

Born 20 November 1924, Warsaw, Poland.

EDUCATION

- 1945-1947 Ingénieur diplômé: *Ecole Polytechnique*, Paris; Admission class of 1944.
 1947-1949 Master of Science in 1948, Professional Engineer in 1949 in Aeronautics:
California Institute of Technology, Pasadena CA.
 1949-1952 Docteur d'Etat ès Sciences Mathématiques: *Faculté des Sciences de Paris*.
 1953-1954 Post-doctoral Member, under John von Neumann, of the School of Mathematics :
Institute for Advanced Study, Princeton NJ.

PRINCIPAL POSITIONS

- 1949-1957 Staff member (Attaché, then Chargé, then Maître de Recherches):
Centre National de la Recherche Scientifique, Paris, France.
 1957-1958 Maître de Conférences de Mathématiques Appliquées: *Université*, Lille, France.
 Maître de Conférences d'Analyse Mathématique: *École Polytechnique*, Paris.
 1958-1993 Research Staff Member, 1958-74; IBM Fellow, 1974-93;
 IBM Fellow Emeritus since 1993: *IBM Thomas J. Watson Research Center*,
 Yorktown Heights NY.
 1987-1999 Abraham Robinson Adjunct Professor of Mathematical Sciences;
 1999– Sterling Professor of Mathematical Sciences (first tenured appointment):
 Mathematics Department: *Yale University*, New Haven CT.
 1988– Fellow, *Saybrook College*, New Haven CT

POSITIONS HELD ON LEAVE OF ONE TERM OR MORE

- 1950-1953 Ingénieur, Groupe de Télévision en Couleur: *LEP, S.A.* (Groupe Philips), Paris, France.
 1953-1954 Member of the School of Mathematics: *Institute for Advanced Study*, Princeton NJ.
 1955-1957 Chargé de Cours de Mathématiques & Membre du Séminaire Jean Piaget:
Université, Genève.
 1962-1963 Visiting Professor of Economics & Research Fellow in Psychology:
Harvard University, Cambridge MA.
 1963-1964 Visiting Professor of Applied Mathematics & Staff Member of the Joint Committee
 on Biomedical Computer Science: *Harvard University*, Cambridge MA.
 1966-1967 Professeur invité de Mathématiques: *Faculté des Sciences*, Paris, France.
 1979-1980 Visiting Professor, later Professor of the Practice of Mathematics.
 1984-1986 Mathematics Department: *Harvard University*, Cambridge MA.
 1995 Professeur de l'Académie des Sciences: *École Polytechnique*, Palaiseau, France.
 1999 G.C. Steward Visiting Fellow: *Gonville & Caius College*;
 Member: *Newton Institute for Mathematical Sciences*, Cambridge, UK.

