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"Meet a NASA Astrobiologist" #5 — Monica Vidaurri (May 28, 2019)

INTERVIEWER: Go for it.

MONICA VIDAURRI: Awesome. OK, well, hello, everybody. Oh, my gosh. It's so cool to be doing these talks. I always love it so much. So my name is Monica Vidaurri. I'm living in Washington, DC. I work out of NASA Goddard Space Flight Center, which is about 15 minutes north of Washington, DC. I'm originally from San Antonio, Texas, so quite the move up here. My official job title is science consultant, but I'm an astrobiologist and policy specialist for Goddard. So doing a lot of big things with science and also policy.

The cool part about all that is that I am actually still in my undergraduate degree. So I am in college right now. I am studying biology, and government, and international politics in George Mason University, which is in Virginia, about south of DC, a couple minutes south of DC. And I just found out last week that I am going to be going to grad school, and I'm going to be studying biodefense in the fall. So I'm really excited for that, more school on the way. And I'm really excited to stay at NASA and, hopefully, do some stuff in the biodefense realm, if I can.

So I'll give you a little bit of background of what I do. So I first came up to DC as a intern. I was a legislative intern in Congress. And I worked for a senator in Congress. And I was able to go to all the earrings and talk about all the law and everything that goes into the legislative process. And it's kind of funny because, as a kid, I had always wanted to be an astronaut. And I had wanted to be an astronaut for as long as I can remember. So I just kind of took a completely different direction when I showed up in DC and I took that internship.

I'd always been kind of fascinated with the night sky. And so by the time it came time to go to college, I signed up for biology to do astrobiology, but then I also signed up for a policy, because I wanted to make it so that everybody can do science, and so everybody can do astronomy. I had realized that the astronomy field, especially astrobiology, was kind of new, and I wanted to make sure that I was reaching out to people and making sure people were just as excited about it as I was. So that's why I picked up the policy as well.

So coming back to the story, I moved up here to DC. I started working in Congress. It was so much fun. And there, I actually learned a lot about science policy. They stuck me on a lot of science policy kind of projects. So, how much funding do we give the James Webb Space Telescope, and all of that kind of stuff. So it was really, really interesting to be involved in that realm.

So it actually turns out there's not a whole lot in the science policy realm. And so I was kind of doing this job, and I was like, oh, what's the protocol for this kind of stuff? And it turns out there's really not much. So I was like, OK, we're going to do the policy, and we're going to do the astrobiology. And we're going to make sure that everything is super clear and there's lines of communication between the policy and the science. And so that's when I kind of found out what I really wanted to do.

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From there, I was offered a job at the American Chemical Society. I was fully planning on going back to Texas and finishing my degree, but I kind of had other plans. I went to the American Chemical Society, and I did some government affairs, like public affairs, all that stuff. And I had a little bit of chemistry, too, which was a lot of fun, actually.

After the ACS, I ended up at the White House. And there's obviously no shortage of government work there and policy work there. So that was also a lot of fun. And I was able to see some really cool things. I was able to go in the West Wing and do all of that stuff. So it was, like, really, really fun.

And then, I kind of ended up at NASA. I realized I was doing all of these different policy things, but I still had that love for space, and I still had that love for science. And I was going through all these jobs, just doing the policy. And I was like, man, I really miss doing science. I really miss doing astrobiology and doing biology in general, because I'd always loved to work in labs, and I'd always loved to go to the campus telescopes and look at the stars and all of that stuff. So I was like, you know? I really miss it.

INTERVIEWER: Uh-oh, we lost Monica.

MONICA VIDAURRI: It's just been so much fun. And I'm lucky enough to where, at NASA, I found myself in a position where I could do the biology, and I could do the policy. So right now, I'm doing a couple-- I'm doing a little bit of things kind of at the same time. I'm working on looking at mission budgets-- so the big missions, like Hubble, and James Webb, and all of that. I look at how much we spend, how much is realistic, all of that boring, number-crunching stuff. It's not boring to me. I actually really enjoy it.

