

ARTHUR JAFFE

WEB SITE: WWW.ARTHURJAFFE.NET

University Education:

AB in Chemistry 1959, Princeton University
BA in Mathematics 1961, Cambridge University
PhD in Physics 1966, Princeton University

Current Activities:

Landon T. Clay Professor of Mathematics and Theoretical Science, Harvard University
Chairman of the Board, Dublin Institute for Advanced Study, School of Theoretical Physics
Member of the Science Board, Santa Fe Institute
Member of the Advisory Board, *Communication in Mathematical Physics*
Member of the Editorial Board, *Annals of Functional Analysis* (AFA)
Member of the International Advisory Board, Center for Mathematical Physics, Hamburg
Member of the Board of Directors, Jacobs University Bremen Foundation of America

Memberships, Scholarships, etc.:

Honorary Member of the Royal Irish Academy 2009
Member of the US National Academy of Sciences 2000
Member of the American Academy of Arts and Sciences 1978
Fellow of the American Mathematical Society
Fellow of the American Association for the Advancement of Science
Fellow of the Society of Industrial and Applied Mathematicians
Fellow of the American Physical Society
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
Alfred P. Sloan Foundation Faculty Fellow
John Simon Guggenheim Foundation Fellow (two appointments)
National Research Council Post-doctoral Fellow
National Science Foundation Pre-doctoral Fellow
Marshall Scholar

Some Prior Activities:

Co-Founder, Member, Director, and President of the Clay Mathematics Institute, 1998–2002
Chair of the Council of Scientific Society Presidents, 2000
President of the American Mathematical Society, 1997–1998
Chair of the American Association for the Advancement of Science Mathematics Section, 2001
President of the International Association of Mathematical Physics, 1991–1996
Member of the Board of Advisors, John Templeton Foundation 2008–2012
Member of the Board of Directors, Institute for Schools of the Future 2000–2010
President's Commission for the National Medal of Science: Member 1996–2002, Chair 2001–2002
Member of the Perspective Commission: the International University of Bremen, 2006
Chairman of the Harvard University Department of Mathematics, 1987–1990
Co-Initiator: Pinnacle Project for Gifted Children, American Psychological Association, 2001
Member of the Advisory Board, Pennsylvania State University Department of Mathematics
Member of the Board, International Mathematical Olympiad 2001, 1997–2003
Member of the Executive Committee, Mathematical Sciences Education Board (NRC) 2001–2009
Trustee, Mathematical Sciences Research Institute, Berkeley, 1991–1994
Board Member and Advisor, Project Euclid, 2000–2004
Committee on Resources for the Mathematical Sciences (David Committee) NRC 1980–1983

Co-Founder and Organizer of the Cargèse Summer School in Mathematical Physics, 1976, 1979, 1981, 1987, 1991, 1994, 1996.

Founder and Chair Mathematics Advocacy Task Force of the American Mathematical Society, 1996–1997

Reviews: Penn State U. Math. (Chair); E.T.H. Mathematics; Princeton Physics (Chair); Princeton Mathematics; American University in Beirut (Chair); Brandeis University Science Programs; Dublin Institute for Advanced Study, School of Theoretical Physics (Chair).

Communications in Mathematical Physics, Editor 1976–1979; Chief Editor 1979–2000

Letters in Mathematical Physics, Editorial Board

Reviews in Mathematical Physics, Associate Editor

Annals of Physics, Assistant Editor 1981–2000

Progress in Physics, Birkhäuser Boston, Founding Editor 1980–1983

Geometry and Functional Analysis, Editorial Board 1989–2000

Journal of Mathematical Physics, Editorial Board 1973–1976

Selected Visiting Positions and Lectureships:

Statutory Public Lecture, Dublin Institute for Advanced Study 2016

Friedrich Hirzebruch Lecture, Bonn 2015

Schrödinger Lecture, Schrödinger Institute Vienna 2012

Boston University, Visiting Professor 2001–2002

Class of 1927 Lecturer, Rensselaer Polytechnic Institute 2000

University of Rome, Visiting Professor 1995

Frank Hahn Lecturer, Yale University 1985

Hedrick Lecturer at the Mathematical Association of America 1985

Porter Lecturer, Rice University 1983

University of California, Distinguished Visiting Professor 1982

Rockefeller University, Visiting Professor 1979; Adjunct Professor 1980–1986

Accademia Nazionale dei Lincei, Lecture Series 1977

Princeton University, Visiting Professor 1971

E.T.H. Zürich (Swiss Federal Institute of Technology), Guest Professor 2005, 1968

