

Matt Grau

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 2100D Physical Science Building
Physics Department
Old Dominion University
Norfolk, VA 23529

Education

- 2016 ◇ **Ph.D. Physics** University of Colorado Boulder, Boulder CO
- 2012 ◇ **M.S. Physics** University of Colorado Boulder, Boulder CO
- 2009 ◇ **B.S. Physics** California Institute of Technology, Pasadena CA

Appointments

- 2021 – ◇ **Assistant Professor** Old Dominion University, Norfolk, VA
- 2020 – 2021 ◇ **Senior Scientist (Oberassistent)** ETH Zürich, Zürich, Switzerland
- 2016 – 2019 ◇ **Postdoctoral Research Assistant** ETH Zürich, Zürich, Switzerland
- 2009 – 2015 ◇ **Graduate Research Assistant** JILA, Boulder, CO

Teaching

Old Dominion University

- Fall 2023 – 2026 ◇ PHYS 137T: Introduction to Quantum Science and Technology
- Spring 2022 – 2025 ◇ PHYS 456: Intermediate Quantum Mechanics
- Fall 2022, Spring 2023 ◇ PHYS 297: Introduction to Undergraduate Research
(co-Instructors: Charles Hyde, Yuan Zhang)
- Fall 2022 ◇ PHYS 411: Introduction to Atomic Physics

ETH Zürich

- Spring 2021 ◇ Physics III: Introduction to optical, statistical, and quantum physics (Head TA)
- Spring 2020 ◇ Cavity QED and Ion Trap Physics (Co-Instructor: Daniel Kienzler)

Awards and Honors

- 2026 ◇ Named Most Inspirational Faculty Member by the College of Sciences Outstanding Scholar, Old Dominion University
- ◇ Cheng Fund for Innovative Research Award, Old Dominion University College of Sciences
- ◇ Outstanding Undergraduate Research Mentor Award, Old Dominion University College of Sciences
- ◇ High Impact Faculty Certificate of Commendation, Old Dominion University Academic Success Center
- 2025 ◇ Old Dominion University SCHEV Outstanding Faculty Award “Rising Star” Nominee
- 2024 ◇ Tenure Track Faculty Distinguished Teaching Award, Old Dominion University College of Sciences
- ◇ Certificate of Excellence in Undergraduate Research, The Perry Honors College
- ◇ High Impact Faculty Certificate of Commendation, Old Dominion University Academic Success Center

Publications

Submitted Manuscripts

4. G. Blume, C. Kirk, S. Poudel, J. Hill, A. Kachwala, J. Grames, M. L. Stutzman, **M. Grau**, and S. Marsillac. "Fabry-Perot Resonance Shifts as a Novel Non-destructive In Situ Surface Damage Diagnostic". *Physical Review Letters* (2026).
3. T. Rainaldi, J. Montgomery, C. G. Yale, B. K. McFarland, M. C. Revelle, D. Lobser, E. C. Tortorici, S. M. Clark, G. Siopsis, **M. Grau**, and F. Ringer. "Trigonometric Continuous-Variable Quantum Gates: Realization with Trapped Ions and Nonperturbative Wigner Negativity". *PRX Quantum* (2026).
2. **M. Grau**, C. Kirk, G. Blume, J. Hill, S. Poudel, A. Kachwala, M. Stutzman, J. M. Grames, S. Marsillac, and M. Poelker. "Cryogenic Enhancement of Electron Spin Polarization from a Strained GaAs/GaAsP Superlattice Photocathode". *Physical Review Letters* (2026).
1. G. Blume, C. Kirk, S. Poudel, A. Hill, J. Hill, J. M. Grames, M. L. Stutzman, S. Marsillac, and **M. Grau**. "Advancements in Spin-polarized Photocathodes Fabricated by MOCVD". *The European Physical Journal Plus* (2026).

