation (as quoted in [8, p. 13]):

In the summer of 1905, G. A. Bliss, assistant professor of mathematics, resigned to accept a position at Princeton. Oliver D. Kellogg has been elected as his successor... This, together with the large enrollment in mathematics, has made it necessary to appoint two additional instructors in that subject. R. L. Börger and W. D. A. Westfall have been appointed.

We have seen that the Hilbertians Kellogg and Westfall were prominent in university affairs over the next thirteen years.
The other three mathematicians in Table 1 had checkered careers at Missouri. Robert Lacey Börger (1873–1932) earned his A.B. at Lake City Agricultural Institute (now the University of Florida) in 1893, taught for a year in Illinois, and then matriculated at Johns Hopkins, where he left without obtaining a degree. He was appointed assistant professor at Lake City in 1896 and promoted to professor two years later but was summarily dismissed in 1904 when the school’s new president sought someone with a doctorate and postdoctoral experience. In the meantime Börger had taken graduate courses at Chicago during every summer quarter from 1898 through 1902. He spent the entire year after his dismissal at Chicago, earning a master’s degree. That was his background before his appointment as instructor at Missouri in 1905. Paul Ehrlich wrote, “Börger fits the hardscrabble pattern…of working one’s way up through the ranks, without the privilege of doctoral study after obtaining the B.A., but continuing graduate work piecemeal during summers, and with an occasional full year of study” [9, p. 3]. Two years after coming to Missouri Börger earned a Ph.D. at Chicago under Leonard Dickson for a dissertation on ternary linear groups in a Galois field of order \( p^n \). After obtaining his degree Börger left Missouri for an instructorship at the University of Illinois. He moved to Ohio University in Athens, OH, in 1916 and remained there as head of the department for the rest of his career.

Eli Stuart Haynes (1880–1956) represents the department’s older tie to astronomy, being hired as an assistant in mathematics after earning his Missouri A.B. in 1905 but moving to the Laws Observatory the next year. He earned a Ph.D. in astronomy at Berkeley in 1913 and returned to Mizzou ten years later as professor of astronomy and director of the Laws Observatory. His wife is more relevant to this account. Nola (Anderson) Haynes (1897–1996) earned bachelor’s and master’s degrees at Missouri and then taught in high school and a junior college. She then matriculated in the graduate program at Missouri, which was beginning to mature, and earned her Ph.D. in 1929 under Louis Ingold for the dissertation “An extension of Maschke’s symbolism.” Recall that Heinrich Maschke was Ingold’s thesis advisor at Chicago, making Nola Haynes a third-generation descendant of Felix Klein. After another year as instructor Nola Anderson became chair at H. Sophie Newcomb College (a degree-granting, coordinate college for women at Tulane), a position she held until returning to Missouri in 1938 to marry E. S. Haynes. In a 1981 interview she recalled, “There was a very strict nepotism law and I was giving up my career for marriage, thinking I would never teach again. Then when the Second World War came…I was the first person called back” [11, online supplement, Haynes, p. 2]. However, in 1946 she joined the faculty as acting associate professor and when her husband retired five years later, she became the first woman to hold the title of associate professor of mathematics at the university. E. S. Haynes died in 1956; Nola Haynes remained at Missouri until her retirement eleven years later. When she died in December 1996, just 19 days shy of her 100th birthday, her family created the Nola Anderson Haynes Scholarship fund at the university.

Nola Haynes was not the first woman to hold a faculty position at Missouri, nor the first to obtain a doctorate there. The first female faculty member was Mary Shore (Walker) Hull (1882–1952), who had attended Arkansas Industrial College (now the University of Arkansas) before transferring to Missouri in 1900. She earned an A.B. (1903) and A.M. (1904), the latter with the thesis “On finite groups with special reference to Klein’s ikosaeder.” In 1905 she was appointed assistant in mathematics and promoted to instructor two years later, thus becoming the first woman on Mizzou’s mathematics faculty.

Mary Walker’s academic record as a student at Missouri illustrates the breadth and depth of departmental offerings at the turn of the twentieth century. She took advanced courses with all three Hilbertians—number theory with Kellogg, real and complex
variables with Hedrick, and differential equations with Westfall—as well as Galois Theory (Ames), Lie groups (Bliss), and Fourier series (Defoe). This impressive list of advanced courses ranks among the best offered by American universities at that time.

