

Norbert Matthias Linke

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Born:	20 th March 1983 in Munich, Germany	Citizenship:	German

Profile

I am an experimental quantum physicist working with trapped atomic ions. I am focusing on the implementation of quantum algorithms enhanced with machine learning techniques, the simulation of interesting quantum phenomena such as para-particles or polaritons, and medium-distance quantum networking with entangled near-telecom ion-photons.

Research positions

01/2019 – present: Assistant Professor of Physics and Fellow of the Joint Quantum Institute, University of Maryland, College Park, MD, USA

07/2017 – 12/2018: Faculty Research Scientist, Trapped ion quantum information group, Joint Quantum Institute, University of Maryland (Prof. C. Monroe), MD, USA

02/2015 – 06/2017: Post-doctoral Research Associate, Trapped ion quantum information group, Joint Quantum Institute, University of Maryland (Prof. C. Monroe), MD, USA

10/2012 – 12/2014: Post-doctoral Research Assistant, Ion trap group, Department of Physics, University of Oxford (Prof. D. M. Lucas), UK

Education

2008 – 2012: **University of Oxford, UK, D.Phil. in Atomic & Laser Physics**
Dissertation: “*Background-free detection and mixed-species crystals in micro- and macroscopic ion-traps for scalable QIP.*” supervisor: Prof. D. M. Lucas

2002 – 2008: **University of Ulm, Germany, Diplom in Physics (grade 1.1, range 1.0-4.0)**
Diploma Thesis (1.0): “*Cold ion crystals in a segmented Paul trap as a deterministic source of single ions.*” supervisor: Prof. F. Schmidt-Kaler

University of Ulm, Germany, Bachelor in Philosophy (B.A.) (1.3)
Bachelor Thesis (1.3): “*Pyrrhonian Scepticism.*” supervisor: Prof. M. Kober

1993 – 2002: **Secondary school: Ludwigsgymnasium München, Germany, Abitur (1.4)**

Publications

(34.) “*Quantum walks and Dirac cellular automata on a programmable trapped-ion quantum computer*”, C. Huerta Alderete, S. Singh, N. H. Nguyen, D. Zhu, R. Balu, C. Monroe, C. M. Chandrashekar, N. M. Linke, preprint arXiv:2002.02537 (2020).

(33.) “*Universal one-dimensional discrete-time quantum walks and their implementation on near-term quantum hardware*”, S. Singh, C. H. Alderete, R. Balu, C. Monroe, N. M. Linke, C. M. Chandrashekar, preprint arXiv:2001.11197 (2020).

(32.) “*Dynamical mean field theory algorithm and experiment on quantum computers*”, I. Rungger, N. Fitzpatrick, H. Chen, C. H. Alderete, H. Apel, A. Cowtan, A. Patterson, D. Munoz Ramo, Y. Zhu, N. H. Nguyen, E. Grant, S. Chretien, L. Wossnig, N. M. Linke, R. Duncan, arXiv:1910.04735 (2019).

