BAKER, Frances E. December 19, 1902–April 4, 1995.
University of Iowa (BA 1923, MS 1925), University of Chicago (PhD 1934).

Frances Ellen Baker was born in Anna, Illinois, the elder of two daughters of Katherine (Riedelbauch) (1868–1952) and Richard Philip Baker (1866–1937). Frances Baker's mother was born in Glasford, near Peoria, Illinois, and attended the Peoria county schools. She studied music privately and, except when she was attending college, was a private teacher of piano and voice as well as a choir director at intervals from 1890 to 1898. She earned a diploma in music from the School of Music at Illinois Wesleyan University in 1897 and was instructor of piano and music and head of the music department at Lamar College (now closed) in Lamar, Missouri, from 1898 to 1901.

Baker's father, born in Shropshire, England, received his undergraduate education at Oxford University and at the University of London, from which he received a bachelor's degree in 1887. In 1888 he moved to Texas and taught music and in a secondary school while he studied law. In early 1891 he was admitted to the Texas bar and practiced law there until 1894. He then studied mathematics at the University of Chicago 1894–96, except for the fall term of 1895 when he taught in the music department of the University of Oregon. During his first year at Chicago he also read entrance examination papers in Latin and Greek and was organist and director of a choir. According to Frances Baker, he was awarded a fellowship in mathematics at Chicago for 1896–97 but did not accept because the "stipend [was] insufficient to live on." Instead, he taught mathematics, chemistry, and physics at the Kenosha Boys' School in Wisconsin. From 1897 to 1901, R. P. Baker was president, and head of science and mathematics, of Lamar College, where presumably he met his future wife.

In 1901 Baker's father became co-principal and head of science and mathematics at Union Academy, a private secondary school in Anna, in southwestern Illinois. On February 22, 1902, Katherine Riedelbauch and Richard Philip Baker were married in Glasford, Illinois. The Bakers made their first trip to England in the summer of 1903 to introduce their new daughter, Frances, born in December 1902, to her English grandparents. R. P. Baker remained at Union Academy until 1904; during 1903–04 Katherine Baker taught elementary German there. The Bakers spent the next year in Chicago, where R. P. Baker was head chemist at R. R. Donnelly, a printing company. For many years R. P. Baker had constructed mathematical models, which he considered essential for teaching geometry. In January 1905 he had printed a catalog of a hundred models he had made and was selling. Many of his models are currently in the mathematical collections of the National Museum of American History, Smithsonian Institution, and of the University of Arizona.

In the fall of 1905 R. P. Baker began a thirty-two year association with the mathematics department of the State University of Iowa (commonly referred to as the University of Iowa). He was instructor from 1905 to 1910, when he earned his PhD in mathematics from the University of Chicago with a dissertation directed by E. H. Moore. Baker was assistant professor 1910–15 and then associate professor until his death in 1937. Katherine Baker continued to give private lessons in piano and voice from 1906 until 1926. The Bakers established and played with the first chamber music ensemble in Iowa City. The Bakers' other daughter, Gladys Elizabeth, was born in Iowa City in July 1908.

Frances Baker received her elementary education from her parents. She wrote in 1985, "My father gave me significant mathematical instruction and guidance from age 10 onward. Before that age I owe [my] earliest mathematical training to my mother, especially in arithmetic and music" (Smithsonian questionnaire). Her mother also taught her German, and Gladys Baker reported later that "Frances was already an accomplished pianist when she entered high school in 1915" and that "her German was good enough so that later in the University she could enroll in a third year class" (Gladys Baker, Biographical Notes). She attended public high school in Iowa City, was active with the school newspaper and yearbook, and graduated as valedictorian of her class in 1919.