Peer Reviewed Articles

21. T. Rainaldi, V. Ale, **M. Grau**, D. Kharzeev, E. Rico, F. Ringer, P. Shome, and G. Siopsis. "Trigonometric continuous-variable gates and hybrid quantum simulations of the sine-Gordon model". *Journal of High Energy Physics* **2026**, 125 (2026). DOI: [10.1007/JHEP03\(2026\)125](https://doi.org/10.1007/JHEP03(2026)125).
20. A. Masters, G. Blume, S. Poudel, J. M. Grames, M. Poelker, M. Stutzman, S. Polly, S. M. Hubbard, S. Marsillac, and **M. Grau**. "Impact of superlattice size on quantum efficiency and polarization in MOCVD-grown strained GaAs/GaAsP photocathodes". *Appl. Phys. Lett.* **128**, 083501 (2026). DOI: [10.1063/5.0315264](https://doi.org/10.1063/5.0315264).
19. A. Kachwala, G. Blume, S. Marsillac, J. Grames, and **M. Grau**. "Modeling strain and quantum confinement in GaAs/Ga_xIn_{1-x}P superlattices for spin-polarized electron sources". *J. Appl. Phys.* **138**, 234902 (2025). DOI: [10.1063/5.0300193](https://doi.org/10.1063/5.0300193).
18. J. Y. Araz, **M. Grau**, J. Montgomery, and F. Ringer. "Hybrid quantum simulations with qubits and qumodes on trapped-ion platforms". *Phys. Rev. A* **112**, 012620 (2025). DOI: [10.1103/kbv4-jj51](https://doi.org/10.1103/kbv4-jj51).
17. J. Y. Araz, S. Bhowmick, **M. Grau**, T. J. McEntire, and F. Ringer. "State preparation of lattice field theories using quantum optimal control". *Phys. Rev. D* **111**, 034506 (2025). DOI: [10.1103/PhysRevD.111.034506](https://doi.org/10.1103/PhysRevD.111.034506).
16. Y. Zhou, J. O. Island, and **M. Grau**. "Quantum logic control and precision measurements of molecular ions in a ring trap: An approach for testing fundamental symmetries". *Phys. Rev. A* **109**, 033107 (2024). DOI: [10.1103/PhysRevA.109.033107](https://doi.org/10.1103/PhysRevA.109.033107).
15. B. Belfore, A. Masters, D. Poudel, G. Blume, S. Polly, E. Wang, S. M. Hubbard, M. Stutzman, J. M. Grames, M. Poelker, **M. Grau**, and S. Marsillac. "High figure of merit spin polarized electron sources grown via MOCVD". *Appl. Phys. Lett.* **123**, 222102 (2023). DOI: [10.1063/5.0170106](https://doi.org/10.1063/5.0170106).
14. I. Kurchavov, D. Maison, L. Skripnikov, **M. Grau**, and A. Petrov. "Nuclear magnetic quadrupole moment of ¹⁷⁵Lu and parity-violating polarization degree of levels in ¹⁷⁵LuOH⁺". *Phys. Rev. A* **108**, 052815 (2023). DOI: [10.1103/PhysRevA.108.052815](https://doi.org/10.1103/PhysRevA.108.052815).
13. O. Wipfli, H. F. Passagem, C. Fischer, **M. Grau**, and J. P. Home. "Integration of a high finesse cryogenic build-up cavity with an ion trap". *Rev. Sci. Instrum.* **94**, 083204 (2023). DOI: [10.1063/5.0155418](https://doi.org/10.1063/5.0155418).
12. D. E. Maison, L. V. Skripnikov, G. Penyazkov, **M. Grau**, and A. N. Petrov. "T, P-odd effects in the LuOH⁺ cation". *Phys. Rev. A* **106**, 062827 (2022). DOI: [10.1103/PhysRevA.106.062827](https://doi.org/10.1103/PhysRevA.106.062827).

