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State of the Universe
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Astronomy is a powerful gateway to learning; it taps into a fundamental human curiosity we all share. People often ask how I got into astrophysics. And I know this comes up because I don't look like most peoples' images of a "typical" astronomer or astrophysicist. There are few Blacks in the field and even fewer Black women. Across all STEM disciplines, men and women of color make up only **about 7% of PhD holders**, while the same group makes up about 30% of the US population. And at the highest levels, men and women of color make up only about 3 to 5% of the physics and astronomy faculty at US universities and colleges. We see attrition in this population at every level, with minority participation dropping from middle and high school, to enrollment in STEM majors in college, to graduation rates across all levels, and to employment in STEM fields.

So how did I get into astronomy? Well like many third and fourth graders, I wanted to be an astronaut. Perhaps unlike most, I realized you couldn't just sign up and be one. I knew you had to be a scientist or a pilot – or better yet, both – and I knew that I was good at math and science. But it wasn't until my second year of college that I looked through a telescope for the first time. It was aimed at Jupiter, and the cool thing was – it looked just like the pictures I'd seen, giant red spot and all. I was hooked! I declared my major at the Massachusetts Institute of Technology as Earth Atmospheric and Planetary Science and as a bonus was brought under the wing of an amazing mentor, **Dr. Jim Elliot**.

I graduated from MIT with a Bachelor's and eventually moved on to get my Ph.D. in astronomy from the University of Washington. I studied how nearby bright and dark matter structure distorts our view of the distant universe by bending the light that reaches us. This is known as Gravitational Lensing. From there I went on to continue my research, as a National Science Foundation Astronomy & Astrophysics Postdoctoral Fellow at our nation's premier public observatory for visible light astronomy, NSF's National Optical Astronomy Observatory, or NOAO, based in Tucson, AZ. I still have not made it to space (it was bad eyesight that got me), but I do get to spend my days studying the universe.

As we've heard, STEM training prepares students to meet areas of national need that drive our economy, and diversity itself is important to the process of innovation. If we are going to meet national challenges, we must address the barriers that stand in the way of progress for women and underrepresented minority groups in STEM.

Since my own experience was influenced by access to great mentors, throughout my career, I have made it a priority to mentor and support students like me – students from underrepresented backgrounds who have a passion for learning about the objects we see in the sky and in those beautiful pictures from ground based observatories, like where I now work, and space-based telescopes like NASA's *Hubble Space Telescope*.

This school year, I have been mentoring a mixed class of 4th and 5th graders at Rio Vista Elementary School in Tucson through the **Project ASTRO** program run by NOAO. The class is an English as a second language class. Their amazing teacher, Ms. Stephanie Delgado, is using her students' natural interests in astronomy and science to help them become proficient English speakers. She participates in both the Project ASTRO and the partially-NASA-funded **Mars Rover Celebration** program.

I've visited with Ms. Delgado's class several times to talk about galaxies and telescopes and about their project to design a Mars Rover. We talk, in what for them is a second-language, about things like landing and maneuvering on unknown terrain and how to transmit data 100s of millions of miles back to Earth. It is a joy to see these students' excitement about science and planetary exploration. Just a couple weeks ago, I got an email from Ms. Delgado saying that the class had performed a skit explaining their rover design for the rover program's competition. She sent me a video. Not only is it great; they won! Most of these kids are not what would traditionally be called 'gifted learners' but they've had their curiosity nurtured and having experienced success, they **all** want to continue studying science.

We've heard about different roadblocks students face on a path to pursuing their curiosity and finding success in STEM. Another common issue is a simple one of familiarity. What does an astronomer do? Can you BE an astronomer? (Most people don't know astronomers.) This is particularly common for students at minority serving institutions, like Howard University where I am visiting Faculty in the Physics and Astronomy Department this semester, supported by an **NSF Advance** grant awarded to the Chair of the Engineering Department, Dr. Sonya Smith. She and I hope that my mentorship can play an important role in overcoming this roadblock for the students that I'll be working with.

A few years ago, I had the opportunity to represent NOAO at the Society of Hispanic Professional Engineers meeting. I was there to talk about the fact that astronomy depends on, not just researchers, but on skilled engineers who have the mechanical, electrical, materials and systems engineering expertise to build and maintain the telescopes as well as the cutting edge instruments we need to make discoveries, and those beautiful images. There, I had engineer after engineer come up and tell me that it was astronomy that really drew them into STEM. One young man told me specifically that his father **insisted** that he leave astronomy for something "more practical" like engineering. He was clearly very excited to learn that he could still be part of astronomical discoveries as an engineer! He could still follow his dreams and that we, astronomers, need people like him!