



# AMERICAN ASTRONOMICAL SOCIETY

Enhancing and sharing humanity's scientific understanding of the universe since 1899.

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### The State of the Universe

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All kids are born scientists. To keep them that way we need to provide them with authentic, hands-on, messy science experiences and give them access to real scientists who can model their futures. Astronomy is a natural hook when it comes to engaging our young people. I'd like to tell a few stories from my years in astronomy research and education.

The University of Chicago's Yerkes Observatory is home to the world's largest refracting telescope, inspiring on its own, but also a place where many NASA- and NSF-funded programs have been run. One summer I had the opportunity to work with two visually impaired college students who designed and implemented a camp entitled "Astronomy is for Everyone." These young women were empowered to use their own life experiences to create a camp that sighted, visually impaired, hearing impaired and, well, everyone loved. This was an incredible experience for the college students and it also modeled a brighter future for campers and their parents. Kids who came to camp hesitant and unsure left with a new confidence that they too could explore the universe and maybe even run their own astronomy camp someday.

Working with these talented young people gave the teachers an appreciation for a wider range of learners and learning styles. Shortly after this experience I urged one of my hearing impaired students to present "how the ear works" (and how the ear does not always work as it should) as an introduction to our unit on sound. My student won an award for self-advocacy based on her work, while her classmates became much more aware of the challenges that others face.

Seeing the importance of real world experiences, I teamed up with an astronomer/engineer who was working at Yerkes on a camera for SOFIA—NASA's telescope in a 747—to bring Python programming into my Physics Fundamentals classroom. The number sense of my students soared, as did their confidence in their ability to solve problems. One girl who had always struggled with math quickly became a Python expert and helped other students debug their programs. This same girl blurted out after class "I've never been smart at anything before!" This was a huge turning point for my student. In addition, having a real world expert, an engineer, an astronomer, a guy who does work for NASA, was important to my students—he made the work we were doing important.

I soon learned of a NASA Education and Public Outreach program based at the California Institute of Technology, called NITARP (NASA/IPAC Teacher Archive Research Program), which challenges teachers, astronomers and students across the nation to work together and do authentic astronomical research. As my students and I learned new skills side-by-side and compared results, the results did not always match! And mine were not always right! That's



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powerful—for students and teachers to share this journey and then go back and problem solve to find the best answer is not something we normally do in the classroom. Entry into this program was not reserved for the elite; male and female, honors and special needs, majority and minority students were all represented.

While doing science was our main goal, NITARP was so much more. A girl who previously considered herself “bad at computers” learned to manage huge amounts data using spreadsheets and Python programming. A special-needs student who struggled to keep up used his artistic ability to make a poster visually pleasing. A boy who was too nervous to eat before our presentation stepped up, shook hands with and clearly explained our work to astronomers and educators from all over the world. One group even composed and performed on the guitar an ode to their favorite astro-photographer. Educators became more expert in doing science, they became better mentors for students and colleagues, and commanded a higher level of respect. Kids sometimes think teachers just make things up; now, hearing about my real science experience has made my kids believers, because “you know, she does work for NASA.”

Having worked with the Yerkes, NITARP and SOFIA programs, I was privileged to be chosen as one of the first six Airborne Astronomy Ambassadors to fly aboard SOFIA in the spring of 2011. Afterwards, whenever my students and I gave astronomy talks and star parties for area grade schoolers, it was the flight jacket that prompted the little ones to ask questions and to take their NASA stickers home with pride. Often their parents would email the next day saying they heard about the “NASA” lady for hours on end. At one star party, a boy and his little sister kept coming back over and over to my telescopes, with the big brother translating into Spanish for his sister. Towards the end of the night, Mom came up to me and asked for my autograph for her son. “Astronaut,” she said pointing at my jacket, and while I explained to her and her children that I was a teacher who had flown on an airplane with a really big telescope, she nodded knowingly and said again “Astronaut” referring to me and then to her son. The most touching part of the evening was when Big Brother ran back to me and put 11 cents in my hand. “No-no,” I said, “you keep that,” but he pushed the money back in to my hand while Mom looked on smiling. Was this family hooked? I would say so. They had seen the heavens in a way they never had before, guided by a NASA education and outreach “expert.”

New knowledge, new confidence, a new perspective that the world—that THEIR world—has no bounds: that is what my kids get from connecting to real science.