

Personal Information

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Date and Place of birth: 16 February 1963
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Link to Lab: www.bgu.ac.il/atomchip

Main Research Fields

Quantum Optics, Atom Chips, Interferometry, Magnetometry, Nano fabrication, Photonics, Spectroscopy, Particle physics, Searches for new physics, Quantum technology.

Scientific Career and International Experience

2003 - present Ben-Gurion University of the Negev, Israel (Full professor since July 2018)

2000 - 2003 Researcher at the University of Heidelberg (Marie Curie Fellow), Germany

1999 - 2000 Post-Doc, Innsbruck, Austria

1993 - 1998 Higgs searches at CERN – PhD (home institute: Weizmann)

1989 - 1992 Quark Gluon Plasma (High Energy Physics M.Sc. at Weizmann)

1983 - 1988 Undergraduate, self-taught (open university) – graduated with excellence

Scholarships, Awards, and Honours

2013: Miller Institute for Fundamental Science - Visiting Professor award (Berkeley)

2011: Lamb Medal for quantum optics (<http://www.lambmedal.org/>) for applying the field of material science to quantum optics

2003: Award by the Israeli Center for Science of Complex Systems

2000: Marie-Curie Fellow

*Our group students have received numerous national and international awards, not listed here.

Positions and Service

- Founder and first director of the BGU nano fabrication facility, conducting R&D for, and supplying chips to, labs in Israel and abroad (e.g. recently to the UK, Germany and the US)
- Founder and first director of the BGU center for quantum science and technology.
- Committee member for conferences and foundations (e.g. GIF, ISF).
- Reviewer for the EC, journals, universities and foundations.
- Editor of book on quantum information.
- Member of the BGU Physics recruiting and promoting faculty committee (Minuyim)

Recent Grants and Funding

- Israeli Science Foundation (Regular and Quantum Technology grants)
- EC "Matter-Waves" consortium
- EC "Quantum Technology" consortium (COST)
- EC "Optical Clocks" consortium
- DIP (DFG) Quantum hybrid devices (PI)
- Technology (e.g. US Air Force, US Navy, Israeli AeroSpace Industries, Accubeat Atomic Clocks Ltd.)

Science projects in the last 5 years

- Searching for Dark Matter (built the first DM detector in Israel)
- Searching for new physics at CERN with anti-hydrogen atoms, e.g. gravitational free-fall
- Searching for new physics with a newly built Yb optical frequency atomic clock
- Experiments on the interface of Quantum Mechanics and General Relativity
- Experiments with novel atom interferometers, for new insights into the foundations of Quantum theory
- Experiments on fundamental topics of Quantum Mechanics such as spin, entanglement and decoherence.

Technology projects in the last 5 years

- Compact cold atom clock (delivered to the industry)
- Compact atomic magnetic sensor (delivered to the industry)
- Advanced atom chips for quantum technology
- Atomic acceleration sensors
- Constructing the Israeli time keeping center

Recent lectures in conferences and seminars

PIERS2015 (July, Prague) – invited keynote. (Dr. Mark Keil eventually replaced me)

2015 seminars in Innsbruck, Shanghai and Beijing.

PQE-2016 – invited.

Obergurgl 2016 (February) – hot topics session.

Israeli-Italy workshop (April 2016, BIU) – invited. (Yonathan Japha replaced me)

VI International Conference "Frontiers of Nonlinear Physics" (July 2016, Russia) – invited.

2016 seminars in Vienna, Southampton, Nottingham and SFB colloquium in ULM.

FRISNO-2017, Ein Gedi, Israel.

Conference of atomtronics (<http://benasque.org/2017atomtronics/>) (May 2017, Spain) – invited.

Unconference (12 persons) in Oxford on time (June 2017) - invited.

Conference in Crete on Quantum optics (August 2017) - invited.

Workshop in Aspen on Dark Matter (Sep. 2017) – invited (no talk – just discussions)

Conference in Armenia on Quantum optics (September 2017) - invited.

Israeli Physics Society (December 2017) – invited, opening talk of the cold atom session.

2017 seminars in Jerusalem, Bar-Ilan, NIST, Rutgers

PQE-2018 (Utah, January 2018) – 2 invited talks (one on atomtronics given by me, and one on clock interferometry – given by my student Yair Margalit).

Conference on Fluctuation-Induced Phenomena (Bad-Honnef, May 2018) – invited.

Quantum technology (international workshop in Jerusalem, June 2018) – invited.

MPLP 2018 (Novosibirsk, August 2018) – invited.

2018 seminars in Innsbruck, Weizmann, and RQC colloquium in Moscow

Time and fundamentals of quantum mechanics (Weizmann, January 2019) – invited.

Optical, Opto-Atomic and Entanglement-Enhanced Precision Metrology XII. SPIE Photonics West (OPTO), San Francisco, CA during Feb 2 - Feb 7, 2019 – invited.

Atomtronics, (Benasque, May 2019) – invited.

Foundations of Physics (Oxford, May 2019) – invited.

Frontiers of Nonlinear Physics, FNP-2019 (Russia, June 2019) – invited.

Stern-Gerlach 100 Year Fest (Frankfurt, September 2019) – invited.

Redefining the foundations of physics in the quantum technology era (Trieste, September 2019), <http://www.tequantum.eu/> – invited.