11. T. S. Roussy, D. A. Palken, W. B. Cairncross, B. M. Brubaker, D. N. Gresh, **M. Grau**, K. C. Cossel, K. B. Ng, Y. Shagam, Y. Zhou, V. V. Flambaum, K. W. Lehnert, J. Ye, and E. A. Cornell. "Experimental Constraint on Axionlike Particles over Seven Orders of Magnitude in Mass". *Phys. Rev. Lett.* **126**, 171301 (2021). [DOI: 10.1103/PhysRevLett.126.171301](https://doi.org/10.1103/PhysRevLett.126.171301).
10. B. J. Ward, N. Andriessen, J. M. Tembo, J. Kabika, **M. Grau**, A. Scheidegger, E. Morgenroth, and L. Strande. "Predictive models using "cheap and easy" field measurements: Can they fill a gap in planning, monitoring, and implementing fecal sludge management solutions?" *Water Res.* **196**, 116997 (2021). [DOI: 10.1016/j.watres.2021.116997](https://doi.org/10.1016/j.watres.2021.116997).
9. F. Reiter, F. Lange, S. Jain, **M. Grau**, J. P. Home, and Z. Lenarcic. "Engineering generalized Gibbs ensembles with trapped ions". *Phys. Rev. Res.* **3**, 033142 (2021). [DOI: 10.1103/PhysRevResearch.3.033142](https://doi.org/10.1103/PhysRevResearch.3.033142).
8. D. E. Maison, L. V. Skripnikov, V. V. Flambaum, and **M. Grau**. "Search for CP-violating nuclear magnetic quadrupole moment using the LuOH^+ cation". *J. Chem. Phys.* **153**, 224302 (2020). [DOI: 10.1063/5.0028983](https://doi.org/10.1063/5.0028983).
7. S. Jain, J. Alonso, **M. Grau**, and J. P. Home. "Scalable Arrays of Micro-Penning Traps for Quantum Computing and Simulation". *Phys. Rev. X* **10**, 031027 (2020). [DOI: 10.1103/PhysRevX.10.031027](https://doi.org/10.1103/PhysRevX.10.031027).
6. W. B. Cairncross, D. N. Gresh, **M. Grau**, K. C. Cossel, T. S. Roussy, Y. Ni, Y. Zhou, J. Ye, and E. A. Cornell. "Precision Measurement of the Electron's Electric Dipole Moment Using Trapped Molecular Ions". *Phys. Rev. Lett.* **119**, 153001 (2017). [DOI: 10.1103/PhysRevLett.119.153001](https://doi.org/10.1103/PhysRevLett.119.153001).
5. K.-K. Ni, H. Loh, **M. Grau**, K. C. Cossel, J. Ye, and E. A. Cornell. "State-specific detection of trapped HfF^+ by photodissociation". *J. Mol. Spectrosc.* **300**, 12–15 (2014). [DOI: 10.1016/j.jms.2014.02.001](https://doi.org/10.1016/j.jms.2014.02.001).
4. M. H. Matheny, **M. Grau**, L. G. Villanueva, R. B. Karabalin, M. C. Cross, and M. L. Roukes. "Phase Synchronization of Two Anharmonic Nanomechanical Oscillators". *Phys. Rev. Lett.* **112**, 014101 (2014). [DOI: 10.1103/PhysRevLett.112.014101](https://doi.org/10.1103/PhysRevLett.112.014101).
3. H. Loh, K. C. Cossel, M. C. Grau, K.-K. Ni, E. R. Meyer, J. L. Bohn, J. Ye, and E. A. Cornell. "Precision Spectroscopy of Polarized Molecules in an Ion Trap". *Science* **342**, 1220–1222 (2013). [DOI: 10.1126/science.1243683](https://doi.org/10.1126/science.1243683).
2. **M. Grau**, A. Leanhardt, H. Loh, L. Sinclair, R. Stutz, T. Yahn, and E. Cornell. "Near-infrared LIF spectroscopy of HfF^+ ". *J. Mol. Spectrosc.* **272**, 32–35 (2012). [DOI: 10.1016/j.jms.2011.12.006](https://doi.org/10.1016/j.jms.2011.12.006).
1. H. Loh, J. Wang, **M. Grau**, T. S. Yahn, R. W. Field, C. H. Greene, and E. A. Cornell. "Laser-induced fluorescence studies of HfF^+ produced by autoionization". *J. Chem. Phys.* **135**, 154308 (2011). [DOI: 10.1063/1.3652333](https://doi.org/10.1063/1.3652333).

Thesis

2016 ◇ *Measuring the electron electric dipole moment with trapped molecular ions*

Invited Conference Talks

3. A precision measurement of the electron's electric dipole moment using trapped molecular ions. Precision Physics, Quantum Electrodynamics, and Fundamental Interactions, IESC Cargese, France *May 2017*
2. Measuring the electron EDM with trapped molecular ions. ECTI 2016, Arosa, Switzerland *August 2016*
1. Testing T-symmetry using trapped molecular ions. 594. WE-Heraeus-Seminar, Bad Honnef, Germany *June 2015*

Invited Seminar Talks

11. Searching for Symmetry Violation with Molecular Ions and Quantum Logic. Physics Colloquium, Virginia Commonwealth University, Richmond, Virginia, USA *November 2024*

Invited Seminar Talks (continued)

10. Searching for Symmetry Violation with Molecular Ions. Triangle Quantum Computing Seminar, Raleigh, North Carolina, USA *October 2024*
9. Searching for Symmetry Violation with Molecular Ions. CQRT Seminar, University of Oklahoma, Norman, Oklahoma, USA *November 2023*
8. Searching for Symmetry Violation with Molecular Ions. William & Mary, Williamsburg, Virginia, USA *October 2023*
7. Trapped ion quantum computing. Jefferson Lab Accelerator Seminar, Newport News, Virginia, USA *June 2022*
6. Searching for new physics with trapped molecular ions. Van Swinderen Institute, Groningen, Netherlands *March 2021*
5. Searching for new physics with trapped molecular ions. Old Dominion University, Norfolk, Virginia, USA *March 2021*
4. Precision tests of fundamental symmetry violation using trapped molecular ions. Durham University, Durham, United Kingdom *April 2020*
3. Precision tests of fundamental symmetry violation using trapped molecular ions. Heinrich Heine University Düsseldorf, Dusseldorf, Germany *November 2019*
2. Trapping Ions in an optical lattice. JILA, Boulder, CO *March 2019*
1. Trapping Ions in an optical lattice. Caltech, Pasadena, CA *March 2019*

