

J. Caleb Speirs

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Summary

Colorado School of Mines graduate with Master's in Applied Physics and Bachelor's in Engineering Physics with experience in teaching and good oral and written communication skills.

Education

Colorado School of Mines M.S. May 2012
Applied Physics
GPA: 3.12

Colorado School of Mines B.S. May 2011
Engineering Physics
GPA: 3.36

Teaching Experience

PHY111 Algebra-based Physics I, *Instructor* Arapahoe Community College
Aug 2012 to Present

- Currently teaching a 5 credit hour, 25 student Physics I lab and lecture course.
- Topics covering introductory physics: kinematics, vectors, Newton's laws, circular motion, work and energy, and rotational motion.

Advanced Lab II, *Teaching Assistant* Colorado School of Mines
Jan 2012 to May 2012

Instructor: Lawrence Wiencke, Ph.D.

- Responsible for equipment set-up, organization, maintenance, and trouble-shooting, which includes MCA Cards, scintillator detectors, delay and gate generators, high voltage supplies and amplifiers, pre-amplifiers, and X-ray generator.
- Taught the 20 student course when instructor was absent.
- Experiments include γ -ray and α particle attenuation, Compton scattering, Muon lifetime measurement, X-ray scattering, Cosmic-ray angular distribution and γ - γ coincidence.
- Oversaw and enforced lab safety regulations while promoting student responsibility for own safety.

Modern Physics Lab I, *Teaching Assistant* Colorado School of Mines
Aug 2011 to Dec 2011

Instructor: Frank Kowalski, Ph.D.

- Organized changes to the course curriculum and structure when needed, working together with the instructor and fellow teaching assistant.
- Lab topics include noise, uncertainty, diffraction, acoustics, spectroscopy, polarization, Doppler shift, and charge-to-mass ratio.
- Administered and coordinated grading of homework and lab report assignments.
- Facilitated student involvement in the laboratory portion of the class, and supported the approximately 30 students in the learning process during their work.

Research Experience

Thesis Project: Utilizing spatial frequency-modulated imaging in two-photon microscopy, I developed, constructed and characterized a two-photon microscope capable of using a single-element detector with line-cursor geometry.

Senior Design: Working with MOABC at CSM, designed a long working-distance high NA objective with constraints specific to multi-photon microscopy.

Other Work: Responsible also for the design and construction of a high-resolution multi-photon laser microscope capable of imaging a single quantum dot.

Publications And Presentations

E. Hoover et. al. "Eliminating the Scattering Ambiguity in multifocal, multimodal multiphoton imaging systems", *J. Biophotonics* **5** (5-6), 425-436, May 2012

D. G. Winters, J. Speirs, E. Block, R. Bartels and J. A. Squier, "High-Speed Two-Dimensional Multiphoton Microscope using Spatial Modulation", *CLEO: Science and Innovations*, San Jose, CA. May 6, 2012. Nonlinear Microscopy (JW3G)

Thesis: John Caleb Speirs, *Extended Source Geometries for Multiphoton Microscopy: Eliminating the Scattering Ambiguity*, Colorado School of Mines, 2012

Presented: John Caleb Speirs, "Characterizing Single Quantum Dots with a Multiphoton Microscope", SPS Zone Meeting, Grand Junction, CO, Oct 1, 2011.

Presented: Caleb Speirs, "Extended Source Geometries for Multiphoton Microscopy: Eliminating the Scattering Ambiguity", Physics Department Colloquium, Colorado School of Mines, May 1, 2012.

Group Work

Project Leader in the CSM EPICS team project program designing a safety adapter for the Denver Airport Fire Department

- Led diverse multidisciplinary team in design project improving a fireman's helmet
- Presented final product in technical reports and public presentation

Project Leader in an EPICS II team project for Dr. David Wu of the Chemical Engineering department of CSM.

- Simulation of a self-assembling virus capsid. Required use of C++, Microsoft Visual Studio, and various programming techniques

Skills

Computer Software: Mathematica, MATLab, Microsoft Visual Studio, Solidworks (CAD), Mac OS, Linux/Unix operating systems, Latex typesetting language, C++, Java, and OOP modality, Microsoft Excel, Word, Project, PowerPoint.

Mathematical Background: Calculus, differential equations (partial and otherwise), group theory, Fourier analysis, complex integration and analytic functions, Green's functions, Hilbert spaces and orthonormal sets, Lagrangian and Hamiltonian formalism, dirac notation, calculus of variations, probabilities and statistics, linear algebra.

Laboratory Skills: Oscilloscopes, multimeters, scintillators (use and components), breadboards, understanding of design and making analog and digital circuits, familiar with vacuum systems, optics lab, and machine shop (end mill, engine lathe, cutting devices, acetylene torch cutting, welding, grinding, polishing and painting).

Professional Memberships

American Physical Society, 2010-2012

National Society of Physics Students, 2010-2012

Other Activities

- Volunteer, AAPT CO/WY Section Meeting, May 1st, 2010.
- Treasurer, Society of Physics Students (SPS), Spring 2010 - Spring 2011
- A voluntary two-year mission for The Church of Jesus Christ of Latter-day Saint, Aug 2007 - Aug 2009