
November 28, 2007

Dr. James J. Butler
Physics Department Chair
Pacific University
2043 College Way
Forest Grove, OR 97116

Dear Dr. Butler,

I am writing to apply for the position of Assistant Professor of Physics at Pacific University. I am currently a doctoral candidate at Duke University, and expect to complete my PhD degree requirements by May 2008. As a graduate of Whitman College, I fully believe in the value of a liberal arts education, especially in the science fields. In choosing my career path, I seek to offer students the best of my own experiences: participation in leading-edge research, personal and dedicated instructors, and exposure to broad topics in physics as well as the core liberal arts.

My academic training and research experience, both at the undergraduate, and graduate levels, have prepared me to be a dynamic instructor and to lead an active research program that involves undergraduates. My first experience in physics research was as an undergraduate in an optics lab and I quickly discovered that cutting-edge science can be carried out on a single optical table with a handful of simple devices. Performing research was the most influential experience in my decision to pursue an advanced degree in physics, so I strive to offer this experience to my own students and share with them the "kick in the discovery."

My past and current research has been in the general fields of nonlinear and quantum optics. At Whitman College, under the supervision of Professor Mark Beck, I demonstrated a new technique for quantum state measurement by performing balanced homodyne tomography with array detectors. As a graduate student in Professor Daniel Gauthier's group, I have been fortunate to participate in a broad range of research projects: performing the first direct observation of optical precursors, developing broadband fiber-based slow-light, demonstrating an all-optical switch based on nonlinear optical patterns, and constructing a simple 2D magneto-optical trap (MOT). This breadth of experience allows me to select from a large number of projects and identify many research opportunities for undergraduate students.

In general, I am interested in studying the interactions between light and matter, especially when nonlinear interactions give rise to new phenomena with novel applications. For my future research, I intend to continue my initial work with the highly-anisotropic atom trap, as described in the enclosed Statement of Research. This research is ideal for undergraduate students for several reasons. First, the MOT system involves multiple facets of atomic and optical physics. Second, the modern techniques for atom cooling and trapping require standard laboratory equipment, and third, the experiment uses relatively inexpensive components and devices. Students participating in this project will gain practical skills in optical system design, data collection and analysis, vac-

uum technology, and laser operation. Fundamental concepts such as geometrical optics, optical polarization, magnetic fields, atomic resonance, nonlinear optics, and optical and quantum coherence are all reinforced through learning to operate a MOT. The proposed project can lead many different directions and will give students the opportunity to conduct relevant new research resulting in conference presentations and peer-reviewed journal publications.

Throughout my graduate career, I have had many rewarding experiences as a teacher and mentor. As a senior undergraduate, I served as a teaching assistant for the introductory laboratory course. At Duke, I led laboratory sessions for introductory physics courses designed for Engineering and Pre-Med students. After becoming a research assistant, I chose to continue my role as a teacher and mentor by tutoring physics students through the Duke University Peer Tutoring Program. This spring, I will be co-teaching a Research Skills course that is designed to expose students to many of the tools used in a research setting such as the LabVIEW programming language, data analysis, optical system design, numerical modeling and document preparation.

Outside of the university setting, I have contributed to an elementary school outreach program by designing and presenting a variety of science activities to 2nd, 3rd and 5th grade classes. I have also served as a scientific consultant for the Palouse Discovery Science Center in Pullman, Washington, a hands-on science museum founded in 2003 that is developing exhibits for the interactive exploration of science and nature.

Overall, I feel I would be a good fit for Pacific University. My research interests are well suited to undergraduate students, and I have experience in both mentoring undergraduate researchers and performing research as an undergraduate myself. I also maintain an active interest in teaching and have broadened my teaching experience by seeking out opportunities to teach in a wide variety of settings. On a more personal note, as a native of the Pacific Northwest, I would love to return to the area.

I have enclosed my curriculum vitae (including a full publication list), a statement of my teaching philosophy, and a description of my proposed research. Letters of recommendation will arrive under separate cover. I am happy to provide any additional information should you be interested. I look forward to hearing from you and hope to have an opportunity to discuss the position and how I could contribute to the Department of Physics at Pacific University.

Best Regards,

Andrew M. C. Dawes