

Levi P. Neukirch, Ph.D.

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 Rochester, NY 14627 USA

INTERESTS Quantum photonics, optical metrology, hybrid quantum systems, classical and quantum optomechanics, optical trapping, and general instrument development

EXPERIENCE

2015 - present **Postdoctoral Associate**, Nick Vamivakas' Group, University of Rochester

2012-2015 **Graduate research assistant**, Nick Vamivakas' Group, University of Rochester

2009-2012 **Graduate research assistant**, John Tarduno's Group, University of Rochester

2006-2008 **Undergraduate research assistant**, Timothy Gay's Group, University of Nebraska

EDUCATION **Ph.D. Physics**, defended August 2015, (GPA 3.84/4.0), University of Rochester
 Title: "Optomechanics with Levitated Nanodiamonds"
 Advisor: Professor A. Nickolas Vamivakas

M.A. Physics, May 2010, University of Rochester

B.S. Physics, December 2007 (GPA 3.78/4.0), University of Nebraska

HONORS, AWARDS, AND CERTIFICATES

University of Rochester

 ▷ Agnes M. and George Messersmith Graduate Fellowship, 2014-2015

 ▷ Certificate in Teaching College Physics, 2012

 ▷ Department of Education GAANN Fellowship, 2008-2011

Los Alamos National Laboratory

 ▷ LDRD Distinguished Scholars Program, Summer 2007

University of Nebraska

 ▷ University Regents Scholarship, 2003-2007

TECHNICAL EXPERTISE

Lasers and optics: solid state, semiconductor, and gas lasers; standard optical techniques; diagnostic instrumentation

Mechanical design and fabrication: machine tool use (most metals, plastics, and ceramics); welding/brazing

Vacuum technology: high-vacuum ($< 10^{-6}$ Torr) system design

Electronics design and fabrication: analog schematic/layout design using SPICE software; board prototyping/fabrication

Cryogenic Systems: Experience with cryogen-free, and standard LN₂ and LHe systems

Software: Unix/Linux, Windows, L^AT_EX/B^IB_TE_X, LabVIEW, MATLAB, AutoCAD, Generic Mapping Tools (GMT), and others. Some knowledge of Python, C/C++

TEACHING
EXPERIENCE

University of Rochester

Instructor

Gave lectures, led workshops, and created coursework including homework, quizzes, and exams.

- ▷ PHY 113: General Physics I (Summer 2012)

Teaching Assistant

Led weekly workshops, graded homework and exams, and held weekly office hours.

- ▷ PHY 114: General Physics II (Spring 2013, Spring 2014)
- ▷ PHY 113: General Physics I (Fall 2012)
- ▷ PHY 218: Electricity and Magnetism II (Spring 2009)
- ▷ PHY 217: Electricity and Magnetism I (Spring 2008)

PRESENTATIONS
AND POSTERS

10. *Progress Toward a Spin-Optomechanics Platform With Vacuum Levitated Nanodiamonds*
L.P. Neukirch, E von Haartman, J.M. Rosenholm, and A.N. Vamivakas
OSA Frontiers in Optics/Laser Science, October 2015.
9. *Cooling optically levitated dielectric nanoparticles via parametric feedback*
L.P. Neukirch, B. Rodenburg, M. Bhattacharya, and A.N. Vamivakas
Division of Atomic, Molecular, and Optical Physics Annual Meeting, June 2015.
8. *Optomechanical applications of optically levitated nanoparticles*
L.P. Neukirch and A.N. Vamivakas
American Physical Society (APS) March Meeting, March 2015.
7. *A study of optically levitated NV centers*
L.P. Neukirch, J. Gieseler, R. Quidant, L. Novotny, and A.N. Vamivakas
Coherence and Quantum Optics (CQO) X / Quantum Information and Measurement (QIM) 2, June 2013.
6. *Systematic studies of optically-trapped dielectric nanospheres*
L.P. Neukirch, J. Gieseler, R. Quidant, L. Novotny, and A.N. Vamivakas
APS March Meeting, 2013.
5. *Toward a millennial-scale context for the South Atlantic Anomaly: Archeomagnetic studies of Iron Age southern Africa*
L.P. Neukirch, J.A. Tarduno, T.N. Huffman, M.K. Watkeys, C.A. Scribner, and R.D. Cottrell
MagIC Science & Database Workshop (September 2011)
4. *Development of a SERF atomic magnetometer for paleomagnetic applications*
L.P. Neukirch, T. Kornack, and J.A. Tarduno
American Geophysical Union (AGU) Fall Meeting, 2010.
3. *Centennial geomagnetic field strength change recorded in Iron Age (1000-1800 AD) ceramics from southern Africa*
L.P. Neukirch, J.A. Tarduno, M.K. Watkeys, R.D. Cottrell, T.N. Huffman, A.K. Wendt, and J. Voronov
AGU Fall Meeting, 2009.

