Nathan E. Lundblad

Curriculum Vitae

CONTACT

Department of Physics and Astronomy
Bates College
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POSITION

8/2021–present: Professor of Physics
Department of Physics and Astronomy
Bates College

EDUCATION

California Institute of Technology

Ph.D. (Physics), June 2006
Dissertation: *All-optical spinor Bose-Einstein condensation and the spinor dynamics-driven atom laser*
Thesis advisor: Prof. Kenneth Libbrecht

M.S. (Physics), June 2002

University of California, Berkeley

B.A. *cum laude*, Astrophysics, Physics (high honors), May 1998
Senior thesis (Physics): *The nonlinear refractive index of rubidium vapor*
Senior thesis advisor: Prof. Raymond Chiao

PREVIOUS POSITIONS

8/2015–7/2021: Associate Professor of Physics, Bates College

8/2016–12/2016 (sabbatical leave): Visiting Associate Research Professor, Joint Quantum Institute, University of Maryland

8/2009–7/2015: Assistant Professor of Physics, Bates College

10/2008–7/2009: Postdoctoral Fellow, Joint Quantum Institute (JQI) /
National Institute of Standards and Technology (NIST) / University of Maryland
10/2006–10/2008: NRC Postdoctoral Research Associate, **JQI / NIST**

Advisors: Dr. James V. Porto, Dr. William D. Phillips

Summer 2006: Research Associate, **Jet Propulsion Laboratory (JPL)**
4/2001–5/2006: Graduate Student Researcher, Caltech/JPL

Advisors (JPL): Dr. Lute Maleki, Dr. Robert J. Thompson
Advisor (Caltech): Prof. Kenneth Libbrecht

HONORS AND AWARDS

2023 NASA Exceptional Scientific Achievement Medal
"for research into the dynamics of ultracold shell structures on the ISS which has opened a pathway to deeper understanding of the Bose- Einstein condensed bubble."

2022 International Space Station Research Awards—Compelling Results Award—Physical Sciences
"for demonstrating use of microgravity in investigating the role of geometry and topology in quantum systems. "

2022 NASA Group Achievement Award (BECCAL Science Definition Team)

"for expertly representing NASA and the science community in development of BECCAL science requirements, and for enhancing the BECCAL science plan."

2015 Phillips Fellowship (Bates College)

2006–2008 National Research Council (NRC) Research Associateship

2006 NASA Group Achievement Award (JPL Bose-Einstein condensate team)

2005 NASA Level C Bonus Award (in recognition of BEC research)

2000–2004 Robert Andrews Millikan Graduate Fellowship, Caltech

1998 Departmental Citation, UC Berkeley Astronomy Department

1997 Dorothea Klumpke Roberts Prize, UC Berkeley Astronomy Department

1994 International Baccalaureate Full Diploma (Vista High School, Vista, CA)

Publications

Google Scholar; Scopus; ADS

(† denotes Bates College undergraduate co-author)

21. "Quantum gas mixtures and dual-species atom interferometry in space," Ethan R. Elliott, David C. Aveline, Nicholas P. Bigelow, Patrick Boegel, Sofia Botsi, Eric Charron, José P. D'Incao, Peter Engels, Timothé Estrampes, Naceur Gaaloul, James R. Kellogg, James M. Kohel, Norman E. Lay, **N. Lundblad**, Matthias Meister, Maren E. Mossman, Gabriel Müller, Holger Müller, Kamal Oudrhiri, Leah E. Phillips, Annie Pichery, Ernst M. Rasel, Charles A. Sackett, Matteo Sbroscia, Wolfgang P. Schleich, Robert J. Thompson and Jason R. Williams,
Nature **623**, 502–508 (2023)

20. "Microgravity facilities for cold atom experiments," Matthias Raudonis, Albert Roura, Matthias Meister, Christoph Lotz, Ludger Overmeyer, Sven Herrmann, Andreas Gierse, Claus Lämmerzahl, Nicholas P. Bigelow, Maike Lachmann, Baptist Piest, Naceur Gaaloul, Ernst M. Rasel, Christian Schubert, Waldemar Herr, Christian Deppner, Holger Ahlers, Wolfgang Ertmer, Jason R. Williams, **N. Lundblad** and Lisa Wörner, Quantum Science and Technology **8** 044001 (2023)

19. "Exploring the limits of ultracold atoms in space," Robert J. Thompson, David Aveline, Sheng-Wey Chiow, Ethan Elliott, James Kellogg, James Kohel, Matteo Sbroscia, Christian Schneider, Jason Williams, **N. Lundblad**, Cass Sackett, Dan Stamper-Kurn, and Lisa Woerner, Quantum Science and Technology **8** 024004 (2023)

18. "Perspective on quantum bubbles in microgravity," **N. Lundblad**, David Aveline, Antun Balaž, Elliot Bentine, Nicholas Bigelow, Patrick Boegel, Maxim Efremov, Naceur Gaaloul, Matthias Meister, Maxim Olshanii, Carlos Sá de Melo, Andrea Tononi, Smitha Vishveshwara, Angela White, Alexander Wolf, and Barry Garraway, Quantum Science and Technology **8** 024003 (2023)

17. "Exploring the quantum world with a third generation ultra-cold atom facility," Robert J. Thompson, David Aveline, Sheng-Wey Chiow, Ethan Elliott, James Kellogg, James Kohel, Matteo Sbroscia, Leah Phillips, Christian Schneider, Jason Williams, Nick Bigelow, Peter Engels, **N. Lundblad**, Cass Sackett and Lisa Woerner, Quantum Science and Technology **8** 014007 (2023)

