



IN MEMORIAM

William George Bade
Professor of Mathematics, Emeritus
UC Berkeley
1924 – 2012

Bill Bade, born May 29, 1924, in Oakland, and a longtime member of Berkeley's Mathematics faculty, died on August 10, 2012. His calm voice, sound judgment, and subdued demeanor were a steadying influence in our department throughout his tenure.

Bill contributed innovative research in his specialty, Banach algebras. Some details are given below.

Bill's father, William Frederic Bade, was a Professor of Old Testament Literature and Semitic Language at the Pacific School of Religion in Berkeley. He was a seminal figure in the development of archaeological exploration of the Near East, leading five expeditions to the biblical city of Mizpah in what was then Palestine. In 1935, in the last of those expeditions, William F. was accompanied by his family, including eleven-year-old Bill, who learned there, he relates, to speak some 'street Arabic'. As a teenager, Bill was put in charge of preserving all the metal objects from the digs. When cleaning a bronze he revealed one of the few Babylonian inscriptions unearthed in Palestine. The archeological work of W. F. Bade is preserved in the Bade Museum of the Pacific School of Religion, on whose Board of Trustees Bill served.

Bill's father was a close friend of John Muir, and an early member of the Sierra Club, founded by Muir in 1892. The two were together on several treks to the California mountains. Bill inherited his father's love of nature.

Bill's maternal grandfather, George White Marston (1850-1946), was a successful entrepreneur and wealthy philanthropist based in San Diego. He became a founding trustee of Pomona College in 1887, and served on the Pomona College Board from then until his death. He was a generous donor to the College.

Bill's father died in 1936. Bill moved with his mother and older sister to San Diego, where they lived with his maternal grandparents in the family house. He attended San Diego High School, graduating in 1942. Because of the family connection, Bill decided to attend Pomona College, entering as a freshman in 1942, the year after the U.S. entered World War II.

In the summer of 1943, in response to a Navy recruitment team that visited Pomona College, Bill went to Los Angeles, where he took and passed the test to become a V-12 student. He was sent to the California Institute of Technology, where he earned a B.S. in Physics in 1945. By then World War II was nearly over, and the Navy's plans for Bill changed. Bill was sent to Columbia University and then to Harvard Business School to train as a Disbursing Officer. He served in that capacity in the Pacific on the atoll of Truk, until he was released from active duty in 1947. He served in the U.S. Naval Reserve until his honorable discharge in 1955.

Bill entered the graduate program at the University of California, Los Angeles, in 1947, originally intending to study Physics. But he quickly realized he was more interested in Mathematics. He switched to the Mathematics program after one semester, earning an M.A. in 1948.

At UCLA, Bill became a student of Professor Angus Taylor, an expert in the expanding field of functional analysis. The circumstances were described by Bill in what he wrote for Taylor's memorial service in 1999:

In 1947 I was a beginning graduate student in Mathematics at UCLA with no idea what direction I was going... I found an expository article of Angus... His aim was to tell how mathematicians find research problems and, as we say, "do mathematics"... This article was so persuasive and exciting that I knew I had found my niche and I am still there. I enrolled in his course on Banach spaces and soon I was one of his thesis students. He was a very clear and careful teacher and a wise thesis adviser, encouraging but not directing, so the student had the joy of discovery.

There was also a nonmathematical bond linking Bill and Angus: Angus was an accomplished mountaineer, climbing in the Sierra and the Alps. The two shared a common love of the natural world.

A symposium in the summer of 1950, in Oklahoma, turned out to be a pivotal event in Bill's career. The conference, sponsored by the U.S. Office of Naval Research, encouraged participants to bring along graduate students, who would earn their keep by writing up notes for the lectures delivered by distinguished speakers. Taylor brought Bill to the conference. Bill was assigned to write the notes for the lecture of Nelson Dunford, Professor at Yale.

Bill received his Ph.D. in June 1951. Shortly thereafter, Taylor wrote to Charles Morrey, the chair of Berkeley's Department of Mathematics (and a friend of his), recommending Bill for an Instructorship for the Academic Year 1951-1952. The recommendation was approved, and Bill moved to Berkeley for that year.

Eleanor (Elly) Jane Barry, who became Bill's wife, graduated from Pomona College 1948 as a history major. The two met in 1948 and were married on July 2, 1952.

In 1951, Dunford and Jacob Schwartz were in the early stages of writing Part I of what would become their exhaustive three-volume tome "Linear Operators", which collects most of what was known at the time about functional analysis. The work survives to this day as a much-used reference.

