Cody Leary

Assistant Professor of Physics
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Education

- **University of Oregon** — Eugene, OR
  Ph.D., Physics (June 2010), M.S. Physics (June 2004) — *Sept 2003 - June 2010*
  - Area of specialization: Experimental Quantum Optics
  - Dissertation: *Measurement and Control of Transverse Photonic Degrees of Freedom via Parity Sorting and Spin-Orbit Interaction*
  - Dissertation Committee: D. Steck, M. Raymer (advisor), S. van Enk, J. Nockel, A. Marcus
  - Other areas of emphasis: Quantum Field Theory, General Relativity
- **University of Puget Sound** — Tacoma, WA
  B.S. Physics (with honors); B.S. Mathematics — *1999 - 2003*

Teaching and Mentoring Activities

- **Assistant Professor**
  The College of Wooster — *Aug 2011 - Present*
  - **Courses taught:** Physics 203, Physics 204, Physics 204 Lab, Physics 205, Physics 220 Lab, Physics 350
  - **I.S. students supervised:** Margaret Raabe (2012), Mohommad Ahmad (2012).
- **Research Advisor**
  University of Oregon — *Jan 2006 - June 2010*
  - Supervised the research projects of several graduate and undergraduate students in the physics department, while working closely with these students in an advisory/mentorship role.
  - **Graduate students supervised:** Henning Soller (2006), Hayden McGuinness (2006), Lucia Schwarz (2008-2009), Dashiell Vitullo (2007-2010).
  - **Undergraduate students supervised:** Kestrel Schwaiger (2006), Lydia Baumgardner (2007), Yonaton Schultz (2007), Zachary Bond (2009). Two of these undergraduates (L. Baumgardner and Z. Bond), went on to present research results at a national undergraduate research symposium. The work of L. Baumgardner was published in the journal *Opt. Express* (see below).
- **NSF GK-12 Teaching Fellow**
  University of Oregon — *Sept 2004 - Sept 2006*
  - Worked with secondary school teachers in Oregon by teaching a portion of their mathematics, physics, and engineering classes (averaging ≈ 15 hrs/ week), thereby modeling effective methods of science teaching in their classrooms and helping them to improve their teaching skills.
  - Generated original teaching materials, demonstration equipment, homework, and exams.
  - Provided otherwise unavailable university-owned physics teaching/demonstration equipment.
- **Graduate Teaching Assistant**
  University of Oregon — *Sept 2003 - June 2004*
  - Gave short (≈ 10 minute) lectures, led discussion groups, presided over problem-solving sessions, and graded assignments and exams for introductory university physics courses.

- Worked with undergraduates having difficulties in their physics classes during office hours and at the university 'drop-in' tutoring center.

- **Teaching Assistant, Summer Access Program**
  University of Puget Sound *June 2003 - July 2003*
  - Taught hands-on physical science courses to economically disadvantaged secondary students.

- **Undergraduate Teaching Assistant**
  University of Puget Sound *Sept 2002 - Aug 2003*
  - Assisted students, set up laboratory equipment, and graded assignments for university courses.

- **Undergraduate Physics and Mathematics Tutor**
  University of Puget Sound Learning Center *Sept 2002 - May 2003*
  - Tutored students at all levels of undergraduate physics, mathematics, and physical chemistry, both individually and in groups, including a visually impaired mathematics student.

Research Activities

- **Assistant Professor**
  The College of Wooster *August 2011 - Present*
  - Developing experimental means to measure and control transverse spatial states of light, investigating bimodal two-photon interference.
  - Received Wooster Sophomore Research Program Grant (2012)
  - Awarded HHMI Undergraduate Science Education Grant (2012, pending validation by HHMI)

- **Postdoctoral Research**
  University of Warsaw *August 2010 - August 2011*
  - Developed entangled multi-photon sources for use in three-photon interference experiments and realistic quantum communication protocols

- **Doctoral Research**
  University of Oregon *Sept 2003 - June 2010*
  - Performed theoretical and experimental analysis of the interaction of the spin and orbital angular momentum of photons in optical fibers
  - Developed a direct quantitative analogy between the physics of photons propagating in optical fibers and that of electrons propagating in electronic waveguides
  - Designed, machined, and built apparatus for measuring two-dimensional parity of photonic transverse spatial states
  - Performed the first stable experimental parity sorting of photons