16. "Cold atoms in space: community workshop summary and proposed road-map," (many authors), EPJ Quantum Technology **9**, 30 (2022)

15. "Observation of ultracold atomic bubbles in orbital microgravity", R. A. Carollo, D. C. Aveline, B. Rhyno, S. Vishveshwara, C. Lannert, J. D. Murphree, E. R. Elliott, J. R. Williams, R. J. Thompson, and **N. Lundblad**, *Nature* **606** 281-286 (2022)

14. "Thermodynamics in expanding shell-shaped Bose-Einstein condensates," B. Rhyno, N. Lundblad, D. C. Aveline, C. Lannert, and S. Vishveshwara, *Physical Review A (Atomic, Molecular, and Optical Physics)* **104**, 063310 (2021)

13. "The Bose-Einstein Condensate and Cold Atom Laboratory," the BECCAL collaboration and NASA BECCAL Science Definition Team, *EPJ Quantum Technology* **8**, 1 (2021)

12. "Repeated measurements with minimally destructive partial-transfer absorption imaging," Erin Marshall Seroka, A. Valdés-Curiel, D. Trypogeorgos, N. Lundblad, and I. B. Spielman, *Optics Express* **27**, 36611 (2019)

11. "Shell potentials for microgravity Bose-Einstein condensates," N. Lundblad, R. A. Carollo, C. Lannert, M. J. Gold†, X. Jiang†, D. Paseltiner†, N. Sergay†, and D. C. Aveline,*npj Microgravity* **5**, 30 (2019)

10. "Synthetic clock transitions via continuous dynamical decoupling," D. Trypogeorgos (JQI), A. Valdés-Curiel (JQI), N. Lundblad, and I. B. Spielman, *Physical Review A (Atomic, Molecular, and Optical Physics)* **97**, 013407 (2018)

9. Contributed News & Views: "Designer atom arrays for quantum computing," N. Lundblad, *Nature* **561**, 43 (2018)

8. "Observation of $\lambda/4$ structure in a low-loss radiofrequency-dressed optical lattice," N. Lundblad, S. Ansari†, Y. Guo†, E. Moan†, *Physical Review A (Atomic, Molecular, and Optical Physics)* **90**, 053612 (2014)

7. "Differential Light Shift Cancellation in a Magnetic-Field-Insensitive Transition of ^{87}Rb," R. Chicireanu, K. D. Nelson, S. Olmschenk, N. Lundblad, A. Derevianko, and J. V. Porto, *Physical Review Letters* **106**, 063002 (2011)

6. "Experimental observation of magic-wavelength behavior of ^{87}Rb atoms in an optical lattice," N. Lundblad, M. Schlosser, and J. V. Porto, *Physical Review A (Atomic, Molecular, and Optical Physics)* **81**, 031611(R) (2010) (Selected for synopsis in *Physics*, a collection highlighting exceptional papers from the *Physical Review* journals)

5. "Field-sensitive addressing and control of field-insensitive neutral-atom qubits," N. Lundblad, J. M. Obrecht, I. B. Spielman and J. V. Porto, *Nature Physics* **5**, 575 (2009)

4. "Atoms in a radiofrequency-dressed optical lattice," N. Lundblad, P. J. Lee, I. B. Spielman, B. L. Brown, W. D. Phillips, and J. V. Porto, *Physical Review Letters* **100**, 150401 (2008)

3. "Spinor dynamics-driven formation of a dual-beam atom laser," N. Lundblad, R. J. Thompson, D. C. Aveline and L. Maleki, *Optics Express* **14**, 10164 (2006)

2. "Two-species cold atomic beam," N. Lundblad, D. Aveline, R. J. Thompson, J. Kohel, J. Ramirez-Serrano, W. Klipstein, D. Enzer, N. Yu, and L. Maleki, *J. Opt. Soc. Am. B* **21**, 3 (2004)

1. "High power single frequency 780nm laser source generated from frequency doubling of a seeded fiber amplifier in a cascade of PPLN crystals," R. J. Thompson, D. C. Aveline, M. Tu, N. Lundblad and L. Maleki, *Optics Express* **11**, 1709 (2003)

Grants Received

External grants

"Quantum dynamics of ultracold bubbles," NASA ROSES, NNH22ZDA001N-FP:E.6 Fundamental Physics, Co-PIs Dr. David Aveline (JPL), Dr. Matteo Sbroscia (JPL), Prof. Smitha Vishveshwara (UIUC), Dr. Naceur Gaaloul (Hannover), ($\sim$ \$1.5MM), 2024–2028 (estimated)

"Microgravity dynamics of bubble-geometry Bose-Einstein condensates," NASA Physical Science Research Program, NNH13ZTT002N: "Research Opportunities in Fundamental Physics," Co-PIs Dr. David Aveline (JPL), Prof. Courtney Lannert (UMass/Smith College), Prof. Smitha Vishveshwara (UIUC) ($\sim$ \$1.1MM), May 2014–May 2024.

"Bose-Einstein-Condensate Cold Atom Laboratory Science Definition Team," NASA and Jet Propulsion Laboratory, \$47k, September 2017–August 2020.