Contributed Conference Talks and Posters

11. Measurement of the $\text{Ba}^+ \text{D}_{5/2}$ state lifetime in cryogenic ion trap. Contributed talk, DAMOP 2026, Providence, Rhode Island *June 2026*
10. Spin-transparent storage rings as a quantum computing architecture. Poster, DAMOP 2023, Spokane, Washington *June 2023*
9. Testing fundamental symmetries with lutetium based molecular ions. Facility for Rare Isotope Beams, East Lansing, Michigan *November 2022*
8. Progress towards optically trapping 2D ion crystals. Contributed talk, DAMOP 2020, virtual *June 2020*
7. Towards optically trapped 2D ion crystals for quantum simulation. Poster, DAMOP 2019, Milwaukee, Wisconsin *May 2019*
6. Trapping Ions in an optical lattice for quantum simulation. Contributed talk, DAMOP 2017, Sacramento, California *June 2017*
5. Designing an optical lattice trap for ions. Poster, DAMOP 2017, Sacramento, California *June 2017*
4. Systematics in a measurement of the electron's electric dipole moment using trapped molecular ions. Poster, DAMOP 2015, Columbus, Ohio *June 2015*
3. Towards an Electron EDM Measurement with Trapped Ions. Poster, ICAP 2014, Washington, D.C. *August 2014*
2. Progress towards an electron EDM measurement using trapped hafnium fluoride ions. Poster, DAMOP 2012, Orange County, California *June 2012*
1. Measuring the electron EDM using HfF^+ . Poster, ICOLS 2011, Hannover, Germany *May 2011*

Co-authored Conference Presentations

17. Measurement of the isotope shift in the 350 nm and 413 nm transitions of atomic barium. Contributed talk, DAMOP 2025, Portland, Oregon *June 2025*

Co-authored Conference Presentations (continued)

16. Polarized Particles in a Spin-Transparent Storage Ring as a Quantum Computer. Contributed talk, DAMOP 2023, Spokane, Washington *June 2023*
15. Stability of trapped ions in Paul trap with rotating bias field. Poster, DAMOP 2023, Spokane, Washington *June 2023*
14. Constraining the axion coupling to time-variation of the electron's electric dipole moment. Poster, DAMOP 2019, Milwaukee, Wisconsin *May 2019*
13. A precision measurement of the electron's electric dipole moment using trapped molecular ions. Contributed talk, DAMOP 2017, Sacramento, California *June 2017*
12. Progress of the JILA electron EDM experiment. Contributed talk, ISMS 2016, Urbana-Champaign, Illinois *June 2016*
11. Toward rotational state-selective photoionization of ThF^+ ions. Contributed talk, ISMS 2016, Urbana-Champaign, Illinois *June 2016*
10. Progress of the JILA electron EDM experiment. Contributed talk, DAMOP 2016, Providence, Rhode Island *May 2016*
9. Increasing measurement sensitivity for the electron's electric dipole moment using trapped molecular ions. Contributed talk, DAMOP 2016, Providence, Rhode Island *May 2016*
8. Second generation measurement of the electric dipole moment of the electron using trapped ThF^+ ions. Poster, DAMOP 2016, Providence, Rhode Island *May 2016*
7. A new precision measurement of the electron's electric dipole moment using trapped ions. Poster, DAMOP 2016, Providence, Rhode Island *May 2016*
6. Precision spectroscopy of trapped HfF^+ with a coherence time of 1 second. Contributed talk, ISMS 2015, Urbana-Champaign, Illinois *June 2015*
5. Progress towards a measurement of the electron electric dipole moment with trapped molecular ions. Poster, DAMOP 2014, Madison, Wisconsin *June 2014*
4. State-sensitive detection of HfF^+ for eEDM search. Contributed talk, DAMOP 2013, Quebec City, Canada *June 2013*
3. Progress towards a measurement of the electron electric dipole moment with trapped molecular ions. Poster, DAMOP 2013, Quebec City, Canada *June 2013*
2. Progress towards an electron EDM search using hafnium fluoride ions. Contributed talk, DAMOP 2011, Atlanta, Georgia *June 2011*
1. Autoionization of HfF for an electron EDM search. Poster, DAMOP 2010, Houston, Texas *May 2010*

Students

Old Dominion University - Graduate (Current)

7. *Summer 2026* –. Chamod Hewa
6. *Summer 2025* –. John Hill. *in collaboration with Dr. Sylvain Marsillac* (ECE)
5. *Summer 2023* –. Urban Kobal. Graduate Summer Award Program, 2026
4. *Fall 2022* –. Greg Blume. *in collaboration with Dr. Sylvain Marsillac*
3. *Fall 2022* –. Lucas Sturnfield. *in collaboration with Dr. Sylvain Marsillac* (D.Eng)
2. *Summer 2022* –. Will Jeffries. VSGC Graduate STEM Research Fellowship, Summer 2026 Dissertation Completion Award

