Dan Seed ([00:00](https://www.rev.com/transcript-editor/shared/4QPQfeJ3FbwD0MJyweK-p_7FlL93FhVCd_jAp6xYPdeMPjcvYcsFACUTAz0cFFdw2D-llGR9JYUrQxZOJ5vLlGUXm3c?loadFrom=DocumentDeeplink&ts=0.45)):

Hello and welcome to Big Ideas, a podcast from Texas State University. I'm your host, Dan Seed from the School of Journalism and Mass Communication. This month we're joined by Dr. Andrea Banzatti, an assistant professor in the physics department, and Dr. Banzatti area of expertise is planet formation, and he's about to head out this summer to conduct research using NASA's James Webb Space Telescope. Dr. Banzatti, thank you so much for joining us.

Andrea Banzatti ([00:26](https://www.rev.com/transcript-editor/shared/IohWTFPI3df8OSxBiaeMt1eoLhyd1T7eEwa7TQvNqGOX3Lt2AfScJ9b9CYdQG65BWjk8CcMSQrB8nSRocDvYpi5Ofdk?loadFrom=DocumentDeeplink&ts=26.19)):

Thank you.

Dan Seed ([00:27](https://www.rev.com/transcript-editor/shared/TwXkGRVDZNLh4EK-5T7arXSf434GMTVPrrPbuKHKTPXvkcXeBNexzaeLV3Gjmb5aII3xpbXV-J1WEKEZDNGIq5ar5z0?loadFrom=DocumentDeeplink&ts=27.24)):

So I've read your bio, looked at your scholarly work, but I'm not going to lie, I'm not going to pretend here that I can distill this down for our audience, even though it's all very interesting. So I'll let you do that. But first, how did you get into this field? I mean, it's so fascinating and it always interests me how people get into this exploration of space. Walk us through that. What drew you to it and then where has your career gone from that point?

Andrea Banzatti ([00:53](https://www.rev.com/transcript-editor/shared/u_TOayaN7xFrnRzza_6GOKsefVstUaqo2ensiwqyjmI3SB_mgASpYNSre5V0sZBpmaTEwewzGLSIFreHFLTTD86nb-g?loadFrom=DocumentDeeplink&ts=53.13)):

Thank you. Thank you for your question is always truly one of the most fascinating questions to ask to any of us. Where do you come from? How did you get into this field? And yeah, maybe the story I can say is interesting because it's not maybe the usual story or I was born and I knew that I would be an astronomer. I was not born that way.

([01:18](https://www.rev.com/transcript-editor/shared/StEXTOvesGyPBuxIqMeU2Oh3Ffuolu2e84TdlSnpQNVb7RXlMS3h-wtRNIM0530nIRA1M5miimfD0_korVQkWJSnVpQ?loadFrom=DocumentDeeplink&ts=78.18)):

So it was really an interest for astronomy and then later for plant formation that I discovered as I was going. So I studied physics and then when I was studying physics, I started being attracted to astrophysics. And maybe it's in a peculiar way. The one fact that I remember that really started pushing me in that direction was that I was with a group of fellow students friends on a weekend of study. We retreated in the country and in Italy in a beautiful place to study together to get ready for the exams. The evenings were beautiful, beautiful sky was a dark place, and so we could look at the sky and unfortunately it was a full moon night. So full moon means that you cannot see very well the stars because it's very bright. And so I went up to study about the moon and I explained that night the moon to my friends about the shape, the colors that we see, the darker spots, and also literature, how that had been addressed in literature.

([02:23](https://www.rev.com/transcript-editor/shared/lsO_tU7GiRvZwxiz7lZrRqRnRXRTVgV64nPsbTtRDtwsN35jD7Xl3mh_gzIRO1CKFibWeU3qCFKJ9kxXFFOCa1y4E0s?loadFrom=DocumentDeeplink&ts=143.07)):

Anyway, long story short, that night really was a step for me where after that night I thought, well, maybe I should go into astrophysics. And then I started taking astrophysics courses. And at my department there was no, so there was one strong group in Milano where I studied that was studying cosmology. And for some reason cosmology did not attract me that much. And they had some labs. They were working actually on another great space mission. It was the plank mission, so like the state of the art of cosmology. But yeah, for some reason I was not too attracted to that. And I remember I was reading a book on Earth, the Formation of Earth back then. It was a book by two American scientists, rare Earth. So this book really inspired me towards the question, where do we come from as a planet? Where is earth coming from?

