

Shmuel Agmon (1922–2025)

In memory of a beloved mathematician

Ehud de Shalit and Yehuda Pinchover

Professor Shmuel Agmon passed away on March 21, 2025. He was the eldest member of the Israel Academy of Sciences and Humanities, and one of the founding faculty members of the Einstein Institute of Mathematics at the Hebrew University. Together with A. P. Calderón, E. De Giorgi, L. Hörmander, F. John, O. A. Ladyzhenskaya, P. Lax, and L. Nirenberg, Agmon has been one of the world's leading researchers in the field of partial differential equations (PDEs) over the past half-century – a field that has proven highly valuable not only in mathematics, but also in scientific disciplines such as physics, biology, chemistry, and engineering.

Shmuel Agmon was born on February 2, 1922, in Tel Aviv, to the writer and Zionist activist Natan Bistrizky and his wife Chaya (née Guttman). The family moved from Nazareth, where Chaya had worked as a dentist, to Jerusalem, where Shmuel completed his studies at the Hebrew Gymnasium. Although he was drawn to mathematics from a young age, he also found time for chess (he was the Jerusalem youth champion) and was a member of the “Machanot HaOlim” youth movement. In 1939, he went for training at Kibbutz Na'an, but within a year returned to academic studies at the Hebrew University. Among his teachers were Michael Fekete, Abraham Halevi Fraenkel, Benjamin Amira, and Yaakov Levitzki.

Agmon's studies were interrupted by World War II, during which he volunteered for four years in the Jewish Brigade. After being discharged, he completed his studies at the Hebrew University and was invited by Professor Szolem Mandelbrojt to pursue his doctorate at the Sorbonne in Paris. He completed his PhD in 1949 in the field of complex functions and then took a position at Rice University in Texas. At Rice, he transitioned into the field of PDEs, which would define his career. His encounters with the leading analysts Peter Lax and Louis Nirenberg – especially his collaboration and friendship with the latter – deeply influenced him and shaped his professional path.

In 1952, he joined the Hebrew University, pioneering the field of PDEs in Israel and mentoring many students. In 1964, he was elected to the Israel Academy of Sciences and Humanities.

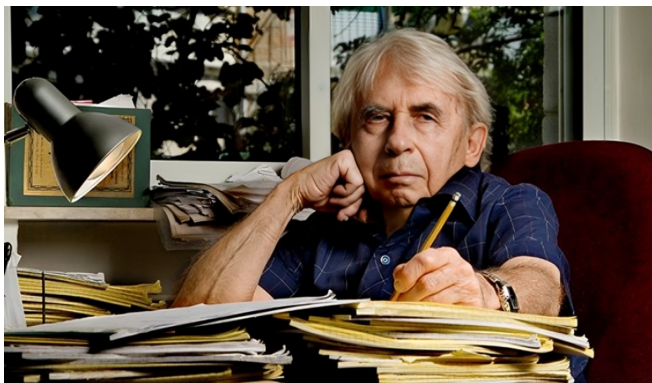
Shmuel Agmon is one of the founders of the modern theory of linear elliptic PDEs. His research focused on the qualitative theory of linear elliptic differential equations. His groundbreaking and highly



S. Agmon in AgmonFest 2007. (© D. Guthrie)

influential papers [5, 6] with Douglis and Nirenberg, published in 1959 and 1964, generalized the classical Schauder theory on regularity of second-order elliptic boundary value problems to general higher-order elliptic equations and even to systems of such equations. These papers covered the theory of L^p spaces for $1 < p < \infty$ and Hölder spaces while, for example, the Hörmander's classical 1963 book is restricted to the L^2 theory. These works, among the most cited in mathematical analysis, continue to influence the modern theory of linear and nonlinear elliptic equations. Agmon's 1965 book [1] on linear boundary value problems for elliptic PDEs of general order became a foundational text in the field (a revised edition was published in 2010 [4]).

From the mid-1960s, Agmon worked on the spectral theory and scattering theory of Schrödinger-type equations, publishing results of great significance in mathematical physics. His early breakthrough results on the spectral properties of Schrödinger operators and scattering theory were published as a book in the highly selective Lezioni Fermiane [Fermi Lectures] series [2]. Agmon's contributions in this field include, in particular, precise estimates on the decay of eigenfunctions of Schrödinger operators on unbounded Riemannian manifolds – expressed in terms of an ingenious metric he introduced, now known as the *Agmon metric* (see his widely



S. Agmon, a recipient of the EMET 2007 Prize. (© Yael Ben Haim)

influential lecture notes [3]) – as well as his results on the structure and behavior of positive solutions of second-order elliptic equations, and on the limiting absorption principle, had a profound and lasting impact on this extensively studied field. Furthermore, his work advanced the understanding of wavefunction scattering for both short-range and long-range potentials.

For his work, Shmuel Agmon was awarded the Weizmann Prize, the Rothschild Prize, the Israel Prize, and the EMET Prize. He was a speaker at the International Congress of Mathematicians (ICM) in 1962 and 1970.

Agmon was widely respected worldwide and known among his colleagues for his broad intellectual horizons, phenomenal memory, modesty, and sense of humor. In 1947, he married Galia Yardeni, a researcher of literature and the history of journalism in the Land of Israel, who sadly passed away in 1968. They had three sons, Noam Agmon, a theoretical chemist, Ariel Agmon, a neurobiologist, and Eytan Agmon, a musicologist. In 1972, he married Nechama de-Shalit, a psychiatrist who passed away in 1998.

Shmuel Agmon witnessed momentous events throughout his life and was blessed with longevity and good health. May his memory be a blessing.

References

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S. Agmon with his former students and H. Brezis, AgmonFest 2007. (© D. Guthrie)

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Yehuda Pinchover (born in 1953 in Haifa, Israel) is a professor emeritus of mathematics at the Technion – Israel Institute of Technology, where he taught from 1988 until his retirement in October 2021. He has authored more than 80 research papers, primarily on positive solutions of elliptic and parabolic PDEs and variational inequalities. He is the coauthor of a textbook, coeditor of conference proceedings, and has served as a visiting professor at UCLA, ETH Zürich, Université Pierre et Marie Curie (Paris VI), the Hebrew University, the University of Padua, and the University of Potsdam. Pinchover completed his PhD under the supervision of Shmuel Agmon and misses him deeply.

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