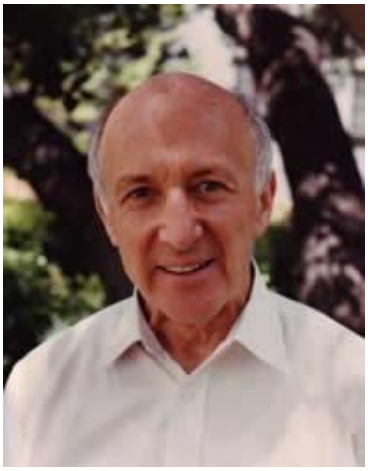

IN MEMORIAM

Leon Albert Henkin
Professor of Mathematics, Emeritus
UC Berkeley
1921 – 2006

Leon Albert Henkin, eminent logician, leader in mathematics education, and pioneering and persistent activist in the effort to bring more underrepresented minorities and women into mathematics, died November 1, 2006, after a brief illness.

Henkin was born on April 19, 1921, in Brooklyn, New York, and received a B.A. degree in mathematics and philosophy at Columbia University in 1941 and a Ph.D. in mathematics under the logician Alonzo Church at Princeton University in 1947. During 1942– 1946 he served the U.S. war effort, finishing as head of the Separation Performance Group at Oak Ridge. After academic positions at Princeton and the University of Southern California, he joined the University of California, Berkeley, faculty in 1953 as associate professor of mathematics. He was the first new permanent appointment in the drive of the great logician Alfred Tarski to make Berkeley the world's leading center for mathematical logic. In 1958 Henkin was promoted to professor and in 1959 he became the first chair of the pioneering new interdisciplinary Group in Logic and the Methodology of Science. He served as acting chair or chair of the Department of Mathematics during 1966– 1968 and 1983– 1985, and became professor emeritus in 1991.

Among his many wide- ranging contributions to logic Henkin is perhaps best known for his "radically" (to use the description of Willard Quine) new proof of the Gödel completeness theorem (in which he introduced what became a fundamental technique of model theory, the use of so- called "Henkin constants," which are used to witness the truth of existential statements), and for his work in algebraic logic (where he coauthored the monumental 823- page two- volume Cylindric Algebras with J. D. Monk and Tarski).

The completeness theorem for first- order logic states, roughly speaking, that the axioms and rules of inference of the logic are sufficient to construct proofs of all formulas of the logic which one would want to be provable (i.e. those that are true under all interpretations — or valid, to use the technical term). Henkin regarded his famous completeness proof for first- order logic together with an accompanying proof of a kind of completeness for the much broader nth- order logics (for integers n greater than 1) as his best work, regarding the latter as a result holding significant promise for as yet undiscovered future contributions to mathematics and philosophy.

Broadly speaking, the aim of algebraic logic is to study logic by using the methods of algebra. It was started around 1850 by George Boole, who constructed algebras corresponding to propositional logic (the logic of 'and', 'or', and 'not'). Tarski introduced so- called cylindric algebras, which correspond to first- order logic with equality (i.e. propositional logic extended to deal with relations, including equality, and making use of the quantifiers "there exists ... such that", and "for every"). The theory was started by Tarski and some of his

students, then developed jointly by Tarski and Henkin, and brought to completion in certain respects in the "Bible" of the subject, the aforementioned volumes of Henkin, Monk, and Tarski.

Several other publications of Henkin during the fifties contributed substantially to the early development of model theory as a flourishing branch of mathematical logic. He was one of the first to make use of the method of diagrams and he applied it and the compactness theorem of first- order logic to areas of mathematics other than logic, in particular to abstract algebra. Perhaps most important for model theory itself were his generalizations of the notions of w- consistency and w- completeness, which led in time to the celebrated omitting- types theorem.

Henkin displayed further originality by broadening the traditional (everyday) and logical languages, whose sentences are linear, to include formulas with only- partially ordered strings of existential and universal quantifiers and by developing the introductory theory of such languages with their now so- called "Henkin quantifiers."

Henkin was good at asking the right questions. A famous one published in the problem section of the Journal of Symbolic Logic concerning the Gödel incompleteness theorem gave rise in time to an active branch of modal logic in which the modal operator "it is necessary that" is interpreted as "it is provable that."

