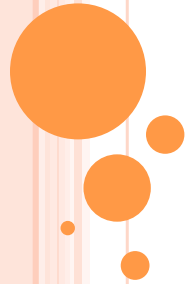
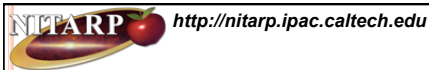


NITARP: THE NASA IPAC TEACHER ARCHIVE RESEARCH PROGRAM (OVERVIEW)



Luisa Rebull
05 Jan 2014



DATA IN THE CLASSROOM

- Four categories, with different audiences, challenges, goals:
 - Reproductions of simple or done projects, using real data (professional quality or really good amateur).
 - Essentially reproductions of done projects, using new data (or a combination of new+archival data).
 - Looking for new things in old data (e.g., citizen science).
 - Original research, professional quality new or archival data.
- Each is valid and worthy and important; each has a different footprint and reaches a different audience of educators and students and the public.
- ...But the last bin is kind of...empty. Reaches fewest people, requires most of participants, and is the most intense for participants.

WHAT IS NITARP?

- NASA/IPAC Teacher Archive Research Project. (IPAC = Infrared Processing and Analysis Center)
- NITARP has been going since 2009.
 - 2005-08, called the Spitzer Research Program for Teachers and Students.
- Goal is (and was) to *give educators an authentic research experience* using real astronomical data and tools.
- Educators then turn around and carry this experience into the classroom and beyond.

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BRIEF ASIDE: SCIENCE VS. ENGINEERING

- NITARP is going to be a science experience.
- (No reason it can't be expanded to engineering, but we haven't had the resources to do this.)
- So, what is the difference?
- *Engineers build things, scientists learn about nature.*
- Curiosity rover – engineers got it to Mars; scientists' jobs really start once it's there.
- There is a continuum of individuals, but mostly two populations, two cultures, etc. NASA has a lot of both, but more engr. And good missions/telescopes/facilities come out of the two groups working well together.

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NITARP <http://nitarp.ipac.c>

SarcasticRover @SarcasticRover
I just got an text message from SCIENCE. It wants you to do it.
Expand



@sarcasticrover

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NITARP <http://nitarp.ipac.caltech.edu>

BRIEF (FUNDING) HISTORY

- The original Spitzer program was funded out of the Spitzer EPO budget, which basically evaporated with Spitzer's cryogen.
- The NITARP program was rescued from the ashes in 2009 and was funded by discretionary money from the ADAP program (Doug Hudgins) combined with the archives at IPAC (Spitzer, NED, IRSA, etc.).
- Chaos in NASA EPO in 2013. Somehow, Doug Hudgins still found us money (if you see Doug Hudgins, **THANK HIM**), but the rest of the money is now gone.
- Chaos at NASA (sequestration) means restrictions on NASA travel, so NITARP travel now through Caltech → much more expensive.
- The 2014 class is half the size of the 2012, 2013 classes.
- We are also formally now 100% a research program. (We are not an EPO program.)

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EDUCATOR POOL

- We select our educators to be :
 - Very **savvy educators** (already capable of involving students in research or research-like experiences).
 - Reasonably savvy astronomers before we get to them, but **little/no experience in real (astronomy) research**.
 - Willing to commit to **fluctuating time commitment** over 13+ months, for **free**.
- National application process. (Due **September!**)
- This year, had ~4.5x as many applicants as spots. (2012:4x; 2013:5x)

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ALUMNI POOL...

