I have always wanted to combine research in physics with an opportunity to share its joys with children. When, after a longish turn on the academic two-year carousel, we finally settled with our five children in Durham in 1998, I had my chance. Over the past few years I have greatly enjoyed finding ways to collaborate with teachers in the local schools. Like many of my colleagues, I have visited classrooms, bringing demonstration materials from the excellent collection maintained by Dr. McNairy and presenting topics from the nature of electricity to string theory and cosmology to students of all ages. Such visits offer students not only the opportunity to learn some topics not covered by their standard curriculum, or to go to greater depth in others, but also the chance to experience science as an exciting and fun adventure undertaken by people they can meet firsthand. They are an important part of what we as a science department can bring to the local schools; they are also a lot of fun.

Over the course of a few years, I found that one topic in particular excited the imagination and curiosity of young children at Forest View Elementary the school attended by my children. The subject was astronomy. Regular invitations led me to begin to develop a set of presentations on subjects like the phases of the Moon, the seasons, why the sky is blue and the Sun looks yellow, etc. I invited students and parents for evening skywatching on the school grounds, during which I pointed out constellations and stars, and spoke of the myths as well as some of the scientific discoveries associated to them. I invited students and parents to the observatory on the roof of the Physics building, where we would peer through telescopes at planets and bright stars.

In the 2001-02 academic year, over 200 students visited the roof observatory, but our observations were limited by the dated telescopes as well as campus light pollution. With the support and encouragement of John Harer, then Vice Provost for Academic Affairs and an amateur astronomer, the department was able to establish a teaching observatory in the Duke forest in 2002, with modern telescopes in the relative dark of the woods (see related story). Outreach activities were from the beginning an important part of the observatory's mission.

At about the same time, I found I was being invited to present in classrooms more times than I could fit into my schedule. John Heffernan, an energetic and dedicated third grade teacher at Forest View, taught me about the North Carolina Standard Course of Studies, a statewide curriculum standard, and pointed out that the third grade syllabus included a unit on cycles in the Earth/Sun/Moon system, their cause and their effects on life on Earth. I was teaching the department's introductory Astronomy class, PHY55, at the time, developing ways to integrate the new observatory into the course, and I offered my students the opportunity to join me at Forest View, teaching third grade students some of the things we were discussing in class. With five volunteers working in three classrooms, and with me hurriedly writing lesson plans based on my presentations, we taught the entire unit to three classes in the fall. In the spring, with an expanded group, we added lessons on the properties of light for these three classes, and taught the astronomy units to the other third grade classes, previously hesitant teachers now welcoming us enthusiastically.

That summer, with the help of a NASA Space Grant, John and I rewrote the curriculum
materials in a more organized form, available at http://www.cgtp.duke.edu/~plesser/outreachstuff/EarthSunMoon.pdf, and the following year Duke volunteers taught the entire sequence to all third grades at Forest View as well as Hillandale Elementary. The program has continued to grow, and this past year comprised 16 volunteers, including one postdoc, one graduate student, some Physics majors, and other undergraduates, teaching the entire unit to 13 third grades at four local elementary schools. The students meet with their classes for an hour once a week, and all meet with me once a week to discuss the upcoming lessons, teaching ideas, and science background.

In August, the Durham Public School system will introduce a standard curriculum unit (kit) for teaching this material. About half of the inquiry-based activities in the kit are based on the lesson plans developed at Duke. As the kits are rolled out to the first cohort of teachers this fall, the plan is to provide a Duke volunteer to support each teacher using the kit for the first time. Over the next few years this will introduce the kit to all third grades in the district. This summer, John was awarded a prestigious Kenan Fellowship to continue to work with me to develop this curriculum and to make it available statewide. Over the next two years we will work to produce a web-based version designed to make it accessible to teachers throughout NC.

Teaching children science is an amazingly rewarding experience, for me as well as for the student volunteers. One student, now a Physics major, wrote me: “I want to thank you for ... helping me get involved in the 'extracurricular side of physics' here at Duke. Seeing the kids at Forest View get so excited about science has really made me consider a career in physics.” I couldn't have said it better.

Students at Hillandale Elementary compare a styrofoam "Moon" to the real thing.
Physics major Jon Adkins explains the seasons to a Hillandale third grade class.

Duke volunteer Katie Dunn and Ms. Spearman's class discuss the phases of the Moon.