"MRI: Acquisition of a High-Power Narrow-Band Tunable Laser System for Use in Physics Research," NSF 1039500 (Co-PIs Lilian Childress and Hong Lin), \$308k, 1 October 2010–30 September 2011.

"(DEPSCOR) Condensed-matter analog systems with ultracold atoms in novel optical lattices," Air Force Office of Scientific Research (AFOSR), \$388k, 1 January 2010–31 December 2012.

Internal and travel grants

Bates College "STEM Scholars" Summer Research Grant: \$6,742, Summer 2023 (target student: Paloma Rodriguez Thorne '24)

"Gamma-Ray Spectroscopy Lab for Physics Teaching and Research," Bates College Faculty Development Fund: \$12,142, October 2012. With Dr. Wesley Gillis.

Bates College "STEM Scholars" Summer Research Grant: \$12,854, Summer 2022 (target students: Aly Reardon '24, Kira Yanagi '24)

Bates College Summer Research Grant: \$12,565, Summer 2022 (target students: Adrian deCola '23, Hongke Lu '24)

Bates College Summer Research Grant: \$12,968, Summer 2021 (target students: Elias Veilleux '23, Hamza Kalim '23)

Bates College Summer Research Grant: \$6,400, Summer 2020 (target students Yichun Liu '21, Gabe Salvi '22)

Bates College Summer Research Grant: \$7,288, Summer 2019 (target student: Avi Brach-Neufeld '20)

Bates College / Sherman Fairchild Summer Research Grant: \$18,423, Summer 2018 (target students: Xiaole "Alex" Jiang '21, Hannah Fitts '20, Max Gold '19)

Bates College / Sherman Fairchild Summer Research Grant: \$12,514, Summer 2017 (target students: Nicholas Sergay '18 and Salim Ourari '18)

"Acousto-optic interferometer for novel pulse-shaping tool," Bates College Faculty Development Fund: $10,000, June 2016. With Dr. Tom Jarvis.

Bates College / Sherman Fairchild Summer Research Grant: $12,526, Summer 2016 (target students: Tiago Correia '17 and Yara Abdelhady '18)

"Master laser for next-generation Bose-Einstein condensate studies," Bates College Faculty Development Fund: $10,000, June 2015.

Bates College Summer Research Apprenticeship Grant: $3,500, Summer 2015 (target students: Salim Ourari '18 and Milan Brankovic '17)

Bates College STEM Faculty-Student Research Grant: $5,520, Summer 2015 (target student: Nicholas Sergay '18)

Gordon Research Conferences Predominantly Undergraduate Institution (PUI) Fund and Chairs' Fund: $1160, 2013 Atomic Physics GRC (Salve Regina University)

Bates College STEM Faculty-Student Research Grant: $3,500, Summer 2013 (target student: Yang Guo '14)

Bates College Early Career Student Research Opportunities in Mathematics and the Natural Sciences: $3,228, Summer 2011 (target student: Kathilee Kenlock 3/2 '15)

Bates College Summer Research Apprenticeship Grant: $3,500, Summer 2011 (target students: Albert Shi '14 and Yang Guo '14)

Bates College Summer Research Apprenticeship Grant: $3,500, Summer 2010 (target student: Marc Tollin '12)

Invited Talks

42. "Ultracold bubbles in space: atomic physics aboard the International Space Station," Department of Physics Colloquium, University of Illinois at Urbana-Champaign
(March 20, 2024)

41. Ultracold Atoms and Molecules Summer School: "Ultracold atomic physics in microgravity" (Bad Honnef, Germany)
(August 6–12, 2023)

40. "Studying ultracold bubbles with CAL," NASA Fundamental Physics Workshop (Santa Barbara, CA)
(May 23, 2023)

39. "Ultracold bubbles in space: atomic physics aboard the International Space Station," Department of Physics Colloquium, Miami University
(April 5, 2023)

38. "Ultracold bubbles in space atomic physics aboard the International Space Station," Workshop on Low Dimensional Quantum Gases, Sao Paolo, Brazil
(March 20, 2023)

37. "Ultracold bubbles in space: atomic physics aboard the International Space Station," 777. WE-Heraeus-Seminar (Bad Honnef, Germany)
(December 12, 2022)

36. "Ultracold bubbles in space: atomic physics aboard the International Space Station," FINESS 2022 (St. Martin, Germany)
(May 6, 2022)

35. "Ultracold atomic bubbles in microgravity: progress and prospects," Online Workshop on Prospects of Quantum Bubble Physics
(April 6, 2022)

34. "Ultracold atomic bubbles in orbital microgravity," Department of Physics Colloquium, U. Mass. Boston
(September 16, 2021)

33. "Ultracold quantum bubbles aboard the International Space Station," Sixteenth Marcel Grossman Meeting
(July 7, 2021)

32. "Ultracold bubbles in space: atomic physics aboard the International Space Station," Joint Quantum Institute (JQI) Seminar
(December 14, 2020) https://www.youtube.com/watch?v=rJwCjlBeyAI

31. "Quantum bubbles in space: ultracold atomic physics aboard the International Space Station," Physics Department Colloquium, Union College
(January 22, 2020)

30. "Ultracold atoms in shell-geometry traps with ISS / CAL: recent experiments and future prospects," BECCAL Brainstorming Workshop (Ulm, Germany)
(December 12, 2019)

29. "Ultracold atoms in shell-geometry traps with ISS/CAL: recent experiments and future prospects," NASA Fundamental Physics and Quantum Technology Workshop (Washington, DC)
(April 8, 2019)