But I also am a policy analyst. So any policy that affects NASA, like the presidential budget request and all the stuff we get from Congress, y'all have probably heard of the Moon 2024 plan, so plans to go back to the moon in five years. All of that policy that affects the different sectors and the different science divisions at NASA, I kind of analyze that, and I make sure to monitor everything that's going on with policy, and I let the people here at Goddard know exactly what's going to happen and how it's going to affect their science. So I do that, anything policy related that comes out of Congress or the White House, it kind of goes to me.

I also do things like diversity and inclusion. And right now, I'm working on a program for opportunities for underrepresented minorities at NASA. So that's one of those things where there's a lot of scientists here, and we're all kind of working together on these projects.

And then, finally, on the actual astrobiology side, I look at exoplanetary atmospheres. I do what's called "atmospheric modeling." And so I run different tests and different scenarios on exoplanets that we find, and I kind of figure out if life can survive there and how it does survive there. So no shortage of science there, we just launched our planet hunter tests last summer, early last summer, I believe.

Oh, no, that was in 2017. Oh, gosh. Yes, so we do have planet hunters in the sky, believe it or not, looking for different exoplanets, and looking at their atmospheres. And so I go in, and I take a look at the

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atmosphere, and I think, oh, I think about, can an ozone layer exist there? Like, what's the atmosphere made out of? Could water exist there? Liquid water? And I just answer all those questions.

So a lot of what I talked about was not astrobiology. I come from a very strong policy background. And the switch to science was really, really huge for me. It was really hard going back to science after all this time know in the policy realm and working in Washington politics. And trying to transfer over to the hard science, and the physics, and the math was so hard, I'm not going to lie. But it was so rewarding.

But coming back to the non-astrobiology, you would kind of be surprised how much non-astrobiology goes into astrobiology. When people think about astrobiology or any of the astro sciences in general-- like astrophysics or whatever-- people think about math, and sitting at telescopes, and lots of physics, and taking all these pictures of the stars. And, yeah, that's a big part of it. But there's also a lof of, well, non-science. And there's also a lot of different science that goes into astrobiology.

So the non-science, when we launch big projects and telescopes like James Webb and Hubble or whatever, we have to make sure that we have the policy specialists, and we have to make sure that we have the communication specialists so that we're talking with Congress, and we're talking with, let's say, SpaceX or whoever is working with us on this project, and we have to make sure that the standards are the same.

We have to make sure that whatever spacecraft we send up, that it's going to be safe, that it's in an orbit that won't collide with anything else. We have to make sure that we're in constant contact with Congress to make sure that we're getting the funding that we need and that Congress knows what we're launching into space, right? Because this concerns them, too.

We also work with historians, believe it or not. When we try to solve new problems, we like to take a look at how it's been solved in the past and what techniques we've used in the past. So we also work with a lot of historians. Believe it or not, we work with artists and graphic designers, musicians, too. They help us-- anything to help us tell the story of our projects and tell the story of who we are at NASA, honestly. We have those people on board.

So life lesson number one, I guess, you don't have to do math. You don't have to do the physics-- which is so much fun. I would highly encourage it. But there is room in the space sector for everybody. There is room at NASA for everybody. Like I said, musicians, artists, historians, policy people, whoever, there's really, really a lot, a lot that goes into the search for life in the universe, which is what astrobiology is. I like to tell people that I get to look for aliens for a living. Because it's totally true. We get to look at how life can exist elsewhere. And believe it or not, that involves a lot of "non-science."

But coming back to the science, let's just take a look at biology. Biology, as it exists on Earth, is probably one of the bigger science fields that we have. I mean, you have biology-- so you have ecology, zoology-- every single medical field falls into the realm of biology-- microbiology, biophysics, biochemistry, geobiology-- all of these things go into the field of biology. And when you put an "astro" in front of the name, that just means you put it in space.

