SUCCESSFUL COMPONENTS OF PLANETARY SCIENCE FIELD TRIPS, B. H. Betts, R. Kenealy, and D. B. Nash, San Juan Capistrano Research Institute, 31872 Camino Capistrano, San Juan Capistrano, CA 92675, Email: betts@sji.org, phone: 714-240-2010.

SUMMARY. Over 12,000 students in the 3rd to 8th grades have come to the San Juan Institute (SJI) over the last four years to attend SJI's field trip programs, including Journey Through the Solar System, a two hour introduction to the Solar System. We have evolved the program based upon teacher, student, and educator feedback, and have found several successful components. Some of these are relatively obvious, while others may not be. Here we wish to pass those lessons along to others who may try similar programs. The components we have identified as successful include: having a two-pronged philosophy of what is to be accomplished which consists of (1) trying to excite students about science, and helping them get over science anxiety by seeing science as fun, and (2) passing along basic planetary science and physical science information in the process; utilizing table top demonstrations; providing the students with workbooks to use during the presentation; providing hands-on activities including meteorites as ways to "touch space" (SJI has also recently put on display a local meteorite); having a drawing contest; utilizing visual aids including pictures and video; having lectures with coherent themes; having a question and answer session; giving students a tour through a working science lab facility; obtaining formal evaluations and informal feedback from teachers and students, and revising the program in response; and providing students with current planetary and space events and sky information updates. The latter has been incorporated into a new service SJI is offering this year: the Sky and Space Update, which is updated weekly and can be accessed by phone (714-240-3420), email list (email educate@sji.org, putting subscribe last_name first_name in the subject line), or the World Wide Web (http://www.sji.org). In addition, logistically, SJI has found it most practical to work with groups of 50 to 80 children at a time, have a program of about two hours plus a break, and to have bookings months in advance. SJI is now working to capitalize on its mature field trip program by introducing it to various media including videotape, interactive video, and the WWW.

BACKGROUND. As part of an ongoing Field Trip series entitled "Journey Through the Solar System," groups of 60 to 100 elementary school (3rd-6th grade) students visit SJI for two hours of interactive lectures and demonstrations on the subject of planetary science. Over 3000 students attended SJI Field Trips during 1995, bringing the total number of students directly instructed by this program to over 12,000 in 4 years. By November 1995 the program was completely booked through June 1996 (at our current level of 2 field trips per week). The children come from all parts of Southern California and comprise a rich mixture of cultural backgrounds. In 1994 SJI added a second program for students in the 5th-8th grades, "Exploring Planets with the Electromagnetic Spectrum." The feedback we have received from students and teachers who have experienced these programs has been extensive and extremely positive. SJI also has several non-field trip aspects of its education and public outreach programs including: (1) a high school and undergraduate student laboratory intern program; (2) a public lecture series highlighting current topics in Planetary Science; (3) one day teacher workshops following science conferences held at SJI; (4) an upcoming multi-day summer teacher workshop; and (5) museum-style exhibits at SJI open to the public, e.g. the recently added San Juan Capistrano meteorite and occasional viewings of lunar samples.
SUCCESSFUL FIELD TRIP COMPONENTS: Components that we have found to be successful based upon teacher, student, and educator feedback include:

**Philosophy:** a general two pronged philosophy of what is to be accomplished: (1) exciting students about science and helping them to get over fears they may have by seeing science as fun and (2) passing along basic planetary science and physical science information in the process. Most of the following are outgrowths of this philosophy.

**Demonstrations:** utilizing demonstrations to excite the students; for example, in our Solar System field trip, we do table-top demonstrations with CO₂ gas and dry ice with ties to the Martian atmosphere and polar caps, and with liquid nitrogen simulating planetary temperatures.

**Workbooks:** student workbooks (on clipboards with pencils) used during the presentation keep the students actively involved and act as written records for the students after the field trip.

**Hands-on:** providing hands-on activities gets the children physically involved in the learning process. Two examples are passing around meteorites and having them use a telescope.

**Drawing contest:** having an on-the-spot drawing or similar contest helps to inspire some of the children who may not be as interested in the science content, but who may get excited about space in the context of art or in the form of a contest. It is also a simple and practical activity that involves the students during the 15-minute break midway through the 2-hour program.

**Visual aids:** Pictures (projected on a screen) and video are two of the most obvious and publicly interesting sets of material to come out of the space program, both human and robotic.

**Lectures:** having lectures with coherent themes that tie everything together and lead the students through the activities and the workbook.

**Q and A:** having a question and answer session with a working scientist not only allows children to get answers to questions their teacher may not have been able to answer, but also makes scientists real in their minds.

**Tour:** giving students a tour through a science facility again acts to demystify science while making it interesting. At SJI, students are given a short (5 min.) exit tour of our lab facilities.

**Consistent feedback and evaluation:** obtaining formal teacher evaluations using a simple 1-page form as well as informal verbal and written feedback from teachers and students. Revising the program to reflect their desires matches what teachers and students really need and want, rather than just what you might think they want.

**Current information:** serving as a dissemination source for current events in planetary science and space exploration, as well as providing simple sky information. This serves to get students more involved in current excitement in space exploration. The sky information gives them activities to take with them after they leave. These types of information have been incorporated into SJI's weekly Sky and Space Update, offered by phone, email, and WWW, and presented to students attending field trips. Please check it out and tell people who may be interested in it.

LOGISTICS: SJI has found it practical to work with groups of 50 to 80 children at a time--two or so classes--small enough to connect with the children, and large enough to reach many students per year. Two hour field trips plus a 15-minute break tend to keep the students interested, provide for practical needs, and allow schools to come in the morning and either eat near SJI or return to school for lunch. SJI is now working to capitalize on its mature field trip program by introducing it to various media including videotape, interactive video, and the WWW.

Please contact the authors for more information about SJI's field trips, applying the lessons learned, or using the established field trips to test or implement newly developed education support materials.