- (31.) “*Variational Generation of Thermofield Double States and Critical Ground States with a Quantum Computer*,” D. Zhu, S. Johri, N. M. Linke, K. A. Landsman, N. H. Nguyen, C. H. Alderete, A. Y. Matsuura, T. H. Hsieh, C. Monroe, preprint arXiv:1906.02699 (2019).
- (30.) „*Noise reduction using past causal cones in variational quantum algorithms*,” O. Shehab, I. H. Kim, N. H. Nguyen, K. A. Landsman, Cinthia H. Alderete, Daiwei Zhu, C. Monroe, and Norbert M. Linke, preprint arXiv:1906.00476 (2019).
29. “*Toward convergence of effective field theory simulations on digital quantum computers*,” O. Shehab, K. A. Landsman, Y. Nam, D. Zhu, N. M. Linke, M. J. Keesan, R. C. Pooser, C. Monroe, preprint **Phys. Rev. A** **100**, 062319 (2019).
28. 2D Quantum Metamaterials – Proceedings of the 2018 NIST Workshop, edited by: W. P. Kirk, J. N. Randall, and J. H. G. Owen, Chapter 10: “Trapped Ions” by N. M. Linke, World Scientific Publishing (2019).
27. “*Two-qubit entangling gates within arbitrarily long chains of trapped ions*,” K. A. Landsman, Y. Wu, P. H. Leung, D. Zhu, N. M. Linke, K. R. Brown, L.-M. Duan, C. Monroe, **Phys. Rev. A** **100**, 022332 (2019).
26. “*Training of Quantum Circuits on a Hybrid Quantum Computer*,” D. Zhu, N. M. Linke, M. Benedetti, K. A. Landsman, N. H. Nguyen, C. H. Alderete, A. Perdomo-Ortiz, N. Korda, A. Garfoot, C. Brecque, L. Egan, O. Perdomo, and C. Monroe, **Science Advances** **5**, 10 (2019).
25. “*Full-Stack, Real-System Quantum Computer Studies: Architectural Comparisons and Design Insights*,” P. Murali, N. M. Linke, M. Martonosi, A. J. Abhari, N. H. Nguyen, C. H. Alderete, 46th International Symposium on Computer Architecture, **ISCA 2019**, 527-540 (2019).
24. “*Parallel Entangling Operations on a Universal Ion Trap Quantum Computer*,” C. Figgatt, A. Ostrander, N. M. Linke, K. A. Landsman, D. Zhu, D. Maslov, C. Monroe; **Nature** **572**, 368-372 (2019).
23. “*Validating and Certifying Stabilizer States*,” A. Kalev, A. Kyriallidis, N. M. Linke; **Phys. Rev. A** **99**, 042337 (2019).
22. “*Verified Quantum Information Scrambling*,” K. A. Landsman, C. Figgatt, T. Schuster, N. M. Linke, B. Yoshida, N. Y. Yao, C. Monroe; **Nature** **567**, 61-65 (2019).
21. “*Measuring the Renyi entropy of a two-site Fermi-Hubbard model on a trapped ion quantum computer*,” N. M. Linke, S. Johri, C. Figgatt, K. A. Landsman, C. Monroe, **Phys. Rev. A** **98**, 052334 (2018).
20. “*Machine Learning Assisted Readout of Trapped Ion Qubits*,” A. Seif, K. A. Landsman, N. M. Linke, C. Figgatt, C. Monroe, and M. Hafezi, **J. Phys. B: At. Mol. Opt. Phys.** **51**, 174006 (2018).
19. “*Demonstration of a Bayesian Quantum Game on an Ion Trap Quantum Computer*,” N. Solmeyer, N. M. Linke, C. Figgatt, K. A. Landsman, R. Balu, G. Siopsis, C. Monroe, **Quantum Sci. Tech.** **3**, 045002 (2018).
18. “*Observation of Hopping and Blockade of Bosons in a Trapped Ion Spin Chain*,” S. Debnath, N. M. Linke, S.-T. Wang, C. Figgatt, K. A. Landsman, L.-M. Duan, C. Monroe; **Phys. Rev. Lett.** **120**, 073001 (2018), Editor’s Suggestion.
17. “*Robust two-qubit gates in a linear ion crystal using a frequency-modulated drive force*,” P.-H. Leung, K. A. Landsman, C. Figgatt, N. M. Linke, C. Monroe, K. R. Brown, **Phys. Rev. Lett.**, **120**, 020501 (2018).
16. “*Complete 3-qubit Grover search on a programmable quantum computer*,” C. Figgatt, D. Maslov, K. A. Landsman, N. M. Linke, S. Debnath, C. Monroe; **Nat. Commun.** **8**, 1918 (2017).
15. “*Fault tolerant quantum error detection*,” N. M. Linke, M. Gutierrez, K. A. Landsman, C. Figgatt, S. Debnath, K. R. Brown, C. Monroe; **Sci. Adv.** **3**, 10 (2017).
14. “*Experimental comparison of two quantum computing architectures*,” N. M. Linke, D. Maslov, M. Roetteler, S. Debnath, C. Figgatt, K. A. Landsman, K. Wright, C. Monroe; **Proc. Natl. Acad. Sci.** **114**, 13 (2017).
13. “*High-fidelity spatial addressing of Ca-43 qubits using near-field microwave control*,” D. P. L. Aude Craik, N. M. Linke, M. A. Sepiol, T. P. Harty, C. J. Ballance, D. N. Stacey, A. M. Steane, D. M. Lucas, D. T. C. Allcock; **Phys. Rev. A** **95**, 022337 (2017).
12. “*Demonstration of a small programmable quantum computer with atomic qubits*,” S. Debnath, N. M. Linke, C. Figgatt, K. A. Landsman, K. Wright, C. Monroe; **Nature** **536**, 63 (2016), cover story.