28. "Planned experiments aboard CAL with ultracold atoms in bubble-geometry traps," NASA Fundamental Physics Workshop (La Jolla, CA)
(April 9, 2018)

27. "Planned experiments with shell-geometry Bose-Einstein condensation in microgravity aboard NASA CAL," Progress in Quantum Electronics (Snowbird, UT)
(January 12, 2018)

26. "BEC research in microgravity," Gordon Research Conference in Atomic Physics (Newport, RI)
(June 14, 2017)

25. "Planned studies of shell-geometry BECs aboard NASA CAL," NASA Fundamental Physics Workshop (Santa Barbara, CA)
(June 1, 2017)

24. "Planned studies of shell-geometry BECs aboard NASA CAL," NASA / DLR Joint Workshop "Cold Atoms In Space" (Bremen, Germany)
(December 16, 2016)

23. "Microgravity bubble-geometry Bose-Einstein condensates aboard NASA CAL: prospects

and challenges," NASA Fundamental Physics Workshop (Dana Point, CA)
(April 11, 2016)

22. "Quantum-gas physics in orbit: prospects for microgravity Bose-Einstein condensates aboard NASA's Cold Atom Laboratory," Physics Department Colloquium, Dartmouth College
(October 16, 2015)

21. "Quantum-gas physics in orbit: prospects for microgravity Bose-Einstein condensates aboard NASA's Cold Atom Laboratory," Physics Department Colloquium, Williams College
(May 8, 2015)

20. "Quantum-gas physics in orbit: prospects for microgravity Bose-Einstein condensates aboard NASA's Cold Atom Laboratory," Physics Department Colloquium, University of Maine
(March 27, 2015)

19. "Quantum-gas physics in orbit: prospects for microgravity Bose-Einstein condensates aboard NASA's Cold Atom Laboratory," Physics Department Colloquium, University of Virginia
(February 27, 2015)

18. "Tailored geometries for BEC physics: radiofrequency-dressed optical lattices and microgravity bubble-geometry condensates," NASA Fundamental Physics Principal Investigator Workshop (Pasadena, CA)
(November 17, 2014)

17. "Crystals made of light: doing solid-state physics with a gas near absolute zero," Physics Department Colloquium, Colgate University
(October 28, 2014)

16. "Bubble-Geometry Bose-Einstein Condensates in Microgravity," 30^{th} American Society for Gravitational and Space Research (ASGSR) Conference (Pasadena, CA)
(October 25, 2014)

15. "Simulating solid-state physics in dilute vapors using Bose-Einstein condensates, lasers and radio waves," Physics Department Colloquium, Willamette College
(April 18, 2014)

14. "Matter waves, atom lasers, and crystals made of light: an introduction to ultracold atomic physics," Physics Department Colloquium, Amherst College
(November 8, 2012)

13. "Optical lattice-based addressing and control of long-lived neutral-atom qubits," International Conference on Laser Spectroscopy (ICOLS) 2011 (Hameln, Germany)
(June 1, 2011)

12. "Matter waves, atom lasers, and crystals made of light: an introduction to ultracold atomic physics," Physics Department Colloquium, Bowdoin College
(April 29, 2011)

11. "Matter waves, atom lasers, and crystals made of light: an introduction to ultracold atomic physics," Physics Department Colloquium, Colby College
(November 8, 2010)

10. "Bose-Einstein condensates, condensed-matter analogues, and novel optical lattices: ultracold atomic physics with undergraduates," New Laser Scientists Conference (Rochester, NY, held in conjunction OSA/DLS meeting)
(October 29, 2010)

9. "Experimental observation of magic-wavelength behavior in optical-lattice-trapped ^{87}Rb," Atomic, Molecular, and Optical Physics Seminar, Physics Department, University of Connecticut (Storrs) (April 5, 2010)

8. "Optical lattice-based addressing and control of long-lived neutral-atom qubits," LPHYS 2009 (Barcelona, Spain) (July 16, 2009)

7. "Optical lattice-based addressing and control of long-lived neutral-atom qubits," CLEO/IQEC (Baltimore, MD) (June 3, 2009)

6. "Quantum information processing with ultracold atoms in optical lattices," Physics Department seminar, Bates College (January 29, 2009)

5. "Radiofrequency-dressed optical lattices: custom potentials for ultracold atoms," Atomic, Molecular, and Optical Physics Seminar, Physics Department, Princeton University (December 12, 2008)

4. "Quantum information processing with ultracold atoms in optical lattices," Physics Department colloquium, Princeton University (December 11, 2008)

3. "Quantum information processing with ultracold atoms in optical lattices," QIBEC Seminar, NIST Gaithersburg (December 10, 2008)

2. "Harnessing the ultracold: quantum computing and solid-state physics with Bose-Einstein condensates," Physics Department seminar, University of San Diego (December 2, 2008)

1. "Ultracold atoms in optical lattices: quantum information and solid-state physics with dilute-gas Bose-Einstein condensates," Physics Department colloquium, Union College (April 17, 2008)

Teaching / Mentoring

Bates College

Courses taught, through AY2024–25:

