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| Jessie: | ... everybody. Welcome to the 4th of our ExoGuide talks. It's my pleasure today to introduce Knicole Colon. She's got lots of info in her talk about her background, but just for some recent context, she's been at the NASA Goddard Space Flight Center since 2017. She currently works on TESS as the deputy director of the Guest Investigator Program and on Webb as the deputy project scientist for exoplanet science, and on Pandora as the project scientist. |
|  | Her talk will touch on a lot of things, but I wanted to particularly point out that Knicole would be and excellent resource if you have questions about NASA postdoctoral program, what it means to be a civil servant at NASA and how to kick off a new mission. And of course, as you'll hear, if you have questions about anything to do about transiting planets she's a good resource. So just a quick reminder of the format, we'll hear from Knicole in the first hour and then the committee members will leave and you guys will have an informal round table discussion with Knicole for the second hour where you can explore a variety of topics. Okay. Thank you so much for being with us today Knicole. Please take it away. |
| Knicole Colón: | All right. Great. Allow me to just start my timer so I just am aware of how long I'm talking. Well first, let me make sure I can share my screen and my keynotes. And let's see, can you see that? I think, yes, I see it comes up. Okay. Perfect. And I'm not sure if I'll stay on chat [crosstalk]- |
| Jessie: | You're good. |
| Knicole Colón: | Okay. Thank you. And I'm not sure if I'll see the chat as we go along, but definitely feel free to invest if you have an urgent question or of course we have plenty of time for discussion later as well. So firstly, of course I want to start off saying I'm happy to be here today and share my experiences working at NASA. Oh, I'm the co-host, that's me. I'm sharing on my screen [crosstalk]- |
| Jessie: | That way you can see hands on the chat. |
| Knicole Colón: | Perfect. Thank you. So sharing my experiences working at NASA with you all and for lack of a better summary, I didn't know really what to put as a title for my talk, so I just put Life at NASA. But I wanted to start off first telling you a bit about my journey and how I ended up working at NASA before talking about the type of work that I do. Oh, okay. And then also I wanted to share some opportunities that may be adventurous to you all as an early career scientist. So this presentation will basically be in three acts, with the first act focusing on how I got to NASA. |
|  | And basically, in visual form, this was my literal path to NASA, I guess, on terms of what Google Maps shows. So I wanted to go through this background because I didn't actually expect to end up at NASA, that wasn't really my original plan. So I wanted to tell you a little bit about how I got where I am today. So I grew up in New Jersey and I went to college there. And I went to the College of New Jersey where we probably say that the T stands for the, so it's always TCNJ, FYI. It's a small liberal arts college, so you probably possibly have not even heard of it unless you're from the area, best known for being down the road from Princeton essentially and The College of New Jersey used to be Princeton's name, so that's our claim for fame I guess. |
|  | But anyway, even though it was a small college I was lucky enough to have some internship experience there, including one at Arecibo Observatory. So I was devastated with everything that happened last year. We don't have to talk about that with the observatory, it's devastating to see that. But basically because of that research experience that I had I did radio astronomy for the summer and I thought I wanted to study star formations, so I applied to graduate school with that in mind. However, I kind of I guess, I don't know if chickened out is the right word to say, but I hesitated. Did I want to apply myself to star formations right when I got to grad school? And the answer ultimately was, no. |
|  | So I ended up going to the University of Florida where I really had kind of awesome timing I guess because when I started grad school, my first year there was a professor also starting his first year, his name was Eric Ford and he was a team member on the Kepler Mission. And the Kepler Mission actually had not launched yet when I started grad school, so it was an awesome time to join and contribute to science that this new planet hunter was going to do. So it was very exciting and he had an opening for grad students so I was like, I'll take it. So really I spent part of my graduate work on studying Kepler planets and candidates and doing ground based follow up of them. And so also one cool thing about the University of Florida at the time was that it was the only U.S. institution with access to the GTC of the telescope pictured here, the Gran Telescopio Canarias. |