- **REU (Research Experience for Undergraduates)**
  Los Alamos National Laboratory *Summer 2002*
  - Performed computational simulation of Bose-Einstein condensate (BEC) dynamics
  - Contributed to the development of parallel, high-performance codes for the BEC simulations

- **Murdoch Summer Research Award Recipient**
  University of Puget Sound *Summer 2001*
  - Performed Young's double slit experiment for monochromatic light at the single-photon level

Publications

- **C. C. Leary**, M. G. Raymer, and S. J. Van Enk, "Quantitative Analogy between Electrons and Photons Propagating in Inhomogeneous Guiding Media," *manuscript in preparation* (2010).
- Yoonshik Kang, Kiyoung Cho, Jaewoo Noh, Dash Vitullo, **Cody Leary**, and Michael G. Raymer, "Remote preparation of complex spatial state of single photons and verification by two-photon imaging experiment," *Opt. Express* **18**, 1217 (2010).
- **C. C. Leary**, M. G. Raymer, and S. J. Van Enk, "Spin and Orbital Rotation of Electrons and Photons via Spin-Orbit Interaction," *Phys. Rev. A* (Rapid Communications) **80**, 061804 (2009). (*Selected to appear in the December 2009 issue of the Virtual Journal of Quantum Information*)
- **C. C. Leary**, L. A. Baumgardner, and M. G. Raymer, "Stable mode sorting by two-dimensional parity of photonic transverse spatial states," *Opt. Express*, **17**, 4 (2009).
- **C. C. Leary**, D. Reeb, and M. G. Raymer, "Self-spin-controlled rotation of spatial states of a Dirac electron in a cylindrical potential via spin-orbit interaction," *New J. Phys.* **10**, 103022 (2008).

Publications in Conference Proceedings

- Dashiell L. Vitullo, M. G. Raymer, **Cody C. Leary**, Siddharth Ramachandran, "Photonic Spin-Orbit Interaction in Few-Mode Optical Fiber," in the proceedings of the Frontiers in Optics: Laser Science XXVII Conference, San Jose, California, October 16-20 2011.
- **C. C. Leary** and M. G. Raymer, "Single-Photon Spin-Orbit Coupling and LOQC," in Conference on Laser and Electro Optics 2008 and 2008 Quantum Electronics and Laser Science Conference (CLEO/QELS), San Jose, CA, May 4-9, 2008.
- **C. C. Leary** and M. G. Raymer, "Cluster State LOQC with Entangled Spatial Modes," in Conference on Coherence and Quantum Optics 2007, Rochester, New York, June 13, 2007.

Invited Seminars and Conference Presentations

April	2012	Invited Seminar	Physics Department, Oberlin College	Oberlin, OH
Jan	2011	Invited Seminar	Physics Department The College of Wooster	Wooster, OH
Nov	2010	Invited Seminar	Center for Theoretical Physics, Polish Academy of Sciences	Warsaw, Poland
Oct	2010	Invited Seminar	Physics Department	University of Warsaw, Poland
Mar	2010	Conference Talk	American Physical Society March Meeting	Portland, OR
Oct	2009	Invited Seminar	Physics Department	Willamette University, OR
Jun	2009	Conference Poster	7th Quantum Optics Conference	Zakopane, Poland
Feb	2009	Conference Poster	Southwest Quantum Information and Technology	Seattle, WA
May	2008	Conference Talk	Quantum Electronics and Laser Science (QELS)	San Jose, CA
Feb	2008	Conference Talk and Technology	Southwest Quantum Information	Santa Fe, NM
Nov	2007	Invited Seminar	Ultrafast Group	Oxford University, UK
Jun	2007	Conference Poster	Coherence in Quantum Optics	Rochester, NY

Awards and Fellowships

2012	Research Grant, Wooster Sophomore Research Program
2012	Research Grant, HHMI Undergraduate Science Education (Pending validation by HHMI)
2009	Travel Grant, 7th Quantum Optics Conference, Zakopane, Poland
2008	APS Travel Grant, CLEO/QELS 2008, San Jose, CA
2004-2006	NSF GK-12 Fellowship
2001-2003	Seward and Jack Fellowships (each given to an outstanding physics major)
1999-2003	Wallerich and Howarth Fellowships (each given to four outstanding science majors)