SELECTED LECTURERSHIPS & OTHER PART-TIME OR SHORT-TERM LEAVE ACTIVITIES

- 1953-1971 Research Associate, later Lecturer in Electrical Engineering, most recently
Institute Lecturer: *Massachusetts Institute of Technology*, Cambridge MA.
- 1969-1977 Senior Staff Member: *National Bureau of Economic Research*, New York NY.
- 1970 Visiting Professor of Engineering & Applied Science: *Yale University*, New Haven CT.
- 1972 Visiting Professor of Physiology: *Albert Einstein College of Medicine*, Bronx NY.
- 1974 Visiting Professor of Physiology: *SUNY Downstate Medical Center*, Brooklyn NY.
Abraham Wald Memorial Lecturer: *Columbia University*, New York NY.
Samuel Wilks Memorial Lecturer: *Princeton University*, Princeton NJ.
- 1980 Visiteur: *Institut des Hautes Études Scientifiques (IHES)*, Bures-sur-Yvette, France.
- 1980-1982 National Lecturer: *Sigma Xi, The Scientific Research Society of America*.
- 1983 *International Congress of Mathematicians (IMU)*, Warsaw, Polska.
Distinguished Short-Term Visiting Professor: *University of Guelph*, Guelph ON, Canada.
James Hudnall Distinguished Visiting Lecturer: *University of Chicago*, Chicago IL.
- 1984, 2001 Visitor: *Mittag-Leffler Institute*, Djursholm, Sweden.
- 1984 Walker-Ames Distinguished Professor: *University of Washington*, Seattle WA.
- 1987 Gunnar Källen Memorial Lecturer: *University*, Lund, Sverige.
- 1987, 2000 Regents' Lecturer: *University of California*, Santa Cruz CA; Riverside CA.
- 1987 Heisenberg Lecturer: *Bayerische Akademie der Wissenschaften*, München, Deutschland.
- 1987-1994 Charter Member: *Geometry Center*, Minneapolis MN.
- 1988 Six Hundredth Anniversary, *University of Cologne*, Deutschland.
- 1990 Rouse Ball Lecturer in Mathematical Science, *University of Cambridge*, Cambridge, UK.
Cherwell-Simon Lecturer in Physics, *University of Oxford*, Oxford, UK.
- 1991 Schrödinger Lecturer, *Imperial College*, London, UK.
- 1992 Charles M. and Martha Hitchcock Professor: *University of California*, Berkeley CA.
International Congress of Mathematics Education, Québec, Canada.
- 1994 Vito Volterra Lecturer, *Accademia Nazionale dei Lincei*, Roma, Italia.
- 1995 Professeur de l'Académie des Sciences: *École Polytechnique*, Palaiseau, France.
- 1997 Celsius Lecturer, *University of Uppsala*, Sverige.
- 1998 R. & B. Sackler Visiting Professor: *University*, Oslo, Norway.
- 1999 Scott Lecturer in Physics, *Cavendish Laboratory*, Cambridge, UK.
G.C. Stewart Lecturer, *Gonville & Caius College*, Cambridge, UK.
- 2001 Sonja Kovalevsky-dagarna. *Royal Swedish Academy of Sciences*, Stockholm, Sverige.
E. Lorenz Lecturer. Annual Meeting, *American Geophysical Union*, San Francisco CA.

DECORATIONS

- 1989 – Chevalier: *L'Ordre National de la Légion d'Honneur*, Paris, France.

ACADEMIES

- 1982 – Fellow: *American Academy of Arts and Sciences*, Cambridge MA.
- 1987 – Foreign Associate, Member since 2001: *USA National Academy of Sciences*, Washington DC.
- “His creative thinking was essential for physicists working in diverse fields to capture the essence of previously intractable problems and to unveil order and simplicity in systems with a seemingly high degree of disorder, irregularity, and complexity.”
- Member *ex officio*: *Connecticut Academy of Science and Engineering*, Hartford CT.
- Member: *European Academy of Arts, Sciences and Humanities*, Paris, France.
- 1989-93 Member *ex officio*, as IBM Fellow: *IBM Academy of Technology*, Armonk NY.
- 1998 – Foreign Member: *Norwegian Academy of Science and Letters*, Oslo, Norge.
- 2004 – Member, *American Philosophical Society*, Philadelphia PA.

AWARDS, PRIZES, AND MEDALS (WITH SELECTED EXCERPTS FROM CITATIONS)

- 1974 IBM Fellowship:
IBM Corporation, Armonk NY.
- “There are few contemporary scholars who have made such penetrating contributions to as many fields of physical and social science...In his work, both in depth and range, he is the world leader. His success, where others have faltered, has been due to a combination of command of mathematical tools, extraordinary breadth, and even rarer intellectual courage.”
- 1983 Research Division Outstanding Innovation Award in 1983; Corporate Award in 1984:
1984 *IBM Corporation*, Armonk NY.
- 1985 Barnard Medal for Meritorious Service to Science, “Magna est Veritas:”
USA National Academy of Sciences and Columbia University, Washington DC and New York NY.
- “In the great tradition of natural philosophers past you looked at the world around you on a broader canvas.”
- 1986 Franklin Medal for Signal and Eminent Service in Science:
The Franklin Institute, Philadelphia PA.
- “For outstanding contributions to mathematics and the creation of the field of fractal geometry, and important and illuminating applications of this new concept to many fields of science.”
- 1988 Charles Proteus Steinmetz Medal:
IEEE Chapter, General Electric Company, and Union College, Schenectady NY.
- “Fractals have given new insights into every field of science, mathematics, engineering, economics, psychology, art, and literature.”
- Alumni Distinguished Service Award for Outstanding Achievement:
California Institute of Technology, Pasadena CA.
- “[gave] insight into such complex phenomena as turbulence of liquids...”
- Senior Award (Humboldt Preis):
Alexander von Humboldt-Stiftung, Bonn, Deutschland.
- “Science for Art” Prize:
Fondation Moët-Hennessy-Louis Vuitton, Paris, France.