Mary Shore Walker’s later career illustrates the effects of anti-nepotism policies. Because Missouri had not yet awarded a doctorate in mathematics when she earned her master’s degree, she obtained leaves to enroll at Yale, where she received her Ph.D. in 1909. While in New Haven she met fellow graduate student Albert Wallace Hull, who obtained his Ph.D. in physics the same year, but she returned to Missouri as an instructor for two years while he taught at Worcester Polytechnic Institute. She was a gifted teacher whose “freshmen classes said she made math sound like poetry” [2, p. 20]. However, unlike Nola (Anderson) Haynes, Walker-Hull’s academic career ended permanently when she wed in June 1911.

To further assess the success of the Mizzou program a century ago we describe the achievements of some of its outstanding students and the genesis of the doctoral program. Three notable mathematicians who earned bachelor’s and master’s degrees (like Mary Walker) were subsequently listed among mathematicians awarded stars in American Men of Science. Wallie Abraham Hurwitz (1886–1958) earned both degrees in 1906, having made a definite impression on Gilbert Bliss during his junior year: “W. A. Hurwitz was an extraordinarily able and precocious student in one of his classes” [3, p. 201]. Upon graduation he enrolled at Harvard 1906–1909 and then traveled to Göttingen for a year, earning a doctorate in 1910 under David Hilbert. But Hurwitz did not join the Hilbert outpost at his alma mater afterwards, instead spending a very productive career at Cornell.

Edward Wilson Chittenden (1885–1977) received his Missouri degrees in 1909 and 1910 before earning his Ph.D. at Chicago under E. H. Moore in 1912; he went on to a distinguished career at the University of Iowa. Lester Randolph Ford (1886–1967) received his degrees in 1911 and 1912 before earning a Harvard Ph.D. under Bôcher in 1917 after two years in Paris. His professional career was divided between Rice and the Illinois Institute of Technology. His numerous and longtime MAA activities were recognized when the MAA established the Lester R. Ford Award for authors of expository papers in the Monthly. Missouri undergraduates Walker, Hurwitz, Chittenden, and Ford earned Ph.D.s at Yale, Göttingen, Chicago, and Harvard, respectively, thus attesting to the high level of the program constructed by the Hilbert colonists!

Missouri awarded its first Ph.D. in mathematics in 1910 to the Lithuania-born Louis Lazarus Silverman (1884–1967), whose dissertation does not list an advisor. Upon
graduation he taught for eight years at Cornell, where he published joint papers with Wallie Hurwitz. Silverman then moved to Dartmouth until retiring in 1953.

The next doctorate was awarded in 1915 to Eula Adeline (Weeks) King (1882–1967), who had taken undergraduate courses at Mizzou while teaching high school, graduating in 1908 as valedictorian of the class. After earning a master’s degree the next year, she enrolled in the graduate program at Bryn Mawr College but left after three years without obtaining a degree. Once again she found success at Missouri, earning her Ph.D. for a dissertation supervised by Earle Hedrick, making her a second-generation descendant of Hilbert.

With Ph.D. in hand, the career path that Eula Weeks pursued—high-school teacher—is somewhat surprising. If she felt such a calling, her case would be similar to Anna Mullikin, who chose high-school teaching after earning a doctorate under R. L. Moore and displaying considerable research ability. (See [5] for details.) Mullikin remained single but in 1924 Weeks married industrial-arts teacher Harry King, a fellow faculty member at Grover Cleveland H.S. in St. Louis. Up till then she had been very active in the MAA and the embryonic National Council of Teachers of Mathematics, but her professional career ended with her marriage. We have been unable to discover if the dissertations by Louis Silverman or Eula Weeks-King were ever published.

The Missouri Ph.D. program did not mature until the late 1920s, raising the question why the mathematics department did not establish a viable doctoral program in mathematics under Hedrick, Kellogg, and Westfall (plus Dunkel and Ingold). A lack of sufficient finances would seem to be ruled out because Missouri was among sixteen select universities that provided subventions for the financially strapped Transactions during its first ten years of existence, 1900–1909. Such a commitment seems to suggest that the University of Missouri sought to position itself as one of the leading mathematics departments in the country.

From 1907 to 1916 the nucleus of the Missouri mathematics faculty included three Hilbert colonists—Hedrick, Kellogg, and Westfall. Also, Dunkel had pursued postgraduate studies at Göttingen. In addition, Hurwitz had also obtained his Ph.D. under Hilbert. When one includes the secondary influence of the Klein sphere mentioned in several places above, one can see the positive influence that Germany exerted on the westward migration of the American mathematical research community.

