ERIC BERSIN

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PRESENT ADDRESS
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EDUCATION

Massachusetts Institute of Technology, Cambridge, MA
PhD Candidate, Electrical Engineering and Computer Science
Area: Applied Physics and Devices
Advisor: Professor Dirk Englund

Harvard University, Cambridge, MA
A.B. *cum laude*, May 2014
Biomedical Engineering and Chemistry & Physics, High Honors
Senior Thesis: Methods towards high sensitivity magnetometry using nitrogen-vacancy centers.
Thesis Advisor: Professor Mikhail Lukin

Adlai E. Stevenson High School, Lincolnshire, IL
Valedictorian, June 2010

RESEARCH INTERESTS

Atomic physics, quantum optics, quantum computation and communication, precision sensing, nanophotonics and devices.

RESEARCH EXPERIENCE

Englund Group Cambridge, MA
PhD Student Aug. 2015 - Present
Worked in the quantum photonics group of Professor Dirk Englund. Studied nitrogen-vacancy centers in diamond 1D photonic crystal nanocavities and applications for scalable quantum entanglement. Future projects seek to build many-qubit photonic circuit for quantum networking.

Hänsch Group Munich, Germany
Fulbright Scholar Sept. 2014 - July 2015
Worked in the laser spectroscopy and quantum physics group of Professor Theodor Hänsch, specifically on the cavity quantum optics project under direct supervision of Dr. David Hunger. Examined behavior of Rayleigh scatterers and single photon emitters in open access microcavities and their effect on finesse, transverse mode mixing, and overall cavity performance.

Lukin Group Cambridge, MA
Undergraduate Researcher Feb. 2012 - May 2014
Worked in the quantum optics group of Professor Mikhail Lukin. Examined magnetometry potential of nitrogen-vacancy centers in diamond. Worked towards room-temperature sensing of single-electron spins. Worked to sense nuclear spins in DNA and apply this methodology to other biological systems. Thesis work demonstrated NV depth determination using NMR measurements of immersion oil.

Whitesides Group Cambridge, MA
Undergraduate Researcher Sept. 2010 - Aug. 2011
Worked in the biochemistry group of Professor George Whitesides. Performed protein expression and purification. Investigated disease diagnostic capabilities of human carbonic anhydrase and various bacteriophages.

TEACHING EXPERIENCE

MIT Summer Research Program

Research Advisor June 2016 - August 2016

Served as a research advisor in MIT's Summer Research Program, which seeks to provide advanced research opportunities to students from underrepresented demographics. Supervised an undergraduate student's research into quantum frequency conversion for 10 weeks, full time.

Kirkland House

Resident Tutor July 2016 - Present

Served as a tutor in physics and engineering for Kirkland House, one of Harvard's undergraduate residences. Held weekly problem solving office hours, reviewed and advised on fellowships applications, and organized computer science tutorial sessions for new STEM majors.

Non-resident Tutor Aug. 2015 - July 2016

Served as a non-resident tutor in physics and engineering for Kirkland House, one of Harvard's undergraduate residences. Held weekly problem solving and career advising office hours.

Tiger Cub Tutoring

Tutor July 2015 - Present

Taught physics, helped with standardized testing preparation, and assisted with college applications for socioeconomically disadvantaged students.

Harvard Physics Department Cambridge, MA

Laboratory Teaching Fellow Aug. 2011 - May 2013

Taught laboratory sections for introductory mechanics (Harvard courses Physics 11a and 15a). Held weekly problem-solving office hours. Awarded Derek Bok Center Certificate for Distinction in Teaching in fall of 2011 and spring of 2013.

Tutoring Center for Mathematics and Science Buffalo Grove, IL

Tutor Aug. 2009 - Dec. 2013

Taught physics, chemistry, biology, and mathematics to students ranging from kindergarten to college.

PUBLICATIONS AND CONFERENCE PRESENTATIONS

E. Bersin, N. Harris, C. Lee, D. Bunandar, S.L. Mouradian, M. Walsh, T. Schröder, D. Englund. Photonic Integrated Circuits for Quantum Communication. *IEEE Photonics Conference*, 2016. Invited Talk.

S. Mouradian, T. Schröder, J. Zheng, T.J. Lu, H. Choi, N. Wan, M. Walsh, **E. Bersin**, D. Englund. NV-based quantum memories coupled to photonic integrated circuits. *Proc. SPIE* 9920, Active Photonic Materials VIII, 992014. September 16, 2016.

I. Lovchinsky, A.O. Sushkov, E. Urbach, N.P. de Leon, K. De Greve, R. Evans, **E. Bersin**, F. Jelezko, R.L. Walsworth, H. Park, M.D. Lukin. Nuclear Magnetic Resonance detection and spectroscopy of single proteins using quantum logic. *Science* **351**, 836-841 (2016).