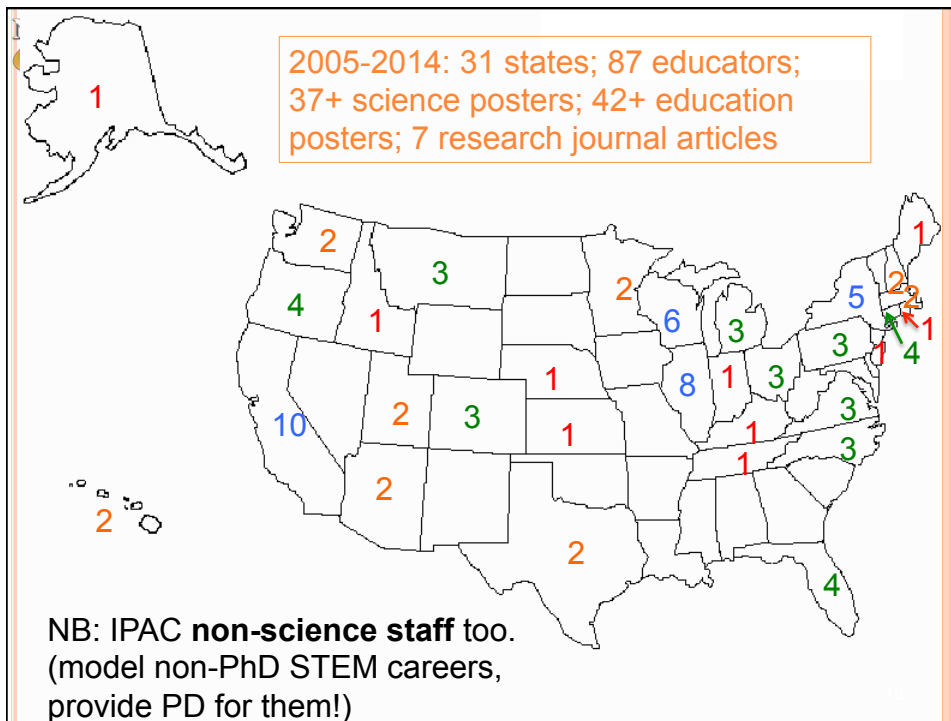
- Historically, we have been aimed at high school classroom educators, and this is still our largest contingent (alumni and participants).
- First expansion was to 7-8th gr (in 2004-2008 era).
- Second expansion was to comm. coll. (2010).
- Then amateurs (2011).
- Then museum educators (2012).
- Then 'lurkers' (2013) – other folks not in classrooms, not in museums, but in higher-level positions (we hope both NITARP and their institutions can mutually benefit).
- With the contraction in 2014, we're back to traditional educators (middle & high school).

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RECENT PARTICIPANT REACTIONS

- “I just wanted to let you know that this 38 year veteran teacher believes [NITARP] is one of the **greatest types of professional development I have ever done.**”
- [student:] “I cannot put into words how amazing and priceless the experience was.”
- “You and this program (NITARP) have been truly remarkable and has already **changed my life forever.** I'm just waiting to see what happens next.”





SCIENTIST POOL

- We select our scientists to be :
 - Very **patient**. Educators are skilled but not undergrad students.
 - Able to help team come up with a project that **MUST** be done **within a year**, no deferrals.
 - Willing to **step in** and rescue team (quickly finish reducing data, code something up, etc.), if team becomes too frustrated.
 - Willing to commit to **fluctuating time commitment** over 13+ months, for **free**.
- Each team has a **mentor teacher** (who has been through program before) to act as deputy lead, translating for both camps, which helps everyone.
- All essentially local, experienced scientists (so far).
- Have let scientists work independently, manage their teams, with support if they want it.

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MAIN PROGRAM COMPONENTS (1)

- *Group of educators teamed with a scientist mentor; work to develop a science research program, do it, write it up.*
- Educators & scientist mentors attend a start-up workshop at a winter AAS (Jan 2014).
 - Workshop includes intro to program, etc.
 - Learn about how AAS meetings work.
 - Start to define project, exchange contact information.
 - (We pay for teacher travel.)
- Work long-distance with the team to write a proposal. (due **7 March 2014!!**)
 - Must use data from IPAC: IRSA, NED, and/or NASA Exoplanet Archive.
 - Use telecons, internet-based resources such as our wiki, etc.
 - Proposal will be reviewed! (More on this later.)

You are here!

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MAIN PROGRAM COMPONENTS (2)

- Meet for 4 days at IPAC to work on the data and understand how science works (Summer 2014).
 - Each team decides on a mutually acceptable date – **YOU SHOULD DO THIS TODAY!**
 - Each educator **might be able to** bring up to 2 students to this visit; students must be heavily involved in the project. [Funding uncertainty. What if more students? What if no students? What if young students?]
 - (We pay for educator/student travel.)
 - (Work remotely before and afterwards, using online resources.)
- Present results of the project in AAS posters (Jan 2015).
 - At least 2 posters: Science and Education.
 - Again, each educator might be able to bring up to 2 students; students must be heavily involved.
 - (We pay for educator/student travel.)

