

The Little Shop of Physics (LSOP) had an exciting year of hands-on science in 2014! The traveling Road Program with over 100+ hands-on experiments visited over 18,000 students on the second half of our *Science...Get Curious* tour and the first half of our *Your Getting Warmer* Tour. We broke the Guinness World Record for largest physics lesson ever with over 10,000 students at *Weather and Science Day*. LSOP continued to take part in special events reaching tens of thousands of people, including The USA Science and Engineering Festival, Super Science Saturday and our own 23rd Annual Open House. We continued our outreach on Native American Reservations, including our 8-year partnership with Oglala Lakota College. We have expanded our Internet presence, launched a new website and several new weekly podcast series. Little Shop of Physics has continued our professional development and teacher mentoring efforts.

The cornerstone of Little Shop of Physics is our Road Program. Every Thursday, LSOP takes the show on the road with our 100+ interactive experiments. We set up at schools, and invite students to explore science. Little Shop of Physics Staff includes University Instructors and former K-12 Educators, who believe strongly in the kind of inquiry-based exploratory learning that is so unique to LSOP. Our interns are Colorado State University undergraduate students, several of whom are future science teachers. The interns are primarily responsible for building and maintaining our hands-on experiments, and receive mentoring from the staff while have a unique experience teaching in the classroom.



Every year LSOP Road Program has a theme, which is used to tie together the experience with an introductory engagement investigation as well as a closing science-based gift that we give to all the students so that they can continue to do science at home. Spring 2014 marked the second half of our *Science...Get Curious!* Tour. This tour focused on exploratory learning and the scientific process. The introductory exercise used a “light microphone” which consisted of a solar panel connected to an amplifier and speaker. Students would suggest different sources of light in which to “listen”. The giveaway consisted of color-changing Little Shop of Physics bracelets, and students were told that these bracelets turn purple, but that they would have to experiment to figure out how. Fall 2014 marked the beginning of the *You’re Getting Warmer* Tour, which has a double meaning of getting closer to understanding and also thermal energy. The introductory exercise involves a LSOP intern lighting flash-cotton in their hand, which burns with surprising speed and intensity, but does not hurt in part because of the phase transition of water from liquid to vapor removing some of the energy. The closing gift is a reusable hand warmer which uses the energy of sodium acetate transitioning from a liquid to solid in order to release thermal energy. The way students are able to reuse the hand warmers is by melting them in boiling water.

*LSOP intern and future science teacher Katie Wybenga works with an elementary student investigating the properties of clouds as part of our Road*

Guinness Book of World Records. The lesson incorporated large scale spectacles on the field performed by the LSOP Crew, smaller scale demonstrations in the stands carried out by 150 Colorado State University student volunteers, and well an interactive competent with each student getting a gift bag that they got to take home afterwards.

LSOP was invited by the National Science Foundation (NSF) to take part in their booth at the USA Science and Engineering Festival at the Walter E. Washington Convention Center in DC. Over the course of 3 days, we made available 60 of our hands-on science experiments, and presented an interactive stage show titled *Under Pressure*. An estimated 20,000 students, teachers, and members of the public spent time with LSOP. In a letter, Susan Mason the Head of NSF's Head of External Affairs wrote "*The extensive array of hands-on experiments comprising the 'Little Shop of Physics' was absolutely amazing and reflected your extraordinary commitment to sharing the excitement and importance of science in everyday life.*"



*LSOP Intern Shelby Eisenbach and Channel 9 Meteorologist Kathy Sabine pop a giant fog filled balloon to demonstrate that air has mass as part of the record breaking Weather and Science Day at Coors Field.*

The Little Shop of Physics continued to take part in free public events in addition to the road program. Our 23rd Annual Open House drew a crowd of over 6,000 people to Colorado State University, for a full day of science fun. The largest event on CSU Campus, Open House continues to be a staple of the Fort Collins community, and it is what we are most known for around the community. We participated in Super Science Saturday at the National Center for Atmospheric Research in Boulder. LSOP hosted several Community Nights in various locations. These public events showcasing our Road Program Experiments allow families to experience Little Shop of Physics who would not be able to otherwise.

We expanded our work on Native American Reservations, continuing our long-term partnership with the Colorado State University Native American Cultural Center. Over the course of the year, we visited the the Pine Ridge, Navajo, and Southern Ute Reservations. These regions have a high poverty rate and are traditionally underserved. Several teachers told us that LSOP was the only science their students experienced over the entire school year. In addition to our hands-on science experiments, we conducted teacher workshops and created a brand new program called *Get Curious*, where students are able to use our tools (high speed camera, microscopes, magnetic sensors, light sensors, and electronic stethoscopes) to explore their world around them. Over the past several years, students and educators at Oglala Lakota College (OLC) on the Pine Ridge Reservation have started their own traveling science program based on the Little Shop of Physics. In 2014 we hosted a crew from OLC for a weekend, and LSOP staff and interns assisted them and building and maintaining experiments for their Road Program. A separate crew was also able to come down and present as part of our Open House.

Little Shop of Physics has expanded our internet presence. In 2014 we launched our new website, and have begun releasing new content every week for *Tie Dye Friday*. In addition to our long running LSOP Podcast (Shopcast), *EveryDay Science!*, which features LSOP Director Brian Jones doing science with elementary students, we launched several brand new Shopcast seres. *Show Me Some Science!*, is based on requests from teachers, and designed to be incorporated into their lessons to show phenomena that might be difficult or impossible to demonstrate in class, such as pulling a Newton's Law applied to pulling school bus and quantum levitation. *Get Your Science On!* is based on requests from students, and features experiments from our Road Program. This Shopcast goes into detail on how to build the experiments, as well as the science that each one demonstrates. We also filmed a set of videos that will be released soon called *Flash Science*, where we demonstrate quick, flashy experiments that can be done with everyday materials. These Shopcasts are aimed at older teenagers and adults.

The Little Shop of Physics continued our commitment to Teacher Professional Development. We conducted several teacher workshops, including at the Colorado Science Conference, the American Association of Physics Teachers National Meeting, and at Oglala Lakota College on the Pine Ridge Reservation. For the 8th consecutive year, we taught our summer Weather and Climate Teacher Course at Colorado State University. LSOP constructed 3 different standards-aligned science kits, including lesson plans and accompanying documentation, and we conducted teacher training on the kits for teachers in Poudre School District. These kits included States of Matter for 3rd grade, Magnetism for 4th grade, and Force and Motion for Kindergarten and 2nd grade.