Missouri up to 1902

In order to place the Golden Age in perspective, we end with a synopsis of Missouri’s early history as it relates to mathematics. Although the development of the faculty and course offerings were quite similar to most other land-grant universities from today’s Midwest, Mizzou can boast of particularly strong administrative ties to mathematics from the beginning.

The University of Missouri was established in 1839 when the state enacted a fund to originate a state university like those that had been founded in Michigan and Indiana in 1837 and 1838, respectively. John Hiram Lathrop (1799–1866) was appointed the first president, having been strongly recommended by William W. Hudson (d. 1859), the mathematics professor at Columbia College who had been one of Lathrop’s classmates at Yale. Up until 1829 Lathrop had been the professor of mathematics, with duties extending to natural science (physics) and astronomy as well.

The university’s first building was completed in July 1843. Because Lathrop was aware of advances in engineering education that had taken place at West Point, he
mandated that the sophomore course (in the entirely prescribed curriculum) include applications to leveling and surveying, projections, and navigation.

When Lathrop resigned in 1849 to become the first chancellor at the newly established University of Wisconsin, mathematics professor William Hudson was appointed interim president. Lathrop’s successor, James Shannon, made one notable change when he restricted the duties of university tutor Robert A. Grant to mathematics. The rank of tutor was similar to instructor today, and Grant was listed as a faculty member in the college catalog.

But Robert Grant was involved in a much more dramatic incident than being a mere tutor: *shooting a student to death*. In 1856 15-year-old George P. Clarkson was reprimanded for fighting. He placed the blame squarely on Grant, striking him with a cane when they met after the hearing. The faculty reconvened and voted to expel Clarkson at once. Later that day the student and tutor crossed paths on a downtown street, words were exchanged, and pistols were drawn and fired. Clarkson’s shot was off the mark but Grant’s was accurate; the teenager was critically wounded and died a few days later. At the subsequent public trial Grant was acquitted as having acted in self defense, but Mizzou dismissed him anyway.

Also in 1856, the mathematician William Hudson was appointed president on a regular basis after James Shannon was dismissed because of pro-slavery lectures delivered across the state. Hudson himself was a slaveholder who had accompanied Shannon on
many of his lecture tours but he did not proselytize his views publicly. However, poor health soon overcame President Hudson and he died in June 1859. Later the law and medical schools were built on 183 acres from the Hudson tract left from his estate that also included the “Hudson mansion,” then the largest private residence in Columbia.

In 1860 Edward F. Fristoe was appointed professor of mathematics and astronomy. This was the beginning of a difficult period in the state of Missouri, which was torn asunder by divided loyalties during the Civil War. Precarious finances forced the university to close the following spring, but the passage of the historic Morrill Act of July 1862 establishing land-grant universities compelled Missouri legislators to reopen the university in the fall to qualify for funding. Conditions became so bad that one senior student, appointed tutor while attending his own classes, became responsible for all instruction in mathematics when Fristoe resigned to fight in the war.

The immediate postwar period was also difficult for the university. One positive development was the establishment in September 1867 of a Normal School devoted to training prospective teachers for public schools. Because most public-school teachers were women, this development had the effect of allowing women to matriculate for the first time; as a result, 22 were admitted in the fall of 1868. Three years later women were allowed to take courses in all curricula.

Mathematics professor Joseph Ficklin (1833–1887) had come to Missouri at the end of the Civil War in 1865. He became the first Missouri mathematician to publish in a professional journal when his short note on calculus appeared in the *Analyst* [10]. Ficklin remained at Missouri until his death in 1887, so overall he served as chair for 22 years.

In 1876 Samuel Spahr Laws was appointed president. Like initial president Lathrop, Laws had a solid background in mathematics, having been professor of the subject at the newly founded Westminster College, a Presbyterian school located in nearby Fulton. The Laws Observatory was subsequently named in his honor because of a new telescope he purchased with his own funds.

Laws’s successor, Richard H. Jesse, had no particular ties to mathematics, yet he was responsible for making Missouri a Hilbert outpost a dozen years after coming to office in 1891. President Jesse’s term got off to a rocky start when a fire destroyed the main building in January 1892, just six months after his inauguration, but construction proceeded so quickly that six buildings were completed by the opening of classes in the fall of 1893.

