Authentic Astronomy Research Experiences for Teachers: The NASA/IPAC Teacher Archive Research Program (NITARP)

L. M. Rebull (Spitzer Science Center [SSC], JPL/Caltech), V. Gorjian (JPL/SSC), G. K. Squires (SSC), and the NITARP team

ABSTRACT: How many times have you gotten a question from the general public, or read a news story, and concluded that "they just don't understand how real science works"? One really good way to get the word out about how science works is to have more people experience the process of scientific research. The way we have chosen to do this, since 2004, is to provide authentic research experiences for teachers using real astronomical data. (The program used to be called the Spitzer Researchh Program for Teachers and Students, and in 2009 was rechristened *NITARP*, the NASA/IPAC Teacher Archive Research Program.) We partner small groups of teachers with a mentor astronomer, they do original research on a current astronomical topic as a team, write up a poster, and present it at an American Astronomical Society (AAS) meeting. The teachers incorporate this experience into their classroom, and their experiences color their teaching for years to come, influencing 100s of students per teacher. This program differs from other similar programs in that: (a) *Each team works on an original, unique project*. There are no canned labs here! (b) Each team *presents their results* in posters at the AAS, in science sessions (not just outreach sessions). The posters are distributed throughout the meeting, inamongst other researchers' work; the participants are not "given a free pass" because they are teachers. (c) The *'product' of this project is the scientific result*, not any sort of curriculum packet. The teachers adapt their project to their classroom environment, and we change the way they think about science and scientists.

•**OUR GOAL** is to give teachers an *authentic research experience* using real astronomical data on a current astronomical topic.
•**WE USE** *real astronomical data* from archives housed at IPAC (Spitzer, IRSA, NED, NStED, etc.) and each team does a *new* project.
•**WE SELECT** teachers from a national competitive application process; teachers must already be familiar with the basics of astronomy (e.g., what is a magnitude) and astronomical data (e.g., what is a FITS file). Most of the educators are high school teachers, but 8th grade and community college, as well as non-classroom educators, may also benefit.

MAIN PROGRAM COMPONENTS

•Group of teachers teamed with a scientist mentor; work to develop a science research program, do it, write it up.
•Teachers (& scientist mentors) attend a *start-up workshop* at a winter AAS (next: Jan 2012).
  •Workshop includes intro to infrared, tools, etc.
  •Learn about how AAS meetings work.
  •Start to define project that addresses a current astronomical topic.
  •(We pay for teacher travel.)
•Work long-distance with the team to write a proposal. (next: due Feb 2012.)
  •Must use data from Spitzer, IRSA, NED, and/or NStED.
  •Use telecons, internet-based resources such as our wiki, etc.
  •Proposal is reviewed! Rewite proposal, if necessary, in response.
•Meet for *3 days at IPAC* to work on the data and understand how science works (next: Summer 2012; one of the 2011 teams meeting THIS WEEK).
  •Each team decides on a mutually acceptable date.
  •Each teacher may be able to bring up to 2 students to this visit; students must be heavily involved in the project. (We pay for teacher/student travel.)
  •(Work remotely before and afterwards, using online resources.)
•*Present results* of the project in AAS posters (next: Jan 2013; 2011 class presents Jan 2012).
  •At least 2 posters: Science and Education.
  •Again, each teacher may be able to bring students and we pay travel.
•Teachers serve as NASA/NITARP ambassadors.
  •12 hours' worth of professional development workshops, talks, etc. over 2 years.
  •We help provide some of the tools to use.
•Teachers report back to us all the cool stuff accomplished in connection with this project. (Covers a wide range of results!)
•Teachers serve as mentor teachers to the rest of the NITARP community of teachers and students. Now have ~50 teachers who have been through the program, and almost uniformly they want to do more; they don't want to stop after just 1.5-2 years!

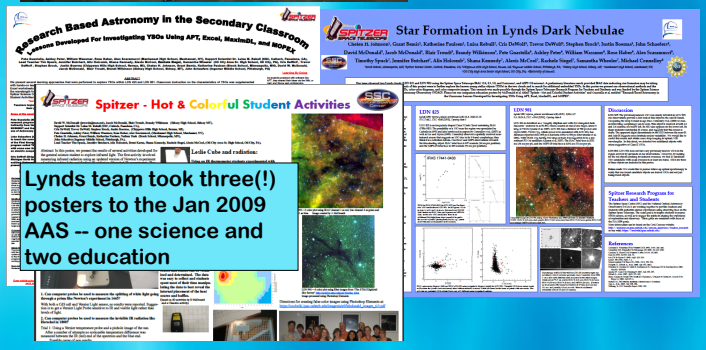
PROGRAM ACCOMPLISHMENTS (from previous incarnation as the Spitzer program starting in 2004 through NITARP, as of July 2011)

•56 educators trained (or training) in real astronomy research.
•47 science or education posters presented.
•4 research articles published in major refereed astronomical journals.
•117 students (high school, middle school, college) visited IPAC and/or attended AAS meetings.
•1200+ students used data through the program.
•More than 100 students report that the program has influenced them to pursue careers in science or related fields.
•Teachers and students have delivered ~200 presentations, reaching over 14,000 people.
•At least 100 newspaper, radio, and tv reports (plus numerous internet articles) reported on various aspects of teacher and student involvement.
•At least 43 high school students using their experiences in this program have received several regional and international science awards.

CASE STUDY: Brand new Lynds team teachers at Jan 2008 AAS meeting.

Lynds team teachers+ students+ mentor scientist L. Rebull at IPAC, June 2008. Note more relaxed than 2008 AAS -- they are becoming confident that they know what they are doing!

Lynds team teachers+ students at Jan 2009 AAS, in front of their poster (plus B. Elmegreen who was just stopping by to learn about the poster). Note that this is an incomplete group shot; many more students from this team attended the AAS.



Lynds team took three(!) posters to the Jan 2009 AAS -- one science and two education

WHAT'S NEXT

•Three 2011 teams visited/are visiting IPAC this summer (one in July, one this week, one in 2 weeks).
•These three teams are presenting science and education posters at the Austin AAS in Jan 2012 – look for the posters!
•Applications for the 2012 class are now being solicited and are due Friday, Sep 23, 2011. The first trip will be to the Austin AAS in Jan 2012.
•Watch us work! We have a wiki on which we collect materials we've developed (which you can use too!), and the current teams share data, analysis, and drafts. http://coolwiki.ipac.caltech.edu
•For more information, see http://nitarp.ipac.caltech.edu
•(Astronomers interested in mentoring or subsidizing teams should contact us for more information!)

We gratefully acknowledge funding via NASA Astrophysics Data Program funds and NASA/IPAC Archive Outreach funds.