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So now, you're dealing with astrophysics. You're dealing with astronomy. You're dealing with cosmology. And cosmology is the study of the history of the universe. So it's things like, how old is the universe? How did the universe even start? How did these different galaxies form? And it all kind of goes into this one big question of astrobiology, which is, are we alone in the universe? And that is such a big question to answer.

And it's something that not just the physics side, or just the biology side, or just the chemistry side can answer, right? This is an effort by so many different disciplines and so many different people. So that's exactly what we do. I work in a big team of people. And I'm one of like two, I think-- it's just me and one other policy specialist, but I'm also an astrobiologist. And we work with chemists. We work with physicists. We work with mathematicians-- all these different kinds of people to help solve this question.

So, yeah, a lot that goes into astrobiology, a lot that gets into-- that goes into getting our science off the ground. So that's engineers, the people that launch the satellites, and they launched the telescopes, and even launched humans into space, and launching them to the moon pretty soon-- so a lot, a lot, a lot that goes into that.

So, for me, personally, as someone that does both the biology and the policy, I mean, they kind of seem totally different. They go into the same question, right? But when you look at just biology and policy, it's like, well, what do they have in common?

So, for me, the biology and the policy kind of me at the intersection of space policy and things like what's called "planetary protection and ethics of space exploration." So I like to think about questions where it's like, if we go to Mars, if we set foot on Mars, we have to be careful that we don't bring microbes from Earth. We have to make sure that we don't bring our cooties from Earth and bring them to Mars or bring them to the moon, right? We want to make sure that we keep these environments.

And Mars and the moon, they do have environments. We want to make sure that we keep them safe from anything, any living being, any little thing-- any little bacteria that lives on Earth that can stow away on our spacecraft or stow away in an astronaut suit, we have to make sure that that doesn't spread to another planet. So that's what contamination is.

And also, if we go to another planet, there might be microbes that exist there that we don't know exist yet, right? If we go to Mars and we start digging around and turns out we find out life, what if it's dangerous to life on Earth? What if it's dangerous to humans?

So we also have to be careful about what's called "backwards contamination," is if we bring back life from another planet that we didn't really know existed. So that's another kind of area where the biology and the policy meet. We have to make sure that we're implementing these safety standards and these contamination standards, and making sure that wherever we explore, we don't get it dirty and we don't get it contaminated. So that is a huge, huge part of combining the biology and the policy.

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Another thing I look at is, actually, the ethics of space exploration. We want to make sure that everybody is involved in space exploration. We want to make sure that this technology is available to everybody, right? And so there's a lot that we think about when we think about the ethics of space exploration. Are we being accessible? And making sure everybody gets the chance to go to the moon and all of that stuff? So that's also where the biology and the policy meet as well.

So, yeah-- I mean, this is just a whole lot, right? Coming up with new ways that we can decontaminate our rovers, we can decontaminate our people and making sure we're responsibly exploring these other planets, we're responsibly exploring the moon. And so that's, actually, a really, really big part of what astrobiologists do on top of, of course, looking for the aliens.

So when we go back and look at the things that I'm doing right now with the budgeting, and the policy, and the diversity, and all that, on top of the atmospheric modeling and the physics, they all seem totally different. It's like, why are you picking up all of these projects? But, in reality, with the field of astrobiology, it's so, so important to be multidisciplinary and to kind of have a really good understanding of everything that goes into the science of astrobiology. And I just can't reiterate this enough. Astrobiology is such a multidisciplinary field, and it takes everybody to be a part of this. It truly does.

So I think one of my favorite things about astrobiology and about the job that I do is that I get to keep this childlike wonder, I guess. I never really grew up, right? Because, as a scientist, you need that to succeed. I love telling people I work for aliens for a living. I tell my parents that. I tell adults that all the time. It's like my absolute favorite thing. Astrobiology is really one of those fields where you can let your imagination just absolutely run wild.

