

# Curriculum Vitae

## Anton Zeilinger

Born on May 20th, 1945 in Ried/Innkreis, Austria

Present addresses: Faculty of Physics, University of Vienna  
Boltzmannngasse 5, 1090 Vienna, Austria

Institute for Quantum Optics and Quantum Information  
Austrian Academy of Sciences  
Boltzmannngasse 3, 1090 Vienna, Austria

[anton.zeilinger@univie.ac.at](mailto:anton.zeilinger@univie.ac.at)

### EDUCATION

1979 Habilitation, Technical University Vienna  
1971 Ph.D., University of Vienna, thesis on "Neutron Depolarization  
in Dysprosium Single Crystals" under Prof. H. Rauch  
1963-1971 Study of Physics and Mathematics, University Vienna  
1963 Matura (School Leaving Examination),  
Bundesgymnasium Wien 13, Fichtnergasse 15, Vienna

### PROFESSIONAL CAREER

2004-present Scientific Director, IQOQI  
Institute of Quantum Optics and Quantum Information,  
Austrian Academy of Sciences, Vienna  
1999-present Full Professor of Experimental Physics, University of Vienna  
1990-1999 Full Professor of Experimental Physics, University of  
Innsbruck  
1988-1989 Full Professor of Physics (Lehrstuhlvertretung),  
Technical University of Munich  
1983-1990 Associate Professor, Technical University of Vienna  
1981-1983 Associate Professor of Physics, M.I.T. (Visiting)  
1972-1981 Research Assistant (Senior), Atominstitut Vienna  
with Professor Helmut Rauch

## VISITING RESEARCH AFFILIATIONS

- 2001-2004 Senior Humboldt Fellow, Humboldt University, Berlin, Germany
- 1998 Visiting Research Fellow, Merton College, Oxford University, UK
- 1995 Chaire Internationale, Collège de France, Paris, France
- 1986-1989 Adjunct Full Professor, part-time, Hampshire College, Amherst, USA
- 1983-1990 Regular summer research appointments at M.I.T., USA
- 1977-1978 Fulbright Fellow, Research Associate at M.I.T. in the Neutron Diffraction Laboratory under Prof. C.G. Shull (Nobel Laureate 1994), USA
- 1974-1989 Guest Researcher (part-time), Institut Laue-Langevin, Grenoble, France

## DISTINGUISHED LECTURESHIPS

- 2009 Lecture, 150<sup>th</sup> birthday of Max Planck, Max Planck Society, German Physical Society, Berlin-Brandenburgische Academy of Sciences, Humboldt University Berlin, Germany
- 2009 First Kavli Colloquium, Kavli Institute of Nanoscience, Delft University of Technology, Netherlands
- 2009 PITP Lecture on Quantum Phenomena, Pacific Institute of Theoretical Physics, Vancouver, Canada
- 2008 Asher Perez Memorial Lecture, Technion, Haifa, Israel
- 2007 Wolfgang-Paul Lecture, Bonn University, Germany
- 2006 Barut Memorial Lect., Bogazici University, Istanbul, Turkey
- 2006 Rosenthal Lecture, Yale University, USA
- 2006 Johannes Gutenberg Lecture, Mainz University, Germany
- 2003 Angström Lecture, Uppsala University, Stockholm, Sweden
- 2003 Amos de-Shalit Memorial Lecture, Weizmann Institute, Rehovot, Israel
- 2003 Solly Cohen and Shimon Offer Memorial Lecture, Racah Institute of Physics, Hebrew University of Jerusalem, Israel
- 2003 Schrödinger Lecture, Imperial College, London, UK
- 2003 Niels Bohr Lecture, Copenhagen University, Denmark
- 2002 Chemerda Lecture, Pennsylvania State University, USA
- 1999 Schrödinger Lecture, Trinity College, Dublin, Ireland
- 1997 H.L. Welsh Lecture in Physics, University of Toronto, Canada
- 1984 Sir Thomas Lyle Fellow, University of Melbourne, Australia

## DISTINGUISHED MEMBERSHIPS

2009	Foreign Member, Académie des Sciences, Institut de France
2006	Foreign Member, Serbian Academy of Sciences and Arts
2005	Honorary Member, Slovak Academy of Sciences
2005	Member, German Academy of Sciences Leopoldina
2002	Member, Berlin-Brandenburg Academy of Sciences
2000	Member, Academia Scientiarum et Artium Europaea
1999	Fellow, American Physical Society
1998	Full Member, Austrian Academy of Sciences
1994	Corresponding Member, Austrian Academy of Sciences

## HONORARY PROFESSORSHIPS AND DOCTORATES

2006	Honorary Doctorate, Gdansk University, Poland
2005	Honorary Doctorate, Humboldt University Berlin, Germany
1996	Honorary Professor, University of Science and Technology of China