Henkin's international reputation in logic was recognized by his early election to a term as president of the Association for Symbolic Logic beginning in 1962.

Henkin was known as an extraordinarily clear expositor — in lectures, books, and films. He received the prestigious Chauvenet Prize for mathematical expository writing from the Mathematical Association of America (MAA) in 1964 for his paper "Are Mathematics and Logic Identical?" This skill was recognized again in 1972 when the MAA honored him with a Lester R. Ford Award. He coauthored the undergraduate textbook Retracing Elementary Mathematics, which was published in 1962 and widely used, especially in the training of future teachers of mathematics. Henkin was an active participant in the interdisciplinary Group in Science and Mathematics Education (SESAME) and supervised dissertations of doctoral students in it as well as students in mathematics and in logic and the methodology of science. During 1973– 1975 his interests broadened further while he served as associate director of the University's Lawrence Hall of Science.

Beginning in 1959, for over 15 years Henkin served as principal investigator of the University of California system's creative Community Teaching Fellowship Program, which sent graduate students from departments of mathematics into local elementary schools to teach special mathematics sessions using the "discovery method". In 1983 he played a central role in the development of the Bay Area Mathematics project, an early collaboration linking students, teachers, parents, administrators, and community leaders to improve the teaching of mathematics in the schools. He pushed this idea nationally, fathering the American Mathematics Project, with the same goals. Henkin also led, with David Blackwell, emeritus professor of statistics and mathematics, a 1989 study of mathematical literacy in the U.S., commissioned by the American Association for the Advancement of Science. Part of an effort dubbed Project 2061, their report advocated sweeping changes in mathematics education, including less rote memorization of mathematical rules and a more engaging and lively exploration of concepts and processes that explain the world around us.

Henkin's role as a creative and energetic leader in the field of mathematics education was recognized by his receipt of the MAA's first Gung and Hu Distinguished Service to Mathematics Award in 1990 with the citation "Few individuals of our era have had a greater impact on the health of American mathematics than Leon Henkin." It also noted that Henkin "was one of the pioneers to recognize the importance of mathematicians involving themselves actively in the improvement of mathematics education at all levels."

Early in his career Henkin had noted the paucity of women and ethnic minorities in the upper ranks of mathematicians. With his strong social conscience and energy he set about to do something to change this. In 1964 he spearheaded the formation of the Committee on Special Scholarships of the Berkeley Division, which was comprised of top campus scholars, to study the problem and establish opportunity scholarships for disadvantaged students. This program, which started out preparing high school students to succeed in college and supporting them with Special Opportunity Scholarships, served as a model for the federal Upward Bound Program, which was founded a year or so later. In 1966 he formed the Mathematics Opportunity Committee, which recruited and supported disadvantaged students for the Department of Mathematics graduate program and helped the department take an early lead in increasing the number of Ph.D.s in mathematics conferred on students from underrepresented minorities. The Committee on Special Scholarships, which Henkin chaired

for many years, established the celebrated Professional Development Program, which focused on undergraduate minority students in mathematics and related fields and produced many who became mathematics majors and went on to earn Ph.D.s. The program proved so successful at promoting academic achievement among minority undergraduates that it spawned clones in other academic areas. The resulting programs were combined in 1992 and became the Coalition for Excellence and Diversity in Science, Mathematics, and Engineering, which received the 1998 Presidential Award for Excellence in Science, Mathematics, and Engineering from President Clinton. Henkin also played a fundamental role in the creation of the Mills College Summer Mathematics Institute and its successor, the Summer Institute for the Mathematical Sciences program at Berkeley, six- week programs that offered fast- paced, highly stimulating seminars for talented undergraduate women. The Berkeley campus honored Henkin's enormous contributions in these areas by establishing the Leon Henkin Citation for Distinguished Service, presented to a Berkeley faculty member for "exceptional commitment to the educational development of students from groups who are underrepresented in the academy". Quite fittingly, the first recipient of this citation was Leon Albert Henkin himself.

Leon Henkin's enormous and wide- ranging contributions to UC Berkeley and the world were further recognized in 1991 by the award to him of the Berkeley Citation. He is and will be sorely missed. He is survived by his wife, Ginette (nee Potvin), his sons Paul and Julian, and his sister, Estelle Kuhn.

John Addison
William Craig
Caroline Kane
Alan Schoenfeld