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ASIDE: WHAT IF NO STUDENTS?

- This program is for **your enrichment first**, because of your leveraging potential.
- If you are a classroom educator(*):
 - You do not **HAVE** to bring students. If no one 'steps up', or you run into bureaucratic snags, or you would be more comfortable learning yourself first, or you feel your own learning would be enhanced if you were alone, **THIS IS FINE.**
 - We leave it to you to figure out (if) who to bring. Pick the leaders, or the ones who would benefit the most, or the smartest, or the ones who want it the most. You're their conduit; you gotta work with 'em!
 - If they crap out during the year, **NO OBLIGATION** to bring them back and/or keep working with them.
 - Resources donated from past participants for student selection are on the website.
 - Talk with your mentor teacher, your scientist, your team.
 - Talk to the 2013 participants while you're here!

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ASIDE: WHAT IF NO STUDENTS?

- If you are **not** a classroom educator:
 - We suggest NOT bringing students. We've had problems before.
 - (Some of you were offered a NITARP spot with the understanding you weren't bringing students on our dime.)
 - Additional *adults* change the chemistry more substantially than additional students, so please don't raise money to bring more adults.
 - Be mindful that your teammates will be bringing underage students (who often do not look underage).
- In any case:
 - You can work with whoever you want back at home!
 - **Think about how you can best leverage your participation, given your resources.**
 - Talk with your mentor teacher, scientist, team.
 - Talk to the 2013 participants while you're here!

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ASIDE: WHAT IF YOUNG STUDENTS?

- We have had middle school educators since the beginning of the program.
- In the early years, far fewer teachers brought students at all.
- In the NITARP era, the middle school educators have brought students.
- Students of all ages struggle. High school seniors: "expect to work harder than you ever have in your life"; "I thought that scientific research would be complex and complicated, but this exceeds that to a whole new level"; "This was an amazing experience, but is not for the faint of heart".
- From what we have seen, **the younger students struggle far more**. Some give up halfway through.
- Especially in 2014, we are trying to make our limited money stretch farther ...
- (You can work with whoever you want at home.)

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ASIDE: MORE STUDENTS?

- Of course, all of you can involve as many folks (of whatever age) as you want at home, to whatever degree makes sense to you, on whatever timescale.
- If you were accepted with the offer of supporting students, we are planning to pay for **up to 2** students to come on the summer visit and next year's AAS, subject to additional budgetary mayhem.(*)
- You can raise your own money to bring **up to 2 more**.
- We **strongly** recommend no more than 4 (empirical limit: you spend all your time shepherding rather than learning).
- The students you bring in the summer need not have to be the same ones you bring to the AAS – though they often are!
- Talk with your mentor teacher, your scientist, your team.
- Talk to the 2013 participants while you're here!

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ASIDE: FUNDING

- It's a mess.
- No, really, it's a mess.
- Horrific mess.
- I have no idea what is going to happen, exactly.
- I'm getting through one trip at a time. I got everyone here, and paid for the people we promised to pay for.
- We will start to deal with the Summer visits in the Spring, and by then we should have a better sense if we can pay for 2, 1, or no students per educator (if we offered to pay for your students).

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MAIN PROGRAM COMPONENTS (3)

- Educators 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.
- Educators report back to us all the cool stuff accomplished in connection with this. (Please do not forget!!)
- Some educators serve as mentor teachers to the rest of the NITARP community of educators and students.

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MENTOR TEACHER CONCEPT

- Now have ~80 educators 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!
- “First year” educators are the brand new ones (first AAS, first IPAC visit, learning the ropes).
- “Second year” educators start with their second AAS, (conduct workshops, work with students, etc.).
- “Third year” and later educators = alumni. Some join new teams as mentors. Some are involved in follow-up research of their original project using other telescopes. Some are involved in the proposal review. (I also bundle 2nd yr into ‘alumni’.)

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WHAT WE EXPECT EDUCATORS TO KNOW

- How to work your computers. How to install software on your laptops.
- The basics of modern astronomy (what is a magnitude, what is a color-magnitude diagram, what is a FITS file).
- How to turn around and use research experiences in the classroom (or equiv).
- (If you feel you are weak on any of these, talk to your team for help -- someone on your team knows, or try other teams, or alumni!)

