

## Blueshift - Episode 5

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**Maggie:** Welcome to Blueshift - the NASA podcast that brings the Universe closer to you! I'm Maggie Masetti.

**Steve:** And I'm Steve Fantasia. We're coming to you from the Astrophysics Division at NASA's Goddard Space Flight Center in Greenbelt, Maryland. Think of this as a backstage pass to all the stuff that's going on at NASA. The missions, the people, the sounds, the sights... well, maybe not the sights.

**Maggie:** That's probably a good thing, Steve, or people might see all the Star Wars action figures we've got lying around here.

**Steve:** We'll also talk to some students about how they spent their summer vacations - working for NASA.

**Maggie:** Plus, our little spacecraft is growing up - the ACE satellite celebrates 10 years in orbit!

**Steve:** And we haven't forgotten about last month's brain teaser - oh, you'll hate us when you hear the answer.

**Maggie:** It's Blueshift, Episode 5 - The Podcast Strikes Back!

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**Steve:** Every summer, our hallways get louder and our offices get fuller - the unmistakable signs that, once again, our interns have arrived.

**Maggie:** For a few months, these college students - and some high school students, too - work on the various research and projects that are underway here at NASA.

**Steve:** Our roving reporter, Mike Arida, sat down with several of our interns to find out what they'd been up to this summer, and what it's like to spend a summer at NASA. So here's Mike ... with a mic.

**Mike:** Hello, I'm Mike Arida, and I'm here with Lynnae Quick who's a summer student here in the Astrophysics Science Division.

**Lynnae:** I was working with Aki Roberge in the Stellar Astrophysics and Exoplanets Laboratory. I'm originally from Greensboro, North Carolina. This will be my second year in a PhD program in physics at Catholic University. I was looking at outflows of gas that come from young stars. We know that if these stars have outflows of gas, then they're accreting gas from a surrounding accretion disk. And if they're accreting gas from this accretion disk, then they can form Jupiter-sized planets. So we were

just trying to, in effect, constrain the time that Jupiter-sized planets could form around young stars, by looking at these flows. But, yeah, I like it a lot. The people are very nice here.

**Mike:** And I'm here with Damon Anderson.

**Damon:** I'm originally from Northern Virginia, in a small place called Casanova. I'm majoring in physics and computer science. We're looking at, like, black holes and some stars, gamma ray bursts, and instead of just looking at X-rays themselves, we're looking at their polarization also, because it tells us stuff about their structure and how they evolve, and that sort of thing. I was sort of interested more along the lines of black holes, so maybe that for next summer.

**Mike:** We're here with Kimberlee O'Dair.

**Kimberlee:** I'm from Colorado, I go to the University of Colorado in Boulder. I'll be going into my senior year, and will be graduating in December, actually. I'm pretty excited about that! I'm working with Dr. Tod Strohmayer and we're working on some projects involving binary white dwarf star systems. Well, we got data from Chandra, ROSAT, and XMM about these two systems. What we're looking for is basically we're noting that their orbital period is decreasing. And so the stars are getting closer and closer together in their orbits. And we're looking at how quickly that's occurring.

**Mike:** Okay.

**Kimberlee:** Mostly. But this is my first experience at NASA, so it's been great. Everyone has their visions of what NASA is like, and so it was interesting to see how many buildings were actually on the center, and how much different work was going on. And I would definitely come back for another internship or, you know, a future job or something. That would be great! So, anything.

**Mike:** Thank you, and good luck.

**Kimberlee:** Thank you!

**Maggie:** A summer intern might only spend a small amount of time here...

**Steve:** But it takes years to plan, build, and launch a mission - and then, you hope it has a long lifetime up in space.

**Maggie:** That's why we're really excited to celebrate a big birthday for one of our missions. So ACE, this is your life.

**Sara:** On the sunny morning of August 25, 1997, a crowd was gathered at the Kennedy Space Center in Cape Canaveral, Florida. A huge Delta II rocket was poised on the launch pad, ready for take-off. On that rocket

was a satellite known as the Advanced Composition Explorer, or ACE, waiting to be launched into orbit to start comparing the composition of matter out in space. A decade later, ACE is still up there, keeping an eye on the solar wind, magnetic fields, and high-energy particles coming from the Sun, and from farther out in the galaxy. Here at Goddard, we are very excited to celebrate the tenth birthday of the ACE mission. I'm Sara Mitchell. Joining me today is Georgia de Nolfo, to talk about what ACE has been doing, and what we can expect in the next ten year. Georgia, it's great to talk to you.

