The NASA/IPAC Teacher Archive Research Program (NITARP): Updates

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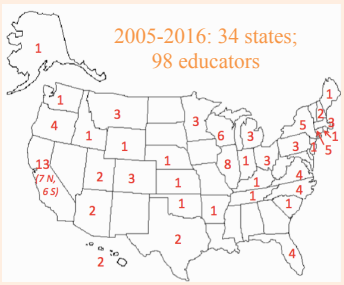
Abstract: NITARP, the NASA/IPAC Teacher Archive Research Program, gets teachers involved in authentic astronomical research. We partner small groups of educators with a professional astronomer/mentor for a year-long original research project. The teams echo the entire research process, from writing a proposal, to doing the research, to presenting the results at an American Astronomical Society (AAS) meeting. The program runs from January through January. Applications are available annually in May and are due in September. The educators' experiences color their teaching for years to come, influencing hundreds of students per teacher. This poster includes updates on the project.

Photo from 2015 AAS: 2014 class (2 teams) finishing up; 2015 class (2 teams) starting up; AND alumni who raised their own money to come!



We cover the country…mostly. We select participants from a national application process. We still have not had participants from some states; teachers particularly in the SE have endemic problems getting release time. States where there are a lot of other astronomy education resources (e.g., MD, MA, AZ, NM, TX, WV, SoCA) have overall less representation, presumably because interested teachers have other astronomy options, though we are making inroads. (2 SoCal teachers in 2016!)

Alumni still want to be involved! Increasingly, NITARP alumni are raising their own money to come back to subsequent AAS meetings (often with students) to present new work. This is entirely alumni-driven! They have such a good time with NITARP that they want to continue, and have lots of motivation to keep going.

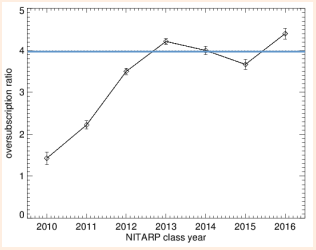
[educator:] The best part of the trip besides watching the students interact with each other [was] participating in actual research. Making analysis mistakes, regrouping and getting back to work. I really enjoyed the authenticity of the experience.

[student:] I knew that coming to Pasadena would mean that I would have amazing opportunities that I probably won't get ever again, but I definitely wasn't prepared for the amount of life changing science I would get handed.

Recent journal article #1: *Rebull, et al., "On Infrared Excesses Associated With Li-Rich K Giants", 2015, AJ, 150, 123.* When stars move from the main sequence to the giant branch, any close-in planets will get 'eaten.' But will it leave any observational signatures? Some models say high Li, fast rotation, and an IR excess can come from planet ingestion. This 2014 NITARP team looked for IR excesses around a sample of 316 sources thought to be K giants. In 24 cases, the source of the IR is not likely to be the optically bright K giant. We found plausible IR excesses around only 28 of our K giants, which was a far smaller number than we expected. But some of the biggest IR excesses were around the fastest rotators with the most lithium! It could be that, if planet ingestion really does cause all these effects, that any ejected dust does not last very long, so we have to be looking at exactly the right time to catch it in the act. Or, planet ingestion only creates dust when the conditions are exactly right (rotating above a threshold? Eating a big enough planet?). Or the few objects we found with very large IR excesses may not be giant stars at the end of their lives at all, but rather giant stars that are very young, on their way to burning hydrogen on the main sequence. (Young stars often have fast rotation, lots of lithium, and very large IR excesses.)

[student:] we realized that we're on the inside now, even though we only know a tiny bit.

[educator:] This experience certainly has changed my thoughts about astronomy and astronomers. I really did not know what they did except teach college classes. I enjoyed seeing the less formal and family friendly atmosphere at Spitzer. This experience will be shared with my students for some time.



Demand is still high. We continue to have ≳4 applicants for each spot. As Common Core and NGSS come into wider use, NITARP is a good match, but only for those teachers whose schools give them enough freedom to participate in these sorts of programs.

We're presenting results. Prior to this AAS meeting, we have presented 49 science posters, 54 education posters, 8 astronomy research journal articles, 2 education journal articles, and 6 evaluation and impact reports.

[student:] I thought that research would be isolating and that it wasn't something I could see myself being interested in for long periods of time, but if I were able to work in a team like this one, I think I could imagine doing research later in life.

Recent journal article #2: *Fitzgerald, et al., "A Review of High School Level Astronomy Student Research Projects over the Last Two Decades", 2014, PASA, 31, 37.* Through the widespread recent availability of internet in the classroom, there are many programs that get real astronomical data into the hands of high school students and teachers. But, how many get actual research into the classroom? This paper describes the 22 major student research projects active since the early 1990s, including NITARP. It compares and contrasts the programs, and discusses the lessons learned and major issues affecting the success of these kinds of programs.

[student: Real astronomers] have to be willing to feel stupid or dumb at times. This program really showed us that you're going to mess up and that its okay. Sometimes your data will be wrong or you worked a problem wrong. It is going to be okay. You can't always expect the right answer on the first try.

[educator: Despite the time and financial investment,] The visit [is] absolutely crucial … because the time we spend in person is about ten times as productive and meaningful as the time spent on telecons and over e-mail. There is something about being in a room together that really pushed out [our] understanding and work forward tremendously.

We gratefully acknowledge funding via NASA Astrophysics Data Program funds.