Frances Baker did her undergraduate studies and two years of graduate work at the University of Iowa. She entered the university in 1919, before her seventeenth birthday. After losing a semester's work early in 1920 because of the Spanish influenza, she made up the credits in summer school and graduated magna cum laude in 1923, having been elected to Phi Beta Kappa her junior year. She studied Latin and Greek as well as mathematics and won both the Latin and Greek prizes her senior year. As an undergraduate Baker was active in the Classics Club, was a member of the Iowa women's debating team, and was elected to Delta Sigma Rho, an honorary debating society. Her sister, Gladys, wrote later that "it was difficult for her to decide on a major subject as she was an all-round scholar but finally settled on Mathematics because that was what she wished to teach" (Gladys Baker, Biographical Notes). Frances Baker wrote in 1985, "A strong motivating factor from my senior year, 1922–1923, was awareness of the historical development of Mathematics through such works as Cassius J. Keyser's book *Mathematical Philosophy*" (Smithsonian questionnaire). For the next two years, she worked for her master's degree, studying mainly under the direction of her father. During her last year she held a graduate fellowship and taught a freshman mathematics course for one semester, before receiving a master's degree in 1925 with work in mathematics and physics.

After earning her master's degree Baker spent most of the next six years teaching, with some graduate study in mathematics. She was an instructor of mathematics and physics and head of the department at Tabor College in Tabor, Iowa, 1925–27. While there she taught mathematics courses through calculus as well as year courses with laboratories in college physics and inorganic chemistry. Because of financial difficulties Tabor College closed in 1927, and Baker held a similar position at Jefferson City Junior College in Missouri 1927–28. During the summer of 1928, she and Gladys made a trip to Europe and included a visit with an aunt in England. After deciding she would not return to Jefferson City, Frances enrolled at the University of Iowa for one semester to earn a teaching certificate. She then attended the University of Chicago for two quarters in 1929, beginning in the spring quarter. From 1929 to 1931 she was instructor of mathematics and head of the department at the Creston, Iowa, Junior College and Senior High School.

Frances Baker returned to the University of Chicago in 1931, held a fellowship 1932–33, and taught a freshman course in the spring quarter of that year. She received her PhD in March 1934 with a dissertation directed by L. E. Dickson on the Waring problem for cubic functions. Although she did not publish her dissertation, it was cited in several articles published in 1934.

The education of her younger sister, Gladys Elizabeth Baker, was similar, but in botany rather than mathematics. Gladys Baker also earned a bachelor's degree and a master's degree at the University of Iowa, in 1930 and 1932, respectively. She continued her graduate work in botany and mycology at Washington University in St. Louis and received her doctorate in 1935. She taught at Hunter College 1936–40 and at Vassar College 1940–63 and was chairman of the plant science department at Vassar 1948–60. She taught at the University of Hawaii at Manoa for most of the next decade until her retirement in 1973.

Frances Ellen Baker lived at home in Iowa City during the first semester 1934–35 and was an instructor at Vassar College during the spring semester 1934–35, while Louise D. Cummings was on leave. In the fall of 1935 she went to Mount Holyoke College, from where Emilie Martin had just retired after nearly thirty years on the faculty. Baker remained at Mount Holyoke for the next seven years as instructor 1935–40 and assistant professor 1935–42. She had a leave in the fall semester 1938, having been injured in an automobile accident, and was replaced for that semester by Mary Barbara Haberzetle (Turner), who had just received her doctorate from Chicago. While at Mount Holyoke Baker taught courses from analytic geometry through calculus, history of mathematics, modern geometry, probability and statistics, and theory of equations; and she directed three honors papers.

In 1942 Baker joined her sister, Gladys, at Vassar College and spent the rest of her career there. She was hired as associate professor, was promoted to professor in 1951, and retired as emeritus professor in 1968. She later mentioned as positive influences Henry S. White, a former president of the AMS who was at Vassar 1905–36, and Mary E. Wells who was on the faculty at Vassar from 1915 until her retirement in 1948. Wells had become department chair when White retired.

Baker directed several honors papers at Vassar in addition to teaching mathematics courses. She chaired the Vassar department 1948–50 and 1951–52. She had three research leaves while at Vassar. During the second and third terms of 1945–46 she was an honorary fellow at the University of Wisconsin; she spent the academic year 1952–53 at Princeton University; and she spent the year 1960–61 at the University of North Carolina. She also spent the summer of 1953 at the University of California at Berkeley.