An eight-year grant from the Office of Naval Research supported the writing of Part I. The grant allowed for the appointment of two research assistants for the years 1952-1954. The positions were offered to and accepted by Bill and Robert Bartle (who later would become a mathematics professor at the University of Illinois, Urbana-Champaign). The Yale math department chipped in some funds to appoint Bill and Bob as instructors (with a one-course load). Bill must have favorably impressed Dunford at the Oklahoma Symposium. He and Elly made the long trip from Berkeley to New Haven by car.

Part I of "Linear Operators" was published 1958. In its preface is the acknowledgement: "Without the patient and unstinting work of Professors Robert Bartle and William G. Bade, who revised and edited nearly every chapter and who contributed a number of sections, it is certain that nothing on the scale of the present treatise could have been completed".

When his Yale appointment ended, in 1955, Bill received an appointment as Assistant Professor of Mathematics at UC Berkeley. Bill and Elly were pleased to be able to return to Berkeley. Bill had to remain in New Haven that summer to complete work in progress. Elly flew back to California with their daughter Sarah and son Michael, born in New Haven.

Bill remained in Berkeley for the rest of his career, becoming Associate Professor in 1959 and Professor in 1964. He became Professor Emeritus upon his retirement in 1991.

At Yale, Bill formed several close and lasting friendships. Two were with Junior Yale faculty members John Wermer (who later became a professor at Brown University) and Henry Helson (who became Bill's colleague in Berkeley, arriving the same year as Bill). Another was with Philip C. Curtis, Jr., who during Bill's Yale years was a graduate student working on a thesis under Charles Rickert, an eminent expert on Banach algebras. Besides being close personal friends, Bill and Phil carried out a long mathematical collaboration.

Between 1960 and 2000 they produced thirteen joint publications (a few involving additional authors). Phil joined the UCLA Mathematics Department in 1955, the same year Bill settled in Berkeley.

The Bill- Phil collaboration featured two related recurrent themes. The first is the notion of a radical Banach algebra. Each element of a Banach algebra has an associated spectrum, a subset of the complex plane. The element is called quasinilpotent if its spectrum consists only of the point 0. Quasinilpotence generalizes nilpotence: a nilpotent element of the algebra, that is, an element some power of which is the zero element, is quasinilpotent, but in general a quasinilpotent element need not be nilpotent.

A Banach algebra all of whose elements are quasinilpotent is called a radical Banach algebra. Many examples can be constructed, but the known tools for analyzing them, at the time Bill and Phil began their studies, were limited.

The second theme is the notion of automatic continuity. In very vague terms, the notion applies in a mathematical structure having both an algebraic component and a way to measure continuity. An associated map is said to be automatically continuous if it is continuous by virtue of the algebra alone.

In a 1960 paper, Bill and Phil studied a question of automatic continuity for maps of one commutative Banach algebra, A , into another, B . The algebra A was taken to be the algebra of continuous complex-valued functions on a certain kind of topological space (namely, a compact Hausdorff space), and the map of A into B was assumed to preserve algebraic structure, i.e., to map sums in A to sums in B and products in A to products in B , a so-called homomorphism. The question is whether such maps are necessarily continuous. Bill and Phil did not answer the question, but they made a penetrating study of what properties a discontinuous homomorphism would have to exhibit. The paper turned out to be the beginning of an unexpected excursion into the foundations of mathematics.

After various extensions of the Bill- Phil results had been made, H. Garth Dales and Jean Esterle, in papers published in 1979 and 1978, respectively, obtained a result that was by then known to imply the existence of a discontinuous homomorphism; but both proofs assumed the validity of the continuum hypothesis.

The continuum hypothesis was conjectured by Georg Cantor, the founder of set theory, in 1878. It was eventually shown to be independent of the basic axioms of set theory, neither provable nor disprovable from those axioms, by Kurt Gödel (1940) and Paul J. Cohen (1963).

Dales originally felt that his proof could be reworked so as to eliminate its reliance on the continuum hypothesis. However, Robert Solovay implemented an approach isolated by W. Hugh Woodin, then a Caltech undergrad (and later our Berkeley colleague) and constructed models of set theory in which all the homomorphisms considered by Bill and Phil are continuous. (In those models, the continuum hypothesis fails, of course.) Woodin's results were eventually included in his Berkeley Ph.D. thesis.

Garth Dales was drawn into the Bill- Phil orbit in Academic Year 1973-74, when he held a visiting position at UCLA. Since then, in addition to his mathematical collaborations with Bill and Phil, he and his wife Joanna have grown very close to the Bade and Curtis families.