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WHAT WE WILL HELP EDUCATORS LEARN

- Basics of infrared (? [your wavelength here]) astronomy.
- Basics of your data (telescope, operations, data) and the other archives (contents, usage) as needed.
- Basics of software usage (e.g., ds9, etc.).
- “How the sausage is made” -- what takes time, what goes fast. (and some surprisingly obvious things...)
 - “Astronomers are normal people.”
 - “There is more programming involved than I realized.”

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WHAT SOFTWARE WILL WE USE?

- It varies from team to team.
- Projects have ranged over 6 orders of magnitude in wavelength – UV to submm.
- Astronomers tend to use a wide variety of tools – they use whatever works fastest to accomplish the task at hand, and this will vary from person to person. (→)
- Some of you will be doing photometry, maybe using APT and/or ds9 (NITARP tutorials on these if you want to get started).
- Some of you will need other tools (NITARP tutorials may exist or maybe will exist).
- In any case, you'll learn as you go.

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...OR SOMETIMES WE TURN THE COMPUTER AROUND.





FIRST AAS MEETING

You are here!

- Day-long workshop to learn the basics, meet your team.
- Learn about your science topic, start on your proposal.
- Block off some dates for a summer meeting.
DO THIS TODAY.
- An alumnus (“mentor teacher”) is the scientist’s deputy for the team.
 - They will help a LOT because they’ve done this before.
- AAS meetings can be overwhelmingly busy!
 - We have a worksheet/treasure hunt (more later).

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AAS MEETING 1 – JUST ONE TEAM



2008 class

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AAS – JAN 2011

2010 class finishing up; 2011 class getting going!



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AAS – JAN 2012

2011 class finishing up; 2012 class getting going!



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AAS – JAN 2013

2012 class finishing up; 2013 class getting going!
(Biggest. Delegation. Ever!)



AAS 2014

- 2014 class is smaller, but 2013 class still large, finishing up.
- (Most of the huge pile of people we send annually are the people presenting results.)
- ~75 people expected.
- (2014 AAS as a whole is going to be smaller due to sequestration impacting government travellers, but we'll cover that again later.)

AFTER THE FIRST AAS

- Over telecons and e-mail, write proposal, learn the basics of the science and tools you will use.
 - Proposals due **March 7**.
- Keep working through the Spring in preparation for the Summer. (Journal club? Early data work?)
- A LOT of material already on how to do work with Spitzer, 2MASS, WISE data is on our wiki (and in Tutorials), and some on Kepler too. (Scientists/mentor teachers probably will want to develop more.)
- We welcome any more material that you develop that you would like to share.

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WORKING REMOTELY

- Have you worked across time zones before? (important throughout year.)
- We have a **wiki** on which people can share information – text, discussions, instructions, examples, images, files. (Other long-distance collaboration tools blocked by schools!)
- **School email breaks** often – attachments vanish or entire mail vanishes. (Fall back to gmail [et al.] if any problems.)
- We strongly encourage **regular telecons**, via Skype or tollfree number (or G+ hangouts; join.me also has nice screensharing though no audio unless you pay). *If you don't do this, team often dysfunctional.* **SET UP A REGULAR TIME TODAY.** Really. We mean it.

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VISITING IPAC

- 4-day IPAC visit (Pasadena, CA).
- Will meet more people from IPAC (including non-astronomer staff).
- Very very busy 4 days!
 - 0.5 day usually is a JPL tour.
 - If you want to do more (SOFIA?), you have to do it, pay for it, beyond our 4 days.
- Historically 3 days; offered 4th in 2011 as “training wheels” – e.g., you guys work without scientist in the building but also not far away, modeling what you will do at home. This seemed to work really well, have repeated.

