

# In Memoriam: Haïm Brezis (1944–2024)

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The mathematical community mourns the loss of Haïm Brezis, who passed away on July 7, 2024, in Jerusalem at the age of eighty. A towering figure in nonlinear analysis and partial differential equations, Brezis leaves behind an extraordinary legacy that has shaped modern mathematics and inspired generations of researchers worldwide.

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## A Life Forged in Adversity

Born on June 1, 1944, in Riom-ès-Montagnes, a small village in the Auvergne region of France, Haïm Brezis entered the world during one of history's darkest hours. His parents, Yaakov and Rivka Brezis, were Orthodox Jewish refugees who had fled to the Massif Central to escape Nazi persecution. His father, originally from Romania, and his mother, who had escaped from Holland with her parents, lived without official documents and could only marry in a secret religious ceremony.

Born just days before the Allied landings in Normandy, Haïm, whose name means “Life” in Hebrew, spent his first weeks literally in the forest, where his parents had retreated to a shepherd’s hut when threats intensified. This remarkable beginning foreshadowed a life of resilience and determination that would characterise his entire career.

After Paris was liberated in August 1944, the family moved to the Latin Quarter, where Yaakov established himself as a furrier. Growing up in this vibrant intellectual environment, young Haïm received his first Hebrew lessons at home and began reading Hebrew before French, a fact that initially confounded his teachers when he persisted in writing French from right to left.

## The Path to Mathematical Excellence

Brezis’s passion for mathematics blossomed during his studies at the Lycée Montaigne and later at the prestigious Lycée Henri IV. His teacher, I. Salanskis, recognised his exceptional talent and encouraged him to pursue a career in mathematics. However, Brezis’s commitment to his religious convictions led him to decline sitting for the École Normale Supérieure entrance examinations on a Saturday, which effectively closed that traditional door to mathematical excellence.

Undeterred, he entered the [Université Pierre et Marie Curie \(Paris VI\)](#) in 1962, where he studied under luminaries including [Claude Chevalley](#), [François Bruhat](#), [Roger Godement](#), [Gustave Choquet](#), and [Laurent Schwartz](#). A pivotal moment came in 1965 when, seeing a poster for a summer seminar in Montreal featuring [Félix Browder](#), the young Brezis immediately flew to Canada. This conference, where he also attended lectures by [Guido Stampacchia](#) and [Shmuel Agmon](#), ignited his deep interest in partial differential equations.

## Revolutionary Contributions to Mathematics

Brezis earned his Doctorat de 3e cycle in 1966 under Gustave Choquet with a thesis on monotone operators, followed by his Doctorat d’État in 1972 under [Jacques-Louis Lions](#). By the time he received his doctorate, he had already published 38 papers, a testament to his prodigious productivity and the importance of his early work.

His research transformed the landscape of nonlinear analysis. His groundbreaking 1973 book, *Opérateurs maximaux monotones et semi-groupes de contractions dans les espaces de Hilbert*, remains an essential reference more than five decades later. As the Académie des Sciences noted in their tribute, “This remarkable work remains an essential reference for the mathematical community, with applications in unexpected fields.”

Throughout his career, Brezis made seminal contributions across multiple areas, including the theory of monotone operators, variational equations and inequalities, quasi-invariant elliptic equations, Ginzburg–Landau equations in superconductivity theory, and Sobolev spaces on manifolds. His 1994 book *Ginzburg Landau Vortices*, written with Fabrice Bethuel and Frédéric Hélein, became the fundamental mathematical reference on phase transition phenomena and superconductivity.

His widely celebrated textbook *Functional Analysis, Sobolev Spaces and Partial Differential Equations*, emerging from his legendary courses at the Université Pierre et Marie Curie, has been translated into ten languages and has served as a foundational text for countless analysts worldwide. Students would pack his lectures year after year, drawn by his clarity, insight, and infectious enthusiasm for mathematics.

### **A Master Teacher and Mentor**

Perhaps no measure better captures Brezis’s impact than his remarkable record as a doctoral adviser. He supervised 60 PhD students, including Pierre-Louis Lions, who won the Fields Medal in 1994. Through his students and their descendants, his mathematical lineage extends to more than a thousand researchers, forming what the Académie des Sciences described as “an impressive school”.

His close collaboration with Louis Nirenberg at the Courant Institute proved particularly influential. Brezis later reflected, “Working closely with Louis Nirenberg, I had the privilege of seeing a great mathematician at work. A luminous and very modest man, Louis has become for me the living model of a Master in the deepest sense of the term.”

### **A Global Mathematical Citizen**

Brezis’s career spanned continents and institutions. Appointed to the Université Pierre et Marie Curie in 1972, he became a full professor in 1976 and served until his retirement in 2007. He simultaneously held positions as a lecturer at the École Polytechnique from 1973 to 1985 and, from 1987, as Distinguished Visiting Professor at Rutgers University, where he spent several months each year until 2022. He was also a regular visitor at the Technion, Haifa, Israel from 2008 to 2022.

His contributions to mathematical publishing were equally significant. He founded and directed the book series *Progress in Nonlinear Differential Equations and Their Applications*, which has published over a hundred volumes since 1988. As editor-in-chief of the *Journal of the European Mathematical Society* (JEMS) from 2003 to 2015, he helped elevate it to become one of the field’s premier journals.

### **Honours and Recognition**

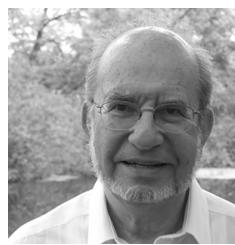
The mathematical community recognised Brezis’s extraordinary contributions with numerous prestigious honours. He received the Ampère Prize in 1985, the Eugène Catalan Prize in 1990, and most recently, the *2024 Leroy P. Steele Prize for Lifetime Achievement* from the *American Mathematical Society*, which was awarded just months before his passing and recognised the full scope of his exceptional career.

He was elected to nine academies, including membership in the French Académie des Sciences (1988), the [American Academy of Arts and Sciences](#), and the [National Academy of Sciences](#) (2003). He held honorary doctorates from eleven universities and served as a chevalier of the French [Légion d'honneur](#).

### Personal Life

In 1982, Brezis married [Michal Govrin](#), a distinguished author and scholar of theatre and literature. Together they had two daughters, Rachel-Shlomit, who became a developmental psychologist specialising in autism, and Miriam-Rivka, who followed a medical path. He also had two brothers: David, a research fellow in philosophy who passed away in 2020, and Mayer, a professor of medicine at Hadassah-Hebrew University Medical Centre.

### An Enduring Legacy



Haïm Brezis's life embodied resilience, brilliance, and dedication. His mathematical legacy, embodied in his theorems, books, and students, will continue to inspire and guide researchers for generations to come. His pioneering work on monotone operators, variational methods, and Ginzburg–Landau equations remains as vital today as when first published, a testament to the timeless quality of his insights. He lived true to his name, Haïm, “Life”, bringing vitality, creativity, and profound meaning to mathematics and to all those fortunate enough to learn from him. The mathematical world is diminished by his passing, yet immeasurably enriched by the legacy he leaves behind.

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### Relevant Video Lecture

For those wishing to see Haïm Brezis in his element, the following video captures him delivering a lecture at the [Scuola Normale Superiore](#). It offers a glimpse into his clarity of thought and his engaging teaching style.

[Lecture, Haim Brezis, 21 September 2016](#)