Dramatic increases in enrollment during the 1890s allowed Jesse to make several faculty appointments. Moreover, professors became associated with departments, so
when the department of astronomy was formed in 1893, mathematics became an entity in its own right. Actually a prized mathematician and an aspiring mathematician of note were already on campus when Jesse came to office in 1891. The aspirant was an unusual student, Cassius Jackson Keyser (1862–1947), who had been a school principal and superintendent before becoming an instructor in mathematics at Missouri in 1889 while studying toward the bachelor’s degree he earned in 1892. He became affiliated with Columbia University for the rest of his life, joining the faculty in 1900, receiving his Ph.D. in 1901, and serving as chair of the department 1910–1916. Keyser retired as Adrain Professor Emeritus of Mathematics in 1927.

Missouri’s mathematics professor when Jesse became president was William Benjamin Smith (1850–1934) who, according to the records of the New York Mathematical Society in 1891, earned a Ph.D. in mathematics and physics at Göttingen in 1879. Smith came to Missouri in 1885, and one of his first students was the above mentioned C. J. Keyser, who credited Smith for his success and sought to resurrect Smith’s accomplishments 50 years later. (See [15, p. 305].) Smith published both an extended review of an important German work [18] and a respected textbook [19] in 1893, his final year at Missouri. He then left for a higher salary at Tulane, where fifteen years later he switched to the philosophy department and wrote a very controversial book on religion.

Upon Smith’s departure, Luther M. Defoe (1860–1933) was appointed temporary head of the mathematics department for the year 1893–1894. An 1893 Harvard graduate, Defoe spent the rest of his life at Missouri except the year 1902–1903 in Cambridge, England. Willoughby Cordell Tindall (1856–1898) was appointed chair in
1894 after Defoe’s interim term. He had been an instructor before taking a leave for graduate work at Harvard 1893–1894, but he left without obtaining a degree. Unfortunately, Tindall died at age 42. John N. Fellows succeeded him in 1898; the only thing we know about him is that he departed in favor of Earle Hedrick five years later.

The “Golden Age” that marked President Jesse’s tenure at Missouri was hardly evident in mathematics up to 1902. After all, Luther Defoe, Willoughby Tindall, and John Fellows are hardly household names. As we saw, however, Jesse appointments from 1903–1907 confirm his lofty stature. Table 1 does not include Arthur Byron Coble (1878–1966), whom Jesse hired as instructor in 1902. Coble had received his Ph.D. at Johns Hopkins under Frank Morley but he returned to Hopkins after just one year at Missouri. In 1918 he accepted a professorship at the University of Illinois, where he remained for the rest of a very productive career in research mathematics. President Jesse brought Earle Hedrick to Missouri to succeed Coble and thereby set the stage for the Hilbert American outpost described in the first part of this article.

REFERENCES

1. L. D. Ames, On the theorem of analysis situs relating to the division of the plane or of space by a closed curve or surface, Bull Amer. Math. Soc. 10 (1904) 301–305; available at http://dx.doi.org/10.1090/S0002-9904-1904-01114-3.
Summary  David Hilbert never traveled to the United States yet he exerted considerable influence on the development of mathematics in the country during the first half of the twentieth century through the thirteen Ph.D. students he produced from 1899 through 1910. This article introduces three of those graduates (Earle Hedrick, O. D. Kellogg, and W. D. A. Westfall) who formed the nucleus of the vibrant mathematics department at the University of Missouri 1903–1925 and who played important roles in the expansion of mathematical activities into what was then the southwestern part of the U.S. The impressive curriculum this trio constructed without aid of a Ph.D. program produced several notable mathematicians. Moreover, the careers of some of their colleagues illustrate various aspects of academic life in America a century ago.

DAVID ZITARELLI has been teaching a course at Temple University on the history of mathematics in America for the past 15 years. During one of those classes he discovered that the World’s Fair held in St. Louis in 1904 sponsored a Mathematical Congress similar to the more famous Chicago Congress conducted eleven years earlier. He reported on his subsequent investigation in the September 2011 issue of the Notices of the AMS, isolating the critical part played by the emerging American Mathematical Society. That article indicated that mathematicians at the University of Missouri played a leading role in the St. Louis Congress, which induced him to study the mathematics department there during the first part of the twentieth century. That research isolated the critical role played by three of David Hilbert’s American students, which resulted in the present article.

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