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Teaching Statement

How physics fits into a greater liberal arts education is not a trivial question. Physics is ideally suited as a tool for teaching students analytical reasoning, critical thinking, and creative problem-solving skills. As such, physics departments face two important challenges: to propel interested students forward on a path of scientific inquiry, and to interest students without a predilection for science. Both present unique challenges and great rewards.

For students already interested in physics, the task at hand is to push them forward. During my own liberal arts education, the invaluable opportunity Wesleyan offered was to incorporate interested undergraduate students into active research. There are incalculable gains to students learning experientially as well as academically - by searching out solutions to questions that excite them, where the answers are not already known. Student driven research creates a feeling of ownership, a feeling that they are truly invested in the development of physics as an active field.

I look to leverage my research network in order to increase students' exposure to large-scale research beyond the capacities of a liberal arts institution. My postdoctoral fellowship outside the U.S. allowed me to work in a multilingual, multicultural environment, and to establish a long-term collaborative partnership with Dr. Daniel Comparat at Laboratoire Aimé Cotton, a highly ranked French atomic and molecular research center located on one of the largest scientific campuses in Europe. I have also maintained a strong collaboration with Professor Andreas Buchleitner, principal investigator of the Quantum Optics and Statistics theory group at the University of Freiburg, designated in 2007 as a German "University of Excellence". Both are excited about the possibility of regular informal undergraduate student exchange.

Less interested students pose a different set of challenges. Most students enrolled in introductory physics initially view it as a chore and not a choice. They are fulfilling a requirement for their major, or a preadmission requirement for medical school. Many students get easily bogged down by all the math and equations, never stopping to look at the bigger picture of what the math represents.

Consequently, one of my biggest challenges as a teacher is to engage students in the material. Combining discussion groups with lectures is one way to get hesitant students interested. I have found this creates an environment where students feel comfortable asking questions. Reviewing the material covered in lecture during discussion groups helps reiterate core ideas with a focus on real-world examples. Flexible office hours and prompt responses to emails help struggling students feel more supported and less lost. I like utilizing weekly short quizzes to engage students by linking the physical principles discussed in lecture to tangible examples that students can relate to. Moreover, weekly quizzes help students stretch their critical-thinking skills to creatively apply the material developed in lecture to situations they haven't considered before. These frequent quizzes

help to identify struggling students and prevent them from falling behind as the course progresses. Finally, quizzes serve as a mechanism to give me feedback on generally problematic areas.

These methods were effective during my time at the University of Virginia. Anonymous student evaluations of my teaching included:

> "Josh was very interesting to listen to and really broke the concepts down well making everything easily understandable."

> "I felt like he invested a lot of energy into our section, which always made it a pleasure to attend."

> "He explains things so well... he actually cares if people do well."

> "Josh was a great teacher, explained concepts simply and effectively."

The reason to have students study physics isn't so they can calculate the trajectory of a cannonball or the period of a pendulum - these are not requisites for being an educated citizen. The importance of physics is that it develops the problem-solving and critical-thinking skills that are required for success outside the physics classroom, the hallmark of a liberal arts education. As a teacher, I try to construct connections between the material my students learn in lecture and the world they know. The equations and math may not stay with them forever, but the problem solving techniques they develop will help them become educated adults and attain their future goals.