## INTERNATIONAL PRIZES AND AWARDS

2010	Wolf-Prize in Physics, Wolf Foundation, Israel
2009	Federal Cross of Merit of the Federal Republic of Germany
2008	Quantum Communication Award, Tamagawa University, Japan
2008	Isaac Newton Medal, Institute of Physics, UK
2007	Quantum Electronics Prize, European Physical Society
2005	King Faisal Prize, King Faisal Foundation, Saudi Arabia
2005	Descartes Prize, European Commission
2004	Lorenz-Oken-Medal, Society of German Researchers and Physicians, Germany
2004	Klopsteg Award, American Association of Physics Teachers, USA
2003	Sartorius Prize, Göttingen Academy of Sciences, Germany
2001	Order Pour le Mérite for Sciences and Arts, Germany
2000	Senior Humboldt Fellow Prize, Alexander von Humboldt-Stiftung, Germany
1997	European Optics Prize, European Optical Society
1996	European Lecturer, European Physical Society
1995	Prix Vinci d'Excellence, Fondation LVMH, Paris, France

## AUSTRIAN PRIZES AND AWARDS

2006	Grand Gold Decoration, City of Vienna
2005	Wilhelm-Exner-Medal, Austrian Association for Enterprises
2002	Johannes Kepler-Prize, Science Prize of Upper Austria
2001	Decoration of Sciences and Arts (Austrian equivalent to the Order of Merit)
2001	Visionary of the Year in Science
2000	Science Prize, City of Vienna
1997	Kardinal Innitzer Würdigungspreis, Vienna
1996	Austrian Scientist of the Year
1980	Prize of the Theodor Körner Foundation, Vienna
1979	Prize for Junior Scientists, Kardinal Innitzer Foundation, Vienna
1975	Prize of the City of Vienna for the Encouragement of Young Scientists

## ADMINISTRATION AND COMMUNITY SERVICES

2009-present	President, International Science Academy Traunkirchen, Austria
2008-present	Member, Planning and Strategy Committee of the Austrian Academy of Sciences
2006-present	Vice Chair, Board of Trustees, Institute of Science and Technology of Austria
2006-present	Member, Executive Board, Institute of Science and Technology of Austria
2006-2009	Dean of the Faculty of Physics, University of Vienna
2004-present	Scientific Director, Institute of Quantum Optics and Quantum Information Vienna, Austrian Academy of Sciences
2002-2003	Member, Founding Convent, University of Vienna, Austria
2002	Initiator of a new Postgraduate Research Institution which has been implemented as Institute of Science and Technology in Austria
1997-1998	President, Austrian Physical Society
1996-1998	Member, Quantum Electronics and Optics Division, European Physical Society
since 1994	Member, Editorial Board, Physical Review A
since 1988	Member, Editorial Board, Foundations of Physics-Letters

## RESEARCH INTERESTS

- Fundamental investigations in Quantum Physics, experiment and theory
- Tests of Quantum Mechanics
- Entanglement and Quantum Nonlocality
- Coherent Neutron and Atom Optics
- Atom Interferometry
- Quantum Cryptography
- Quantum Communication
- Quantum Computation
- Quantum Teleportation
- Einstein-Podolsky-Rosen Paradox
- Decoherence

## MAJOR RESEARCH ACHIEVEMENTS

### **General Physics and Theory**

- Generalized Aharonov-Bohm Effects for Time-Dependent Potentials
- First Papers ever published on Quantum Cellular Automata
- Invention of First Einstein-Podolsky-Rosen Experiment Based on an External Variable (Momentum) Instead of an Internal One (e.g. Spin)
- Discovery of Three-Particle Entanglement as an Extreme Demonstration of Quantum Non-Locality (GHZ)
- Discovery of Entanglement Swapping, the Teleportation of Entanglement
- Identification of Information as the Fundamental Concept in Quantum Physics
- Precision Tests of Quantum Mechanics

### **Neutron Interferometry and Neutron Optics**

- Demonstration of Spinor Symmetry using a Neutron Interferometer
- Young's Experiment with Neutrons
- Measurement of the Magnetic Neutrality of the Neutron
- Observation of the Anomalous Effective Mass of Neutrons
- Tests of the Linearity and the Unitarity of the Schrödinger Equation

## Atom and Molecule Optics, Mesoscopic Physics

- Dynamical Diffraction of Atoms at Thick Light Crystals
- Diffraction of Atoms at a purely Imaginary Potential (On-Resonant Light Field)
- Anomalous Transmission of Atoms through Light Fields
- Coherent Side-Band Modulation of Atomic DeBroglie Waves
- Development of an Atom Interferometer with Gratings of Light
- Development of a Nanometer Mask made of Light for Atoms
- Development of a Moiré Accelerometer and Rotation Sensor using Atoms
- Diffraction of Atoms at Complex  $e^{iGx}$  and  $e^{i\omega t}$  Potentials
- Observation of a Violation of Friedel's Law with Atoms
- Coherent Diffraction of Atoms at Light Crystals in the Channeling Limit
- Atom Holography
- Quantum Physics with Macromolecules and Mesoscopic Systems
- Development of a Macromolecule Interferometer
- Quantum Interference of C-60 and C-70 Molecules
- Quantum Interference of Porphyrine, a biological molecule
- Clarification of Decoherence Mechanisms in Macromolecule Interference
- Detailed Investigation of the Quantum-Classical Transition
- First Demonstration of the Cooling of a Mesoscopic System by Radiation Pressure