([03:24](https://www.rev.com/transcript-editor/shared/fKLwKKgzR6_vHKIWXXxgre1U7-XPIN9ywae4T7cIbS6v8hbLHHa9Tsf6MB0IJoXqEoVDpM-cZfvLJ_4rSr3eDAa6HGg?loadFrom=DocumentDeeplink&ts=204.73)):

How can earth have all the amazing aspects that work all together to make it home for us? And I was learning from that book that there are many, many aspects that make earth a rare perm, at least in our solar system. So that's where the interest for planet formation, how planets come about. So not only our own earth, but more generally planets. And then I went off to Germany for my master thesis. I was looking for a master thesis project in Milano. Now again, the only group was working on cosmology. So I was looking outside and I had this unique opportunity to work at the European Southern Observatory near Munich. And the advisor I found there offer me the opportunity to start researching on plan information from observations. And there was the second most fundamental step for me where I discovered what it means to observe with telescopes. I discovered what it means to do analysis of data taken by telescopes, and I discovered what it means to do research in plan formation. I started to discover that. And since then it has been one step after the other to deepen and deepen this attraction and this research.

Dan Seed ([04:42](https://www.rev.com/transcript-editor/shared/jOYq-9xqrwggEFEFnihQkNS2aMdFd7o1s2fNMIXufN8T94nBQow26BrKuusxZQMsBRaUBINJF-yR43Ig1aZpFXR3lvA?loadFrom=DocumentDeeplink&ts=282.61)):

And so for our audience at home, you've mentioned this idea of planet formation. How does that occur? I'm sure that different planets have different ways of formation and whatnot, or maybe not. What is it that you're looking for when you look out into space to study this?

Andrea Banzatti ([05:01](https://www.rev.com/transcript-editor/shared/6vpFXfhDrOPp0AvuYiCfuPjil97ljgRPq9LlrvOgue6Oo3BJZHkNfufsnszueEz75B2FAI99aFq8FAPRKnVwecTk8qQ?loadFrom=DocumentDeeplink&ts=301.21)):

I think a useful analogy can be the following. So imagine you would like to know where you come from as a human being. You look at yourself right now, you look at the mirror and it's hard for you to build a story. So you don't see yourself as a baby, you don't see yourself as in all the steps in between being a baby and where you are right now. This is very common, a very common problem in astrophysics. So when we look in space, we cannot follow in real time how things happen, evolve, are born and die, even stars. They take way too long for our human timescales. So what can we do? Going back to that analogy, we could be a photographer who goes to a very busy piazza in Italy. Now, those centers of ancient towns where there is the cathedral and there is a big plaza where thousands of people and you take a snapshot of that plaza and you start then from the picture, and then you look with your other scientists, you look, okay, look at that.

([06:04](https://www.rev.com/transcript-editor/shared/el3KbuLqnl0fbfAXvPka0YJtYDHrCfMygQTSTx4eQ6ZUYDZbN-lUn5ufZHVdYM5aOXbpjGAahKtWIFQ0_nRqTHca7nM?loadFrom=DocumentDeeplink&ts=364.01)):

So that's a little human and that's an older human. And then let's try to connect these points. Let's try to understand how things happen are born and evolve by taking a snapshot of many elements of the same class, many stars and analyze them in different stages of evolution formation. So again, this is a very common approach in astrophysics and that's what we do. Even in the case of plant formation, our solar system is already a mature solar system. We have planets that are fully formed and fully developed. We don't know, we cannot look back. No, we cannot rewind our own solar system and see how it looked like. But what we can do is to use telescopes to observe young stars where their own planetary system is still very young. In fact, it's not even there yet. It's still forming. So these young stars form surrounded enshrouded in clouds of gas and dust, and when they are in the process of forming their own planets, those clouds take the shape of a disc, of a rotating disc.