Physics 222: Electricity, Magnetism, and Waves (× 1)
Physics 231: Laboratory Physics (× 10)
Physics 308: Quantum Mechanics (× 1)
Physics 309: Quantum Computing (× 2) *(designed new course)*
Physics 341: Solid State Physics (× 4)
Physics 361: Thermal Physics (× 1)
Physics 409: Quantum Theory (× 2)
Physics 422: Electromagnetic Theory (× 4)
Physics 107: Physics of Living Systems I (× 1)
Physics 107: Classical Physics (× 1)
Physics 107: Classical Physics (laboratory) (× 2)
Physics 108: Modern Physics (× 1)
Physics 108: Modern Physics (laboratory) (× 4)
Physics 109: Energy, Matter, and Motion (× 1)

Physics 109L: Energy, Matter, and Motion (Laboratory) (× 2)
Physics 115: Physics for Policymakers (× 3) *(designed new course)*
Physics s30: Electronics (× 5)
Physics 230: Electronics (× 3)
Physics 360 (IS): Signals and Systems (× 1)
Physics 360 (IS): Ultracold Atomic Physics (× 1)
Physics 360 (IS): Quantum Computing (× 2)
Physics 360 (IS): Introductory Thermodynamics (× 1)
FYS 274: Physics in the Twentieth Century (× 2)
FYS 511: Information is Physical (× 2) *(designed new course)*

Postdoctoral associates supervised:

4) Dr. Jean-Baptiste Gerent (2024–)
3) Dr. Joseph Murphree (2020–2022) (→ ColdQuanta, Inc.)
2) Dr. Ryan Carollo (2018-2019)(→ Switchgear, Inc.)
1) Dr. Thomas Jarvis (2015-2017) (→ Eastern Kentucky University)

Research students supervised (ordered by date of first supervision):
(† denotes senior thesis; ‡ denotes honors thesis)

† 46) John Crossen '24 (senior thesis: *Exploring Infleqtion's Oqtant*)

† 45) Claudia Mabley '24 (full-year senior thesis: *Study of Three-State Rabi Oscillation in Bose-Einstein Condensates*)

† 44) Will Conway '24 (senior thesis: *Precision Enhancement in Cold Atom Labs: A Scalable and Adaptable LoRaWAN-Based Condition Monitoring System with InfluxDB Integration*)

43) Paloma Rodriguez '26 (summer research 2023)

† 42) Kona Lindsey '23 (senior thesis: *Visualizing Ultra-Cold Quantum Gas Bubbles in the Cold Atom Laboratory*)

41) Kira Yanagi '25 (summer research 2022)

40) Aly Reardon '25 (summer research 2022)

† 39) Adrian deCola '23 (summer research 2022, full-year senior thesis)

38) Hongke Lu '24 (summer research 2022)

† 37) Biruk Chafamo '22 (senior thesis: *Numerical Solver Module for the Gross-Pitaevskii Equation*)

† 36) Thomas Monahan '22 (full-year senior thesis: *Machine Learning Methods for Cold Atom Experiments*)

† 35) Owen Neuman '22 (full-year senior thesis: *An Examination of Rabi Dynamics in Quantum Systems*)

‡ 34) Stevens Shea '22 (full-year honors thesis: *Magnetic Trapping of Rubidium en Route to Bose-Einstein Condensate Formation Using an Atom Chip*)

33) M. Hamza Kalim '23 (summer research 2021)

†32) Elias Veilleux '23 (summer research 2020, full-year senior thesis: *Generation and Study of of 5-State Rabi Oscillation in Bose-Einstein Condensates*)

† 31) David Goodstein '21 (senior thesis)

30) John Mieszczanski '22 (summer research 2020)

29) Gabe Salvi '22 (summer research 2020)

† 28) Yichun Liu '21 (summer research 2020, full-year senior thesis)

‡ 27) Michał Ćwik '20 (summer course development 2019, full-year honors thesis: *2D and 3D Magneto-Optical Trapping of Rb-87 in an Atom Chip Bose-Einstein Condensation Apparatus*)

26) Avi Brach-Neufeld '20 (summer research 2019)

† 25) Mark Fusco '19 (full-year senior thesis)

24) Xiaole "Alex" Jiang '21 (summer research 2018)

23) Hannah Fitts '20 (summer research 2018)

† 22) Victor Fitzek '19 (summer research 2018, full-year senior thesis)

‡ 21) Max Gold '19 (short-term and summer research 2018, full-year honors thesis: *Characterization of Trap Frequencies for NASA Cold Atom Laboratory Bose-Einstein Condensates*)

20) Yara Abdelhady '18 (summer research 2016)

‡ 19) Daniel Paseltiner '16 (full-year honors thesis: *Progress towards Bose-Einstein condensation on an atom chip as a functional testbed for experiments aboard the orbital NASA Cold Atom Laboratory*)

18) Niccolò Bigagli '17 (in-semester rotation)

† 17) Nicholas Sergay '18 (summer research 2015, 2017, full-year senior thesis: *A Self-Stabilizing Optical System for Robust Bose-Einstein Condensate Experimentation*)

16) Salim Ourari '18 (summer research 2015, 2017)

15) Milan Brankovic '17 (summer research 2015)

† 14) Spencer Goossens '15 (full-year senior thesis: *Current Stabilization in a Magnetic Trap*)

† 13) Benjamin Lovitz '15 (full-year senior thesis: *Optical Frequency Doubling*)

† 12) Nathaniel Cash '15 (summer research 2014, senior thesis: *The Internal Combustion Engine*)

† 11) Tiago Correia '17 (in-semester rotations, summer research 2016, full-year senior thesis: *Measurements of BEC Trap Dynamics*)