**Georgia:** It's great to be here.

**Sara:** So, what exactly is your role here at Goddard, or your role with ACE?

**Georgia:** Well, I'm a research scientist at Goddard, and I have been studying cosmic rays, galactic cosmic rays, which are very high-energy particles that come from around our galaxy. And my specific role on ACE has been to look at one instrument in particular, called the Cosmic Ray Isotope Spectrometer, or CRIS, which is looking directly at galactic cosmic rays. So, cosmic rays are actually quite exciting because they are particles that move at fractions of the speed of light, so very fast. And they literally span the periodic table, so everything from hydrogen up through the actinides. So it is generally believed that cosmic rays get their energy, so the energy contact that makes them move so fast, from supernova shocks. So when a star dies, it explodes and forms a supernova, and the shock waves accelerate particles to very high energies.

**Sara:** So we're hoping that these are like a little bit of a supernova, coming towards us that we actually get to see?

**Georgia:** Absolutely. It could be that they're part of a supernova, or they're just a part of matter somewhere else in the galaxy that's been influenced by the supernova shock.

**Sara:** That's really exciting, because usually we don't get to touch something that comes from far out there.

**Georgia:** That's right, we're actually sampling matter from different parts of our galaxy. So it's not just matter that comes from the Sun. It's matter from different parts of our galaxy.

**Sara:** So, going back to ACE, what exactly is it doing?

**Georgia:** So ACE is actually looking at how the Sun changes, and how those changes affect the near-Earth environment and also the solar system at large. And it does this by relying on an ensemble of state-of-the-art detectors to sample the matter in the near-Earth environment. And that's really quite challenging and complex, because there is matter coming from all kinds of places in the near-Earth environment.

**Sara:** So really, you're studying everything from the very local to something that's out elsewhere in our galaxy.

**Georgia:** That's right! We are actually able in this near-Earth environment... when I say "near-Earth," ACE is about a million miles upstream of the Earth, in the direction of the Sun, and that's what we're calling the near-Earth environment. And in that environment are a whole host of different populations, or samples, of matter.

**Sara:** Out of curiosity, have there been any big discoveries that have come out of ACE in the last ten years?

**Georgia:** Well, you know, since we're celebrating the tenth anniversary, one thing I'd like to focus on is that ACE has actually been measuring this particle population for what we call a whole solar cycle now. So just to remind you, the Sun does vary every eleven years, its activity varies. It gets a flurry of activity and then it gets slowly quieter, and it does this over eleven year cycles. And in fact, there's another cycle of twenty-two years, in which the magnetic fields of the Sun reverse. And the fact that we've been able to measure these populations over a whole solar cycle is quite interesting. And scientists don't really know what to expect from the next solar cycle. We do know that they repeat, we know that certain things repeat itself, but there are subtle changes with each solar cycle and looking into how those changes affect the particle populations will be quite interesting.

**Sara:** So what is the expected life-span of ACE now?

**Georgia:** Well, that's actually an important question. We've been able to limit the spacecraft maneuvers that we need to make to keep the spacecraft stable, and by doing that we've actually extended the life-span of the mission. So we're hoping now to be around until 2022, so we certainly I think will be celebrating the 20th anniversary of the ACE mission in 2017.

**Sara:** I'm definitely looking forward to ACE's 20th birthday party, and to see what else the wonderful ACE spacecraft can bring us. So thank you for being here, Georgia.

**Georgia:** It was a pleasure to talk to you.

**Sara:** For Blueshift, I'm Sara Mitchell. And happy birthday, ACE!

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**Maggie:** Check out our Web site, where we've got information about the people and science just mentioned. Our address is [universe.nasa.gov/blueshift](http://universe.nasa.gov/blueshift)

**Steve:** As we promised you, I'm back with the answer to the Episode 4 brain teaser. You might recall that the question was, "What real-life Nobel Prize-winning physicist has made an appearance on The Simpsons?" The two most popular answers we got were Stephen Hawking, "that wheelchair guy" as Homer affectionately refers to him, and Dudley Herschbach. Stephen Hawking is indeed a physicist, but while he may be unfathomably smart, he has not won the Nobel Prize. And while Dudley Herschbach has won a Nobel Prize, it was in chemistry, not physics. I'm sorry to say the answer is no Nobel Prize-winning physicist has made an appearance on The Simpsons. A trick question that none of you brainiacs got right. Ha-ha! Better luck next time. Teasingly yours, I'm Steve Fantasia. Now, back to me!

**Steve:** And that's gonna wrap it up for Blueshift Episode 5.

**Maggie:** Remember to check us out on the Web, at [universe.nasa.gov/blueshift](http://universe.nasa.gov/blueshift)

**Steve:** You'll find more info about each of our segments, and a Feedback link where you can send us mail.

**Maggie:** And we love to get mail. I'm Maggie Masetti. And I think I speak for many Star Wars fans when I say, "Episode 5 rules!"

**Steve:** And I'm Steve Fantasia. You've been listening to Blueshift - the NASA podcast that brings the Universe, in all its craziness, closer to YOU!

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