- 1989 Harvey Prize for Science and Technology:
Technion-Israel Institute of Technology, Haifa, Israel.
- 1991 Nevada Prize:
University of Nevada System and Desert Research Institute.
- "Startled scientists, mathematicians and artists alike in 1975 [by] unveiling a dramatic new approach for describing what had previously seemed indescribable."
- 1993 Wolf Foundation Prize for Physics:
Wolf Foundation to Promote Science and Art for the Benefit of Mankind, Herzliyah, Israel.
- "By recognizing the widespread occurrence of fractals and developing mathematical tools for describing them, he has changed our view of nature."
- 1994 Honda Prize:
Soichiro Honda Foundation of Japan, Tokyo, Japan.
- "Identified substantial bridges over the chasms that now separate mathematics, science and technology from one another and from the interests of the common man and the child..."
- 1996 Médaille de Vermeil de la Ville de Paris:
Hôtel de Ville, Paris, France.
- "On vous considère, à juste titre, comme le pionnier d'une nouvelle vision de notre monde... Votre démarche... constitue un effort pour rendre compte de phénomènes dont la théorie ne savait que faire."
- 1999 John Scott Award:
John Scott Fund, Philadelphia PA.
- for "Ingenious Men and Women Who Contribute in Some Outstanding Way to the Comfort, Welfare, or Happiness of Mankind."
- Lewis Fry Richardson Medal:
European Geophysical Society.
- for his "pioneering contributions to the development and applications of scale-invariance and fractal geometry to non-linear geophysics."
- 2002 Sven Berggren Priset:
Kungliga Fysiografiska Sällskapet, Lund, Sverige.
(Academy for the Natural Sciences, Medicine and Technology)
- Medaglia della Presidenza della Repubblica Italiana:
Centro Pio Manzu, Rimini, Italia.
- William Procter Prize for Scientific Achievement:
Sigma Xi, The Scientific Research Society of America.
- 2003 Japan Prize for Science and Technology:
Science and Technology Foundation of Japan, Tokyo, Japan.
- for "a substantial contribution to the advancement of science and technology as well as to the peace and prosperity of mankind."
- 2004 Best Business Book of the Year Award:
The Financial Times Germany/getAbstract.
- for the book *The (mis)Behavior of Markets: A Fractal View of Risk, Ruin and Reward.*