‡ 10) Saad Ansari '14 (full-year honors thesis: *An Investigation of Quantum Dynamics in a Three-Level Bose-Einstein Condensate System*)

‡ 9) Edward Moan '14 (short-term research 2013, full-year honors thesis: *Design and Construction of Multidimensional Optical Lattices for Rubidium Bose-Einstein Condensates*)

†8) Ethan Emerson '12 (senior thesis: *Numerical Simulation of Evaporative Cooling in a Trapped Gas*)

‡ 7) Yang (Chris) Guo '14 (summer research 2011, summer research 2013, full-year honors thesis: *A Study of Matter-Wave Diffraction in Bose-Einstein Condensates for Atom Interferometry Applications*)

6) Kathilee Kenlock '15 (3/2) (in-semester rotation, summer research 2011)

†5) Albert Shi '14 (in-semester rotation, summer research 2011, short-term research 2013, full-year senior thesis: *Spatial Light Modulators for Variable Trapping of Bose-Einstein Condensates*)

4) Janith Rupasinghe '15 (3/2) (summer research 2011)

†3) Nate Funk '11 (summer research 2010, senior thesis: *Stabilizing an External-cavity Diode Laser Using a Beat-note Technique for Use in Laser Cooling Experiments*)

†2) Marc Tollin '12 (in-semester rotation and employment, summer research 2010, full-year senior thesis: *Progress Towards Bose-Einstein Condensation*)

‡ 1) Joanna Moody '14 (in-semester rotation and employment, summer research 2010, Mt. David summit poster 2013, full-year honors thesis: *Critical Speed Analysis of Railcars and Wheelsets on Curved and Straight Track*)

National Institute of Standards and Technology

2007–2008: *Supervisor*

Summer undergraduate research fellows (Justin Schultz, Eric Huang)

California Institute of Technology

2002–2006: *Teaching Assistant*

Senior modern physics laboratory

Senior optics laboratory
Senior presentation/scientific writing course

2003, 2005: *Supervisor*
Summer undergraduate research fellows (Jeffrey Naecker, Naushad Khakoo)

University of California at Berkeley
1997–1998: *Teaching Assistant*
Radio astronomy laboratory (Astronomy 120B, Prof. Carl Heiles)

Contributed Work

"Progress on studying ultracold atomic bubbles aboard the International Space Station using Science Module 3 of the Cold Atom Laboratory," Joseph Murphree, Nathan Lundblad, David Aveline, Courtney Lannert, Brendan Rhyno, Smitha Vishveshwara (poster), **DAMOP**: APS Division of Atomic, Molecular, and Optical Physics, Orlando, FL (2022)

"Observations of ultracold atoms in microgravity shell potentials," Nathan Lundblad, Ryan Carollo, David Aveline, Courtney Lannert, Karmela Padavic, Brendan Rhyno, Smitha Vishveshwara (poster), **DAMOP**: APS Division of Atomic, Molecular, and Optical Physics, Portland, OR (held virtually) (2020)

"Shell-Geometry Bose-Einstein Condensates in Microgravity," Ryan Carollo, Maxwell Gold, Xiaole Jiang, Karmela Padavic, Smitha Vishveshwara, Courtney Lannert, David Aveline, N. Lundblad (poster), **DAMOP**: APS Division of Atomic, Molecular, and Optical Physics, Milwaukee, WI (2019)

"Microgravity experiments with radiofrequency-dressed Bose- Einstein condensates aboard NASA's Cold Atom Laboratory," N. Lundblad, Maxwell Gold, Xiaole Jiang, Ryan Carollo (talk), **APS March Meeting**, Boston, MA (2019)

"Design of a microgravity shell-geometry Bose-Einstein condensate experiment," N. Lundblad, Thomas Jarvis, and Tiago Correia (poster), **Gordon Research Conference in Atomic Physics**, Newport, RI (2017) and **DAMOP**: APS Division of Atomic, Molecular, and Optical Physics, Sacramento, CA (2017)

"Synthetic clock states generated in a Bose-Einstein condensate via continuous dynamical decoupling," N. Lundblad, Dimitrios Trypogeorgos, Ana Valdes-Curiel, Erin Marshall, Ian Spielman (poster), **DAMOP**: APS Division of Atomic, Molecular, and Optical Physics, Sacramento, CA (2017)

"Progress toward studies of bubble-geometry Bose-Einstein condensates in microgravity with a ground-based prototype of NASA CAL," N. Lundblad, Thomas Jarvis, Daniel Paseltiner, and Courtney Lannert (poster), **DAMOP**: APS Division of Atomic, Molecular, and Optical Physics, Providence, RI (2016)

"Ring-shaped Magnetic Trap for Neutral Atoms," Milan Brankovic and N. Lundblad (poster), **Symposium on Undergraduate Research**, APS Division of Laser Science, San Jose CA (2015)

"Observation of a low-loss radiofrequency-dressed optical lattice in the tight-binding regime," N. Lundblad, Saad Ansari, Edward Moan, and Yang Guo (poster), **International Conference on Atomic Physics**, Washington, DC (2014)

"Observation of a low-loss radiofrequency-dressed optical lattice in the tight-binding regime," N. Lundblad, Saad Ansari, Edward Moan, and Yang Guo (poster), **DAMOP**: APS Division of Atomic, Molecular, and Optical Physics, Madison, WI (2014)

