



## IN MEMORIAM

Henry Helson  
Professor of Mathematics, Emeritus  
UC Berkeley  
1927 – 2010

Henry Helson, who died on January 10, 2010, was a leading figure in harmonic analysis whose ideas had an enormous impact. The subject of harmonic analysis was created by the French mathematician Joseph Fourier in the early 1800s. In his study of the heat equation, Fourier had the idea of representing an “arbitrary” function of a real variable in terms of sines and cosines, a representation now called a Fourier series. From this beginning the subject has expanded dramatically over the years; it is indispensable in countless areas of mathematics and its applications.

Born on June 2, 1927, in Lawrence, Kansas, Henry grew up in Bryn Mawr, Pennsylvania, where his father Harry was a professor, carrying out the research that would make him one of the eminent psychologists of his time. His mother Lida, despite her upbringing as a fundamentalist Lutheran, found her way to the Quaker faith when Henry and his sister Martha were children. All three became and remained committed Quakers.

Henry was a precocious child whose exceptional mathematical abilities shone through early. Harry, an admirer of Einstein, hoped Henry would become a physicist, but Henry was hooked on mathematics. He did his undergraduate work at Harvard University, graduating in 1947, his education having been interrupted by 13 months of stateside military service. The military stint was more than a temporary inconvenience; as a Quaker, Henry found it a loathsome experience.

After graduation Henry spent a year in Europe on a traveling fellowship, fulfilling a desire he had nurtured to witness the devastation wreaked by World War II. He visited various locales in Europe but spent most of the time in Poland, first in Warsaw and then in Wrocław. He was attracted to Poland because it struck him as the most desperate place in Europe, and because it had been a thriving mathematical center between the two world wars. In spring 1948 in Wrocław, under the mentorship of a local mathematician, Henry wrote his first two mathematical papers, which were published in Polish journals.

Henry entered Harvard’s mathematics Ph.D. program in the fall of 1948. That fall the famed Swedish mathematician Arne Beurling was visiting Harvard, and under urging by his advisor, Lynn Loomis, Henry enrolled in Beurling’s course. As Henry has written, “. . . that set my subsequent mathematical trail. . .” Henry was captivated by what he called Beurling’s “wonderful ideas.” He completed his thesis and received his Ph.D. in the spring of 1950, but was late getting on the job market. Eventually, an instructorship offer came from the University of California, Los Angeles, but this was during the California loyalty oath controversy; Henry would not sign the oath. Instead, he managed to spend the year 1950-51 with Beurling in Uppsala, with side trips to other European universities. Back in the U.S., Henry became an instructor at Yale University, and subsequently an assistant professor. But at that time the senior Yale mathematicians regarded junior faculty

positions as strictly temporary, which put Henry on the job market again. In 1955, he accepted an assistant professorship offer from the University of California, Berkeley (the loyalty oath having by then been declared unconstitutional). Henry spent the remainder of his career at Berkeley, becoming associate professor in 1958, professor in 1961, and professor emeritus in 1993.

Henry met his wife Ravenna while at Yale; the couple married in 1954. Ravenna had received a Ph.D. in psychology from Berkeley and was more than pleased to return there. She had a distinguished career as research psychologist at Berkeley's Institute of Personality and Social Research, including serving as director of the Mills Longitudinal Study, which she founded. The couple raised three children, born between the years 1956 and 1960.

Henry's early research, dating from the 1950s, quickly gained recognition. He settled or made substantial progress on several open problems, and initiated new developments. Henry's two most influential papers, it is generally agreed, were joint ones with David Lowdenslager, a young Princeton University colleague; they appeared in 1958 and 1961. The papers, because of the techniques they introduced and the vast further progress they engendered, constitute a quantum leap in harmonic analysis.

A natural venue for classical Fourier analysis is the unit circle in the complex plane. Motivated by questions in prediction theory (a branch of probability), Helson and Lowdenslager enlarged the classical theory so as to include multivariable Fourier series. In their scheme, the unit circle is replaced by a torus, possibly an infinite-dimensional torus. It was quickly recognized that the Helson- Lowdenslager techniques, an elegant blend of classical analysis and functional analysis, can be used in many contexts beyond the original one.