|  | And if you see I'm actually in that picture for scale, so it's a 10.4 meter telescope in the Canary Islands in Spain. And it was also just coming online, being commissioned. So I was able to use that telescope to be one of the first people to use the telescope to study transiting exoplanets. And so I used that to follow up Kelper planet candidates and vet them, and also did transmission spectrophotometry to study exoplanet atmosphere. And I did that using narrow band spectrometry at different wavelengths of light. So I'm bringing all this up too to say, I enjoyed research overall and at that point though in grad school I kind of honestly figured I'd end up teaching at a small school like TCNJ, that was kind of where I thought my journey would lead me because I really enjoyed going to undergrad at a small liberal arts college. |
|  | And I just honestly that I would do a couple of postdoc positions, get some more research experience and publications, and then become a professor. So I started down that path, I did my first postdoc at the University of Hawaii and I expanded my research expertise there from just optical wavelength work to infrared spectrometry of transiting exoplanets. And I enjoyed living on the island for a little while. The top picture is actually a view from my office, so I guess I really couldn't complain too much. It was a postdoc so they're temporary positions. So after that I went to my second postdoc at Lehigh University in Pennsylvanian, bouncing around the country here. |
|  | And there I had an entirely new experience again where I joined the KELT science team. And I really got to play a larger role there than ever before in discovering exoplanets. So KELT, just to tell you a little bit about it. It's two small ground based telescopes, one in Arizona, one in South Africa, and they're almost more like cameras, they're really small telescopes. And they were doing wide scope surveys to find transiting planets from the ground and you can see the numbers here that KELT in total found 26 planets. There were about 20 people really involved. So I was one of them and it was a lot of fun being in the weeds versus working before just analyzing Kepler data. This time I was really part a science team actually discovering exoplanets. So I thought that was really a lot of fun. But of course, again being in a second postdoc it was again a temporary position and I was already thinking, okay, what's my next move going to be? |
|  | And at that point, I'm not sure exactly when my thoughts transitioned, but I wasn't confident any longer that I wanted to go back to be a professor at a small liberal arts type of college. So I didn't know if I wanted to do research full-time, or teach full-time, or do something different like outreach full-time, or a combination of all those. But thankfully, my advisor understood that I really wanted to explore some options to prepare myself for my long term career and so a couple of things kind of happened all at once after we talked about it and I started exploring opportunities. Oh, going backwards. Okay. |
|  | So while I was a postdoc I kept doing research of course, that was my main job. But I actually applied for and got hired at an adjunct facility at a Penn State branch campus for one semester where I taught intro astronomy. And so I got to relive some teaching experience because I hadn't taught since first year of grad school in a lab. And I also got to do some cool outreach opportunities. I went to some universities in Texas and got to talk to a lot of Hispanic students about what it's like to do astronomy and do research to study exoplanets and all that, so that was really cool. But also I got invited to be on a proposal review panel for a NASA mission. So all these thing's kind of happened at once and it was at the review panel for this NASA mission that I really felt the connection I guess I was looking for. |
|  | I just honestly thought it was so cool, for lack of a better word, to be helping NASA decide what this telescope was going to look at. We got to review all these proposals and say, these are the best science cases out there and we want to observe these targets with this telescope. And so at that meeting I happened to mention my interest or excitement about the process to someone actually working at NASA headquarters. And that person said, well, you know that mission is hiring right now? And I was in the middle of my postdoc and I wasn't really even job hunting at that point, so the thought of applying to a new job it didn't really cross my mind. But then apparently the person from NASA headquarters talked to the other person working on this mission and then they were encouraging me to apply. And the very short version of that, after that meeting within a few months I applied for the job, kind of had an interview and then got the job. And that was how I ended up working out at NASA Ames Research Center actually on the Kepler and K2 mission. |
|  | So I bounced back again to the other side of the country for that job. But this was my first real foray into NASA and so now I went from a postdoc to I guess officially as the support scientist role as a NASA contractor. So I worked at NASA Ames but I was hired and paid by an outside institution technically. But my role was to support the mission in what was called their Guest Observer Program office and really for that type of role, I should say, the length of it was kind of indefinite in the sense that as long as I did a good job and there was funding available that I could have that job as long as I wanted essentially. Of course the mission was going to end for that and funding would run out, so there was a finite lifetime to that job. But that's the first example of the type of position that is available at NASA to work on missions, kind of temporary but still long term contractor position. |