Students (continued)

Old Dominion University - Graduate (Former)

1. *Fall 2023*. Michaela Bochman. *in collaboration with Dr. Sylvain Marsillac* (ECE)

Old Dominion University - Undergraduate (Current)

30. *Fall 2026* –. Cabell Jones. Instrumentation for oceanographic lidar
29. *Fall 2026* –. Ashton Trexler. Trapped-ion bosonic gates (Senior Thesis)
28. *Summer 2026* –. Jacob VanSparrentak-Herring. Developing a DDS-based frequency source
27. *Summer 2026* –. Cody Hardy. Designing Helmholtz coils for $^{137}\text{Ba}^+$ hyperfine qubits
26. *Summer 2026* –. Rowan Marsillac. Measuring NV^- spectra
25. *Summer 2026* –. Jeevan Citrarasan. FPGA experiment control of NV^- centers
24. *Spring 2025* –. Ambrose Orth. Characterizing thermionic emission. Undergraduate Research and Creativity Fellowship
23. *Fall 2024* –. Austen Wendt. Fitting NV^- ODMR spectra

Old Dominion University - Undergraduate (Former)

22. *Summer 2026*. Luke Reisig. Simulating the Sine-Gordon Model Using an Open Quantum System. REU student
21. *Spring 2026*. Isaiah McCoy. Measuring the metastable $\text{D}_{5/2}$ state lifetime in Ba^+ (Senior Thesis)
20. *Fall 2022 – Spring 2026*. Joshua Wager. Loading barium into an ion trap using ablation (Senior Thesis). Undergraduate Research and Creativity Fellowship, VSGC Undergraduate STEM Research Scholarship, ODU Outstanding Undergraduate Researcher Award Recipient. *Now a PhD student in Physics at the University of Wisconsin–Madison.*
19. *Fall 2023 – Fall 2025*. Kaitlyn Levine. Measuring AOM diffraction efficiency (Independent Undergraduate Research). *in collaboration with Dr. Charles Sukenik*
18. *Summer 2025*. James Wile. Simulating mid-circuit measurement comagnetometry
17. *Spring 2025 – Summer 2025*. Panagiotis Taoulas. Repumping hyperfine states of Lu^+ . Undergraduate Research and Creativity Fellowship, College of Sciences Outstanding Scholar. *Now a PhD student in Nuclear Engineering at Texas A&M University.*
16. *Summer 2024*. Annika Cote. Observing Electron Spins in Diamond Using NV^- Centers (Senior Thesis). *in collaboration with Dr. Yuan Zhang*
15. *Summer 2024*. Jessica Blevins. Photoluminescence spectroscopy of NV centers in diamond. VSGC funded REU. *Now a Master's student in Physics at Miami University.*
14. *Summer 2024*. Michael Hildebrand. Computer code to generate microwave pulse sequences. VSGC funded REU
13. *Fall 2023 – Fall 2024*. Lawrence Umali. Generating 614 nm light to reset barium qubits. Undergraduate Research and Creativity Fellowship
12. *Summer 2023 – Spring 2024*. Ryan O'Neill. Calculating the rovibronic structure of I_2 (Senior Thesis)
11. *Summer 2023*. Jacob Chaney. Repump Laser For Lu^+ Cooling. Program for Undergraduate Research and Scholarship
10. *Spring 2023 – Spring 2024*. Melanie Johnson. Current control of barium atomic beam oven (Senior Thesis)
9. *Fall 2022 – Spring 2023*. Thomas Powell. Saturated absorption spectroscopy of I_2 molecules (Senior Thesis)
8. *Fall 2022 – Spring 2023*. David Routhier. Third harmonic generation of 351 nm laser light (Senior Thesis)
7. *Fall 2022 – Spring 2023*. DaRon Wilkins. Generating laser sidebands to address hyperfine splitting the $^3\text{D}_1$ state of Lu^+ (Senior Thesis)

Students (continued)

6. *Summer 2022.* Alastair Deans. Calculating the rovibronic structure of I_2 . *Now an M.S. student in Physics at Old Dominion University.*
5. *Summer 2022.* Wyatt Elliot. Designing and PCB connector interface between the experimental chamber and digital control system
4. *Summer 2022 – Spring 2023.* Evan Johnson. Stabilizing multiple lasers to a single high-finesse optical cavity (Senior Thesis). VSGC Undergraduate STEM Research Scholarship
3. *Spring 2022.* Urban Kobal. Simulating Ion-Trapping and the Stability of the Trap (Senior Thesis)
2. *Spring 2022 – Summer 2022.* Tyler Rose. Design and fabrication of a lab environmental monitoring system
1. *Spring 2022.* Anthony Shea. Design and fabrication of a linear Paul trap (Senior Thesis)

