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**Anita:** The first planet orbiting a normal star outside our Solar System was discovered not all that long ago, in 1995. Since then, astronomers have gone on to discover more than 200 planets, and the count is going up almost daily. The search for these other worlds and studying their properties is a very exciting area of research in astrophysics today, and we have an active group working in this field here at Goddard. This is Anita Krishnamurthi, and joining me today is Dr. Jennifer Wiseman, head of the Lab for Exoplanet and Stellar Astrophysics in the Astrophysics Science Division at NASA Goddard Space Flight Center. Hi Jennifer, I'm glad you could join us today.

**Jennifer:** I'm glad to be here.

**Anita:** This study of exoplanets has just exploded in the past decade, hasn't it?

**Jennifer:** It's a very exciting time for astronomy right now, because we are finding planets around other stars and this is a question that humans have had for centuries - is whether or not there are planets similar to our own around other stars, and now we know the answer is, "Yes."

**Anita:** Can you start us off by setting the stage a little bit on exactly what it takes to find these planets?

**Jennifer:** Planets are very difficult to see. They are dim, they don't emit their own visible light - they only reflect the light from their parent star, so that makes them hard to see, in that sense. They're also small, so if you add together those two properties of planets around other stars, it means they're hard to find. So astronomers have to be somewhat like detectives, and use mostly kind of indirect techniques to find planets around other stars.

**Anita:** Sounds really hard! So why are we finding so many, now? I mean, why 200, now, as opposed to ten years ago?

**Jennifer:** Well, the technology that we have now is much better than even in just recent decades. So we now have the sensitivity, and much of this is done from ground-based telescopes, to find very small changes in the frequency of light from these stars, and that shift in frequency is what we call Doppler shift. It tells us that the star is moving back and forth a little bit, that tells us that the planet is tugging on the star. And we also have had some time to survey many, many stars to see exactly how many of them have this kind of cyclic pattern of motion, so that's given us the time to detect some of these planets, especially the ones with shorter orbits. Those are the two main things that have helped us recently.

**Anita:** So this is clearly a very active area of research today. Where is this field going next?

**Jennifer:** Well, the big questions are being answered step by step, so I think what we would like to know first of all is how many stars have planets orbiting them, and what kinds of planets. Do most stars have big Jupiter-like planets? Do most of them have smaller Earth-like planets? The near-term future for that question looks bright because we have a NASA mission launching next year that's called Kepler, that's designed to survey many, many stars in a distant starfield toward the center of our Galaxy, looking for transits - looking for systems where the planet is orbiting and eclipsing between the star and us (as the observer). And through this mission, we'll be able to do some statistical studies on how many stars have planets and what those planets are like. That'll tell us how common it is for us to have Earth-like planets in solar systems. Then we want to know how many of these sort of terrestrial planets have atmospheres and compositions that are similar to our own. So our future goal is to develop missions that can both take pictures of these planets and take spectra of them, that is, to decompose the light into the different frequencies emitted by different elements like oxygen, or molecules like water. And that can tell us whether or not these planets can support life. That's something that we have as an ultimate goal.

**Anita:** A lot going on! So, is your lab involved in developing any of these missions that you mentioned?

**Jennifer:** Our scientists are involved in just about every aspect of this question of extrasolar planets. We have some scientists that are involved in developing missions that would be able to actually block out the starlight, so that you could see the very faint material around the star, including planets and the material from which planets form. That mission that we're looking toward is called the Terrestrial Planet Finder mission, and we have different techniques in development to consider for that mission. We have scientists, both in our lab and in other NASA laboratories, that are interested in looking more precisely at the stellar motions - that wobble I mentioned to you - using astrometry, such as will be used in the Space Interferometry Mission, and also using very precise techniques for looking at the line-of-sight wobble or even transits, as I mentioned to you, for different types of stars. We're also interested, in our lab, in the upcoming James Webb Space Telescope that's set to launch in about 2013. That telescope will be a large infrared facility, and will be able to both characterize the regions around stars where planets are forming, and maybe even characterize some of the planets themselves. So that's another future excitement that we have, just around the corner.

**Anita:** Thank you very much for joining us today, Jennifer. It's been great talking to you and hearing about all the work in this field and what your lab does.

**Jennifer:** My pleasure.