In 1974, with support from the National Science Foundation, Bill, Phil and Garth organized a conference at UCLA which was unusual for its time in that it had a narrow focus, namely, certain aspects of Banach algebra theory that those three and others were actively pursuing. The conference was such a success that it was decided it should be repeated. It has become a biennial event at shifting locations both in the U.S. and throughout the world (e.g., at various times in Canada, England, Denmark, Sweden, Australia). Helping to create the conferences is one example of how Bill served the mathematics community. The invited lectures he delivered throughout the world is another example.

Bill served a three- year term as treasurer of the Pacific Journal of Mathematics. He served at various times on several committees of the American Mathematical Society, and helped the NSF several times by reviewing research proposals. All this is in addition to the usual refereeing jobs that come the way of any prominent researcher.

Bill held visiting positions at Aarhus University, Denmark, in 1969-70 and in 1974-75, at University of Copenhagen, Denmark, in 1979-1980 under a Fulbright Travel Grant, and at Leeds University, England, in

1987. He was appointed Honorary Member of the Department of Pure Mathematics, Leeds University, in 1994.

In 1965-66 Bill was a Research Professor in Berkeley's Miller Institute for Basic Research in Science. He was elected a member of the London Mathematical Society in 1987.

Bill bore a heavy load of departmental administrative responsibilities. For many years, as a vice chair, he headed our graduate admissions and appointments committees. He viewed his role broadly, not merely as an academic advisor to graduate students, but as a personal friend. Through his concern he helped many students deal with the stresses they encounter in graduate school.

Other departmental committees on which Bill served include the Schedule Committee (1967-69), Committee on Conversion to the Quarter System (1964-65), Committee on Revision of Undergraduate Courses (1964-65), Committee on Promotion of Assistant Professors (1966-67), and Committee on Interdepartmental Relations (1967-68). At the campus level, Bill was a member of the Committee on Certificate of Completion, School of Education (1957-58); a member of the Committee on Physical Sciences, College of Letters and Science (1961-62); Subject Representative to the School of Education (1966-68); a member of the Committee on Teaching Majors and Minors, School of Education; a member of the Area Advisory Committee, Council for International Exchange Scholars (1980-81); Member, Committee on Graduate Student Instructors (1984-85). Bill served the Fulbright Exchange Program as a member of the Area Advisory Committee, Chair of the Area Advisory Committee for Scandinavia, Ireland and the U.K., and a member of the Council for International Exchange Scholars, in successive years from 1980-1983.

Bill was a popular and an effective teacher at all levels, from huge lower- division lecture courses in beginning calculus, to upper- division courses for math majors, to graduate courses and graduate seminars. As a lecturer he was not theatrical; rather he was low- key, patient, and remarkably clear.

Bill supervised 24 doctoral dissertations. The topics of those dissertations are unusually diverse, some in Bill's specialty, Banach algebras, but others not. Many of his former doctoral students have made substantial contributions to Banach algebras and to other areas of mathematics.

An NSF grant enabled Bill and Phil to spend summers on their joint research. They also managed to spend several sabbaticals abroad together, accompanied by their families. The two families, ultimately containing six Bade children and five Curtis children, were a harmonious unit.

Bill's love of nature infused his entire life. When his father died, Bill inherited a property in Angwin, California, northeast of Berkeley, on which had been erected a cookhouse and a two- bedroom cabin. The Bades made various improvements in the property, and visited it often in the summer, where, in particular, it served as a base for exploratory hikes.

Bill and Elly became experts on the local flora, as well as on the flora of locales where they made extensive visits. The two were ardent supporters of the UCB Botanical Garden and the California Native Plant Society, volunteering many hours, in particular, to assist in fundraising efforts.

Bill was a tall man with a robust physique. His robustness no doubt helped him survive the health problems he faced late in life longer than one might expect.

In January 2006 Bill had back surgery. Two days later he developed "Sundowners Syndrome", which involves memory loss and confusion. His recovery required a protracted rehabilitation regimen including, in particular, physical therapy to enable him to walk again and speech therapy to bring his memory back. Bill's family aided by taping pictures of him to the walls of his hospital room to help him remember things he did with them.

Bill had diabetes II, and during his last few years he had to undergo dialysis three times a week at a dialysis center in Oakland. Each session lasted 3.5 hours.

Bill passed away suddenly on August 10, 2012, in the skilled nursing section of Piedmont Gardens, the Oakland retirement community where he and Elly had moved.

Bill Bade will be remembered as an unpretentious man of kindness and integrity. He is survived by his wife of 60 years, Elly, by sons Michael, Alan and Ned, by daughters Sarah, Anne and Margaret, and by five grandchildren.

Marc
Rieffel
Donald Sarason
2013

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