"Development of a 1D Optical Lattice for Studying Analog Solid-State Physics With Bose-Einstein Condensates," Yang Guo and N. Lundblad (poster), **Symposium on Undergraduate Research**, APS Division of Laser Science, Orlando FL (2013)

"Production of an ^{87}Rb BEC in a hybrid magnetic/optical trap," Joanna Moody, Edward Moan, and N. Lundblad (poster), **Symposium on Undergraduate Research**, APS Division of Laser Science, Orlando FL (2013)

"A hybrid-trap BEC for radiofrequency-dressed optical lattice experiments," Joanna Moody, Yang Guo, Edward Moan, Albert Shi and N. Lundblad (poster), **Gordon Research Con-**

ference in Atomic Physics, Newport, RI (2013)

"A hybrid-trap BEC for radiofrequency-dressed optical lattice experiments," Joanna Moody and N. Lundblad (poster), **DAMOP**: APS Division of Atomic, Molecular, and Optical Physics, Quebec City, Canada (2013)

"Ultracold atoms in honeycomb and rf-dressed optical lattices," N. Lundblad (poster), **American Physical Society New England Section**, Williams College (2012)

"Ultracold atoms in honeycomb and rf-dressed optical lattices," N. Lundblad (invited poster), **Atomic, Molecular, and Optical Physics Program Review**, Air Force Office of Scientific Research, Arlington, VA (2012)

"Magic-wavelength behavior and site-specific addressing and control of long-lived microwave qubits," N. Lundblad et al., in *Proceedings of the 20th International Conference on Laser Spectroscopy*. Berlin: Logos Verlag, 2011, 83–93.

"Design and Construction of a Bose-Einstein Condensate Apparatus for Use in Optical-Lattice Experiments," Marc Tollin and N. Lundblad (talk), **Symposium on Undergraduate Research**, APS Division of Laser Science, San Jose CA (2011)

"Experimental observation of magic-wavelength behavior of a microwave transition in optical lattice-trapped rubidium," N. Lundblad et al. (talk), **DAMOP**, Houston, TX (2010)

"Optical lattice-based addressing and control of long-lived neutral-atom qubits," N. Lundblad et al. (poster), **Gordon Research Conference in Atomic Physics**, Tilton, NH (2009)

"Magic wavelength for hyperfine clock transitions in lattice-trapped ^{87}Rb," N. Lundblad et al. (talk), **DAMOP**, Charlottesville, VA (2009)

"Optical lattice-based addressing and control of long-lived neutral-atom qubits," N. Lundblad et al. (talk), **DAMOP**, Charlottesville, VA (2009)

"Site-specific addressing of long-lived neutral-atom qubits," N. Lundblad et al. (talk), **Southwestern Quantum Information and Technology (SQuInT)**, Seattle, WA (2009)

"Exploring a two-qubit SWAP gate with clock states," N. Lundblad et al. (talk), **DAMOP**, State College, PA (2008)

"Radiofrequency-dressed optical lattices: custom potentials for ultracold atoms," N. Lundblad et al. (talk), **SQuInT**, Santa Fe, NM (2008), and **DAMOP**, State College, PA (2008)

"Clocks and accelerometers for space tests of fundamental physics," L. Maleki, J. M. Kohel, N. Lundblad, J. D. Prestage, R. J. Thompson and N. Yu, in *Lasers, Clocks and Drag-Free Control: Exploration of Relativistic Gravity in Space*. Berlin: Springer, 2008, 285–296

"Microscopic adiabatic potentials via radiofrequency dressing of a double-well optical lattice," N. Lundblad et al. (talk), **DAMOP**, Calgary, Alberta (2007), and poster, **Gordon Research Conference in Atomic Physics**, Tilton, NH (2007)

"Dual-beam atom laser driven by spinor dynamics," N. Lundblad et al. (article), **NASA Tech Briefs** (April 2007)

"Spinor dynamics-driven formation of a twin-beam atom laser," N. Lundblad et al. (poster), **International Conference on Atomic Physics**, Innsbruck, Austria (2006), **DAMOP**, Knoxville, TN (2006), and **CLEO/QELS**, Long Beach, CA (2006)

"Loading, guiding and manipulating neutral atoms in atom chip," D. C. Aveline, R. J. Thompson, N. Lundblad, N. Yu, J. M. Kohel and L. Maleki (poster), **DAMOP**, Knoxville, TN (2006), and **CLEO/QELS**, Long Beach, CA (2006)

"Initial experiments with an all-optical spinor BEC," N. Lundblad et al. (poster), **Gordon Research Conference in Atomic Physics**, Tilton, NH (2005)

"Single-beam all-optical BEC in Rb vapor," N. Lundblad et al. (poster), **DAMOP**, Lincoln, NE (2005)

"Simulation of laser cooling and trapping in engineering applications," J. Ramirez-Serrano, J. Kohel, R. J. Thompson, N. Yu, and N. Lundblad (article), **NASA Tech Briefs** (January 2005)

"Laboratory apparatus generates dual-species cold atomic beam", N. Lundblad et al. (arti-

cle), **NASA Tech Briefs** (July 2004)

"900 mW of 780 nm CW light from a frequency-doubled fiber laser," R. J. Thompson, M. Tu, D. C. Aveline, N. Lundblad and L. Maleki (poster), **Gordon Research Conference in Atomic Physics** , Tilton, NH (2003)