In 1943 and 1944 Baker gave talks at Rutgers University and at McGill University on the mathematical models her father had constructed forty years earlier. She also gave talks on topics in the history of mathematics at Hollins College in 1947, at Hobart and William Smith Colleges in 1952, at the University Club in Sun City, Arizona, in 1978, and at a meeting of the Southwestern Section of the MAA at Northern Arizona University in 1980. Starting a few years before her retirement, she became a frequent book reviewer for the library journal *Choice* and reviewed twenty-five books, more than half in probability or statistics, from 1964 through 1974.

At Vassar, Baker was a member of the Science Club 1942–48 and the local chapters of Phi Beta Kappa and Sigma Xi. She served as treasurer, on the membership committee, and as president of the Vassar Phi Beta Kappa chapter. In 1957–58 and 1966–67 she was president of the Vassar Sigma Xi chapter. She was a member of the History of Science Society from 1940 until 1968 and was a member of the New York Academy of Sciences from 1964 until the early 1970s. Baker was a member of

the Protestant Episcopal church. She described her interests as reading, music, and travel.

In January 1974, Gladys Baker moved to Sun City, Arizona, just outside Phoenix, and Frances Baker moved to a separate home there that autumn. While there Frances read college mathematics books for Recordings for the Blind. As her health worsened in the mid-1980s, she moved into intermediate care facilities, and in November 1989 she moved to the Plaza del Rio Care Center in nearby Peoria, Arizona, where she lived until her death at age ninety-two in 1995. Services were held in Iowa. She was survived by her sister, Gladys, who died in Arizona in 2007, just after her ninety-ninth birthday.

Organizational affiliations: AMS, MAA, IMS, Hist. Sci. Soc., Sigma Delta Epsilon, Phi Beta Kappa, Sigma Xi.

Thesis and dissertation:
1925 Compound statements on four classes. MS thesis, University of Iowa, directed by Richard Philip Baker. See also **1928**.
1934 A contribution to the Waring problem for cubic functions. PhD dissertation, University of Chicago, directed by Leonard Eugene Dickson. Private edition distributed by the University of Chicago Libraries. Review: *JFM* 60.0942.02 (H. Rothe-Ille).

Publications:
1928 Compound statements on four classes. *Amer. J. Math.* 50:195–208. Reviews: *JFM* 54.0143.02 (H. Prüfer); *Rev. semestr. publ. math.* 34, pt. 1: 3 (W. G. J. ten Pas).
1938 Comments on a paper by Dr. Doole. *Amer. Math. Monthly* 45:679–81. Reviews: *JFM* 64.0203.01 (L. Von Schrutka); *Zbl* 019.40304 (H. Geppert).
1954 Review of "Leibniz' Mathematische Studien in Paris" and *Die Entwicklungsgeschichte der Leibnizchen Mathematik ... in Paris (1672–1676)*, both by J. E. Hofmann. *Scripta Math.* 20:175–78. Submitted by invitation, March 1951.

Abstract:
1952 The Leibniz characteristic triangle. *Amer. Math. Monthly* 59:589–90 #7. Presented to the MAA, Geneva, NY, 10 May 1952.

Presentation not listed above:
On the construction of Heron parallelograms and triangles. Presented to a meeting of the MAA, Flagstaff, AZ, 25–26 Apr 1980.

References to: AmMSc 6–8, 9P–11P, WhoAmW 5–7.
"Frances Ellen Baker." (Obituary) *Arizona Republic*, 8 Apr 1995.
"Frances Ellen Baker." (Obituary) *Phoenix Gazette*, 8 Apr 1995.

Other sources: PhD dissertation vita 1934; Owens questionnaire 1937; Smithsonian questionnaire 1985; Mount Holyoke College Archives; communications with Gladys E. Baker and with Barton County Historical Society, Lamar, MO; Gladys Baker, Biographical Notes for Frances Ellen Baker, 1902–1995 (typescript to author); R. P. Baker PhD dissertation vita 1910; Smithsonian questionnaire for R. P. Baker 1985 (completed by Frances E. Baker); US Census 1900 MO, 1910, 1920, 1930 IA.

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