11. “High-fidelity quantum logic gates using trapped-ion hyperfine qubits,” C. J. Ballance, T. P. Harty, N. M. Linke, M. A. Sepiol, D. M. Lucas; **Phys. Rev. Lett.** **117**, 060504 (2016).
10. “Hybrid quantum logic and a test of Bell's inequality using two different atomic species,” C. J. Ballance, V. M. Schäfer, J. P. Home, D. J. Szwer, S. C. Webster, D. T. C. Allcock, N. M. Linke, T. P. Harty, D. P. L. Aude Craik, D. N. Stacey, A. M. Steane, D. M. Lucas; **Nature** **528**, 384 (2015).
9. “High-fidelity preparation, gates, memory and readout of a trapped-ion quantum bit,” T. P. Harty, D. T. C. Allcock, C. J. Ballance, L. Guidoni, H. A. Janacek, N. M. Linke, D. N. Stacey, D. M. Lucas; **Phys. Rev. Lett.** **113**, 220501 (2014).
8. “Injection locking of two frequency-doubled lasers with 3.2 GHz offset for driving Raman transitions with low photon scattering in $^{43}\text{Ca}^+$,” N. M. Linke, C.J. Ballance, D. M. Lucas; **Opt. Lett.** **38**, 5087 (2013).
7. “Microwave control electrodes for scalable, parallel, single-qubit operations in a surface-electrode ion trap,” D. P. L. Aude Craik, N. M. Linke, T. P. Harty, C. J. Ballance, D. M. Lucas, A. M. Steane, D. T. C. Allcock; **Appl. Phys. B** **114** (2013).
6. “A microfabricated ion trap with integrated microwave circuitry,” D. T. C. Allcock, T. P. Harty, C. J. Ballance, B. C. Keitch, N. M. Linke, D. N. Stacey, D. M. Lucas; **Appl. Phys. Lett.** **102**, 044103 (2013).
5. “Background-free detection of trapped ions,” N. M. Linke, D. T. C. Allcock, D. J. Szwer, C. J. Ballance, T. P. Harty, H. A. Janacek, D. N. Stacey, A. M. Steane and D. M. Lucas; **Appl. Phys. B** **107**, 1175 (2012).
4. “Heating rate and electrode charging measurements in a scalable, microfabricated, surface-electrode ion trap,” D. T. C. Allcock, T. P. Harty, H. A. Janacek, N. M. Linke, C. J. Ballance, A. M. Steane, D. M. Lucas, R. L. Jarecki Jr., S. D. Habermehl, M. G. Blain, D. Stick, D. L. Moehring; **Appl. Phys. B** **107**, 913 (2012).
3. “Implementation of a symmetric surface electrode ion trap with field compensation using a modulated Raman effect,” D. T. C. Allcock, J. A. Sherman, D. N. Stacey, A. H. Burrell, M. J. Curtis, G. Imreh, N. M. Linke, D. J. Szwer, S. C. Webster, A. M. Steane, D. M. Lucas; **New J. Phys.** **12** 053026 (2010).
2. “Optimized focusing ion optics for an ultracold deterministic single ion source targeting nm resolution,” R. Fickler, W. Schnitzler, N. M. Linke, F. Schmidt-Kaler, K. Singer; **J. Mod. Opt.** **56**, 2061 (2009).
1. “Deterministic Ultracold Ion Source targeting the Heisenberg Limit,” W. Schnitzler, N. M. Linke, R. Fickler, J. Meijer, F. Schmidt-Kaler, and K. Singer; **Phys. Rev. Lett.** **102**, 070501 (2009).

Grants awarded

AFOSR Conference support, FA9550-19-1-0344: \$14k, 2019-2020

ARO-SI, W911NF-17-S-0002-02 (ARO): \$450k, 2019-2022

ARO-DURIP, W911NF-17-S-0002-02: \$172k, 2019

PFC Seed grant (co-PI with J. Zhang, P. Titum and A. Seif, JQI): \$50k (PFC@JQI), 2017-2018

Research community activities

Peer-reviewed publications for:

Nature, Nature Communications, Quantum Science and Technology, Applied Physics B, Annals of Physics

Grant reviews:

AFOSR, NSERC (Canada)

Project review:

Los Alamos National Lab

Conferences:

Co-organizer: TQT-JQI Joint Trapped Ion Workshop, Waterloo, Canada April 2020

Main organizer and co-chair: 2nd North American Conference on Trapped Ions, nacti2019.umd.edu, UMD College Park, MD, July 2019

Session Chair: DPG Frühjahrstagung 2019, Rostock, Germany, March 2019

Session Chair: DAMOP 2018, Fort Lauderdale, FL, May 2018

Talks and Seminars

"A Trapped-Ion Quantum Architecture," Physics Colloquium, Universität Innsbruck, Austria (Mar. 2020) – **invited**.