And I'll give you a couple of examples. So we know how life exists on Earth, right? Like, human, we breathe in air, we exhale carbon dioxide, we have fish that live in the sea and we know how they live, we know how plants take sunlight-- you know, photosynthesis, all of that.

And even though the Earth is very diverse in life, it's all dependent on what's called "Earth analogs." So earth conditions for life. So we have an ozone layer. We have an atmosphere that's mostly nitrogen. We have a sun that's a certain distance away. We have a pretty common global temperature. And these are all just kind of the ingredients that we have to sustain our life on Earth.

Now Earth is one of-- I think it's like 4,500 exoplanets? So 4,500 exoplanets that we have found that exist outside of our solar system. By the way, an exoplanet is any planet that exists outside of the solar system. And we've found almost 5,000 of those. If not, we probably passed the 5,000 mark already. So that's 5,000 different planets that we know of that we have confirmed that exist out there. And I want to say it's around 1,000 of those? Maybe a little less, but it's somewhere around that number, that we believe our Earthlike planets.

So if there's 1,000 more Earths out there that could potentially have life, that's, like, the coolest thing to me. Like, that is so wild. Can you imagine looking through your telescope and you see other civilizations,

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and you see other people like us, and they're communicating, and trying to find us, too? Like, that is so exciting to me.

But if you want to take it a step further, Earth isn't the only planet that's out there. There's other terrestrial planets. There's other planets that may potentially have liquid water on them. The thing that's really cool about astrobiology, to me, is that life doesn't have to exist the way it does on Earth. And so even though the techniques that we have right now, we only look at Earth conditions, we look for water. We look for what's called biosignatures. We look for methane. We look for carbon dioxide, right? We look for signs that a planet is breathing, you know what I mean?

And so one of the coolest things that I think we get to think about as astrobiologists is that, what if life doesn't have to exist like that? Right? What if there's another beginning that maybe they breathe in carbon dioxide. Or maybe instead of fish living in the sea, maybe you have little life forms that live in lava. We know that other planets have-- other planets that they have volcanoes, they could possibly have volcanoes on them. What if life can exist there?

We have extremophiles on earth that live in the sulfur pits and at the base of volcanoes. But what if there is life on other planets that actually-- they thrive there? They live lava or they live in rocks or something like that? So the possibilities are just so endless for life in the universe, you know? What if there are beings that don't even have cells or they don't even have DNA and they are totally fine? And so that's one of the bigger questions that, I think, we have a lot of fun with.

And I know you can probably Google, too, sketches of the artist renditions, when we have artists at NASA that try to think about, oh, yeah, what if life existed on Pluto? What if you have little superconductors walking around in these super cold temperatures? They think it's totally fine. And they love the cold, right? But we wouldn't really know how to find them because we only know how to find what exists on Earth. So that's just one of my favorite questions to think it about as astrobiologist, too, is, what can exist out there?

And the possibilities are just endless, just absolutely endless. And I love thinking about that. And how do we even begin looking for life that doesn't exist on Earth? How do we begin looking for what's called "techno signatures," right? What if there's other intelligent life out there? And what if they have satellites? And what if they've got cell phones and they're trying to text us, too? How do we find that? How do we pick that up? And so these are questions that we get to ask every day, which, I think, is probably the most exciting part of my job.

So, yeah, I mean, there's lots of questions that we can concern ourselves with. And I think one of the wildest theories that we were just talking about today, actually, is, what happens if you have a metal planet and the beings kind of take the forms of magnetic fields, right? So we just kind of let our imagination run wild on those, and it's so much fun.

So coming back to how life exists on Earth and how we look for what are these bio signatures, we look for signs of the planet breathing, how exactly do we do that? So there's a couple of different methods

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that we use. One that I use the most is what's called "transit photometry or transit spectroscopy, or however you do it. The main point of that is the "transit," right? And what a transit is, I will go ahead and show you using my coffee cup and my desk lamp.

