

# Curriculum Vitae: Prof. Dr. Immanuel Bloch

## Personal and Professional Information

**Date of Birth** 16. November, 1972 (Age: 43)

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## Professional Experience/Position Offers

- since 2012 Vice-Dean of the “Fakultät für Physik”, LMU Munich (Germany)
- 2012-2014 Managing Director, Max Planck Institute of Quantum Optics, Garching (Germany)
- 2009-present Full Professor (W3), Chair at the Ludwig-Maximilians-University, Munich (Germany)
- 2008-present Scientific Director, Max Planck Institute of Quantum Optics, Garching (Germany)
- 2003-2009 Full Professor (C4), Chair at the Johannes-Gutenberg University, Mainz (Germany)
- 2002-2003 Senior Scientist, Ludwig-Maximilians-University, Munich (Germany)
- 2000-2002 Senior Scientist, Max Planck Institute of Quantum Optics, Garching (Germany)

## Education

- 1998-2000 PhD thesis in physics, Ludwig-Maximilians University, Munich (Prof. T.W. Hänsch)
- 1997-1998 Research visit, Stanford University (Prof. M.A. Kasevich)
- 1995-1996 Diploma thesis, Institute for Applied Physics, University of Bonn
- 1991-1995 Studies in physics, University of Bonn
- 1994 Research visit, CERN

## Publications

Over 120 publications, (**29 in Nature/Science**, **45 in Phys. Rev. Lett./Nature Physics**)

Google Scholar: h-index 68, # of citations >31600;

ISI WoS: h-index 59, # of citations >19890,

Average citations per article >170

## Invited Talks and Lectures

Over **200 talks at international conferences and workshops** (including several schools) including many plenary and keynote talks. In addition, over **110 invited talks at national meetings**.

Full list may be downloaded from: <http://www.quantum-munich.de> (People/Immanuel Bloch)

## **International Prizes/Awards/Academy Memberships**

- 2016 Harvey Prize
- 2015 Fellow of the American Physical Society
- 2014 Einstein Colloquium – Weizmann Institute of Science
- 2013 International BEC Award 2013
- 2013 Körber European Science Prize
- 2013 ERC Synergy Grant “UQUAM” (Corresponding PI, with E. Altman, J. Dalibard & P. Zoller)
- 2013 Hector Science Prize – Appointment as Hector Fellow
- 2013 Dr. Alexander M. Cruickshank Lecturer of the Gordon Research Conference program
- 2012 Distinguished Lecturer – MPI for the Science of Light
- 2011 Elected member of the German National Academy of Sciences (Leopoldina)
- 2011 EPS Senior Prize for Fundamental Aspects of Quantum Electronics and Optics
- 2010 Kavli Colloquium Lecturer – TU Delft
- 2008 Member of the Canadian Institute for Advanced Research (CIFAR)
- 2008 Distinguished Lecturer (Technion)
- 2007 Philip-Morris Research Prize
- 2005 International Commission for Optics Prize
- 2005 National Merit Medal of Germany (Bundesverdienstorden)
- 2004 Arkadi Aronov Memorial Lecturer (Weizmann Institute of Science)
- 2004 Gottfried Wilhelm Leibniz Prize of the German Science Foundation (DFG)
- 2004 Marie-Curie Excellence Grant of the European Union
- 2003 Rudolf-Kaiser-Prize
- 2002 Otto-Hahn Medal of the Max-Planck Society
- 2001 PhD Prize of the Ludwig-Maximilians-University, Munich
- 2000 Research Prize of the Physics Faculty of the Ludwig-Maximilians University, Munich
- 2000 Philip-Morris Research Prize (together with T.W. Hänsch & T. Esslinger)

## **Organisation of International Conferences (Steering Committee, Program Committee)**

- 2015 Frontiers in Quantum Simulations with Cold Atoms (INT, Seattle, USA)
- 2015 International Conference on Quantum Simulations (Benasque, Spain)
- 2014 ICTP Workshop on LZ Interferometry & Quantum Control in CM Physics (Izmir 2014)
- 2014 Intl. Conference on Quantum Communication, Measurement and Computing (Hefei 2014)
- 2014 Intl. Conference on Atomic Physics (ICAP 2014)
- 2013 Intl. BEC Conference (San Feliu, Spain)
- 2013 Intl. Conference on Quantum Simulations (Benasque, Spain)
- 2013 Quantum Information Processing and Computing QIPC2013 (Florence, Italy)
- 2012 Quantum Simulations with Ultracold Atoms (ICTP Trieste, Italy)
- 2012 Photonics Europe 2012 Quantum and Atom Optics (Brussels, Belgium)
- 2011 2<sup>nd</sup> Exploratory Round Table Conference on Quantum Information Science (Shanghai, China)
- 2011 Advanced Workshop on Non-Standard Superfluids and Insulators (ICTP Trieste, Italy)
- 2011 IQEC/CLEO Pacific Rim, Cold Atoms and Molecules Committee Chair (Sydney, Australia)
- 2011 Quantum Gases in Dilute Atom Vapours (Bad Honnef, Germany)
- 2011 International Conference on Quantum Technologies (Moscow, Russia)
- 2011 Frontiers in Quantum Gases: Bose-Einstein Condensation (Sant Feliu, Spain)
- 2011 26<sup>th</sup> International Conference on Low Temperature Physics (Beijing, China)
- 2010 Beyond Standard Optical Lattices (KITP, Santa Barbara, USA)