|  | And what I did in that position was a lot of work to interface with the community at conferences, via social media, newsletter, things like that and to really make them aware of opportunities to use the data from the Kelper Mission, how to receive funding to analyze mission data, how to propose to the certain targets with the mission, anything to help them use the data. And also I was an interface in the sense of serving on a help desk, I answered emails sent to the help desk, if people had questions about how to access data, or what is this blip I see in my data, is it an artifact, all kinds of stuff like that. I helped set up a users panel. So these are the kinds of jobs that are tasks that I did in support of this mission and to support this Guest Observer Program where the guest observers are everyone in the community who wanted to use the telescope, so that was a really nice introduction I guess to working at NASA. But again, as things go, I knew that the mission was ending. |
|  | So I joined that project while it was in the second part of its lifetime. So the Kepler prime mission operated for four years, but then the spacecraft basically broke and then they repurposed it for the K2 mission where it observed along the ecliptic plain of the sky. And the mission or the spacecraft was going to run out of fuel at some point, so that was really going to limit the mission lifetime. So I knew working on the mission that I was enjoying life at NASA. But beyond Kepler and K2 there wasn't much else going on directly in astrophysics at NASA Ames Research Center that interested me. And so I was looking for, how can I still work at NASA and work on astrophysics and work on missions in the long run? |
|  | And so that's where Goddard comes into play because really it's almost comes down to timing again, because in the time period TESS was about to launch, the Transiting Exoplanet Survey Satellite. TESS was launching soon, Goddard was then supposed to be launching soon, but they really will launch this year to my knowledge. But Webb is coming up soon, James Webb Space Telescope. So these exoplanet missions that were up and coming and Goddard was playing a major role in them and so because of that Goddard also started hiring to bring in people to support these missions and that's what came up while I was at Ames were jobs to work on TESS and to work on science to support James Webb. Well, so basically I knew that Goddard was a good place for me to go if I wanted to continue the type of work I was already doing. And I will say that it took three tries to be honest. I applied to three different jobs at Goddard, I didn't get the first two I applied to, but the third one was the charm. |
|  | And I honestly, I don't know this for sure either, but I think that networking in general helped potentially quite a bit in playing a role to get me to Goddard. So I'd already been working at least on a NASA mission at Ames and so I started meeting lots of people at conferences that I went to as part of my job, and so I think I was able to meet a lot of people from Goddard that way through my work on the Kepler Mission. So yes, so I don't know how much networking really played into getting me a job at Goddard but I suspect it did play a role. So I just wanted to call it out, any little thing helped basically or I feel like it helped me at least in terms of just kind of getting your name out there, and the type of work you do, or what you're interested in. So if I'd never spoken up at the proposal review panel, I probably wouldn't be where I am today, that's almost what I think, so that's really how I got to Goddard. |
|  | So now, what do I actually do at NASA though now? So Jessi listed my excessively long title that I have right now, some of them excessively long. So basically these are how I would define myself at Goddard in these roles. So first and foremost, I mean, again at NASA Ames I was a contractor, so kind of indefinite job but still funding limited lets say, resource limited. But coming into Goddard I was hired as a civil servant, so what that means is I have a permanent job as a federal employee. And with that position there was a probation period, so as long as you didn't mess anything up you basically automatically get tenure after a few years and there's actually no need for a tenure package or anything like that, which is really nice. So I officially had tenure, so I'm in this permanent job but if I do want to be promoted I do have to put together some type of promotion package, which I'm honestly still learning about. But that's a little bit of a very brief background on what is a civil servant. |
|  | And also when I was hired, the position I was hired under was kind of generically to do exoplanet science and to support James Webb Space Telescope science specifically. I wasn't actually hired to work on a specific mission at first, but once I arrived at Goddard I actually was able to get a role on the Hubble Space Telescope for a little bit. And so I have a little asterisk at the bottom of the slide. So I'm not going to talk more about that here, but we can talk about it later if you want. But I was able to join that project and learn a little bit about what it means to be basically a project scientist on a mission. |
