Deep Impact — A Big Hit for Science and Public Outreach

Douglas Isbell

The collision between Comet Tempel 1 and a copper-clad impactor probe from NASA’s Deep Impact spacecraft was a smashing success for planetary science and for public appreciation of astronomy. All of the research telescopes at Kitt Peak National Observatory and Cerro Tololo Inter-American Observatory gathered good data on the amazing event, and an extra-large public crowd of 55 visitors at Kitt Peak experienced the excitement of the night side-by-side with professional astronomers.

This same public interest froze the NOAO Web site for close to two hours centered around the impact time, as too many people were trying to download a movie of the comet being created live, on the fly, by NOAO public outreach staff from still images taken with the Visitor Center 20-inch telescope. We apologize for any deleterious effects on scientific observing, or on your personal enjoyment. Interesting movies and still images of the comet were posted by 2 a.m. that night, and can be seen at www.noao.edu/news/deep-impact.

At about 9:30 p.m., while much of the crowd was outside learning how to use star charts, Humberto Campins from the University of Central Florida, one of the observers at the WIYN 3.5-meter telescope, dropped by the Visitor Center patio to give a dramatic live update on the mission under the dark skies of Kitt Peak — all was GO!

The attentive crowd returned inside to watch the 10:52 p.m. encounter on NASA-TV, and cheered along with the giddy scientists, when the spectacular impact appeared to validate all of the planning and anticipation that went into Deep Impact, from spacecraft design to space telescope observations to a worldwide ground-based observing campaign that included Kitt Peak, Cerro Tololo, and Gemini.

Local newspaper and TV coverage in Tucson before and after the event featured Kitt Peak prominently. Thanks to everyone who contributed to the success of this cohesive campaign.

Many hundreds of images were taken of Comet Tempel 1 at the Kitt Peak Visitor Center Observatory over more than two hours. The streak of light shown in the image above is the result of adding all of these images together. Starting from the left, the comet was at its natural brightness; the streak brightens significantly in the middle, immediately after impact of the probe!

The Kitt Peak Visitor Center was packed with space enthusiasts the night of the impact event.
What's more exciting than your first observing experience on Kitt Peak? Well, if you are a high school teacher doing the observing, and you manage to bag a supernova in M51 before the rest of the community has seen the announcement, that is pretty special.

The 9th annual Teacher Leaders in Research Based Science Education (TLRBSE) summer workshop took place June 23 – July 4. Eighteen teachers from across the country came to Tucson after completing a challenging on-line course in the spring covering astronomical spectroscopy, techniques for mentoring junior colleagues, and effective ways to bring research-based projects into the classroom.

The teachers arrived eager to meet other people they had gotten to know “electronically” in the distance-learning course. After several days of preparatory lectures and activities, the whole group (see photo) headed for Kitt Peak. (The kitchen recorded one of its busiest days in recent years when both this cadre and the AURA Observatories Council showed up for dinner on the same night!) The teachers all spent time observing at the 2.1-meter telescope, the coudé feed, the McMath-Pierce Solar Telescope and the WIYN 0.9-meter telescope.

In the process of learning how to do astronomical imaging at the WIYN 0.9-meter on June 30 (UT), the TLRBSE teachers selected M51 as a target and recorded images of the galaxy in four filters. "These images were taken prior to the arrival of the IAU circular announcing the discovery, and thus are some of the earliest images of the supernova taken with broadband filters," said Stephen Pompea, manager of science education at NOAO. The group could barely contain their excitement when they learned of their timely observations, and later carried out spectroscopy of SN 2005 cs from the 2.1-meter. The exploits of this group of teachers are highlighted in detail in an NOAO press release (see www.noao.edu/news) that helped garner local newspaper coverage of their Kitt Peak experience, and their plans for using their experience in their Maine and Tennessee classrooms.

The observing experience served as much more than just a chance to learn how data are collected. The teachers will use their observations as part on several ongoing research projects, including a search for novae in the galaxy M31, spectral classification of Active Galactic Nuclei, and the study of sunspots from Zeeman spectroscopy.

With their newfound experience in data collection, reduction, and analysis, these teachers are now well prepared to...
Timely Supernova Observations continued

introduce research-based science to their students. In turn, their students can submit papers on their work to the "RBSE Journal," which is formally reviewed and published by the NOAO educational outreach group. Many of the past students involved with TLRBSE have gone on to local, state and national science fairs.

Recruiting for the 2006 class of TLRBSE will begin soon with a deadline in mid-October. Interested teachers should see www.noao.edu/outreach/tlrbse/about.html or contact us at outreach@noao.edu. We make no promises about another supernova in the local universe next year!

The REU Experiment

Raelin Schneider

Six distinctly different personalities, seemingly endless data sets, two houses, and a Unix work station. Mix together, let sizzle in a little Tucson summer sun, and observe...we have the Research Experiences for Undergraduates (REU) Experiment—2005 edition.

HYPOTHESIS

We arrived in Tucson one by one. I was one of the last to arrive. June 1 was my first day at work, and I was psyched! I was led into Room 27 in the NOAO Tucson building, my new "home away from home," and introduced to the other students. Immediately, I could see different personalities emerge: some were outgoing, others more reserved, others quite grumpy. Kitt Peak REU Director Ken Mighell treated the three new arrivals to a meal at Eric's Café, which turned out to be one of the primary hangouts for the local professional astronomy crowd. This seemed due primarily to the slightly quirky menu and the lively personality of the proprietor, who caters to his scientifically inclined clientele with endless enthusiasm.