So imagine my desk lamp is a star. It's a star just like our sun. And this coffee cup is a planet. And so just like how we orbit the sun, we pass in front, and then maybe we go behind, and then we come around, and your birthday falls somewhere around here. And we pass in front of the sun again. Well, do you see what's happening whenever this coffee cup-- this planet that I'm using-- passes in front of the light? It dims the light, right?

And then, it comes right back up. So what we do is we point our telescopes at whatever star we want to look at, and we point our telescopes at the star, and we say, OK, here's the star. It's emitting this amount of brightness, right? And this brightness is consistent.

So we know, OK, this is the star. Nothing's changing. And if we keep our telescope pointed there and suddenly we see the brightness dip and then come back up after a certain amount of time, then we know, oh my gosh, something's passing in front of that star. And so we keep our telescopes pointed, and we keep pointing back at this one same star, and if the orbit happens consistently and the brightness is consistently dimming like that, then we say, oh my gosh. I think we've just found a planet.

And so that's a big method that we use to find different exoplanets. We simply just look at the sun. And if the brightness goes down a little bit and it goes down consistently over a period of time, we say, oh my gosh. Something's orbiting that star. Like, this is crazy. Oh, my goodness. It could be another Earth. It could be whatever. And so that's what we use to look for exoplanets.

And I mentioned a little bit earlier that I actually look at exoplanetary atmospheres. And so how do we look at the atmospheres? Well, what happens when a planet passes in front of the star, the star actually illuminates-- I don't know if you can see the little glow around my coffee cup here-- but the star actually illuminates the atmosphere of the planet that we're looking at.

So what happens is, we have these spectrometers on our telescopes. And what they do is they look at the light that's emitting from the haze in the planet's atmosphere. And from there, we can pick apart, oh my gosh. This atmosphere is made out of hydrogen.

Oh, my gosh. This hemisphere is made out of nitrogen, or carbon, or it's got this hazy mix to it. We don't really know what's going on. Could it be clouds? And so there's lots of questions that can be answered by that method, the transit spectroscopy or transit photometry.

And it also tells us a lot about the size of the planet as well. So we get to kind of estimate if it's "Earth-like," if it's an "Earth" size. It could be a giant Jupiter-sized gas planet, which, those are always fun to find. And so that's how we look at exoplanets, and that's how my team, specifically, and a lot of astrobiologists that do exoplanetary atmospheres, that's how we kind of think-- that's how we find this data of, what is this planet made out of?

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I mean, we really do our best. There's obviously some technology that we still have to develop to actually figure out whether it's a terrestrial planet or whether a planet has water. But doing that and just looking at the atmosphere and having the atmosphere of being lit up by the sun tells us so much about a planet. And it's so much fun. Because, again, the possibilities are endless.

So that's a lot about what I do. That's a lot about what goes into astrobiology. And there's different ways that we do find exoplanets. And I think, if we have time, I'll probably cover those, too. But coming back to this timeline, what does the future look like, I'm still in college. I am what's called an "early career scientist." And I don't even know if I'd use "early career." Because, usually, early career people, they have already gotten their PhDs and they're already doctors in their field. And so they have these high degrees.

But I'm still in college. And so I'm still trying to figure out if that's the route that I want to go. And so it's kind of fun talking about it because my childhood dream of becoming an astronaut and my childhood dream of going to the stars and looking at the stars, it grew up with me. And I just could never shake it off, and it never went away. So I do still want to be an astronaut. And I would love to go to Mars someday.

And I think, in the future, I would love to see all of you come with me to Mars, and to be my colleagues, and to be my boss someday. And I would love to see that happen-- and go back to the moon and explore all the different moons of Jupiter and Saturn and explore all of this. And I would love to see that in the future. And I'm pretty sure that's what's going to happen. I hope so.