L. M. Pham, S. J. DeVience, F. Casola, I. Lovchinsky, A. O. Sushkov, **E. Bersin**, J. Lee, E. Urbach, P. Cappellaro, H. Park, A. Yacoby, M. Lukin, and R. L. Walsworth. NMR technique for determining the depth of shallow nitrogen-vacancy centers in diamond. *Physical Review B* **93,** 045425 (2016).

E. Bersin, J. Benedikter, M. Mader, T. Hümmer, T. Hänsch, D. Hunger. *Rayleigh scattering in open-access microcavities.* 2015 Meeting of the German Physical Society, Heidelberg, Germany.

I. Lovchinsky, A. Sushkov, **E. Bersin**, N. Chisholm, H. Park, M. Lukin. Nanoscale MRI with Nitrogen-Vacancy centers in diamond. 2014 Meeting of the APS Division of Atomic, Molecular and Optical Physics. Volume 59, Number 8.

E. Bersin, I. Lovchinsky, N. Chisholm, A. Sushkov, D. Hunger, A. Akimov, M. Kubo, N. Yao, S.

Bennett, H. Park, M. Lukin. *Diamonds for ultrasensitive Magnetic Resonance Imaging: from single electrons to single biomolecules.* Plenary Speaker. 2014 National Collegiate Research Conference.

N. Chisholm, I. Lovchinsky, A. Sushkov, M. Kubo, P. Lo, **E. Bersin**, D. Hunger, A. Akimov, S. Bennett, N. Yao, H. Park, M. Lukin. *Towards single electron spin detection at room temperature using nitrogen-vacancy centers.* 2013 Joint Meeting of the APS Division of Atomic, Molecular, and Optical Physics and the CAP Division of Atomic, Molecular, and Optical Physics, Canada. Volume 58, Number 6.

N. Chisholm, I. Lovchinsky, A. Sushkov, **E. Bersin**, D. Hunger, A. Akimov, M. Kubo, P. Lo, A. Sutton, N. Yao, S. Bennett, H. Park, M. Lukin. *Towards room-temperature magnetic sensing of a single electron spin in biological systems.* 2013 National Collegiate Research Conference.

AWARDS, HONORS, AND FELLOWSHIPS

NASA Space Technology Research Fellowship	2016
National Defense Science and Engineering Graduate Fellowship (Awarded but declined)	2016
Fulbright Scholar	2014
NSF Graduate Research Fellowship Honorable Mention	2014, 2015, 2016
Derek Bok Center Certificate of Distinction in Teaching	2011, 2013
Herchel Smith Undergraduate Science Fellow	2013
Harvard College Program for Research in Science and Engineering Fellow	2012
Illinois State Scholar	2010
National Merit Scholar Finalist	2010

SKILLS

Laboratory and Fabrication Techniques
Atomic Force Microscopy, Ellipsometry, Raman Spectroscopy, Fourier Transfrom IR Spectroscopy, Photolithograpy, Thermal Evaporation, Atomic Layer Deposition, Chemical Etching.

Software and Programming Languages
MATLAB, Mathematica, COMSOL, LaTeX, C, Python, Microsoft Office.

Languages
English, German.

LEADERSHIP

Life Sciences Student Advisory Board Cambridge, MA
Biomedical Engineering Representative Apr. 2013 - May 2014
Met once a month to organize activities to bring together concentrators from diverse fields, encourage and showcase undergraduate research, and advise underclassmen on courses and research.

Harvard Program for Research in Science and Engineering Cambridge, MA
Residential Proctor Apr. 2013 - Aug. 2013
Served as a residential proctor for Harvard PRISE. Performed general RA duties, organized social events to promote scientific collaboration, and served in an advisory capacity for research questions.

Harvard and Radcliffe Musical Outreach to Neighborhood Youth Cambridge, MA
Senior Counselor May 2011 - Aug. 2011
Taught music lessons to Cambridge and Boston public school students ages 5-14. Served as a mentor for high school junior counselors seeking to learn to teach. Eleven 1-hour lessons plus one 4-hour planning session per week.

EXTRACURRICULAR ACTIVITIES

Harvard Bach Society Orchestra Sept. 2010 - Dec. 2012
Played viola for each of four annual concerts.

Harvard Glee Club Sept. 2010 - May 2013

Sales Manager Dec. 2010 - Jan. 2011
Advertised and sold CD's at Glee Club concerts. Maintained inventory of merchandise stocks.

Harvard Glee Club Lite Sept. 2010 - May 2013
Music Director Dec. 2011 - May 2013
Arranged, taught, and conducted music for the a cappella subset of the Harvard Glee Club. Oversaw the recording, editing, and production of the group's first professionally produced record.

Harvard Krokodiloes Apr. 2013 - Sept. 2014
Sang baritone and tenor with the Harvard Krokodiloes a cappella group.

Harvard Model United Nations Oct. 2010 - Jan. 2013
Director, League of Nations Mar. 2011 - Jan. 2012
Researched and assembled 40-page background guide for high school delegates in a simulation of the historical League of Nations. Moderated the 60-student committee and crisis proceedings at conference.