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ONE TEAM'S SUMMER VISIT



2011 -
Bright
Rimmed
Clouds

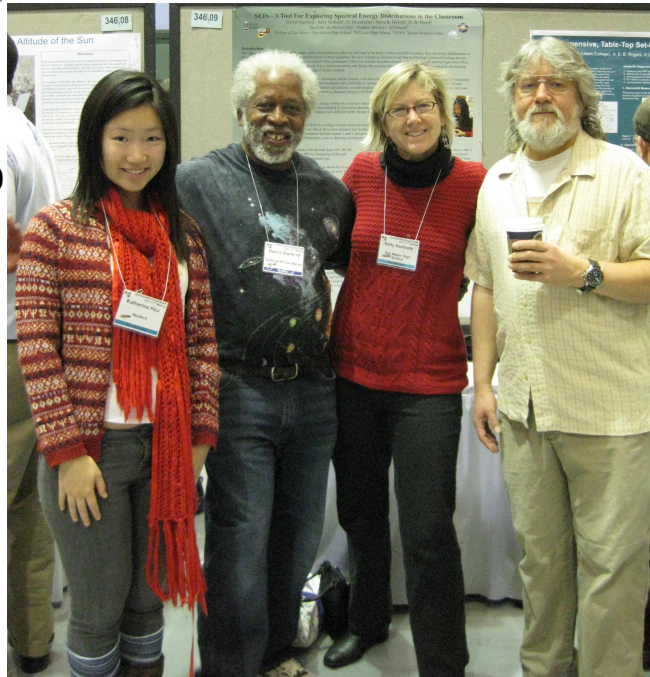
34

AFTER THE VISIT

- Work on the data while you visit and more after you go home.
- You then write up your results for the AAS, both science and education.
 - For the science, an educator should be the lead author. We try to encourage teachers rather than students to lead this. Could be mentor teacher, need not be.
 - For the education, an educator is expected to be the lead author, and include the whole team as appropriate.
 - If merited, your scientist will lead a paper for a refereed astronomy journal.

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A 2010 team



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12 HOURS OF 'SHARING'

- Generally can't stop educators from sharing ☺, but **closing the loop** is hard.
- You know about our **12 hour PD obligation** going in, and had to write up tentative plans as part of your application.
- But, we know your **plans will change** in a year, and thus we are very flexible in what we 'accept' – basically, want you to share the experience:
 - Workshops/Lectures (school, local, regional, national)
 - Articles (you write, or are interviewed for)
 - Anything else ...

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NEXT STEPS

- This is open-ended by design, and 'success' is measured differently for each team.
- (Formal assessment was tried for the first time in 2013.)
- Are there follow-up observations that would help? Some KPNO or Spitzer time may be available, or we can approach other observatories. Talk to your team!
- Can you do a similar analysis on your own of a different object?
- Mentoring the new folks...

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JUST SOME NOTES...

- At some point in this process, you will probably feel overwhelmed. Maybe you already feel like you're in the deep end of the pool.
- This will ebb and flow over the course of the meeting and the year. *I guarantee it.*
- Talk to your mentor teacher. Talk to your scientist. *Talk to your teammates.*
- Everyone brings different strengths and weaknesses to your team. You're all in this together!
- I have a "major milestones" document for you with a summary of, well, milestones through the next 12 months.
- If it doesn't feel like you or your team is "on track" *talk about it!* Talk to your mentor teacher, me, or Varoujan. Maybe you need a nudge back on track. Maybe your team really actually does need to do something different than the 'standard path.'



IT'S OK TO FEEL DUMB (1)

- *Advice from 2013 teacher:*
"Teachers need to maybe be reminded that **it is OK if they don't have any idea what they are doing at times** – and that they are not expected to be experts in the field. They **do need to be able to admit when they are confused**, be open to feed back from other team members, and have time to commit to the study."



IT'S OK TO FEEL DUMB (2)

- Scientists spend their careers feeling dumb. We are trying to figure out how things work, and fail often. Feeling dumb is part of our job description.
- Moreover, your mentor scientists work at Caltech.
- We are NOT the big fish in a small pond, and we are used to this. (I mean, we're holding our own, but ...)
- You may very well be a big fish in your pond. You are most likely not a big fish in this pond. This may take some adjustment.