ETH Zürich

19. *2016 – 2021.* Oliver Wipfli. Optical trapping of ion crystals in a high-finesse cavity (PhD Student). Defended April 2022
18. *2016 – 2021.* Christoph Fischer. Quantum non-demolition readout for optically trapped alkaline-earth Rydberg atoms (PhD Student). Defended January 2022
17. *Spring 2021.* Maria Radisch. Calculating the magic wavelength of Ca^+ (Bachelor Semester Thesis)
16. *Spring 2021.* Javier Naya Hernández. Localized modes in microtrap arrays (Masters Semester Thesis)
15. *Spring 2021.* Lukas Mouton. Optimizing the laser cooling of Ba^+ (Masters Semester Thesis)
14. *Autumn 2020.* Cédric Huber. Ligand Field Theory Calculation of $LuOH^+$ (Masters Semester Thesis)
13. *Autumn 2020.* Noah Berner. Printed Circuit Board Design for Direct Digital Synthesis (Masters Semester Thesis)
12. *Spring 2019.* Theo Dressler. Spectroscopy of high energy Rydberg states of Magnesium (Masters Semester Thesis)
11. *Summer 2018.* Christopher Böhm. Automating control of VECSEL laser system (Summer Internship)
10. *Summer 2018.* Adithyan Radhakrishnan. Lifetime Studies on Magnesium Rydberg Atom (Summer Internship)
9. *Spring 2018.* Theo Dressler. Temperature stabilization inside a Herzan Cabinet to secure laser-light alignment (Bachelor Semester Thesis)
8. *Spring 2018.* Nathan Torelli. Characterization of UV optical fibers (Bachelor Semester Thesis)
7. *Spring 2018.* Ludwig Hruza. Temperature measurement of ^{24}Mg atoms in a MOT using time of flight measurement (Bachelor Semester Thesis)
6. *Spring 2018.* Martin Woschank. Design of a compact 2D magneto-optical trap for loading ion traps (Master's Thesis)
5. *Autumn 2017.* Hung Do Thi Xuan. Laser System for Optical Control of Magnesium Ions (Erasmus Master's Thesis)
4. *Autumn 2017.* Danny Kun. Implementation of a Python DDS communication protocol to drive AOMs (Bachelor Semester Thesis)
3. *Spring 2017.* Nicolo D'Anna. Programmable Analog Input Node (Masters Semester Thesis)
2. *Summer 2016.* Hung Do Thi Xuan. Laser frequency stabilization for optical trapping of Magnesium ions (Summer Internship)
1. *Summer 2016.* Akshay Sawhney. Laser cooling simulation of magnesium atoms (Summer Internship)

University of Colorado Boulder

2013 – 2016. Yiqi Ni. JILA eEDM experiment

Dissertation Committees

italics indicates committee chair

PhD Committees

13. 2026 –. Colin Matthews, PhD Physics
12. 2026 –. Sulyman Hossain, PhD Physics
11. 2026 –. Jeffrey Pearson, PhD Physics
10. 2026 –. Sushil Poudel, PhD Electrical and Computer Engineering
9. 2026 –. Colin Kirk, PhD Electrical and Computer Engineering
8. 2025 –. Kazuki Makino, PhD Physics
7. 2024 –. Markus Zirnheld, PhD Physics
6. 2023 –. Dylan English, PhD Physics
5. 2023 –. Jake Montgomery, PhD Physics (Stony Brook University)
4. 2023 –. *Urban Kobal*, PhD Physics
3. 2022 –. *William Jeffries*, PhD Physics
2. 2022 –. Greg Blume, PhD Physics
1. 2022 – 2026. Noah Swan, PhD Physics. “A study of short range correlated pair formation mechanisms”