But above that, I just hope to keep learning. I love what I do. And I love that I get to do multiple things. And I love NASA, because my job, literally, is to learn. And my job is to ask questions. And my job is to be proven wrong, and to explore all these different kinds of things, and ask questions like, well, what if the aliens don't breathe oxygen, right? What if they won't exhale carbon dioxide. And I get to do that for work, which is so much fun.

And I get to do the policy, too. And I get to be involved in making sure that we go responsibly and making sure that we explore safely. And my job is to keep looking for the aliens, I guess. So I would love to stay in this field in the future, and I would love to see all of you join me in the future and come with me to Mars, please. This is an open invitation. Let's go together.

So that's kind of my story and my unusual journey into astrobiology. I want to thank you all again so much for listening. And with that, I will take any questions you have.

INTERVIEWER: So we're going to read out a couple of questions first, and then we'll go to the chat. This one comes-- [INAUDIBLE] comes from New York team. [INAUDIBLE] Robotics. [INAUDIBLE] couple of questions. I went through all of them. But I want to ask you, what was your favorite part of your job? And the second part would be, do you find it stressful if you can't actually confirm alien life?

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MONICA VIDAURRI: Oh, my gosh. [LAUGHS]. So the first part, the favorite part, oh, my gosh, my favorite part of my job-- ooh, that's such a tough one. I would probably say all these wild, crazy, brainstorming sessions that we get to do, and they actually turn into real life. And so there's a couple of concept telescopes that we're trying to get launched here in a couple of years, maybe in the decade or so, that we want to start directly imaging these exoplanets.

We want to start directly imaging some of these things that we're finding instead of just relying on this color, on the spectroscopy that we get from the orbiting planets, right? We want to take actual pictures of them. And it's one of those things where we sit-in this room and we talk about, let's do this crazy stuff with crazy technology that isn't out yet. And let's develop the technology right now. And it's so exciting to be a part of history. And I think that's my absolute favorite part of the job. And I get to ask questions for a living and be curious for a living.

And so the other one, I do get very frustrated when we don't find the aliens. I've always-- every single exoplanet-- and I've looked at hundreds through telescopes. And it is pretty frustrating when I don't get a little, like, oh, you know, oh, this is [INAUDIBLE]. Like, oh, my gosh, this is crazy. They're saying hi to us. It is a little frustrating.

But I think it's also just really cool just exploring these other worlds that exist out there. Like, these are our neighbors. And these are planets that we're finding dozens more every single day. And we know nothing about them. And they're just these so, literally, alien worlds that they're out there for us to explore. And so while it is frustrating that we don't find intelligent life or maybe microbes or whatever, it is also really fascinating to remember that we're actually exploring alien landscapes, and that is just so fascinating to me.

INTERVIEWER: [INAUDIBLE] actually, talking about alien landscapes, they wanted to know-- and if you guys-- are you able to talk, Kim, give your question yourself or you want me to read it out? I think you're still muted. We've got only a small audience, so we want to unmute them. Just make sure that you don't. But I can read out their question. Have lava flows been seen on other planets?

MONICA VIDAURRI: So not on planets yet. Unfortunately, exoplanets and all of the ones that we've seen, they are very, very, very far out. I need you all to remember, space is very, very big. And so we can't really directly see any kind of lava flows, or water flows, or any kind of signs of that stuff.

But what we see from, again, the spectroscopy and what we see from how we think the planet exists and how it forms based off of the star, we can kind of come to different conclusions about, oh, you know, there might be volcanoes on this planet. There might be water on this planet. So not on other planets, but we do know they exist within our solar system. On Jupiter's moon Io, there is-- it's a very active volcanic moon.

INTERVIEWER: Yes. And we've seen remnant volcanoes on Mars and Venus, right?