- 2010 Frontiers of Ultracold Atoms and Molecules (KITP, Santa Barbara, USA)
- 2008 Frontiers of Degenerate Quantum Gases CASTU, (Beijing, China)
- 2008 XXXII International Workshop on Condensed Matter Theories (Loughborough, UK)
- 2007 SCALA 3<sup>rd</sup> Annual Meeting (Mainz, Germany)

### Other Activities (Editorial Work & Research Management)

- Speaker of the DFG Research Unit/Forschergruppe 2414  
*"Artificial Gauge Fields and Interacting Topological Phases in Ultracold Atoms"*
- Board member of "Physik Journal" (since 2015)
- International Conference on Atomic Physics (ICAP) – Advisory Board (since 2014)
- Board member of the Hector Fellow Academy (since 2014)
- International Scientific Advisory Board – KITP Santa Barbara (2014-2016)
- International Editorial Board: Physical Review B, American Physical Society (since 2013)
- International Editorial Board: Annalen der Physik (since 2013)
- Advisory Committee Member: NIM Excellence Cluster at LMU
- Speaker of the DFG Research Unit/Forschergruppe 801  
*"Strong Correlations in Multiflavor Quantum Gases"*
- Member of the Steering Committee of the DFG funded SFB/TRR49 (until 2008)
- Member of the Heinz-Maier Leibnitz Prize Committee of the DFG (2006-2012)
- Member of the Perspective Committee of the Max-Planck Society
- Referee for: Nature, Science, Nature Physics, Physical Review Letters, and others

### Support of Young Researchers

**11** young academics have received a professorship, **15** postdoctoral researchers have obtained permanent positions in academia and **16** PhD students have finished their thesis. **21** PhD students are currently working in the research team on their thesis.

### Research Management Experience - Grants

Over the past **10 years** I have managed more than **11 research grants** that were awarded by different national and international funding agencies. Funding agencies include (DFG, MPG, EU, DARPA, USAF, Landesstiftung Rheinland-Pfalz, Körber Stiftung).

### Scientific Interests

• Ultracold Quantum Gases • Quantum Optics • Quantum Information Science • Strongly Correlated Quantum Many-Body Systems • Non-Equilibrium Quantum Dynamics

### Main Scientific Achievements (Short List)

- First experimental realization of strongly correlated quantum phases with ultracold atoms in the quantum phase transition from a superfluid to a Mott insulator (*one of the most cited papers overall in Atomic, Molecular and Optical Physics with >3460 WoS/ >5420 GS citations*). This work has opened a new research field at the interface of condensed matter physics, atomic & molecular physics as well as quantum information science.
- Direct observation of the dynamical collapse and revival of a macroscopic quantum field induced by interactions
- First experimental realization of collisional quantum gates with neutral atoms
- First experimental realization of a 'fermionized' Tonks-Girardeau gas of neutral atoms. Here strongly interacting bosonic particles are shown to assume fermionic properties, thereby confirming a several decade old theoretical prediction.
- Experimental realization of noise correlation measurements with ultracold quantum gases and first

observation of fermionic Hanbury-Brown & Twiss type antibunching with neutral atoms

- First observation of superexchange spin interactions with ultracold atoms
- Together with the group of M. Greiner (Harvard), first single-atom resolved observation of a Mott insulator
- First single-site and single-atom resolved spin control in large 2D arrays of neutral atoms
- Direct observation of quantum fluctuations and hidden order in strongly interacting quantum systems
- Generation of tuneable artificial magnetic fields for ultracold atoms in an optical lattice. Extreme effective field strengths of several thousand Tesla were demonstrated.
- Observation of ‘Higgs’ mode in two-dimensional quantum gases at the SF-MI QPT
- First observation of light-cone-like spreading of correlations in a many-body system
- Direct measurement of the Zak-Phase (Berry Phase) in topological Bloch bands
- Microscopic observation of two-magnon bound states
- Realization and direct observation of mesoscopic Rydberg quantum crystals
- First realization of topological two-dimensional Bloch bands with ultracold atoms via the Hofstadter model
- First measurement of Chern number and Hall transport in non-electronic systems
- First realization of an Aharonov-Bohm type interferometer for the measurement of Bloch band topology
- First realization of a Thouless Quantum Pump (simultaneous with the group of Y. Takahashi)
- Observation of Many-Body Localization using interacting fermions in quasi-random lattices
- Observation of Many-Body Localization using interacting bosons in 2D
- First observation of single-site spin- and charge resolved AFM correlations Fermi Hubbard model (simultaneous related work by the groups of M. Greiner & M. Zwierlein)
- First realization of a Topological Spin Pump

#### **Member of International Scientific Societies**

- Deutsche Physikalische Gesellschaft
- European Physical Society
- American Physical Society
- German National Academy of Sciences (Leopoldina)
- Canadian Institute for Advanced Research (CIFAR)
- Scientific Member of the Max-Planck Society