|  | But I'll talk more on the missions that I currently work on now, which include TESS, James Webb and Pandora. So first, I wanted to focus on some of my mission roles and what it means when I say I have all these titles basically and what I actually do. But then I also am going to talk about some science that we do as well, and some science I'm leading, and then other science within our research group too because I've only been at Goddard for a year but we have this incredible research group already and so I just want to share the kinds of things that we have going on. But first focusing on missions, I think you might all be familiar with TESS but I just wanted to kind of step back for a minute and remind you that it first started science operations in 2018. And so what it's doing, it's scanning the sky to discover transiting exoplanets. And it's particularly built as a mission to find small planets around bright nearby stars, especially ones that are well suited for atmospheric characterization. |
|  | So I joined TESS in 2018 right after it started science data collection and so I was basically there from the beginning of science working kind of in a similar role as I did on Kepler and K2, except now I was just a civil servant instead of a contractor. And so I did things like I worked on the website pre the first data launch to make the data launch [inaudible], to make sure that we were ready to announce the data release and insight performance was included in all the documentation. And just making sure we had all the right information to share with the community about what the data looked like, data quality, things like that. |
|  | Overtime my role has evolved. So now I primarily do two things, one is I help broaden the proposal review process. So now I'm on the backend organizing all the proposals. So what that means is you'll see at some point in the future a call for proposal to say we solicit proposal for people who want to observe with TESS. And so you can request money for funding to analyze TESS data or you can request funding and specific targets at a certain cadence that you want to observe them at. And so I'm in the background developing that call for proposal. I'm also in the background pulling together panelists to review your proposal, and making sure that they have all the proposal information, and how to write an evaluation, and I'm there in the meeting monitoring the conversation especially now things are dual anonymous so making sure they say dual anonymous in the discussion. So all these things, that's the type of work I do for that. |
|  | And then I also help manage the program budget. So now I basically make sure that people who are awarded grants get their money and keep on top of how much money we have in our overall program budget, so maybe we can fund a couple of extra grants this year, that kind of stuff. So it's still servicing the community. And our TESS team at Goddard too we interact regularly with people, well, the TESS team is kind of spread all over, so we're at Goddard, MIT is where the main science team is, the data pipeline runs out of NASA Ames, MAST hosts all the TESS data and NASA host all the planet candidates at the [inaudible] site, so there's all these different institutions involved in TESS and so we interface with all of them to just keep TESS running smoothly. |
|  | And in particular too, I stayed on this slide because this was all the prime mission sky coverage for the first two years of the mission. But TESS is in its first extended mission right now until September 2022 and pretty soon we'll be proposing, well, George Ricker, the PI at MIT, will submit his proposal to extend the TESS mission again for another three years. And so our TESS team at Goddard along with everybody else will have a lot of input into that proposal as well, that's something else that we do to make sure the mission can continue if possible. |
|  | So this highlights just a couple of activities that I mentioned on this slide here. Going to conferences is always a big part of what we do, interfacing with the community. The top right was at the last AAS in Hawaii. And sometimes we get to do fun interviews as well. I don't study black holes but I'll get to talk about them because I can represent NASA and share to the public what's the cool stuff that this planet hunter is doing that isn't always about planets either. But yes, so that's some of the stuff I do for TESS. |
|  | Now I'm moving to James Webb, so the James Webb Space Telescope. This is I guess the first mission I worked on technically that hasn't launched yet until Pandora which I'll get to shortly. But the James Webb Space Telescope, just to remind you again in one slide, is basically an infrared optimized 6.5 meter diameter foldable, un-foldable telescope or transformer that's slated to launch later this year, working launch date is in October. And it has four different instruments so it's going to be doing a lot of science once it gets up in space. And basically because exoplanet science will be what James Webb spends a significant fraction of its time on, about of a quarter of its time will be spent observing exoplanets, that's when I was brought onto the project. |
