A Long-Term Engagement
by Toni Sauncy, Society of Physics Students President

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The Angelo State University Society of Physics Students and Sigma Pi Sigma chapters have been actively involved in a variety of different science outreach activities for more than ten years. Our efforts are aimed at K-12 students and have been broad in scope, ranging from the “science adoption” of a fifth-grade class to a community birthday party for the laser, to the more “ordinary,” audience-style presentations for public school students at all grade levels.

As a mid-size regional university in a sparsely populated and expansive geographic area, we were compelled to incorporate “on the road” outreach in order to target those underserved schools with significant populations of groups underrepresented in physics, consistent with SPS National Council initiatives. Our debut on the road in 2003 was at a small rural school, with four undergrads bringing the excitement of physics to a gymnasium filled with eager middle school children and a kindergarten class that tagged along. Since that humble beginning, the “Peer Pressure Team” has been responsible for the intersection of more than 120 undergraduate presenters with well over 10,000 attendees and participants in this decade-long adventure.

We will embark on our seventh annual week-long physics road tour this spring. The program includes a number of fun and educational physics demonstrations related to the concepts of static and dynamic pressure, waves, sound, and mechanics, including levitating balls and a grand finale of thrilling rides on a student-built hovercraft or our exquisitely executed version of a liquid nitrogen/boiling water thunder cloud. The type and variety of demonstrations and hands-on activities in our programs has evolved over the years to meet the needs of our community partners and to connect our undergraduates with other physicists around the nation and the world. For example, in 2005 we joined with physicists around the world to celebrate the World Year of Physics, and in 2010 we geared our presentations around laser physics in honor of the 50th anniversary of the invention of the laser. Every year, a new batch of dynamic and creative undergraduate physics students join in with fresh ideas about ways to engage younger students in the excitement of discovery and at the same time live out their own innate fascination with the “cool” things that nature has to offer. We model much of our repertoire after many similarly dedicated programs around the country.

While there may be debate about the real value of such activity, most can agree that these programs are important, although developing meaningful assessments to substantiate this notion is elusive, if not downright impossible. Nevertheless, university administrations generally agree that these pro-bono public service programs carried out by dedicated faculty and students generate positive attention and are willing to support such endeavors. Some may ask, “Why?” Why spend the time, money, and energy? We claim, as do others, that our purpose is to “enhance attitudes toward science, to educate, and to inspire.” However, in retrospect, I can say confidently that the real necessity of these public engagement opportunities goes well beyond inspiring elementary, middle, and high school students about the possibility of pursuing a career in a science field or even impressing important university donors. I have come to understand that perhaps the single most important consideration is what undergraduate students themselves gain from learning how to participate in public engagement and professional service. Moreover, this introduction to the expectations of a professional community is vital to the success of a healthy departmental culture.

In our home state of Texas, a number of physics degree programs have been discontinued due to a lack of majors, leaving those of us who escaped the ax pondering the best ways to recruit and retain students in physics. With each outreach event, the long-term engagement between my students with their professional community is reinforced. As they realize their role as budding physicists, their commitment to physics grows deeper, and as students are mentored by tireless faculty, the students become mentors themselves. With each demonstration the student is challenged with the mantra “you don’t know it until you teach it.”

“If you can’t explain it simply, you don’t understand it well enough.”
—Albert Einstein
When an undergraduate student learns how to present and explain a demonstration, the “ah-ha!” moment is inevitable, as they truly understand and illustrate tangibly for others some physics principle learned previously in a classroom. It gives them purpose. And maybe having a true sense of purpose causes some to take seriously their oath to dedicate themselves to the service of the profession of physics that they once uttered upon induction into Sigma Pi Sigma.

For some, it makes them strive harder to be part of a future Sigma Pi Sigma induction. As of the 2011 Angelo State SPS Road Tour, the graduation rate of students who participated in at least one week-long excursion was 100%. Inclusion of all students who participated in at least two outreach events of any kind in any one-year period brings the percentage down . . . to 98%. Admittedly, whether or not their participation in professional service played a role in the success of these students is unmeasurable, but survey information from a recent poll of alumni who were actively engaged in service as students argues strongly in favor of the notion that the experience was invaluable to them and that it had a profound effect on their careers and professional lives after graduation.

Why do professional service? Because that is what good scientists do, and as mentors, our encouragement of undergraduates to become engaged for the first time as professional scientists at the very earliest stage of their career matters. These students are immersed in the true culture of scientific citizenship, taking ownership of the physics they present, making an impact not just on the students with whom they interact, but on the profession of physics as a whole. The idea of scientific citizenship starts here, with something as simple and otherwise unimportant as explaining to a fourth grader why a ketchup packet floats in a two liter bottle but sinks when the bottle is gently squeezed. As undergraduate physics programs across the nation find themselves facing programmatic cuts, the value of engaging undergraduate students in purposeful service as a means of retention in the major should be considered not just a good deed, but a long-term investment in the future of physics.

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LEFT
Angelo State University physics student, Blake McCracken, slams boiling water into a cooler with liquid nitrogen to demonstrate a nitrogen thunder cloud. The boiling water, at 212 F, and liquid nitrogen, at −320 F, react to quickly expand and form a cloud.

Photos by Tim Fischer, Midland Reporter-Telegram.