In another direction, Helson and Lowdenslager explored what happens when the complex- valued functions of classical Fourier analysis are replaced by vector- valued functions, the vectors lying in a Hilbert space. Their study impinged on and advanced a central area of operator theory.

The richness of the Helson- Lowdenslager papers is profound. In particular, they contain the roots of much of Henry's subsequent research. When David Lowdenslager died tragically in September 1963, at age 33, it was a terrible blow to Henry and loss to mathematics.

A mere count of Henry's research papers — there were about 55 between 1948 and 2010 — might lead one to conclude that his research output was rather modest. The conclusion would be mistaken. Henry never published routine papers, only papers containing new insights, many representing years of work. He was a masterful expositor of mathematics. His style is exceptionally clear, economical, vigorous, and fluid; and one can say the same of his non- mathematical writings. His final paper was published posthumously in 2010, in the Polish journal *Studia Mathematica*, 62 years after one of his first two papers appeared there.

Henry served generously in various administrative posts. On the campus level, these included membership in the College Committee on Reading and Composition, the Graduate Council, including the council's Committee on Graduate Fellowships, the Subject A Committee, the Committee on Quantitative Reasoning, the Committee on Courses of Instruction, and the Committee on Undergraduate Scholarships and Honors. The last of these assignments, spanning two years, was especially time- consuming. Henry served a three- year term on the council of the American Mathematical Society, its governing body.

Henry directed 20 doctoral dissertations at Berkeley. His first student graduated in 1961, his last in 1996. He had a wide network of friends, both mathematical and non- mathematical. In addition to his doctoral students, he unofficially mentored many other young mathematicians, including Berkeley students, junior Berkeley faculty members, and others he met at mathematics meetings or elsewhere in his extensive travels.

Travel was one of Henry's passions. He was keenly interested in other places and other cultures. He spent sabbaticals at eight different locations, six of them in Europe, the other two in Ghana and India. India held a special fascination for him; between 1980 and 2000 he made four extensive visits there, interacting with and helping many Indian mathematicians.

In 1992, Henry started his own publishing firm, Berkeley Books, motivated by his distaste for our present-day crop of calculus textbooks, by the high cost of mathematics books at all levels, and by what he termed "a passion for entrepreneurial activity." Berkeley Books was a one- man operation except for the actual printing of the prepared text, which was contracted to a local printer. Henry published mostly his own books, but also

two by Berkeley colleagues. Remarkably, despite its unusual nature — low overhead but scant resources for marketing — Berkeley Books never lost money.

The publishing enterprise illustrates Henry's activist mentality. Another illustration involves wine, of which Henry was fond. But he was not content merely to savor wine, he also was impelled to make wine. For many years, he and colleague Bill Bade made an autumn pilgrimage to the wine country to purchase grapes, which they carted back to Henry's patio and, under Henry's guidance, turned into wine. The Helson cellar was always well stocked.

Music was another of Henry's passions. He was an accomplished violinist and violist. After his retirement, freed from many prior responsibilities, he practiced daily for two hours to enhance his skills. He joined a local music group, Amphion, and performed publicly, especially with a talented and congenial quartet he assembled. His last performance at Amphion, and the last time he played the violin, was in September 2009, just a few months before his death. He bravely fought off the terrible effects of disease and chemotherapy and played Brahms's First Violin Sonata.

Henry's fondness for the University of California, which he served loyally for over 50 years, was tempered in recent years by what he viewed as the school's downward trend. On November 20, 2009, a student protest on campus about fee increases turned ugly. On November 25, the Divisional Council of the Academic Senate circulated an e-mail statement concerning the surrounding issues. The following day Henry sent a response to all Senate members, expressing disappointment that the council's statement made no reference to the merits of the protest, and urging the faculty to take a stand against the fee increases and other recent administrative and state government actions that, he felt, would contribute to the degradation of our University. This occurred less than two months before Henry's death.

Henry is survived by his wife Ravenna, sister Martha Wilson, daughter Ravenna Helson Lipchik, sons David and Harold, and three grandchildren.

Donald Sarason  
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