|  | And one thing I didn't mention, with both the TESS position, actually all the positions, once I got to Goddard my position's first on Hubble, on TESS and now James Webb. I actually had to apply to internal job ads to join those missions. So nobody explicitly said, hey, Knicole can you come work on James Webb? I was encouraged to apply to the ad but I still had to apply. So even though I had a job at Goddard, to work on a specific mission I had to do another interview and explain why I was the best fit for the job. So the interview process apparently doesn't always end once you get a permanent job at NASA. But that's just a side note and again, we can talk more about that process as well, is how to end up working on missions. |
|  | But anyway, so what I do on James Webb again, it's a little different because it hasn't launched, but really what I would sum it up as is making sure the telescope is ready for exoplanet science and making sure the community is ready to do science with Webb. So in that sense what I've done is I've given a lot of presentations to the community to provide status updates to really deliver expectations on the performance. We can expect [inaudible] but we won't truly know the performance until we launch. And what the commissioning period is like, when will [inaudible] instruments be commissioned, when will we get the first data sets out. And I also work with the team at base telescope and the different teams who developed the instruments as well to really prioritize improvements in the tools that are used for exoplanet science. And just help ensure the data analysis pipeline is actually ready for time series observation to put out high precision data that we need to study atmosphere of exoplanets in particular. |
|  | So I also can do some fun things, I think they're fun, like dive in and report back on all the more specifics on exoplanet science that Webb will do. So for example, I had gone through the cycle one transiting exoplanet target list and this plot I put together just illustrates first the breadth of targets that will be observed in cycle one, plotting their temperature and size ranges but also demonstrating how many of them were discovered by TESS. So TESS is doing its job basically to find great targets for Webb which is [inaudible]. And just in general we're going to get a lot of great science with Webb out of the first year, so that's the kind of stuff I do with Webb. |
|  | Another thing I'll mention is that working on a mission before it launches, like Webb, in the specific role I have it's kind of temporary within the mission. So essentially my specific position only lasts up until one year post launch but then after that we'll see if I end up in a different role on James Webb with modified tasks or maybe I'll have the opportunity to move on to something else on a different mission. So even though I'm on James Webb now, it doesn't mean I'm on it permanently. It's still some things are just very timely when you work on them, kind of like I was on the Hubble Space Telescope team when I first started but then an opportunity came to join Webb so I basically left Hubble for Webb, but I did that because I wanted experience working on a mission that hadn't launched yet. And Hubble's been up forever so it was a very different mission to work on. |
|  | But now, speaking of very different missions to work on though, I wanted to tell you a little bit more about Pandora too. So this is my other hat that I wear or I'm the project scientist for Pandora. And again, I'll tell you a little bit more about what that means, but first, what is Pandora? It's a small sat designed to study exoplanets and their host stars. And Pandora was actually one of four mission concepts selected just in January as part of a new program called Pioneer. And the Pioneers Program, they're basically missions of $20 million cost cap, so they're smaller missions PUEO sat, SmallSat and ballon, those types of missions. And Elisa Quintana at Goddard is the PI and we also have a deputy PI, Principal Investigator, who is Jessie Dotson at NASA Ames Research Center. So we have multiple NASA centers involved and lots of other institutions as well which I'll show you picture of our team in a couple of slides I think. |
|  | And so what Pandora will do is really observe transiting exoplanets to study and deal with stellar contamination of the exoplanet transmission spectra. So we're going to observe a set of exoplanets that we know have variable host star that have some number of stellar spots on their surface and show signs of that kind of activity. And the point being that especially the set of host stars that we're looking at which are cooler host stars that those spots could be water dominated and that those spots are then contaminating the spectra from the planet, especially if we don't see them. So this is the transit light source effect that you may have heard of it. |