"A Quantum Computer Based on Trapped Ions," Physics Colloquium, Northern Illinois University, DeKalb, IL (Feb. 2020) – **invited**.

"Simulating physical models on a trapped-ion quantum computer," Quantum Simulation Seminar Series, University of Washington, Seattle, WA (Jan. 2020) – **invited**.

"How to construct, optimize, and scale a quantum computer based on trapped ions," Quantum Lunch Seminar, Los Alamos National Laboratory, Los Alamos, NM (Jan. 2020) – **invited**.

"Quantum-classical hybrid algorithms with trapped ions," Atomic Physics Seminar, University of Virginia, Charlottesville, VA (Nov. 2019) – **invited**.

"Quantum-classical hybrid algorithms with trapped ions," Q-Ion conference, Tel Aviv, Israel (Sept. 2019) – **invited**.

"Quantum-classical hybrid circuits with trapped ions," 2nd North American Conference on Trapped Ions (NACTI), University of Maryland, College Park, MD (Jul. 2019) – **invited**.

"Quantum circuit training with trapped ions," CLEO/Europe-EQEC conference, Munich, Germany (Jun. 2019) – **contributed**.

"A programmable trapped-ion quantum computer – first applications in HEP," workshop on QIS/HEP, Aspen Center for Physics, Aspen, CO (May. 2019) – **invited**.

"Quantum information scrambling and hybrid machine learning with trapped ions," QCQC meeting, Department of Chemistry, Emory University, Atlanta, GA (May. 2019) – **invited**.

"A programmable trapped-ion quantum computer," 695. WE-Heraeus-Seminar, Engineering a Scalable Quantum Information Processor, Physikzentrum, Bad Honnef, Germany (Apr. 2019) – **invited**.

"A quantum computer based on trapped ions," colloquium talk, George Washington University, Department of Mathematics, Washington, DC (Apr. 2019) – **invited**.

"Quantum information scrambling and hybrid machine learning with trapped ions," seminar talk, Oak Ridge National Laboratory, Oak Ridge, TN (Apr. 2019) – **invited**.

"Quantum information scrambling and hybrid machine learning with trapped ions," DPG Frühjahrstagung, Rostock, Germany (Mar. 2019) – **invited**.

"Trapped-ion Applications and Quantum Operations," JQI Seminar, University of Maryland, College Park, MD (Feb. 2019) – **invited**.

"Quantum information scrambling and hybrid machine learning with trapped ions," Physics of Quantum Electronics conference (PQE), Snowbird, UT (Jan. 2019) – **invited**.

"A programmable quantum computer based on trapped ions," Software-tailored architecture for quantum co-design (STAQ) kick-off meeting, Duke University, Durham, NC (Dec. 2018) – **contributed**.

"A quantum computer based on trapped ions," Annual Meeting of the Mid-Atlantic Section of the American Physical Society (APS), University of Maryland, College Park, MD (Nov. 2018) – **invited**.

"Quantum simulators with large ion numbers - how to make them - what to learn from them," Trapped Charged Particles (TCP) conference, Traverse City, MI (Sept. 2018) – **invited**.

"Quantum machine learning with trapped ions," Quantum Machine Learning (QML) conference, Joint Center for Quantum Information and Computer Science (QIICS), University of Maryland, College Park, MD (Sept. 2018) – **invited**.

"Quantum games on a trapped-ion quantum computer," Quantum Algorithms Workshop, Army Research Laboratory (ARL), Adelphi, MD (Sept. 2018) – **invited**.

“Hardware for universal quantum computers – a programmable trapped-ion machine,” IEEE Quantum Computing Summit, Georgia Institute of Technology, Atlanta, GA (Aug. 2018) – **invited**.

“A programmable quantum computer based on trapped ions,” given 11 times on a tour of European research groups at the University of Oxford, UK, the Universities of Ulm, Saarbrücken, Freiburg, Mainz, Siegen, and Hannover, Germany, at ETH Zürich, Switzerland, at the University of Innsbruck, Austria, at the Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany, at Aix-Marseille Université, Marseilles, France, and at the Max Planck Institute for Quantum Optics, Garching, Germany (Jun./Jul. 2018) – **contributed**.

“Quantum simulation with trapped atomic ions,” 2D Quantum Metamaterials Workshop, National Institute of Science and Technology (NIST), Gaithersburg, MD (Apr. 2018) – **invited**.