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MONICA VIDAURRI: Yeah, that's correct. Yeah, so Venus, very heavy volcanic activity, too. And on Mars, we've seen some remnants of those as well. So, absolutely. In our solar system, they're everywhere-- and, of course, on Earth.

INTERVIEWER: [INAUDIBLE] Guys, be enthusiastic. So don't be shy. You guys from Clark County, come up with some questions. But [INAUDIBLE] wanted to also know, what is the strangest thing you've ever seen on your job?

MONICA VIDAURRI: Ooh, that's a really good question.

INTERVIEWER: Yes, I know. So many things to pick from, right?

MONICA VIDAURRI: I know, right? So I remember looking at new data for the TRAPPIST system. So the TRAPPIST system is, they're a very, very closed system. And we believe that there are seven Earth-like planets in a row, right? So it's kind of hard to find an Earth-like planet, let alone seven in a row.

And so I remember seeing that data, kind of around the time when it first came out. And I was like, whoa. Like, these are-- it's not just one Earth-like planet. This is seven in one system. And it's pretty close-- relatively close to us, a couple light years away. And I just remember thinking, oh my gosh. This is the craziest thing. I would say probably, oof-- so that's a really good one.

On the policy side, probably the strangest thing was going into the West Wing and seeing-- I was able to meet the president, and I was able to meet all these really cool people. So on the policy side, that was also really, really cool. But, gosh, when it comes back to science, there's just so much stuff. Probably the TRAPPIST system and looking at Earth-like planets, and the data for Earth-like planets is so much fun. It always blows my mind.

INTERVIEWER: I don't have any more from chat. You guys gonna be a little bit brave? You gonna ask some questions on the chat? Or you can unmute and go for it. While we're waiting for that, here's one more question from the Jonesboro group. How many years of university have you needed to become an astrobiologist? And can you tell us about some other classes specific for the degree?

MONICA VIDAURRI: Absolutely, yeah, so that's a really good question. So I started at NASA, actually, in the middle of my undergraduate degree-- well, the middle-ish. I was about three years, almost three years, into my undergraduate degree when I started here. And now, I'm getting ready to graduate and start grad school. So, for me, I only needed the three. And, actually, since my classes, when I started at the University of North Texas, most of my classes were the policy.

And so I have a concentration in Law Philosophy and Governance that I did. And so I was doing a lot of bioethics. I was doing a lot of policy. I was doing ethics of space exploration. And on the science side, I was doing my biology labs. I focused in Microbiology and Genetics. And I was doing a couple of those labs. I did a couple classes on exoplanetry-- it was just planetary in general-- atmospheres and ionospheres.

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And an ionosphere is the electrically charged part of our atmosphere. And so, actually, it was most of the policy. And I was able to kind of jump over. Because I still had this brand-new enthusiasm for astrobiology and for space that wouldn't go away. And so I ramped up on the biology courses and the astronomy courses at the same time that I was doing NASA. So, yeah.

INTERVIEWER: OK, I had one more question for you. It's, how do you determine whether the exoplanet is gasseous or a solid planet?

MONICA VIDAURRI: Ooh, so that's a good question. So when the sun lights up the planet like this, and we can see the haze about it-- so, usually, when we see a really, really hazy planet, that kind of gives us an idea that, oh, this could very well be a gaseous planet. And also, the gassy planets are very, very huge, like Jupiter and Saturn. We typically find gas giants very easily because gas giants are bigger planets.

And when a bigger planet passes in front of the sun, it's way easier to see than a smaller planet, right? And so the rocky planets-- the solid planets, they're typically a lot smaller than the gassy planets. So one thing we look at is the size of it.

And then another thing we look at is how hazy the atmosphere is. If the planet passes in front of that sun and we don't see a whole lot of haze, it's just a little dip in the brightness, then we can kind of say, oh, that planet looks like a solid planet. It looks like a metalloid planet maybe or a terrestrial planet.