2. *The transverse optical pumping of rubidium using linearly-polarized light*
L.P. Neukirch and T.J. Gay
UCARE Undergraduate Research Conference, August 2008.
1. *An exploration of rubidium optical pumping properties at low buffer gas pressures*
L.P. Neukirch, D. Tupa, and T.J. Gay
Los Alamos National Laboratory Summer Student Symposium, August 2007.

PENDING
MANUSCRIPTS

6. Quantum Theory of Cavityless Feedback Cooling of An Optically Trapped Nanoparticle
B. Rodenburg, **L.P. Neukirch**, A.N. Vamivakas, and M. Bhattacharya
Manuscript submitted to *Physical Review Letters*, arXiv:1503.05233.

REFEREED
PUBLICATIONS

5. Multi-dimensional single-spin nano-optomechanics with a levitated nanodiamond
L.P. Neukirch, E. von Haartman, J.M. Rosenholm, and A.N. Vamivakas
Nature Photonics, advance online publication (2015) [doi:10.1038/nphoton.2015.162].
4. Nano-optomechanics with levitated nanoparticles
L.P. Neukirch and A.N. Vamivakas
Contemporary Physics **56**, 48-62 (2015).
3. Observation of nitrogen vacancy photoluminescence from an optically levitated nanodiamond
L.P. Neukirch, J. Gieseler, R. Quidant, L. Novotny, and A.N. Vamivakas
Optics Letters **38**, 2976-2979, (2013).
* This article was featured in *Scientific American* **309**, Issue 4, (2013), "What is it?"
2. An archeomagnetic analysis of burnt grain bin floors from ca. 1200 to 1250 AD Iron-Age South Africa
L.P. Neukirch, J.A. Tarduno, T.N. Huffman, M.K. Watkeys, C.A. Scribner, and R.D. Cottrell
Physics of the Earth and Planetary Interiors **190-191**, 71-79, (2012).
1. Geodynamo, Solar Wind, and Magnetopause 3.4 to 3.45 Billion Years Ago
J.A. Tarduno, R.D. Cottrell, M.K. Watkeys, A. Hofmann, P.V. Doubrovine, E.E. Mamajek, D. Liu, D.G. Sibeck, **L.P. Neukirch**, and Y. Usui
Science **327**, 1238-1240, (2010).

REFERENCES
AVAILABLE TO
CONTACT

Dr. Nick Vamivakas (nick.vamivakas@rochester.edu)

Professor of Optics
University of Rochester

Prof. Vamivakas was my Ph.D. advisor.

Dr. Mishkat Bhattacharya (mxbsps@rit.edu)

Professor of Physics and Astronomy
Rochester Institute of Technology

Prof. Bhattacharya is a theorist with whom I have collaborated during my Ph.D. studies.

Dr. Nick Bigelow (email: nbig@pas.rochester.edu)

Lee A. DuBridge Professor of Physics
Professor of Optics
University of Rochester

Prof. Bigelow was on my thesis committee.

Dr. Timothy Gay (tgay@unl.edu)

Professor of Physics
University of Nebraska

Prof. Gay was my undergraduate research advisor at the University of Nebraska.

Dr. Douglas Cline (cline@pas.rochester.edu)

Professor of Physics
University of Rochester

Prof. Cline was on my thesis committee, and I twice served as head teaching assistant for his PHY 114 course.

Dr. Dale Tupa (email: tupa@lanl.gov)

Staff Scientist, Physics Division
Los Alamos National Laboratory

Dr. Tupa was my supervisor at LANL during the summer of 2007.