Stanford University, Acting Assistant Professor

Institute for Advanced Study, Visiting Member

IBM Research, Yorktown Heights

Mentoring:

Trained over 50 graduate students and post-doctoral fellows

Publications:

Co-author of about 200 articles and books.

Co-editor of 7 other books.

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ARTHUR JAFFE

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 on the acting faculty at Stanford University, he received an invitation to move to Harvard, where he has been based ever since. Currently he holds the “Landon T. Clay Professorship of Mathematics and Theoretical Science.” He has been a guest professor in many other universities, including the E.T.H. Zurich. This latter visit in 1968 led to long-term research friendships, collaborations, and exchanges with two of his former students, as well as their students.

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 mathematical sense. Jaffe gave the mathematical solution to this problem for space-time of two and three dimensions, in joint work with James Glimm and their respective schools. 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. Jaffe 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. Recently he began collaboration with Zhengwei Liu which has resulted in discovering new pictorial languages for mathematics, especially suitable for quantum information. This work links subfactor theory, quantum theory, and quantum information. He is actively engaged in several related research programs. He has co-authored standard books on quantum field theory and on classical gauge theory.

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, a Fellow of the American Academy of Arts and Sciences, and is an Honorary Member of the Royal Irish Academy.

Many mathematical physicists have studied with Jaffe, with his mentoring about 25 doctoral students and a similar number of postdoctoral research collaborators. Jaffe cofounded a series of mathematical physics schools in Cargèse, Corsica, bringing together mathematicians, physicists, and students. The resulting interactions at these schools motivated many later developments both in mathematics and physics.

Jaffe wrote two widely-quoted, non-technical articles. The essay “Ordering the Universe: the Role of Mathematics” served as a justification for research in fundamental mathematics. Written as an appendix to the National Research Council “David Report” in 1982, it has been reprinted widely, as well as being translated into several languages (including Russian and Chinese) to help the discussion of mathematics research in other countries. His article “Theoretical Mathematics” with Frank Quinn, published in 1993, discusses the evolution of the special relationship between mathematics and theoretical physics, and has become widely quoted among persons who study the philosophy of mathematical proof.

Jaffe served as President of the American Mathematical Society during 1997-1998, possibly the only instance of a person originally coming from a background in physics, who became AMS president. Jaffe also served as Chairman of the Council of Scientific Society Presidents, and he had been for six years the President of the International Association of Mathematical Physics.

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

In the last 1990’s, Jaffe conceived the Clay Mathematics Institute (a private mathematics research 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 for 21 years as Chief Editor of *Communications in Mathematical Physics*, a leading journal in the field.

Jaffe is currently Chair of the Board of the Dublin Institute for Advanced Studies, School of Theoretical Physics, succeeding Michael Atiyah in that role.

- In 2014 Jaffe was the Honorary Chairman of the Jury for the 6th International Tournament of Young Mathematicians, Bremen, Germany. In 2014 Jaffe was interviewed by the European Journal of the History of Physics for an upcoming article on his contributions to physics. He gave a number of invited lectures at international conferences and at universities.
- In 2015 Jaffe has been invited to international conferences in Shanghai, China, in Qinquangdao, China, in San Paolo, Brazil, as well to present talks at a number of seminars. He will give the Statutory Public Lecture of the School of Theoretical Physics, Dublin Institute for Advanced Study, Dublin, Ireland. He will present the Frederick Hirzebruch Memorial Lecture at the Max Planck Institute for Mathematics, in Bonn, Germany.
- During the academic year 2015—2016, Jaffe posted or published 10 articles.
- In October 2016 Jaffe organized a workshop at Harvard University on “Subfactor Theory, Quantum Field Theory, and Quantum Information” with Vaughan Jones and Zhengwei Liu. Approximately 90 participants from 12 countries took part.