|  | We're basically going to observe a planet in transit, we may or may not see evidence of a spot, but if we don't see it that doesn't mean there aren't spots on the surface, especially if the star normally does show signs of spots to having a visible rotation period for example. So I'll show you more on the next slide actually, but basically the goal is to correct the planet's atmosphere, the infrared transmission spectrum, correct that, remove out stellar contamination, the stellar spot that might be contaminating it and obtain a true atmospheric transmission spectrum. And so the mission has a launch date of mid 2020s and has a one year duration, but I believe we have or we will hopefully I think, have the opportunity to extend the mission. |
|  | So this slide, I couldn't remember if I included this but I'm glad I did. So this slide illustrates what Pandora will do better than what I just said verbally. But basically at the top panel it's observing in a visible channel over a long time period, we're observing a given set like 24 hours and we're observing a star for multiple sets for 24 hours to really observe the brightness of the star and how it changes as it rotates and basically what that tells us about the spot covering section on the star. And then so bottom panel shows the planet transmission spectrum, so the spec versus wavelength essential, but it's showing at different rotation angles of the star what can happen if there are spots there and how it influences the scaling of the spectrum, the amplitude of the water feature, or maybe it [inaudible] the water feature entirely. So these are things we're going to learn about and collect with Pandora by observing simultaneously in a visible channel and an infrared channel. |
|  | If you're familiar with Hubble, the Wide Field Camera 3, a similar band path that it observed there around 1.4 microns, there's a water feature there. So I kind of said all this already, it's just showing the mission at a glance here. But I also wanted to note that we are hoping to operate simultaneously with James Webb, so operate simultaneously and potentially observe simultaneously, or maybe around the same targets that Webb is observing at some point to help inform Webb observations as well. We have the benefit of observing in the visible and IR over a long time baseline and Webb will do more chucks of transit at a few hours at a time as it can only in the infrared or only in the optical. |
|  | So yes, okay. Perfect. So this our current Pandora science team minus a few recent additions actually. And here I just wanted to point out that we partnered with Lawrence Livermore National Lab, they're managing the project, and providing the telescope, and doing a lot of the engineering work, but most of the people on this slide are doing the science work. And so my role as project scientist is basically to oversee the different science working groups and make sure we're on pace to meet Pandora's science objective and especially given any engineering constraints that might come up. And then I also lead separately one of the science working groups that we have which is specifically for finding the target list. |
|  | So in case you're wondering, at this point we are in a concept study phase. It was announced in January that Pandora was selected. What does that mean? Well, what that means is that we can do this initial formulation phase where we basically investigate a couple of things called trade studies that we said we would do in our proposal that we submitted. So we basically presented in our proposal a baseline mission that we would develop. But some of the science and the output did depend on certain things that we didn't fully explore in the proposal, like the exact detectors we were going to use, thermal variation, more engineering trades mostly, so that's what we're investigating now in the first six months of the mission project. And then we have prepare a report and submit it, and then we get evaluated and after that we expect to hear for moving forward to the next phase, actually by the next January AAS. And all the four missions that were selected in this pioneer survey will be reviewed the same and will all get word if we can proceed to official design I guess in January 2022. So then we can continue to proceed from there. |
|  | So it's really a very broad look at the missions I work on, what I do and how we're working on Pandora now but of course there's more to the story that we can talk about later. But I did want to talk a little bit more science now. So that was a lot of mission stuff, but science wise just a couple of slides I think on that. But basically first, one project that I'm leading that I am excited about partly because it's the planet that I helped discover when I was a postdoc on the Kelt survey. But it's all about this planet called KELT-11b and it's one of the lowest density planets known. And you can see on the plot here how it kind of stands out in density space but also it has a very bright host star and it's not just bright, but a slightly evolved host star which is kind of unique. So all together between its low density, its low surface gravity and its brightness it's one of the targets for atmospheric studies. |
