Blueshift - March 3, 2009

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Sara Mitchell: Welcome to the March 2nd, 2009 episode of Blueshift, brought to you from NASA's Goddard Space Flight Center. We're bringing the Universe closer to you, one object at a time - and this time, we're talking about planets. For this episode, we interviewed Dr. Drake Deming, a scientist here at Goddard who's always on the hunt for new and interesting exoplanets. Drake is the principal investigator on a mission known as EPOCh, which stands for Extrasolar Planet Observations and Characterization. An interesting side note about this mission is that it reuses the Deep Impact satellite, which was launched in 2005 and impacted a comet to study what it was made of. The satellite is already up there, so Drake and his team are using its cameras to look for planets outside of our solar system. Now that's recycling! But today's interview with Drake focuses on a discovery made with the Spitzer Space Telescope of a planet with a very interesting climate. I was curious about the details of this extreme planet and why it's important to scientists - and to you and me.

Sara: What is an extrasolar planet or an exoplanet?

Drake Deming: An extra solar planet is a planet that orbits a star other than the sun. And usually, when we talk about exoplanets, we're talking about planets that orbit sort of normal stars, that is, not pulsars. There are some planets that orbit pulsars, but they're not usually included in what we talk about when we talk about exoplanets.

Sara: And the reason we brought you in in this case is because you had a very interesting exoplanet result that you worked on. Can you tell us a little bit about that particular observation?

Drake: Both Greg Laughlin, who is at the University of California Santa Cruz, and I and other collaborators worked on a project that Greg calls "the big swing." And this project involves the periastron passage of the planet HD 80606b. And periastron just means the closest point of the planet's orbit to the star. And the funny terminology for the planet's name -- HD 80606b -- is because extrasolar planets are just named after the catalog number of the star that they orbit. We don't give them colloquial names, like Joe, or Mary or George; we just call them by their number. And what's unusual about this planet is that its orbital eccentricity -- that is, the ovalness, the elongation of its orbit -- is very high. So that when the planet is closest to star, it's very close to the star, so it receives an enormous blast of radiation from the star -- a sudden heating event.

Sara: What makes this different than other extrasolar planets that have previously been discovered?

Drake: Well, other extrasolar planets are also heated by their stars, but all the other ones that have been studied so far are in relatively circular orbits or close to circular. What's interesting about this case is that the planet goes from a relatively cold temperature to receiving a flux from the star that is 10,000 times greater than what our Earth receives from our sun, and this increase occurs -- this sort of drastic global warming -- occurs within a period of 30 hours. So this sudden heating is very interesting to exoplanet scientists because how the planetary atmosphere responds will tell us a lot about the dynamics of the planet's atmosphere, and also about its orbit and its interior structure.

Sara: So can we see a planet like this? Do we know it looks like?

Drake: All of the studies that have been conducted with the Spitzer Space Telescope on these exotic planets and seeing their infrared heating have been conducted in the combined light of the star and planet. In other words, we don't spatially separate and make an image of the planet. So, in that respect, we can't see it. However, what we do is we learn about it by studying changes in the combined light of the system that are phased to the planet's orbit, so that when we see a mathematical change in the data that changes at the same rate as a parameter of the planet's orbit, then we know that that's due to the planet. So although we can't see it with our eyes, we can see it with our mind -- and with our mathematical techniques, which to me is just as good.

Sara: Well, is that a goal -- that you would like to be able to see them clearly? Is that something that's the next step in exoplanet research?

Drake: Well, there's a whole other portion of exoplanet research currently that is attempting to image planets orbiting other stars, and they have had some success in doing so. And they've been able to image planets that are relatively distant from their star and it would be too cold to have life. And that technique will be pushed until it can eventually work its inner distance into the point where it can see habitable planets like the Earth. What's, I think, fair to say about that technique is that it's technologically much more difficult than the combined-light studies that are now being pursued using Spitzer and Hubble and other telescopes.

Sara: So what's the next step for you? The same planet? Different planet?

Drake: To me, the next big step would be to apply these combined-light studies, these transit studies, to what are called superearths, which would be terrestrial planets like the Earth but probably larger, more massive -- and perhaps habitable, with temperatures that could sustain life -- with more extended atmospheres, generally sort of super versions of the Earth. And that's why they're called superearths. And the reason that we're focusing on those is that theorists predict that they should exist in relatively abundant numbers and they could be characterized by the upcoming James Webb Space Telescope that NASA will launch in 2013.

Sara: Why is it important to study exoplanets to this level of detail? What does it tell us scientifically?

Drake: One of the things we hope to learn by studying exoplanets is we hope to understand the planets in our own solar system better. For example, when we look at Jupiter, we see the Jupiter has very strong equatorial winds carrying gases around the planet. And we really do not understand what's the cause of those winds and how that faster circulation is maintained. So if we can study similar situations on exoplanets -- and eve more extreme cases -- then we may really begin to get a clue for the underlying physical mechanisms. The ultimate goal studying exoplanet is to find another earthlike world. This particular planet we're studying here is not an earthlike world -- it's at the other extreme. But eventually, if terrestrial planets are common in the universe, then there's a good chance that we can find a world like the Earth, with oceans and forests. And I think that, it's clear, that would be of dramatic importance to the human race.

Sara: If you'd like to find out more about HD 80606b and exoplanet research, check out our website at universe.nasa.gov/blueshift. We'd also love to hear your feedback about this episode and what you'd like to hear on Blueshift in the future! Tune in again in a couple of weeks and find out what's going on here! We've got some special stories and interviews in the works! This is Sara Mitchell, bringing the Universe closer to you with Blueshift.

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