Teaching Statement

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I have always been very enthused about teaching. During the seven years that I was an assistant professor at Princeton, I taught introductory physics in both the course for majors and the course for premeds, intermediate mechanics, and graduate particle physics. For a few years, I was also in charge of the labs for the semester of the premed course which focused on E&M. During this time, I significantly updated the labs, bringing in more modern computers and equipment, revising the procedures, and completely rewriting the lab manual. While at Princeton, I also worked with Professor Dan Marlow to develop a special "Freshman Seminar" to teach introductory physics by focusing on weather satellites. We taught mechanics in the context of rockets and satellite orbits, and the students built and used electronics to receive and decode images from NOAA weather satellites [1].

There is of course no teaching requirement at Fermilab, but I have chosen to pursue a wide variety of teaching and outreach opportunities on my own initiative during my time here. My most formal teaching experience has been with the US Particle Accelerator School (USPAS). USPAS is a DOE program that operates a two-week set of courses twice a year, each time with a different host university. The two-week courses must establish to the satisfaction of the host university that they cover *an entire semester's worth of material*, so the students will receive credit at that university. With the USPAS, I have taught graduate accelerator physics hosted by University of Texas Austin (Jan. 2012), University of Tennessee Knoxville (Jan. 2014), and Old Dominion University (Jan. 2015). I also taught undergraduate accelerator physics hosted by Colorado State University (June. 2016)[2]. I have given guest lectures in courses at Northern Illinois University, Columbia University, and MIT, as well as teaching at the Hadronic Collider Physics Summer School (HCPSS) on several occasions [3]. In addition, I've lectured to high school students in our Saturday Morning Physics program, and given a variety of public talks on numerous topics, including science history and "free energy" hoaxes.

Ten years ago, at the request of Vladimir Shiltsev at Fermilab and Rod Gerig at Argonne, I created the "Lee Teng Undergraduate Internship in Accelerator Science in Engineering" [4]. This is a joint 10-week summer internship in which undergraduates work closely with a mentor at one of the two labs on a project related to accelerator science. This has grown into one of the most competitive internships at the lab. Last year we had 126 applicants for 10 slots (five at each lab), and many of our former interns our now pursuing successful careers. From the beginning, I have served as the program director and chair of the selection committee. I've also mentored several undergrads in the program, as well as interns in other internship programs.

Although Fermilab does not grant degrees, we have a formal "Joint University-Fermilab Doctoral Program in Accelerator Science and Technology" [5]. In this program, students who have completed their graduate course work come to Fermilab to do their thesis research, co-mentored by a Fermilab scientist and a professor at their home institution. The lab provides all financial support for the student during this time. I oversaw the Joint Doctoral Program for several years, and I've mentored three graduate students myself. I mentored Xiaobiao Huang in partnership with Prof. S.Y. Lee at Indiana

University. After earning his PhD, Xiaobiao was immediately hired as a staff scientist at SLAC, where he is still working. With Prof. Sacha Kopp at University of Texas Austin, I mentored Bob Zwaska and Meghan McAteer. After his PhD, Bob earned the prestigious Peoples Fellowship at Fermilab, and he is currently a staff scientist. Meghan was awarded a Marie Curie Fellowship to work at CERN, and is currently working at DESY. If I come to UC Davis, I would be very interested in sponsoring a student for this program. I have several ideas for projects which would by synergistic with high energy group and/or the Crocker Cyclotron.

At UC Davis, I feel confident that I could teach any course in the standard physics curriculum, except for perhaps the most specialized, but I am particularly excited about the teaching opportunities afforded by the Crocker Cyclotron, a purpose for which is has been very underutilized. The ways in which the facility can be used for teaching are almost limitless, but they fall broadly into three categories.

- When we re-establish a nuclear research program at the cyclotron, there will be a steady stream of thesis projects for graduate students.
- The beam provided by the cyclotron and be used as a teaching tool for instrumentation, data acquisition, etc. I've learned working with the internship that students are very excited to work with real hardware in a real beam. I envision a set of labs built around the cyclotron which would either be integrated into an existing course, or perhaps developed into a standalone course or seminar.
- There are numerous evolving educational opportunities related to upgrading and improving the cyclotron itself. For example, modernizing he controls system would be an excellent Electrical Engineering Master's project, and there are accelerator physics topics associated with the commissioning of the new ion source and increasing the current of the machine.

As I said, I'm very excited about the educational opportunities of the cyclotron, and I feel that my own background makes me uniquely qualified to take advantage of them.

References

[1] "Satellite Imagery: A New Approach to Introductory Physics", http://home.fnal.gov/%7Eprebys/talks/satellite_seminar.ppt

[2] "Accelerator Physics" (Graduate Course): http://home.fnal.gov/~prebys/misc/uspas_2014/
"Fundamentals of Accelerator Physics" (Undergraduate Course): http://home.fnal.gov/~prebys/misc/uspas_2014/

[3] "Fermilab-CERN Hadron Collider Physics Summer School 2014": https://indico.fnal.gov/conferenceTimeTable.py?confId=8769#20140811

[4] "Lee Teng Undergraduate Internship in Accelerator Science and Engineering": http://www.illinoisacceleratorinstitute.org/

[5] "Joint University - Fermilab Doctoral Program in Accelerator Physics and Technology": http://apc.fnal.gov/programs2/joint_university.shtml