Master's Thesis Committees

- 2026 –. Andrew Maciejunes, MS Physics

Senior Thesis Committees

19. *Fall 2026 - Spring 2027. Ashton Trexler*, Senior Thesis, Physics. “Trapped-ion bosonic gates”
18. *Spring 2026. Isaiah McCoy*, Senior Thesis, Physics. “Measuring the metastable $D_{5/2}$ state lifetime in Ba^+ ”
17. *Fall 2025 - Spring 2026. Joshua Wager*, Senior Thesis, Physics. “Loading barium into an ion trap using ablation”
16. *Fall 2024 - Spring 2025. Jessica Blevins*, Senior Thesis, Physics. “Missing mass profiles in disk galaxies: Λ CDM vs. nonlinear general relativity”
15. *Fall 2024 - Spring 2025. Andrew Maciejunes*, Senior Thesis, Physics. “Solving large-scale vehicle routing problems with hybrid quantum-classical decomposition”
14. *Fall 2024 - Spring 2025. Colin Matthews*, Senior Thesis, Physics. “Modeling the CMB power spectrum using general relativity self interaction”
13. *Summer 2024. Annika Cote*, Senior Thesis, Physics. “Observing electron spins in diamond using NV^- centers”
12. *Fall 2023 - Spring 2024. Maria Rekkus*, Senior Thesis, Physics. “Design and construction of an apparatus to perform Schlieren imaging”
11. *Fall 2023 - Spring 2024. Theodore Skelton*, Senior Thesis, Physics. “Quantum computing with qubits and qumodes”
10. *Fall 2023 - Spring 2024. Ryan O'Neill*, Senior Thesis, Physics. “Calculating the rovibronic structure of I_2 ”
9. *Fall 2023 - Spring 2024. Gabriel Barrios*, Senior Thesis, Physics. “Quantum-classical simulation and analysis of the lattice Schwinger model”
8. *Fall 2023 - Spring 2024. Ruben Galicia-Avila*, Senior Thesis, Physics. “Development of a commercial oceanographic lidar system”
7. *Fall 2022 - Spring 2023. Evan Johnson*, Senior Thesis, Physics. “Stabilizing multiple lasers to a single high-finesse optical cavity”

Dissertation Committees (continued)

6. *Fall 2022 - Spring 2023. DaRon Wilkins, Senior Thesis, Physics. "Generating laser sidebands to address hyperfine splitting of the 3D_1 state of Lu^{+} "*
5. *Fall 2022 - Spring 2023. David Routhier, Senior Thesis, Physics. "Third harmonic generation of 351 nm laser light"*
4. *Fall 2022 - Spring 2023. Thomas Powell, Senior Thesis, Physics. "Saturated absorption spectroscopy of I_2 molecules"*
3. *Spring 2022. Mark Reginato-Colon, Senior Thesis, Physics*
2. *Spring 2022. Urban Kobal, Senior Thesis, Physics. "Simulating ion-trapping and the stability of the trap"*
1. *Spring 2022. Adam Lane, Senior Thesis, Physics*

Grants Awarded

14.	September 2026 – May 2027	<i>AI-Enabled Digital Twin for Scalable Injector Optimization and Control (DOE). Role: Senior Personnel (11%).</i>	\$750,000
13.	July 2026 – June 2028	<i>High Performance GaAs-based Spin-Polarized Electron Photocathodes for DOE NP Current and Future Projects (DOE Award DE-SC0026828). Role: Co-PI (50%).</i>	\$715,000
12.	May 2026 – April 2027	<i>Expanding 'How to Research': A Physics Undergraduate Research Pipeline (ODU College of Sciences Undergraduate Research Program). Role: PI. Submitted on behalf of the Department of Physics.</i>	\$15,000
11.	September 2024 – December 2026	<i>Fabrication of Spin Polarized Electron Sources with High Polarization and QE for DOE NP (DOE). Role: Co-PI (50%).</i>	\$472,000
10.	2024 – 2026	<i>Hybrid Quantum Computation Using Qubits and Qumodes on QSCOUT (Sandia National Laboratories). Role: PI.</i>	user access
9.	February 2024 – December 2024	<i>Summer Research Experience for Undergraduate Students: Exploring NV-Center Quantum Sensing (VSGC Innovative Proposals). Role: PI.</i>	\$7,400
8.	May 2023 – May 2024	<i>Developing Capacity for Quantum Science with Trapped Ions (ODU Program for Undergraduate Research and Scholarship). Role: PI.</i>	\$10,000
7.	March 2023 – December 2023	<i>High School Physics and Mathematics Teacher Professional Development of Integrated STEM through Arduinos at Old Dominion University (VSGC Innovative Proposals). Role: PI.</i>	\$7,300
6.	January 2023 – September 2023	<i>Polarized Bunched Electron Beam in Low-Energy Spin-Transparent Storage Ring as a Quantum Computer (Jefferson Lab LDRD). Role: Co-PI (13%).</i>	\$93,220
5.	2023	<i>Trapping lutetium ions for quantum computing (VSGC New Investigator Program). Role: PI.</i>	\$10,000
4.	September 2022 – December 2024	<i>Enhancing the Design of Photocathodes (DOE). Role: Co-PI (30%).</i>	\$359,000
3.	May 2022 – August 2022	<i>Where is the antimatter? An investigation and mitigation of systematic errors in a novel search for new physics (ODU Summer Research Fellowship Program). Role: PI.</i>	\$7,000
2.	September 2021 – August 2024	<i>Seeing atoms with the naked eye (SNSF Agora 199782). Role: Co-PI. Awarded in former research group. PI: Jonathan P. Home</i>	199'978 CHF