IT'S OK TO FEEL DUMB (3)

- *Feeling dumb is part of our job description.*
- No, really.
- This is a *state of being* for scientists.
- I was born not knowing and have had only a little time to change that here and there. – Richard Feynman



IT'S OK TO FEEL DUMB (4)

- **We are ALL here to help each other understand.** Make all of us slow down until you get it. **We need to promise each other that we will reach across the gulf to you. But you need to reach back.**

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WEBSITES

- <http://nitarp.ipac.caltech.edu/>
- <http://coolwiki.ipac.caltech.edu/>
- First one is “public face” and will have a profile for each of you soon.
- Second is working area – you will have accounts as soon as I can. In both cases, I need **team names** to finish this process.
- We will post talks from today when we get a chance (also “soon”).
- There is a ‘resources for participants’ area on the NITARP site that includes all sorts of good stuff. (policies, procedures)

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TRAVEL ANXIETIES

- Much of your participation in this is travel.
- I think this is cool!
- But this seems to cause the most angst, phone calls, money stress, etc.
- *The faster you turn in receipts, the faster you get your money back.*
- I consolidated EVERYTHING, all the most frequently asked questions, helpful advice, etc. into a multi-page travel advice document. (You got a version customized to you at the beginning of this process, and will get another one customized to each of your next trips.)
- **PLEASE PLEASE PLEASE read and follow those instructions!**



RETURNING TO THE PRESENT...(1)

- The rest of today has two big blocks of time to work with your team.
- **TAKE ADVANTAGE OF THEM.**
- Rearrange things if you have to, e.g., don't pick up registration materials until after 5 if you need to.
- **START THE HEAVY USE OF EMAIL NOW.** Get the communication channels lubricated. After today, you should be able to 'hear' each other's voice in your head as you read emails. Make sure you are not in anyone's spam filter.



RETURNING TO THE PRESENT...(2)

- Plan to meet later in the meeting.
- Plan to attend oral sessions relevant to your science.
- Plan to look for NITARP posters and talk to the 2013 folks.
- Plan to look for posters relevant to your science.
- Plan to look for what makes a good poster and what doesn't, because you have to do this in 12 months!



RETURNING TO THE PRESENT...(3)

- We found, from past years, that the one thing that educators wanted us to do was help them get good press (literal and virtual) at home.
- Towards that end, we collected media and administrative contacts from you.
- We will put out a press release TUESDAY with a few words advertising this class and the prior class's results.
- If you gave us no contacts, it's up to you to relay the release.



<http://nitarp.ipac.caltech.edu>



NASA News

JET PROPULSION LABORATORY CALIFORNIA INSTITUTE OF TECHNOLOGY

MEDIA RELATIONS OFFICE
JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
PASADENA, CALIFORNIA 91109. TELEPHONE 818-354-5011
<http://www.jpl.nasa.gov>

Whitney Clavin 818-354-4673
Jet Propulsion Laboratory
whitney.clavin@jpl.nasa.gov

EMBARGOED UNTIL Jan. 11, 2012 9:20am CT

TEACHER PROGRAM BRINGS NASA RESEARCH TO HIGH SCHOOLS, MIDDLE SCHOOLS, MUSEUMS

Imagine you are a high school student walking into your science class in September and you learn that your teacher is doing research with NASA and you can actually participate.

This experience is occurring in schools around the US as more and more teachers become part of the NASA/IPAC Teacher Archive Research Program. 2012 marks the program's 8th year.

This program partners professional scientists with (primarily) high school teachers to carry out an original research project and present the results at the semi-annual meeting of the American Astronomical Society, the professional organization for astronomers in the US.

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<http://nitarp.ipac.caltech.edu>

SOCIAL MEDIA

- Tweet away!
- Follow Wil Wheaton's law (see here if you need to look it up: http://en.wikipedia.org/wiki/Wil_Wheaton)
- NITARP hashtag is #nitarp
- There is a Facebook NITARP group – let me know if you are not a member, and/or add your students if you want.

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LIST OF SPECIFIC TASKS FOR TODAY

- (Interspersed with listening to the rest of the talks here.)
- Mark 9 March 13 on your calendar as the NITARP proposal deadline.
- Get started learning about your science.
- Pick a summer visit date (or window for dates) so people don't double-book.
- Pick a time/day/frequency for a regular telecon.
- Pick a team name (so I can get you on the wiki and main website).
- Plan a time tomorrow and/or later this week to meet again to keep working.
- Get a group picture! ☺ How about now?