INTERVIEWER: All right. Yeah, that's really amazing to see the different sized planets. And some of them are not only just Jupiter-sized. They're about 10 size the size of Jupiter, right? Some really big guys.

MONICA VIDAURRI: Oh, my gosh. Absolutely. And so Jupiter, we call them hot Jupiters, right? And so Jupiter is a really fun case because Jupiter spins very, very, very fast, right? And it's so huge. The great red spot on Jupiter-- well, it's shrinking, but I think, at one point, I remember they were saying it was to fit three earths inside of that great red spot.

Now, I think it's more like 1 and 1/2 hour or two or something like that. But three Earths just fit inside of this one storm on Jupiter. And so this planet is huge. But we find planets that are 10 times the size of Jupiter. And we find planets that are-- even like maybe 20 times the size of Jupiter, circling these different stars, and it's just so fascinating to see that something that big, that it's a planet, could exist-- and so always, always super fun to find those.

INTERVIEWER: And one question from me is, on those big, giant planets, do you think that you could detect moons of those? So in our solar system, a nice place might be on some of these moons of these big giants. Do you think that there are moons around some of these giant planets?

MONICA VIDAURRI: Oh, definitely. That's totally a possibility. Unfortunately, it is very, very, very hard to detect things. The smaller the thing is, the harder it is to detect. So it's really, really tough to detect

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those. We confirmed, actually, the very first existence of an exomoon. I want to say it was a little over a year ago, maybe two years ago. I don't exactly remember the timeline on that. But not too long ago we confirmed the existence of an exomoon.

So, absolutely, I believe they exist. Our solar system isn't really that different from the other ones that we've seen. We do see a lot of solar systems with what are called M dwarf stars, so they're smaller, cooler stars, but we're kind of learning that we all kind of formed around the same pattern, right?

And so these big gassy planets would maybe, we think, typically, have moons. It's very, very hard to find them, but I absolutely believe, oh, yeah, exomoons are out there. And those big, gassy planets, those giant hot Jupiters, they're definitely a good place to start once we've developed the technology to find those.

INTERVIEWER: OK. So Clark County Idaho wanted to know, what is the biggest planet you've seen so far?

MONICA VIDAURRI: Oh, wow. So I don't see a lot of the hot Jupiters. That's not my realm. I have seen what we call a "super Neptune" before. And it's kind of hard to describe because Neptune-- let's say it's a little bit smaller than Saturn. I'm not exactly sure how to compare it between Earth. Well, let's say it's almost Saturn sized. So I have found an almost Saturn-sized planet before. But my colleagues-- I have other colleagues that they specifically look for-- the big, gassy exoplanets.

And I remember there's one that found one that was, I think-- or confirmed one, I should say, that was 12 times the size of Jupiter. So that was absolutely exciting to see. But I don't really look for the big ones, to be honest with you.

INTERVIEWER: OK, thank you. Last chance for any more questions on the chat. Or, you want to do it directly? Because I'm not seeing any others. I'll give 30 seconds to go.

MONICA VIDAURRI: Don't be shy, guys. [CHUCKLES]

INTERVIEWER: All right. I'm not seeing anything. So I just want to thank you, Monica for spending your time. Again, we'll post it, and I'll keep you abreast. I think it was really great for your presentation to show that it's just not us science geeks running around, but it really does take all types to make a discovery and get things off the ground. And I hope that you all students here can get interested in a variety of topics and make progress for us all.

MONICA VIDAURRI: Absolutely. There's a place at NASA for all of y'all. And so I look forward to seeing all of y'all working with me very soon and coming with me to Mars. And thank you so very much, again, for the opportunity to speak with y'all.

INTERVIEWER: OK, thanks, everyone. And we'll call it good fear. And if you have more questions, you can always email us at Apollo. And everybody else is saying thank you on the chat room. So thank you [INAUDIBLE].

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MONICA VIDAURRI: Thank you. Bye, everyone.

INTERVIEWER: Bye, everyone.