Grants Awarded (continued)

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| 1. | December 2020 –
December 2022 | <i>Photocathodes with 90% Polarization for DOE Nuclear Physics</i> (DOE).
Role: Co-PI (8%). | \$200,000 |
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Academic Service

Department

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| Spring 2026 | ◇ AMO Faculty Search Committee |
| | ◇ Submitted College of Sciences Undergraduate Research Program on behalf of the department |
| 2025 | ◇ Physics Department SWOT Committee |
| 2024 – | ◇ Graduate Admissions Committee |
| 2022 – | ◇ Graduate Recruitment Committee |
| | ◇ Graduate Preview Committee |
| | ◇ Undergraduate Program Committee |
| Summer 2022 | ◇ Research Assistant Professor Search Committee |
| Spring 2022 | ◇ Submitted College of Sciences Undergraduate Research Program on behalf of the department |

College

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|-------------|--|
| Spring 2026 | ◇ Trailing Marshall, Undergraduate Degree Ceremony |
| Fall 2025 | ◇ Lead Marshall, Undergraduate Degree Ceremony |
| Spring 2025 | ◇ Faculty Marshall, Undergraduate Degree Ceremony |
| Fall 2023 | ◇ Robing Marshall, Undergraduate Degree Ceremony |
| Spring 2023 | ◇ Floating Marshall, Undergraduate Degree Ceremony |
| Spring 2022 | ◇ Assistant Deputy Marshall, Advanced Degree Commencement Ceremony |

University

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| Summer 2026 – | ◇ Vertically Integrated Program for Undergraduate Research (VIPUR) Founding Faculty Group |
| Spring 2026 – | ◇ Quantum Students Association Faculty Advisor |
| Spring 2026 | ◇ Faculty Grievance Panel Chair |
| Spring 2025 – | ◇ General Education Steering Committee |
| Summer 2025 – | ◇ General Education Student Learning Outcomes Working Group |
| | ◇ General Education First Year Seminar Working Group |
| Fall 2024 | ◇ General Education Reform Reading Group |
| 2023 – | ◇ Radiation Safety Committee |
| Spring 2025 | ◇ Radiation Safety Officer Search Committee |
| Spring 2022 | ◇ Lead Marshall, Advanced Degree Commencement Ceremony, Strome College of Business |

Professional Service

Conference and Program Service

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| June 2026 | ◇ Session Chair: Molecules at the Frontiers of Quantum Science, DAMOP 2026, Providence, Rhode Island |
| 2025 | ◇ IEEE Quantum Computing and Engineering QTEM Program Committee (QEC25) |

Professional Service (continued)

- April 2025 ♦ ODU GSGA Conference Judge
- June 2023 ♦ Session Chair: Dipolar BECs, DAMOP 2023, Spokane, Washington

Proposal Review

- May 2026 ♦ European Research Council
- 2025 ♦ DOE, NSF, Research Corporation
- 2024 ♦ NSF
- ♦ National Science Centre Poland (PRELUDIUM)
- 2023 ♦ AFOSR
- 2021 ♦ French National Research Agency

Journal Referee

- 2023, 2025, 2026 ♦ Journal of Quantitative Spectroscopy and Radiative Transfer
- 2019 ♦ New Journal of Physics
- 2017 – 2019 ♦ Atoms
- 2017 ♦ Optics Express
- ♦ The European Physical Journal
- 2016 ♦ Applied Physics B

Community Engagement

- July 2026 ♦ *Computing with Atoms Inside a Quantum Computer*, BLAST Keynote Address
- ♦ *Lasers, Refraction, and Optics*, BLAST Session for 80 rising 9th and 10th grade students
- March 2026 ♦ *Searching for Symmetry Violations with Molecular Ions*, ODU Quantum Students Association Talk
- ♦ Deep Creek Science and Medicine Academy Laboratory Tours
- April 2025 ♦ ODU Visiting Students Day Laboratory Tours
- March 2024 ♦ *Searching for missing antimatter with a single ion*, ODU College of Sciences Science Fridays Talk
- November 2023 ♦ *Searching for Symmetry Violation with Molecular Ions*, Society of Physics Students University at Buffalo Talk
- August 2023 ♦ *Searching for New Physics by Looking for Symmetry Violation*, Remote Experience for Young Engineers and Scientists (REYES) Talk
- June 2023 ♦ High School STEM Teacher Professional Development Workshop Organizer
- February 2022 ♦ *Precision measurement: Looking for new physics in all the small places*, ODU Society of Physics Students Speed-Researching Talk
- April 2022 ♦ Virginia State Science and Engineering Fair Judge