"A multiple 2D-MOT system as a compact cold atom beam source," J. Ramirez-Serrano, N. Lundblad, N. Yu, J. Kohel, R. J. Thompson and L. Maleki (poster), **DAMOP**, Boulder, CO (2003)

"Production and characterization of a dual-species cold atomic beam," N. Lundblad et al. (talk), **DAMOP**, Williamsburg, VA (2002), and poster, **CLEO/QELS**, Long Beach, CA (2002)

College Service

· Member, Curriculum Review Committee (CRC) (Winter 2024)

· Search committee for Physics / EACS tenure-track position (2023–2024)
(Chairs: Jeff Oishi & Beverly Johnson)

· Search committee for Physics tenure-track position (2023–2024)
(Chair: Jeff Oishi)

· Liaison / Advisor, Engineering Combined Plan (2018–2022, 2023–2024)

· Member, Committee on Admissions and Financial Aid (2023–2027)

· Member, *ad hoc* Space Committee (Chair: Geoff Swift) (2016–present)

· **Chair**, Search committee for Physics tenure-track position (2022-23: yielded Ryan Cole)

· Sigma Xi induction ceremony guest speaker (2012, 2022), name reader (2016)

· **Chair**, Natural Sciences and Mathematics Division (Academic Affairs Council) (elected) 2019–2023

· **Chair**, Department of Physics and Astronomy 2022–23

· Member, Faculty/Staff Working Group on Fall Planning and College Finances, Fall Planning Team 2020

· **Chair**, Department of Physics and Astronomy 2018–2019
(facilitated Department retreat December 2018, following decadal review)

· Geology Department Review (Internal Committee Chair) 2018

· Summer Research / Sherman Fairchild coordinator, 2016–2018

· Science Facilities Planning Committee, 2016–2018

· Faculty Review Board (elected), 2016–2021

· Digital and Computation Studies Program Committee 2015–2018
(Chairs: Lauren Ashwell, Paula Schlax, Matt Jadud)

· Search committee for two Physics tenure-track positions (2015-2016: yielded Oishi, Diamond-Stanic)
(Chair: Hong Lin)

· Chemistry Department Review (Internal Committee) 2015
(Chair: John Baughman)

· Institutional Planning process, 2015–2016
(Team chair of Facilities, Infrastructure, and Technology; Steering Committee)

· Committee on Faculty Governance (CFG) (elected), 2013–2016
(Various chairs)

· Retirement Investment Committee, 2012–2016
(Chairs: Terry Beckman, Geoff Swift)

· "Purposeful Work" Working Group, Summer 2013–Fall 2013
(Chairs: Michael Sargent, Darby Ray)

· Budget and Finance Advisory Committee (BFAC) (2010–2012)
(Chair: Carl Schwinn)

· Search committee for Physics tenure-track position (2012-2013: yielded Travis Gould)
(Chair: John Smedley)

· Search committee: Associate Director, Office of External Grants (2011-2012)
(Chair: Philip Walsh)

· Search committee for Economics tenure-track position (2011-2012)
(Chair: Lynne Lewis)

Honors thesis non-departmental examiner:
· Michelle Devoe '15 (Geology)
· Daniel Lambright '12 (Philosophy)
· Charles Thaxton '12 (English)

Honors thesis departmental examiner:
· Kirstin Koepnick '21 (Physics)
· Morgan Baxter '20 (Physics)

Honors thesis supervisor:
· Stevens Shea '22
· Michał Ćwik '20
· Maxwell Gold '19
· Daniel Paseltiner '16
· Saad Ansari '14
· Yang (Chris) Guo '14
· Edward Moan '14
· Joanna Moody '14

Professional Activity

NASA Biological and Physical Sciences Advisory Committee (BPAC) (2022–present)

NASA BECCAL Science Definition Team (SDT) Member; Prof. Daniel Stamper-Kurn (UC Berkeley), Chair. (2017–2020)

NSF Panelist (AMO Experiment, $\times 2$)

NSF Panelist (Graduate Research Fellowship, $\times 1$)

PhD defense, external evaluator:
· Andrew Rotunno (College of William and Mary, June 2021)

DAMOP Education Committee (2014–2015, Chair 2015–2016)
(American Physical Society Division of Atomic, Molecular and Optical Physics)
Organized and Chaired DAMOP 2016 Session 1A: Graduate Student Symposium
Coordinated application for $37k in grants to support student travel to DAMOP

Member:
American Physical Society
Division of Atomic, Molecular, and Optical Physics
Division of Laser Science
Advanced Laboratory Physics Association (ALPhA)

American Association of Physics Teachers (AAPT)

Referee:
American Journal of Physics
Nature
Nature Physics
New Journal of Physics
Physical Review Letters
Physical Review A: Atomic, Molecular & Optical Physics
Journal of Physics B: Atomic, Molecular & Optical Physics
NIST Washington Editorial Review Board (WERB) reader

Previous Employment

1998–2000: MIT Lincoln Laboratory, Lexington, MA
Assistant staff (systems analysis), specializing in numerical electromagnetics for radar systems, direction-finding, and ballistic missile defense.

Summer 1997: UC Berkeley Astronomy Department
Research assistant supervised by Prof. Carl Heiles, focusing on the design and construction of a twin-dish 12-GHz interferometric receiver.

Summer 1996: Kansas State University, Manhattan, KS
NSF REU internship with Fermilab E815 (NuTeV), a fixed-target neutrino-beam experiment, focusing on analysis code; supervised by Prof. Tim Bolton.