“A Trapped-Ion Quantum Computer,” LPS Seminar, Laboratory of Physical Sciences, National Security Agency and University of Maryland, College Park, MD (Apr. 2018) – **invited**.

“Phonon Hopping and Blockade with Trapped Ions,” JQI-QuICS-CMTC Seminar, Department of Physics, University of Maryland, College Park, MD (Mar. 2018) – **invited**.

“Quantum Algorithms with Trapped Ions,” QCMC conference, Louisiana State University, Baton Rouge, LA (Mar. 2018) – **invited**.

“A Programmable Quantum Computer based on Trapped Ions,” Physics seminar, Department of Physics, University of Maryland, UMD, MD (Mar. 2018) – **invited**.

“A Programmable Quantum Computer based on Trapped Ions,” Physics seminar, Department of Physics, University of Oregon, Eugene, OR (Feb. 2018) – **invited**.

“A Programmable Quantum Computer based on Trapped Ions,” Physics seminar, Department of Physics, University of Virginia, Charlottesville, VA (Feb. 2018) – **invited**.

“A Programmable Quantum Computer based on Trapped Ions,” Physics seminar, Department of Physics, Penn State University, University Park, PA (Jan. 2018) – **invited**.

“Trapped-Ion Quantum Information,” Physics of the Universe Summit, SpaceX and CalTech, Hawthorne and Pasadena, CA (Jan. 2018) – **invited**.

“Quantum Algorithms on a Programmable Quantum Computer based on Trapped Ions,” Quantum Physics Seminar, Department of Physics, UC Berkeley, Berkeley, CA (Oct. 2017) – **invited**.

“Fault-Tolerant Quantum Error Detection with Trapped Ions,” Quantum Error Correction (QEC) conference, College Park, MD (Sept. 2017) – **invited**.

“Fault-Tolerant Error Detection on a Programmable Ion Trap Quantum Computer,” 1st North American Conference on Trapped Ions (NACTI), NIST, Boulder, CO (Aug. 2017) – **invited**.

“Comparing the Architectures of the First Programmable Quantum Computers,” CLEO/Europe-EQEC conference, Munich, Germany (Jun. 2017) – **contributed**.

“Fault-Tolerant Encoding of a Logical Qubit,” APS Division of Atomic, Molecular and Optical Physics (DAMOP) conference, Sacramento, CA (Jun. 2017) – **contributed**.

“Quantum Computing with Trapped Ions,” Southeast Quantum Computing Workshop, Department of Physics, University of Georgia, Athens, GA (May. 2017) – **invited**.

“Scaling Up and Networking the Ion Trap Quantum Computer,” Graduate Class on Quantum Information, Department of Electrical Engineering, Princeton University, Princeton, NJ (Apr. 2017) – **invited**.

“A Programmable Quantum Computer Module Based on Trapped ions,” Quantum Colloquium, Department of Electrical Engineering, Princeton University, Princeton, NJ (Apr. 2017) – **invited**.

“Quantum Algorithms on a Programmable Ion Trap Quantum Computer,” IEEE Baltimore Colloquium on Quantum Computing, American Center for Physics, College Park, MD (Oct. 2016) – **invited**.

“Quantum Algorithms on a Programmable Ion Trap Quantum Computer,” JQI seminar, University of Maryland, College Park, MD (Oct. 2016) – **invited**.

“Quantum Algorithms and Error Detection a Programmable Ion Trap Quantum Computer,” JQI-QuICS-CMTC seminar, University of Maryland, College Park, MD (Sept. 2016) – **contributed**.

“Quantum Algorithms on a Programmable Ion Trap Quantum Computer,” European Conference on Trapped Ions (4th ECTI), Hot Topic talk, Arosa, Switzerland (Aug. 2016) – **invited**.

“Non-nearest-neighbor gate in a linear ion chain,” Ion storage group talk, National Institute of Standards and Technology (NIST), Boulder, CO (Aug. 2015) – **contributed**.

“High Fidelity Qubit Operations with $^{43}\text{Ca}^+$,” QUANTUM seminar, Institut für Physik, Universität Mainz, Germany (Nov. 2014) – **invited**.

“Trapped Ion Quantum Technologies at Oxford,” Frontiers in Quantum Technologies doctoral training center, Imperial College, London, UK (Jan. 2014) – **contributed**.

“Oxford ion trap group overview,” Ion Traps for Tomorrow's Applications (IOTA) workshop, COST network, Heidelberg, Germany (May 2011) – **contributed**.