## Fundamental Physics with Entangled Photons

- Development of a Novel High-Intensity Source for Polarization-Entangled Photon Pairs
- Observation of a Violation of Bell's Inequality by more than 100 Standard Deviations
- Two-Photon Quantum Eraser Experiments
- Young's Experiment with Photons with High Precision
- Measurement of Pendellösung for Single Photons and for Entangled Photon Pairs
- Experimental Demonstration of Interaction-Free Measurement
- Entangled Entanglement
- Demonstration of Two-Photon Antibunching at a Beam Splitter
- A Double-Slit Heisenberg Microscope Experiment with Photon Pairs
- First Experimental Quantum Teleportation
- Long-Distance Test of Bell's Inequality under Einstein Locality Conditions
- Realization of Multi-Photon Entanglements (GHZ-states)
- Demonstration of GHZ Nonlocality
- Entanglement of the Orbital Angular Momentum of Photons
- Tests of a Leggett-type Nonlocal Hidden Variable Theory
- Nonlocal Delayed-Choice Experiments with Entangled Photons

## Quantum Information, Quantum Communication and Quantum Computation

- Verification of Quantum Dense Coding
- Teleportation of an Entangled Photon
- Experimental Entanglement Swapping
- Development of an Entangled-State Quantum Cryptography System
- Demonstration of Purification of Entangled Pairs
- First Quantum Cryptography with Entangled Photons
- First Experimental Realization of the One-Way Quantum Computer
- Grover's Search Algorithm on a One-Way Quantum Computer
- One-Way Quantum Computation with Active Feed-Forward
- Long-Distance Teleportation Across the River Danube
- Quantum Cryptography Over 144 km
- Detection of Single Photons Returning from a Satellite
- Realization of Quantum Games on a One-Way Quantum Computer

## SCIENTIFIC PUBLICATIONS

More than 430 scientific publications among those, more than 300 in peer reviewed, ISI ranked journals

More than 700 invited talks at conferences and seminars

Some papers have become science citation classics. The paper "Experimental Quantum Teleportation" (Nature 390, 1997) has been cited more than 1.600 times so far (ISI Citation Index).

## BOOKS

### *Frontiers of Neutron Scattering*

In honour of Clifford G. Shull on the occasion of his 70<sup>th</sup> birthday

Editors: R. J. Birgenau, D. E. Moncton, A. Zeilinger

Elsevier Science / North-Holland Publishing Division 1986

### *New Techniques and Ideas in Quantum Measurement Theory*

Annals of the New York Academy of Sciences, Vol. 480

Editors: D. M. Greenberger, A. Zeilinger

New York Academy of Sciences 1987

### *Matter Wave Interferometry*

On the occasion of the 100<sup>th</sup> anniversary of E. Schrödinger's birth

Editors: G. Badurek, H. Rauch, A. Zeilinger

Elsevier Science / North-Holland Publishing Division 1988

*Fundamental Problems in Quantum Theory*  
In Honor of Professor John A. Wheeler  
Annals of the New York Academy of Sciences, V. 755  
Editors: D. M. Greenberger, A. Zeilinger  
New York Academy of Sciences 1995

*Epistemological and Experimental Perspectives on Quantum Physics*  
Vienna Circle Institute Yearbook, Volume 7  
Editors: D. Greenberger, W. L. Reiter, A. Zeilinger  
Kluwer Academic Publishers 1999

*The Physics of Quantum Information*  
*Quantum Cryptography, Quantum Teleportation, Quantum Computation*  
Editors: D. Bouwmeester, A. Ekert, A. Zeilinger  
Springer 2000

*Quantum Information*  
*An Introduction to Basic Theoretical Concepts and Experiments*  
Springer Tracts in Modern Physics, Volume 173  
Editors: G. Alber, T. Beth, M. Horodecki, P. Horodecki, R. Horodecki, M.  
Rötteler, H. Weinfurter, R. Werner, A. Zeilinger  
Springer 2001

*Quantum Computation and Quantum Information Theory*  
Editors: C. Macchiavello, G.M. Palma, A. Zeilinger  
World Scientific Publishing 2001

*Quantum [Un]speakables, From Bell to Quantum Information*  
Editors: R. A. Bertlmann, A. Zeilinger  
Springer 2002

### **Popular science books**

Both books appeared in German. Translations into other languages have appeared or are currently in preparation.

*Einsteins Schleier*  
A. Zeilinger  
C.H. Beck 2003

*Einsteins Spuk*  
A. Zeilinger  
Bertelsmann 2005