2019 seminars in CERN and Fritz-Haber Institute Berlin.

PQE-2020, Snowbird, US (January 2020) – invited.

2020 seminars: e.g. Niels Bohr Institute (Copenhagen), UCL (London), the quantum centre (Vienna).

LPHYS'21 – invited.

Gravity in the lab 21 (Sao Paulo) – invited.

Modern problems of laser physics (mplp2021.laser.nsc.ru) – invited.
Atomtronics21 (AbuDhabi) – invited keynote.

Selected Publications

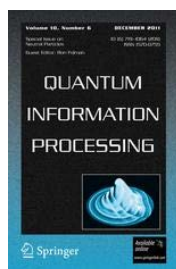
- Y. Margalit, O. Dobkowski, Z. Zhou, O. Amit, Y. Japha, S. Moukouri, D. Rohrlich, A. Mazumdar, S. Bose, C. Henkel, R. Folman, Realization of a complete Stern-Gerlach interferometer: Towards a test of quantum gravity, *Science Advances* **7**, eabg2879 (2021).
- Z. Zhou, Y. Margalit, S. Moukouri, Y. Meir, and R. Folman, “An experimental test of the geodesic rule proposition for the non-cyclic geometric phase”, *Science Advances* **6**, eaay8345 (2020).
- O. Amit, Y. Margalit, O. Dobkowski, Z. Zhou, Y. Japha, M. Zimmermann, M. A. Efremov, F. A. Narducci, E. M. Rasel, W. P. Schleich, and R. Folman, “T³ Stern-Gerlach matter-wave interferometer”, *Phys. Rev. Lett.* **123**, 083601 (2019).
- Z. Zhou, Y. Margalit, D. Rohrlich, Y. Japha, and R. Folman, “Quantum complementarity of clocks in the context of general relativity”, *Classical and Quantum Gravity* **35**, 185003 (2018).
- F. Cerisola, Y. Margalit, S. Machluf, A. J. Roncaglia, J. P. Paz, and R. Folman, “Using a quantum work meter to test nonequilibrium fluctuation theorems”, *Nature Communication* **8**, 1241 (2017).
- Y. Margalit, Z. Zhou, S. Machluf, D. Rohrlich, Y. Japha, and R. Folman, “A self-interfering clock as a ‘which path’ witness”, *Science* **349**, 1025 (2015) (also in Science express).
- S. Machluf, Y. Japha, and R. Folman, “Coherent splitting of matter-waves by an atom chip field gradient beam-splitter”, *Nature Communications* **4**, 2424 (2013).
- M. Givon, Y. Margalit, A. Waxman, T. David, D. Groswasser, Y. Japha, and R. Folman, “Magic frequencies in atom-light interaction for precision probing of the density matrix”, *Phys. Rev. Lett.* **111**, 053004 (2013) – highlighted by PRL editors.
- S. Machluf, J. Coslovsky, P. G. Petrov, Y. Japha, and R. Folman, “Coupling between internal spin dynamics and external degrees of freedom in the presence of colored noise”, *Phys. Rev. Lett.* **105**, 203002 (2010).
- R. Salem, Y. Japha, J. Chabé, B. Hadad, M. Keil, K. A. Milton, and R. Folman, “Nanowire atom chip traps for sub-micron atom-surface distances”, *New J. Phys.* **12**, 023039 (2010).
- S. Aigner, L. Della Pietra, Y. Japha, O. Entin-Wohlman, T. David, R. Salem, R. Folman, and J. Schmiedmayer, “Long-Range Order in Electronic Transport through Disordered Metal Films”, *Science* **319**, 1226 (2008).
- Y. Japha, O. Arzouan, Y. Avishai, and R. Folman, “Using time-reversal symmetry for sensitive incoherent matter-wave Sagnac interferometry”, *Phys. Rev. Lett.* **99**, 060402 (2007).
- D. Rohrlich, Y. Neiman, Y. Japha, and R. Folman, “Interference Swapping in Scattering from a Nonlocal Quantum Target”, *Phys. Rev. Lett.* **96**, 173601 (2006).
- R. Folman, P. Krüger, D. Cassettari, B. Hessmo, T. Maier, and J. Schmiedmayer, “Controlling cold atoms using nanofabricated surfaces: Atom Chips”, *Phys. Rev. Lett.* **84**, 4749 (2000).

A total of 260 papers.

A list of recent publications at <http://www.bgu.ac.il/atomchip/Papers/Papers.htm>

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Special issue edited by R. Folman



See also our review of **atom chips**: M. Keil, O. Amit, S. Zhou, D. Groswasser, Y. Japha, and R. Folman, “Fifteen years of cold matter on the atom chip: Promise, realizations and prospects,” *J. Modern Optics* **63**, 1840-1885 (2016); and our recent review of **Stern-Gerlach experiments** (Springer 2021, in print): <https://arxiv.org/abs/2009.08112>

Examples of popular coverage of our work:

<https://physicsworld.com/a/long-awaited-magnetic-interferometer-might-probe-quantum-gravity/>

<https://www.ipost.com/Business-and-Innovation/Health-and-Science/Einstein-would-have-been-pleased-411597>

<https://www.youtube.com/watch?v=7yMTIO2gDfI>