Poster Presentations

“Quantum Algorithm Demonstrations on a Programmable Quantum Computer,” European Conference on Trapped Ions (4th ECTI), Arosa, Switzerland (2016).

“Quantum Algorithm Demonstrations on a Fully Reconfigurable Ion Trap Quantum Computer,” Southwest Quantum Information and Technology workshop (18th SquInT), Albuquerque, NM (2015).

“Fault-tolerant microwave addressing of trapped ions,” European Conference on Trapped Ions (3rd ECTI), Schloss Waldthausen, Germany (2014).

“Two-qubit entangling gates in $^{43}\text{Ca}^+$ and $^{40}\text{Ca}^+$,” Techniques for Trapped Ions workshop (IonTech 2), COST network, Paris, France (2013).

“Laser cleaning and background-free detection in microfabricated ion traps,” International Conference on Atomic Physics (23rd ICAP), Paris, France (2012).

“High-fidelity multi-qubit EMCCD readout and microfabricated ion traps for QIP,” International conference on Quantum Information Processing and Communication (QIPC), Rome, Italy (2009).

Popular Press

accounts of research covered by:

[ABC](#) (Aus.), [David Ignatius](#), [Electronics Weekly](#), [Endgadget](#), [FAZ](#), [The Inquirer](#), [The Irish Independent](#), [MIT Technology Review](#), [Nature](#), [Nature Podcast](#), [New Scientist](#), [pro-physik.de](#), [Science](#), [Science News](#), [Sci-News](#), [SciTechDaily](#), [Superconductor Week](#), [The Wall Street Journal](#), [phys.org](#), [Welt der Physik](#), [Wired](#)

Teaching

08/2019 – 12/2019: PHYS-276: Electronics lab for Physics Majors, University of Maryland

01/2014 – 12/2014: Stipendiary Lecturer in Physics, teaching 1st year Electricity and Magnetism, Mechanics and Special Relativity, Linear Optics and Circuits, Hertford College, University of Oxford, UK

10/2013 – 06/2014: Tutor for Atomic, Molecular and Laser Physics (3rd year), St. Hilda's College, University of Oxford, UK

- 10/2012 – 09/2013: Stipendiary Lecturer in Physics, teaching Mechanics and Special Relativity (1st year), Quantum Mechanics (2nd year) and Atomic, Molecular and Laser Physics (3rd year), Brasenose College, Oxford, UK
- 10/2010 – 06/2014: Tutor for Atomic, Molecular and Laser Physics (3rd year), Mansfield College, University of Oxford, UK
- 04/2010 – 06/2010: Demonstrator on the Physics Practical Course in Condensed Matter (3rd year) and Thermal Physics (2nd year), University of Oxford, UK
- 10/2009 – 06/2012: Demonstrator on the Physics Practical Course in General Physics (1st year), University of Oxford
- 10/2007 – 02/2008: Tutor for Circuit Theory (2nd year), University of Ulm, Germany
- 04/2007 – 07/2007: Tutor for Optics (1st year), University of Ulm, Germany
- 10/2006 – 02/2007: Tutor for Mechanics and Thermal Physics (1st year), University of Ulm, Germany
- 04/2006 – 07/2006: Tutor for year Linear Algebra (1st year), University of Ulm, Germany
- 10/2004 – 02/2006: Grader for Higher Mathematics for Physicists (1st and 2nd year), University of Ulm, Germany

Fellowships/Awards

- 2019: Fellow of the Joint Quantum Institute of the University of Maryland and the National Institute for Standards and Technology, College, Park, MD
- 2015: Engineering and Physical Sciences Research Council (EPSRC) U.K. National Science Photo of the Year competition, overall winner together with D. P. L. Aude Craik
- 2008: Wykeham Scholarship, New College, University of Oxford, UK

Outreach activities

- 2020: Winterim STEM program, lab tours at UMD, St. Timothy's School, Stevenson, MD
- 2016-2017: Advisor for the International Young Physicists' Tournament (IYPT) club, St. Timothy's School, Stevenson, MD
- 2015: Maryland Day (university open day), laboratory tour guide, University of Maryland, College Park, MD
- 2015: “*Science is Fun*”, physics-based whole school assembly with explosive experimental demonstrations, St. Timothy's School, Stevenson, MD
- 2014: “*Atoms and Light*,” presentation on spectroscopy, Balliol College Oxford outreach program, The John Warner School, Hoddesdon, UK
- 2012: Development day for physics high school teachers, Physics Practical Course, University of Oxford, Oxford, UK