|  | And so jumping just right in, I have been leading a project to study its atmosphere and we collected transmission spectrum, so measuring the transit depth versus a function of wavelength, and first I'll point out that we had TESS, Hubble and Spitzer data and Tess observed KELT-11b over a 27 day period. So it collected about 5 and a half transits and TESS actually provided the first precise optical transit depth for KELT-11b. Because KELT-11b orbits an evolved star, the star is huge, the transit depth is pretty shallow, we'll even see the depth here, so it's already hard to detect from the ground because of the shallow transit. But because the star is huge the transit is very long, it's seven hours, so detecting a long shallow transit from the ground is really hard and there was a heroic effort done to detect the transit from the ground to confirm the KELT signal and that's in the discovery paper. But the error bars I think are off the chart here, so it was very uncertain. |
|  | But now with TESS we were able to get the first precise measurement and the optical, which is great. Also, the TESS depth overall is higher than the Hubble depth, adjusting the presence of some additional optical absorber, which I'll come back to a little later I think, oh yeah, I will. And then also, so we got one transit with Hubble and you can see the Hubble spectrum in that wavelength range. So around 1.4 microns there's this water absorption feature and firstly, with a single transit this Hubble spectrum is actually one of the most precise ever measured so it changed a lot of Hubble quality of data, so it's really exciting to see that. And it's really because the transit is long and the host star is really bright. |
|  | But also around, as you might have noticed already, that the spectrum is not black which is good because that means that we detected a low amplitude but significant water absorption feature that is also actually unusual in shape. And I'll show that on the next slide why we say that further. I do want to point out here that we have one Spitzer transit as well, but it didn't really tell us much information partly because it was a partial transit. So the Spitzer transit was taken actually after it was discovered from the ground and so we didn't quite know the transit time that well from the ground data, so the Spitzer transit ended up covering the partial event and then it just resulted in a large error bar. So we didn't learn too much from the Spitzer but we're hoping one day to observe this with James Webb and the infrared and unfortunately cycle one is pointed at a target we're not inspecting but maybe next time. |
|  | So anyway, just to wrap up, this is my last slide on this section and then I have a few more slides. The KELT-11 spectrum all together shows strong evidence for water absorption but actually when we retrieved the abundance on the water absorption we find it's actually quite low and potentially several order of magnitude lower than expected from planet formation models, so that's kind of funny or intriguing. And also just to demonstrate the shape of the spectrum, why it's weird, I plotted KELT-11 against kind of a twin planet WASP-127b, which has the same mass radius, so density, surface, gravity, but they are different temperatures and have different host star metallicity's. But you can see the WAS-127b points in blue, they slope up and down like they're just [inaudible] a water feature, as what we would have expected from a normal water feature, but KELT-11 doesn't slope downward and so we think that extra bump is possibly from HCN, but that's something we're still exploring. |
|  | And actually we just got more data for KELT-11, so there's new results coming soon which you can see. So before we had just this G141 bandpass with the Wide Field Camera 3 and then we recently got G102. So before we had only done the 1.1 microns and now we're extended that with Hubble to 0.9 microns and it's black and we're still investigating what all this means. But with the new data we're still finding a low water abundance. But I guess just stay tuned in the coming months for a paper on that. |
| Jessie: | Knicole, I know you're watching the time and that we started late but we're getting up to the first hour. |
| Knicole Colón: | Okay, yes, got it. I'm going to run through just these last few slides. So that was one of my projects I was leading but I did want to just show you that we have a great research group. So I listed this as my research group specifically because these are the students and postdocs that I specifically mentored or am currently mentoring. And while I was putting this together I didn't appreciate how many students I already had in the past four years essentially. But it's amazing. So I have John Ahlers, Dana Louie our current postdoc fellows. Steven Vilanueva will be joining in September. I work with a grad student, Ben Hord, and then I have two undergrad summer interns and high school intern, so they're all fantastic. |
|  | Looking at our broader research group too, Tom, Elisa and Josh and I were all in Goddard in 2017 around the same time and then we extended our research group and all the faces highlighted in orange are current postdocs within our group. And then two of our grad students are in blue. And we all work on a variety of things from exoplanets, to stellar flares, to eclipsing binary's, to certain binary planets, so it's been really exciting. I'm not going to go into detail but John Ahlers wrote a great paper last year using TESS data to study KELT-9 and basically show you the beautiful TESS data on the right here, that's a gravity darkened signal we can talk more about that later, but I just want to show the kind of unique work that some folks in our group are doing to understand host star connections to planet properties by studying TESS data, and studying the shape of the signal, and studying in rigorous alignment, things like that. So John's doing some really cool work there. |
