MEMORIAL RESOLUTION OF THE FACULTY OF THE UNIVERSITY OF WISCONSIN-MADISON

ON THE DEATH OF PROFESSOR EMERITA MARY ELLEN RUDIN

Mary Ellen Rudin, Hilldale professor emerita of mathematics, died peacefully at home in Madison on March 18, 2013.

Mary Ellen was born in Hillsboro, Texas, on December 7, 1924. She spent most of her pre-college years in Leakey, another small Texas town. In 1941, she went off to college at the University of Texas in Austin, and she met the noted topologist R.L. Moore on her first day on campus, since he was assisting in advising incoming students. He recognized her talent immediately and steered her into the math program, which she successfully completed in 1944, and she then went directly into graduate school at Austin, receiving her PhD under Moore's supervision in 1949.

After teaching at Duke University and the University of Rochester, she joined the faculty of the University of Wisconsin-Madison as a lecturer in 1959 when her husband Walter came here. Walter Rudin died on May 20, 2010.

Mary Ellen became a full professor in 1971 and professor emerita in 1991. She also held two named chairs: she was appointed Grace Chisholm Young Professor in 1981 and Hilldale Professor in 1988.

She received numerous honors throughout her career. She was a fellow of the American Academy of Arts and Sciences and was a member of the Hungarian Academy of Sciences, and she received honorary doctor of science degrees from the University of North Carolina, the University of the South, Kenyon College, and Cedar Crest College. She served as the vice-president of the American Mathematical Society in 1980-81 and was a member of the board of governors of the Mathematical Association of America from 1973-75 as well as numerous other committees of the AMS and MAA.

Mary Ellen was one of the leading topologists of our time. Besides solving many well-known outstanding open problems, she was a pioneer in the use of set-theoretic tools. She was one of the first to apply the independence methods in set theory to produce independence results in topology. These methods arose in the second half of the twentieth century, following work of Gödel, Cohen, and others, and showed that ZFC (the standard axioms of set theory) are not sufficient to answer many set-theoretic questions, notably CH (the continuum hypothesis) and SH (Suslin's hypothesis, that there are no Suslin trees). To many mathematicians, this seemed to be primarily of interest in mathematical logic, but beginning in the 1950s, Mary Ellen realized that these results had important implications in topology, showing that some fundamental topological questions have one answer in some models of set theory and a different answer in other models. The connections that she found between topology and logic attracted many set theorists and logicians to topology. The best general topologists and set theorists in the world passed regularly through Madison to work with her and her students and colleagues.

In her thesis (1949), she gave an example of a nonseparable Moore space that satisfies the countable chain condition. She published the results of her thesis in three papers in the *Duke Mathematical Journal* (1950, 1951, and 1952).

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In 1955, she used a Suslin tree to construct a Dowker space; this is a normal space whose product with the unit interval is not normal. In 1971, she constructed a Dowker space just in ZFC. Her work on Dowker spaces led to an invited address at the International Congress of Mathematicians in 1974. It also led to her interest in the box topology because her ZFC Dowker space is special kind of box product. If X_n (for $n \in \mathbb{N}$) are topological spaces, then their box product is $\prod_n X_n$, where a base for the topology is given by all products $\prod_n U_n$, with each U_n open in X_n. Mary Ellen was the first person to prove anything non-trivial about box products. In 1972, she showed that assuming CH, $\prod_n X_n$ is normal, and in fact paracompact, whenever all the X_n are compact metric spaces.

Mary Ellen is also famous for her work on $\beta\mathbb{N}$, the space of ultrafilters on the natural numbers, starting in 1966. She was co-inventor of two well-known partial orders on this space, the Rudin-Keisler order and the Rudin-Frolík order. The Rudin-Frolík order led to the first proof in ZFC that the space of non-principal ultrafilters, $\mathbb{N}^* = \beta\mathbb{N} \setminus \mathbb{N}$, is not homogeneous. Under CH, this was already known by a result of Walter Rudin (1956); it is now known that his method of proof will not work in ZFC.

Mary Ellen worked extensively on the question of S and L spaces. She produced the first S space (a hereditarily separable space that is not hereditarily Lindelöf) assuming the existence of Suslin tree in 1972.

In 1999, almost a decade after her retirement, Mary Ellen settled a long-standing conjecture in set-theoretic topology (Nikiel, 1986) by showing that every monotonically normal compact space is the continuous image of linearly ordered compact space.

She was the author of 77 research papers and a famous research monograph, *Lectures on Set Theoretic Topology*. This was published in 1975, but it still remains one of the key references in the field today, summarizing seminal work by herself and others. It contains chapters on box products, S and L spaces, and $\beta\mathbb{N}$ (including Walter Rudin's work on P-points). It also explains models of set theory where Suslin trees exist (Gödel's L) and where they do not exist (models of MA + ¬CH).

She had sixteen PhD students, many of whom went on to have sterling careers of their own. To quote one of them (Michael Starbird, currently a university distinguished teaching professor at the University of Texas at Austin): "From the perspective of a graduate student and collaborator, her most remarkable feature is the flood of ideas that is constantly bursting from her. · · · It is easy to use the Mary Ellen Rudin model to become a great advisor. The first step is to have an endless number of great ideas. Then merely give them totally generously to your students to develop and learn from. It is really quite simple. For Mary Ellen Rudin."

Mary Ellen is survived by her four children, Catherine, Eleanor, Robert, and Charles, and by four grandchildren.

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