



# THE SPITZER SPACE TELESCOPE RESEARCH PROGRAM FOR TEACHERS AND STUDENTS : OVERVIEW



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AND THE REST OF THE SPITZER TEACHER PROGRAM TEAM

## WHO WE ARE

The Spitzer Science Center (SSC) and the National Optical Astronomy Observatory (NOAO) have designed a program for teacher and student research using observing time on the Spitzer Space Telescope. Our educational plan addresses the NASA objectives of improving student proficiency in science and improving science instruction. Our program accomplishes this by giving a team of teachers and their students the chance to use Director's Discretionary Time on the Spitzer Space Telescope for educational observations, thereby getting scientific research into the classroom.

## WHAT WE'VE BEEN DOING

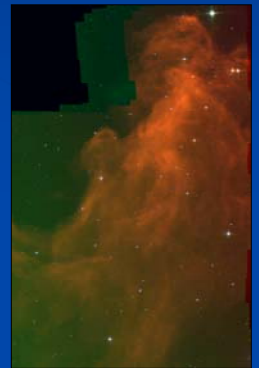
We offered this program to teachers in the Teacher Leaders in Research Based Science Education (TLRBSE), an ongoing NSF-sponsored well-established teacher professional development program at NOAO. The TLRBSE program touches the formal education community through a national audience of well-trained and supported middle and high school teachers. For the Spitzer program's first year (2004), we selected 12 teachers from the 37 TLRBSE teachers who applied. Volunteer scientists were recruited to mentor the teams. NOAO organized workshops to provide these Spitzer teachers with the background information that they needed to start work on this project, and the first round of teachers met with their scientist mentors at the Jan 2005 AAS meeting. The teachers wrote Director's Discretionary Time (DDT) proposals for observing time, including a substantial educational component. B.T. Soifer (SSC director) selected and approved the winning programs. After their data were acquired, each team came to visit the SSC at least once. In subsequent years, some teams have continued on from prior years, and additional teachers have been selected for new teams. Finding volunteer scientists turns out to be the limiting factor in forming new teams. All of the programs' proposals, progress, results, developed materials, and a listing of the team members are available on the web, linked from our "Cool Wiki" at <https://coolwiki.ipac.caltech.edu/>.

## OUR SUCCESSES

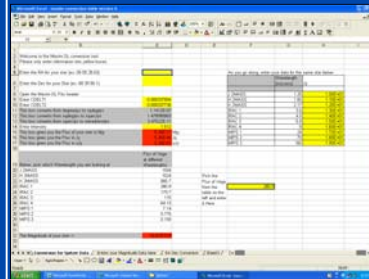
Our success continues to be affirmed on many levels. *More than 15 conference posters or journal articles have resulted from this project, with more being presented at the Jan 2008 AAS meeting.* Several students have placed highly in international science fairs. We won a NASA group achievement award in 2007. This program has provided a model for the outreach efforts planned for WISE, an upcoming NASA mission; we believe that it provides a model for other projects as well. Several of the teachers on the teams have leveraged the work they have done as part of this program to obtain data from other observatories. The cadre of Spitzer teachers we have trained are now in a great position to take advantage of any similar kinds of opportunities tied to other observatories (both ground- and space-based), and could serve as mentors to other teachers.



Left: teachers and scientists at the Jan 2006 AAS meeting

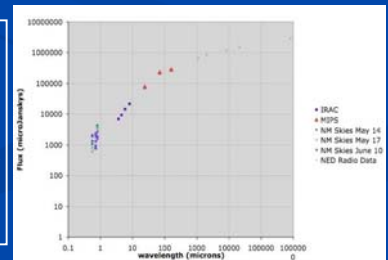


Right: IC 2118 3.6  $\mu\text{m}$  (blue), 5.8  $\mu\text{m}$  (green), 8.0  $\mu\text{m}$  (red) tri-color composite generated using MaxIm DL. (By students M. Heath, N. Kelley, P. Morton, M. Walentosky, S. Weiser – Oil City High School, Oil City, PA)



Left: Spitzer images arrive calibrated in surface flux densities, or Mega-Janskys per steradian (MJy/sr). This means that photometry routines developed for use on optical data will not work (e.g., return reliable numbers)!! On the left is a screen snapshot of an Excel spreadsheet developed by teachers (Roloefsen Moody et al.) to enable conversion of the numbers measured by MaxImDL (using traditional photometry routines) into calibrated flux units.

Right: Spectral distribution of GLAST Global Telescope Network target 4C29.45, from Adkins et al. They concluded that this spectrum matches the standard model of infrared emission from a torus around an AGN, with no additional synchrotron-driven radiation. This project has resulted in a student-driven DDT proposal; those observations are being scheduled.



## WHERE WE PLAN TO GO NEXT

New this year, we have started a wiki (<https://coolwiki.ipac.caltech.edu/>) for all of the teachers, students, and scientists in this project; we hope, other interested parties will also find the wiki useful. *Please see our companion poster, Spuck et al. (next poster), for more information about the wiki.* Multiple teachers from this project have presented or are planning on presenting a workshop on these materials at National Science Teachers Association meetings. We are planning to have another class of teacher teams meet scientist mentors in January 2008. If funding permits, we shall continue this program into the post-cryo Spitzer Warm Mission.