|  | And Emily Gilbert is a grad student and is also doing some really cool work. And she wrote a paper announcing the first habitable-zone Earth-sized planet from TESS, TOI-700D if you're interested. So obviously that there, you can check out the paper if you want to. But that's some really great stuff. And then I think I just have two slides on this I think, but opportunities at NASA and we can totally flesh this out more in our discussion as well. But I wanted to point out first that there are opportunities for grad students. We have a basic intern.nasa.gov website and both undergrads, and grad students, and actually high school students can apply to do internships even if it's just for a standard 10 week summer program, or some people want to be an intern for spring and summer or sorry, spring and fall semesters as well, or year round. So there's a variety of things though you never know what will be posted there, maybe not necessarily an exoplanet sometimes but in all of astrophysics. |
|  | And there are a couple of NASA fellowships, one includes time to spend on research activities at a NASA center. But also, as Jessie mentioned at the very beginning, there are postdoc positions and you've seen kind of our large group of postdocs that we have already and several of them have come in through the NASA Postdoc Program fellowship. And I just want to point out that one nice benefit of being a civil servant is civil servants sponsor NASA Postdoctoral Program fellows, but when someone comes into the program we can often get them funded for free from NASA headquarters for two years. So basically we can bring in a free postdoc that we didn't need to bring in extra grant money to support because then if we do have grant money then we can use that to hire another postdoc or a grad student. So it's a nice way to build the group and just have that opportunity. And so I'm totally happy to talk more about that. |
|  | But there's three deadlines a year, so you can learn more about that. And then regarding longterm jobs, I did just want to highlight... Okay, this is a wall of text, I know. But I wanted to put for posterity I guess, this whole announcement came out I guess a couple of months ago that Goddard will be hiring soon and the point of this, I tried to call out the most important section I guess in blue, is that we all are awaiting the results of the Astro2020 decadal survey and that's going to release a report that NASA will then look at and say, okay, what should NASA do for the next 10 years? And basically Goddard is gearing up to hire to support whatever that decadal report says. And so Goddard is expecting to have several new positions and was to be advertised later this year. |
|  | And so I wanted to bring it to your attention first of all. But also, so this announcement came out a couple of months ago to spread the word early and they are encouraging people to submit expressions of interest that they were interested in the job and I really apologize, I didn't think of this sooner because expressions of interest are due tomorrow. But those are not mandatory, it's more of just getting on their list so that when these jobs do open that they will alert you that the jobs open so they can encourage you to apply. So with that feel free to ask me questions about that. |
|  | And then last but not least, mission leadership opportunities. There's a lot of them. I want to emphasize, I talked a lot about NASA here obviously but that's what I do, that's where I am, that's who I am now. But you actually don't have to work on NASA to work on a mission and there's NASA that was trying to support a whole bunch early career scientists now to learn how to develop new missions, so if you have any interest in that there are these resources that you can check out and I think they're going to continue doing these in the years to come. Okay, so last but not least, I wanted to invite you to our next meeting in the Chesapeake Bay Area exoplanet meeting. It's a meeting we hold virtually now a couple of times a year. All are welcome. Normally if it's in person it would be Chesapeake Bay Area focused people, but now it's everybody. So I just want to thank you for letting me share my experience with you and let me know of course in the next hour if you have questions and want to talk about anything. Thank you. |
| Jessie: | All right. Thank you so much Knicole. Yay. I thought I got everyone to unmute. Thank you so much for that ride. So yes, we're going into the second hour now, so I'm going to head out and I'm going to let you guys chat with Knicole. So it's questions about what she presented, or questions about any of the other things that have come up over the last three months, or that I mentioned that she would be a good resource for, please go ahead and chat with Knicole. So Knicole, I will say goodbye. |
| Knicole Colón: | Bye, Jessie. |
| Jessie: | And thank you again. |