While we were eating, Dr. Mighell jokingly claimed that the NSF REU program was really a "psychological experiment" and the science was really just a "clever cover." Though completely untrue, this humorous statement got me thinking. Thus the "REU Experiment" was born. Can six distinctly different people work together, live together, and play well together for 12 weeks, and still have a successful summer? Will their time in Tucson have any impact on their future goals or aspirations? What were some of the more memorable experiences? Have the willing participants changed as a result?

THE PARTICIPANTS

ShiAnne Kattner, 22, is a student at the University of Wyoming. She is a double major in physics and astronomy. ShiAnne recently had the opportunity to participate in an exchange program at the University of Hawaii, before coming to Tucson to work with Dr. John Glaspey on developing an automated classification system for A-stars.

Mark Franz, 22, is a student at the University of Florida. Originally from Pennsylvania, he is also a dual major in astronomy and physics. Mark F., also known as "Loo" to avoid confusion with the other Mark, drove all of the way from Florida in a Pontiac with one working window and a broken air-conditioner. Crazy? I think so. Mark is working with Dr. Mighell trying to prove that red giants may be variable.

Mark Keremedjiev is an astronomy major at Cornell University. This Montana-grown young man had the privilege of turning 21 right here in Tucson. In addition to all of his birthday presents, he had the opportunity to see his long-time girlfriend, Lauren, who flew all the way to Tucson to celebrate with us. Mark is working with data from the NOAO Deep Wide-Field Survey.

Lauranne Lantz, 20, attends the University of Maryland. She is also a dual astronomy and physics major. Lauranne is the only one of the group not born in the United States. She was born in Switzerland and did not move to the United States until she was six years old. She is working on a project on angular momentum of O and B stars with Dr. Sidney Wolff and Dr. Steve Strom.

Caitlyn Smith, 21, is a student at the University of Indiana. Katie, as she is also known, is actually a veteran of Kitt Peak. As an astrophysics major at one of the three WIYN consortium...
The REU Experiment continued

schools, she has had numerous opportunities to observe with Kitt Peak telescopes. Caitlyn is searching for long-period Cepheid variables with Dr. Lucas Macri.

Raelin Schneider, 20, the author of this report, is a space physics major at Embry-Riddle Aeronautical University, here in Arizona. She is the only member of the REU group not living in the same house as the other five. She is working on a study of the variability of the open cluster NGC 2301 with Dr. Steve Howell.

TIMELINE

June 11: Sabino Canyon Hike ~ The REU students are given their first organized opportunity for interaction.

June 17: Tour of Kitt Peak ~ Ken Mighell gets his annual chance to tire-out a bunch of “20-somethings” on a Friday afternoon tour around the mountain.

June 18: Glaspey’s Pool Party and visit to the International Wildlife Museum ~ The REU students have now adapted to their tight living conditions in Room 27, and are rewarded with a BBQ and a chance to cool down.

July 2: Sunspot, NM ~ The REU students travel to New Mexico for a tour of the VLA and to reclaim the Frisbee-golf championship (though sadly, we ended up falling one point shy of the championship).

July 17–31: Observing time at Kitt Peak.

August 1–5: Presentation time, where we can now distinguish between those that were actually working in Room 27, and the ones that were just really good at faking it.

RESULTS

Any time you put a diverse group of people together, it becomes a potential psychological experiment. No two personalities are quite alike, and the personalities encountered in this year’s REU program occupied the entire spectrum of possibilities.

There were the introverts, the partiers, the oddballs, the jokesters; we were a regular “Breakfast Club.” Of course, there were some conflicts as a result, but ultimately each of the personalities added something to the mix. If you took one person out, something special would be lost, and the REU experiment loses some of its excitement. ShiAnne gave us a voice, Lauranne provided stability, Mark K. gave us excitement, Katie was always there for advice, Mark F. made us laugh, and I was up for anything.

So, can six distinctly different personalities work and play well together for 12 weeks and still have a successful summer? The answer to that is “yes, a very successful summer indeed.”

Some of us are going to be published as a result of this REU experience, some have made critical career decisions, and all of us learned more than we ever imagined. Personally, I learned what it takes to be an observational astronomer. Our observing time at Kitt Peak was one of the most productive educational experiences I have ever had.

Each of the students had observing time on the 2.1-meter and the 0.9-meter telescopes. However, due to the monsoon season, observing was kind of “hit-or-miss.” I was lucky enough to have at least one clear night on each telescope. It was so exciting watching MY data come up on the computer monitor. I remember looking at an image of the Cocoon Nebula and thinking “Wow, I just took a picture of an object 4,000 light-years away.” The nights were long and the bugs were plentiful, but the company was great and the knowledge gained was beyond compare. Observing was, for me, the best and most memorable part of this REU.

CONCLUSIONS

Through this REU program, we have all had the opportunity to make memories, friends, and new discoveries. The newly acquired knowledge each of us has obtained will help us to make decisions about our futures, and we will take it with us wherever we go. Science aside, I believe that the most beneficial part of this REU Experiment has been the diversity of the people and the variety of the experiences we shared.