

ARTHUR JAFFE

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PROJECT: MATHPICTURE.FAS.HARVARD.EDU

Education:

AB in Chemistry, Princeton University, 1959

BA in Mathematics, Clare College, Cambridge University, 1961

PhD in Physics with advisor Arthur S. Wightman, Princeton University, 1966

Current Positions:

Landon T. Clay Professor of Mathematics and Theoretical Science at Harvard University, 1985—

Member of the Council and Chairman of the Board of STP, Dublin Institute for Advanced Study, 2005—

Director: [Mathematical Picture Language Project at Harvard](#), 2017—

Distinguished Visiting Professor of Mathematics: AMSS, Chinese Academy of Sciences, 2017—

Member Editorial Board: [SCIENCE CHINA Mathematics](#), 2018—

Memberships:

Honorary Member of the **Royal Irish Academy**

Member of the **US National Academy of Sciences**

Member of the **American Academy of Arts and Sciences**

Fellow of the **American Association for the Advancement of Science**

Fellow of the **American Mathematical Society**

Fellow of the **Society of Industrial and Applied Mathematicians**

Fellow of the **American Physical Society**

Prior Activities:

Co-Founder, Member, Director, and Founding President, Clay Mathematics Institute, 1998–2002

President, American Mathematical Society, 1997–1998

President, International Association of Mathematical Physics, 1991–1996

Chair, Harvard University Mathematics Department, 1987—1990

Chief Editor of *Communications in Mathematical Physics*, 1979—2001

Co-Founder of the Cargèse Summer Schools in Mathematical Physics, 1974—1996

Professor of Mathematical Physics, Harvard University, 1974—1985

Assistant to Full Professor of Physics, Harvard University, 1967—1970

Acting Assistant Professor of Mathematics, Stanford University, 1966--1967

Awards:

ICCM award (details next page), 2018

Medal from the Collège de France, 1990

Dannie Heineman Prize in Mathematical Physics, APS and AIP, 1980

Prize in Mathematics and Physics, New York Academy of Science, 1979

Selected Lectureships:

Distinguished Public Lecture, **Chinese Academy of Sciences 2018**

Statutory Public Lecture, **Dublin Institute for Advanced Study 2016**

Friedrich Hirzebruch Lecture, **Bonn 2015**

Schrödinger Lecture, **Schrödinger Institute Vienna 2012**

Class of 1927 Lecturer, **Rensselaer Polytechnic Institute 2000**

Frank Hahn Lecturer, **Yale University 1985**

Hedrick Lecturer at the **Mathematical Association of America 1985**

Porter Lecturer, **Rice University 1983**

Lecture Series, **Accademia Nazionale dei Lincei 1977**

Publications:

Over 200 papers, 4 books, edited 7 other books. [Link to full publication list.](#)

Narrative

Arthur Jaffe grew up in Pelham, NY, where he attended the local schools and had interests in science, music, and photography. He received an AB in chemistry from Princeton University and a BA in mathematics from Cambridge University, where he was a Marshall Scholar at Clare College. He then returned to Princeton for his doctorate in physics. After spending a year in the mathematics department of Stanford University, he received an invitation to move to Harvard, where he has been based ever since. On the retirement of George W. Mackey in 1985, Jaffe was appointed his successor as the “Landon T. Clay Professor of Mathematics and Theoretical Science.” Two years later he began a three-year term as Chair of the Mathematics Department at Harvard.

Currently Jaffe has a long-term appointment as Distinguished Visiting Professor in the Academy of Mathematics and Systems Science (AMSS) of the Chinese Academy of Sciences. Jaffe has been a guest professor in some other universities, including the ETH Zurich, UC San Diego, Princeton University, Boston University, and the University of Rome.

In 2017, Jaffe initiated the Picture Language Project at Harvard with his postdoctoral fellow Zhengwei Liu. Their goal is to find new picture languages within which they can establish mathematical theorems, and use intuition from this point of view to discover and prove interesting new results for mathematics and physics. In 2018 he organized a one-month working research group in Beijing for his Harvard researchers and a few other mathematicians. Jaffe’s paper with Zhengwei Liu, “A Mathematical Picture Language Program,” published in the *Proceedings of the National Academy of Sciences* was recently selected by the International Consortium of Chinese Mathematicians (ICCM) as one of the best mathematical papers that was published in the last five years, with at least one author of Chinese descent.

Arthur Jaffe’s research crosses the boundaries between mathematics and physics. One of the major problems in theoretical science is to show the compatibility of the two most important “theories” in 20th century physics: relativity and quantum theory. Although many Nobel prizes have been given in this area, it is still not known whether quantum fields (the putative mathematical framework) makes logical sense. Jaffe gave the mathematical solution to this problem for space-time of less than four dimensions, in joint work with Glimm and Spencer. Their work established the existence of non-linear quantum fields, and founded the subject called “constructive quantum field theory.” In our four-dimensional world, solving this problem remains one of the most puzzling challenges in theoretical science. They also gave the first mathematical proof of the existence of a “phase transition” and symmetry breaking for a quantum field theory. In addition, Jaffe made seminal contributions to the mathematics of non-commutative geometry and to infinite-dimensional analysis. He is actively engaged in several related research programs.

Jaffe received the Dannie Heineman Prize for Mathematical Physics from the American Institute of Physics. He received Physical Science Prize from the New York Academy of Sciences. He has been a lecturer at the Collège de France. Jaffe is a member of the National Academy of Sciences, he is a Fellow of the American Academy of Arts and Sciences, and he is an Honorary Member of the Royal Irish Academy. He was a Visiting Scholar at Clare College Cambridge in 2017.

Many mathematical physicists have studied with Jaffe as doctoral students or postdoctoral collaborators, including Tadeusz Balaban, Jonathan Dimock, Joel Feldman, Jürg Fröhlich, Krzysztof Gawędzki, Ezra Getzler, John Imbrie, Antti Kupiainen, Andrew Lesniewski, Chiara Nappi, Konrad Osterwalder, Robert Schrader, Roland Sénéor, Clifford Taubes, Eugene Wayne, Jonathan Weitsman. Recent students and postdoctoral collaborators include Kaifeng Bu, Weichen Gu, Bas Janssens, Davis Lazowski, Zhengwei Liu, Yunxiang Ren, Michele Tienni, Fei Wei, Alex Wozniakowski, and Jinsong Wu.

Jaffe cofounded a series of mathematical physics schools in Cargèse, Corsica, bringing together mathematicians, physicists, and students. The resulting interactions motivated many later developments both in mathematics and physics. Jaffe served as President of the American Mathematical Society.

In 1999 Jaffe assisted Martin Seligman, former president of the American Psychological Association, in initiating the Pinnacle Project for gifted children. He served as a board member and a sponsor to bring the 2001 International Mathematics Olympiad to Washington and organized the closing ceremony for the Olympiad around the theme of bringing the high-school teams into motivational contact with leading American research mathematicians.

Jaffe conceived the Clay Mathematics Institute and served as its first president. The institute employs research mathematicians, has educational initiatives for high school students, and recognizes achievements in mathematical research. During that time, he designed most of its programs, including the Millennium Problems in Mathematics. This initiative encouraged many talented youth to consider aspiring to a career in mathematics.

Jaffe served from 1979 to 2000 as Chief Editor of *Communications in Mathematical Physics*. During that time he appointed approximately 30 editors. Jaffe has served as Chair of the Board of the Dublin Institute for Advanced Studies, School of Theoretical Physics since 2005, succeeding Michael Atiyah in that role.