([07:13](https://www.rev.com/transcript-editor/shared/IkXAcCn22mrJ4vnoS8msWKNeoXqEsvvic8uJ-Z1UrBO7YjsD3isIcGg7YNDH7xsD7USTCO2nAWX1pFPxpRDqzh4nrSk?loadFrom=DocumentDeeplink&ts=433.13)):

So there is a star, young star at the center, which is already a fully formed star, is already shining like a star and illuminating the surrounding area. But around that star, there is a dark disc of gas and dust these in rotation around the star. Now planets are formed from that dust and gas. So that's sometimes you might have heard that these are called the birthplaces, the cradles of planets and life. But there is an additional problem there. It is as if you wanted to study again a human being, but that little human being, that baby is closed in its own crib. So when you take the snapshot, you only see the crib and you cannot see inside of the crib. Similarly here, these gas and dust hide the planets that are being born to our eyes. So it's really, we have to be creative and smart and use different telescopes, different instruments to be able to enter into that disc and be able to see what's going on inside of the disc that is forming planets that eventually will look similar to a solar system like we have now for us.

Dan Seed ([08:21](https://www.rev.com/transcript-editor/shared/Gy6ps0P7rXa816IAhwWf9WqguRw6U3nsZbijFlJF_lcvEHzxMRZZz0rm7iTu0SSGSKDhUEtw27f2mtZi33ph29GucTA?loadFrom=DocumentDeeplink&ts=501.98)):

That's a great analogy and one that puts it in a really good perspective that I can understand and I'm sure that our audience can as well. And I apologize if some of these questions again are basic, and I'm sure that you get this quite a bit when you talk to people, but when you're talking about a planet formation, how long does this take? Do we know? Do we have a sense or are they different? What's the, the length of time? Are we talking thousands of years, a month or what on this?

Andrea Banzatti ([08:50](https://www.rev.com/transcript-editor/shared/LvfRJUYKhbSWnt7tIlAWuPsRTBqBBY1WrjCDlyPHJK53z9ReslwvfZwdV5ljGrWF54puj1pkkkwD1PbhuirfAVM486Y?loadFrom=DocumentDeeplink&ts=530.87)):

Yeah, so these are millions of years to even billions. So our solar system is even older, but the stage of formation probably takes, it's still a bit uncertain but of the order of many millions, millions of years. So it's a very long process.

Dan Seed ([09:08](https://www.rev.com/transcript-editor/shared/uTBu3W2Wn_pQEPhJ2Fy-NnO3KvuhsSX0ClkgyXCdaRtKa3hxVGFCyTWokOVq_orAAXyyu-DrDCpb_kN-ZB-XoR5D5bM?loadFrom=DocumentDeeplink&ts=548.55)):

One would think that it would take a very long process to form a planet. But describe for us, it's difficult, right? Doing this just with audio and obviously, but put our audience in your shoes. When you look through one of these telescopes and you described what you see, but really give us that moment, what is it like when you look through the telescope and you see this happening?

Andrea Banzatti ([09:32](https://www.rev.com/transcript-editor/shared/pUywozTTK0zFgjxfn4XdyLFhnXEWQsyva5B9fhZr2PV8-2RDNmu61s0M9qh1fwR45A47zL8LNybwu-JozepPaR4wXQs?loadFrom=DocumentDeeplink&ts=572.34)):

Let me say this. So people who are not scientists can understand this all just by thinking what happens to them when they take a little, even just a small telescope and they look at the sky. I remember when I was still a young student in Italy that I would go out with other students and observe the sky with small telescopes. And I remember the awe of even just being able to see Saturn's rings with your own eye through a small telescope. It doesn't need to be big really, but you see a.in the sky. You take even not a binocular that's not enough, but is small telescope. And you point it there and you see that it has rings and I don't know why, but I had the impression I could feel the silence of that planet orbiting very silently in the darkness around the sun.