DIPLOMAS HONORIS CAUSA & THE LIKE

- 1986 Doctor of Science & Engineering Commencement Speaker: *Syracuse University*, Syracuse NY.
 • "Your interests transcend conventional disciplinary bounds and your work in its breadth and depth speeds the way toward unraveling secrets of the universe."
 Commencement Speaker: *St. John's College*, Annapolis MD.
 Doctor of Science: *Laurentian University/Université Laurentienne*, Sudbury ON, Canada.
- 1987 Doctor of Science: *Boston University*, Boston MA.
 • "What you have named 'fractal geometry' describes ... as well the ... commodities market ... and a myriad of phenomena [that point] to a symmetry of pattern within each of the meldings, branchings, and shatterings of nature. [You are honored] for your prolonged and energetic refusal to confine yourself within accepted rigidities [and] for the scientific, mathematical, and aesthetic insights by which you have brought us closer to the character of the universe."
- 1988 Doctor of Science: *State University of New York*, Albany NY.
 Doktor: *Universität Bremen*, Bremen, Deutschland.
 • "For setting standards, as a wanderer-by-choice between the disciplines and between theory and applications."
 Doctor of Humane Letters: *Pace University*, New York NY.
 • "For bringing an unsuspected new form of beauty to mathematics, for giving new dimension to our lives"
- 1989 Doctor of Science & Commencement Speaker: *University of Guelph*, Guelph ON, Canada.
 • "Has reshaped our vision of geometry. Is one of that small number of scientists whose ideas not only have a major impact upon science but also on the popular domain."
- 1992 Doctor of Science & Commencement Speaker: *University of Dallas*, Irving TX.
- 1993 Doctor of Science & Founders Day Speaker: *Union College*, Schenectady NY.
 Engineering Commencement Speaker: *Université de Franche-Comté*, Besançon, France.
 Doctor: *Universidad de Buenos Aires*, Buenos Aires, Argentina.
- 1995 Doctor Philosophiae: *Tel Aviv University*, Ramat Aviv, Israel.
 • "For pioneering work... which broke new ground in the analysis of complex physical systems."
- 1998 Doctor of Science: *Open University* (U.K.), London Commencement.
 • "[He investigated Julia sets] and thereby discovered a related set of extraordinary complexity and beauty which is named after him. The Mandelbrot set has now been studied in great depth, leading to profound mathematical insights. At the same time, the creation of pictures of these exquisite sets has become an art form in its own right... Our course M337 Complex Analysis has a unit entirely devoted to the Mandelbrot set, and many students report that this is the high point of their studies."
 Doctor of Science: *Oikonomiko Panepistemio, University of Business & Commerce*, Athens, Greece.
- 1999 Doctor of Science: *University of St Andrews*, St Andrews, Scotland, U.K.
 • "...created an entirely new geometry with as much system and generality as that of Euclid and a new physical science. Not overawed by tradition or authority...saw that the overwhelming smoothness paradigm with which mathematical physics had attempted to describe Nature was radically flawed and incomplete...Chancellor, as your predecessor...Lord Balfour in 1911 honoured Georg Cantor, I take the greatest pleasure in inviting you to honor a great mathematician of a great mathematical age."
 Master of Arts *privatim*: *Yale University*, New Haven CT.
- 2002 Doctor of Science: *Emory University*, Atlanta GA.
 • "Your path-breaking study of fractals not only has established a prominent field worth of study in its own right but also influenced a broad range of other fields, from architecture to ecology, economics, linguistics, neuroscience, and cinematic techniques."

MEMBERSHIPS IN SCIENTIFIC SOCIETIES

Member (honorary): *Société Physique de France*.

Fellow: •*American Physical Society*.

“For the development of fractal geometry, ... and ... its first applications in physics.”

•*American Association for the Advancement of Science*.

•*American Geophysical Union*.

“For [improving] understanding of order and scale in geophysical processes.”

•*Institute of Mathematical Statistics* (inactive).

•*American Statistical Association* (inactive).

“For many ingenious contributions to stochastic models in several fields.”

•*Institute of Electrical and Electronics Engineers* (inactive).

“For contributions to information theory and its applications, and to understanding of $1/f$ random noise processes.”

•*Econometric Society* (inactive).

Member (elected): *International Statistical Institute* (inactive).

Member: *Société Mathématique de France* (inactive).

American Mathematical Society.

Materials Research Society (inactive).

SELECTED MEMBERSHIPS IN BOARDS AND COMMITTEES

1964-82 Editorial Board of the journal *Information and Control*.

1969-72 Committee on the Applications of Mathematics: *USA National Academy of Sciences*.

1974-78 Editorial Board of the *Journal of Financial Economics*.

1982-88 Editorial Board of the journal *Pure and Applied Geophysics*.

1984— Editorial Board of the journal *Advances in Applied Mathematics*.

1989-92 Editorial Board of the *Journal of Visual Communication and Image Representation*.

1990-91 Advisory Board of the journal *Experimental Mathematics*.

1990-92 Advisory Panel of the journal *Mathematics Review*.

1990-95 Advisory Board of the journal *Physica A*.

1992— Honorary Editor, *Fractals: An Interdisciplinary Journal on the Complex Geometry of Nature*.

1993-96 Commission on Mathematical Physics (C18), *International Union on Pure and Applied Physics*.

1993— President, *Mandelbrot Foundation for Fractals*.

1995— Scientific Council, Me Vis, Bremen, Germany.

2001— Advisory Board of the journal *Quantitative Finance*.

2004— Advisory Board of the journal *Annals of Finance*.

MISCELLANEOUS

1988— Namesake, *The Mandelbrot Competition in Mathematics* for high school students.

1988— Honorary Member, United Mine Workers of America.
Presented by the Sudbury (Ontario, Canada) Local.

GRANTS

1953-54 *Scholar of the Rockefeller Foundation*.

1968 *Fellow of the John Simon Guggenheim Memorial Foundation* (resigned).
Grants from NSF and ONR.