([10:22](https://www.rev.com/transcript-editor/shared/ZJhiP3si4n53GTq1lK5yfh8LXwctIdBiCrFyNPqdVMBRe6dv_54vcu4JqJLjuz7tnoHfz6Y06IC8J0jbKx6bgQO8r_k?loadFrom=DocumentDeeplink&ts=622.35)):

So people can understand that because anybody can do this and anybody can be just shocked by suddenly seeing that the pointy, a little luminos point in the sky. It's actually not just a point, but it's a little sombrero. It's a little Lord of the rings. It's a planet with rings. Similarly, you can look at Jupiter and see the moons and you can see them moving from night to night. So even that, it's amazing. You can as if you were there and you could be flying in space and see that happening in front of you. So it is a very similar awe, but what we see is something more complex to understand. So as a scientist, when I look at the screen, and I still do that, I still wake up in the night, I open my computer and I observe with a telescope from Hawaii, and now we have this opportunity to observe remotely.

([11:15](https://www.rev.com/transcript-editor/shared/JKPMsicIWlI-NvTWTiyhRwNVBb2Rmym7MHWKqSsjuYymseuw-9j4W1D7u4KAhN7-5o8pmT3OiorQpJ6TFGHP3FimJeM?loadFrom=DocumentDeeplink&ts=675.27)):

So that's fantastic. It's very convenient. What the data that I look at are much more hard to understand for a general public. I look at wiggles, I look at spectra, I look at the emission from molecules, from gas molecules that are orbiting around the star in the regions where planets are forming. And I try to listen to their secret. I try to listen to the story by looking at the shape of these wiggles and by analyzing them later after I take the spectra from the telescope and we reduce the data, we prepare them for science, and then there are months of work to try to extract the story that they are telling us. And that's always filled with off from the very beginning when you start to see those wiggles popping out from the screen and you see that, yes, that's there. That's something there. I'm listening to what's happening there. Yeah, probably that's the best way to describe because again, I don't expect common people to have the same art that I have in looking at that data because it's more complicated, but it's fundamentally the same art that I was describing earlier.

Dan Seed ([12:22](https://www.rev.com/transcript-editor/shared/hKc1VYPxrOEYxjV6j44xvFkmcx0FwKsaxEA0EOjnlyyNawdpJttmrn_zawN_b2NuPr3YcDLaESd3_0C-GhkMQmO_oJ4?loadFrom=DocumentDeeplink&ts=742.12)):

You painted such a vivid picture of what it's like to see this, and I wish our listeners could see your face as you describe it, because you light up with passion and joy. You really do describe it so well. The reason that we're having you on here, we've talked about telescopes, but this summer you are receiving observatory time on the James Webb space telescope, and that telescope is NASA's new flagship infrared telescope. It's designed to study exoplanets in distant galleries, and it launched on Christmas Day. It sounds so fascinating. As you've described. Why is getting this observatory time on this telescope such a big deal?

Andrea Banzatti ([13:04](https://www.rev.com/transcript-editor/shared/ZDPLHJxZHyHUm3NVaXaizvdf9oxQ5RffydiHafaDex83qyM2HeWzp2_wXXFR1M9K9RjzJS35ZlWUdr7Mkt9gTLJSzlQ?loadFrom=DocumentDeeplink&ts=784.48)):

It is a big deal for many reasons, and one that is personal is that I've been essentially preparing for this for 10 years. So since I was a young student and I started working in astrophysics in research, at first I was using a different technique, but as soon as I started my PhD in Switzerland with an American professor, Mike Mayer, who is now in Michigan, he pointed me to a different technique to spectroscopy in the infrared. So I remember since then, the very first spectra that I was analyzing were from the Spitzer Space Telescope, which is the younger sibling of jwst for the older, well, it comes first. So I was analyzing infrared spectra from that telescope and already the projection on my work was already pointing towards the next infrared space telescope, which is James Webb. So for me it was a big deal because you see, when someone works for many years preparing for a new instrument, for a new event, for a new something that comes up that is coming, waiting for something always makes it more precious.

([14:14](https://www.rev.com/transcript-editor/shared/30dEGRkXjviFjHptizxE_eX9i97yCdo0-MHcZJUgDD2sZ5CqFo8C1B5-r8tUprl-QjqjN6H8ATkzSp292Gzr6-6I1RA?loadFrom=DocumentDeeplink&ts=854.68)):

And also it's big deal also very objectively for the fact that time on every observatory is given on a competitive way in a competitive process. So we astronomers from all over the world, they apply to use a new facility, a new observatory, like in this case James Web time is only given to a fraction of people who ask time. So it's also a big deal for us, for me and for my research group, for Texas State, for the students at Texas State to be part of the very first people in the world who will get access to data from Genes web.

Dan Seed ([14:53](https://www.rev.com/transcript-editor/shared/lG-EkoC1YcJ-pQO-Xaec85-sQVW7mI2IIKUvoq_UxwCr0R3-voea9uYfxS7qviAm_gnuAeWWpurtk_-N3vn51Lh1k8E?loadFrom=DocumentDeeplink&ts=893.21)):

I was going to say that I was looking at the list of people in one of the documents, the institutions that they represent, and to see Texas state on that list with some of these world renowned institutions in science and astrophysics is pretty amazing. How does that make you feel as a professor? I know that you're working with graduate students on this to be able to have that opportunity. You mentioned it's a culmination or a buildup that you've had your whole life or since you've been studying this, but how does it make you feel knowing that you're selected, you're taking this group of students from Texas state to work there alongside or with in the same realm as these people from these world renowned institutions?

Andrea Banzatti ([15:37](https://www.rev.com/transcript-editor/shared/6_tappA0WpAMW-50tLr1alBfwuC1NQrt9EKoR5DHJFEMquSsjPzV8fPA9WhegoD6OddqGMcD259ZAwyfaPWZbK7JWFk?loadFrom=DocumentDeeplink&ts=937.37)):

For personal reasons, I'm very, very grateful and excited that this has happened. But I should also say that my students are very, very excited. So the students in my research group, even those who are leaving, because we have students who stay for two years and then they move on, now they go to another university for their PhD or for their master. And so my current students probably will never see or they will not be with us when the data arrive and when we will analyze the data. So they are just very excited to be part of a group that has been rewarded with time with Jane Web and they are very happy to be part of the process. Part of this excitement is really for all of us, older or younger professors or students, is that we can touch the sky with our finger and we don't have to be part of a class of rich people who have access to certain things because they're rich.

([16:36](https://www.rev.com/transcript-editor/shared/TDLBtN26rxzjuwwngn9D_LCBdm23Pxh1qcC3A2nkot_odmCoi6XbxfJKAf_K8Yz59iPj3xcUT-fcDWgnRl4Fe6YzUn8?loadFrom=DocumentDeeplink&ts=996.86)):

Texas state does not have strong tradition in astrophysics. We have a small, a physics department with a small component astrophysics. So for us, it's even more exceptional. We feel even more proud of or what we have done because we are so small, like a little kid who makes a big achievement in front of the other siblings. And for the little kid, although the others, the older siblings, they know to walk know how to walk or how to speak. But for the little sibling, it's an amazing achievement to be able to be part of what others can do, those who are older and more experienced and more so that I think that's also part of the feeling of my students who understand that they are part of a team, whether it is Harvard Space Telescope, science Institute, Caltech and so on, and institutes in Europe too.

Dan Seed ([17:32](https://www.rev.com/transcript-editor/shared/ReXu4EcOAETZ1KwLuTgvUcmOeXtn8Tx7EkAAPyultjMqoZDdRqzQbNSMHV_Ge8N_A8CQo7qdHqBkyPKozERfeevh8-E?loadFrom=DocumentDeeplink&ts=1052.66)):

Does this, getting this observatory time, how does this build the program?

Andrea Banzatti ([17:39](https://www.rev.com/transcript-editor/shared/iyuhLsyX4VMSAX1tLAWWDw1hcJlhxJ3K9CJLYOXjztK7ogNzLpSPXgDvcGO4PUH-LnRyMpMeNsKZJ3DpqH6GzhePh1A?loadFrom=DocumentDeeplink&ts=1059.38)):

Yeah, the short answer is we'll see, but I know that people have noticed us, and so I think this is now clearly, I know that I brought expertise now to Texas State and that's why I think I was hired. I think other institutes, other groups are noticing us now and that's good, but not just in a sense that we want to be seen or to be strong. I think it's also in terms of on the one hand involving students from here in a big project that is not only national, but international, but also, yeah, maybe the story is good that a small place can do big things. I think it's a good story. When I was little, I was a big fan of Robin Hood, and I think there is something good in the story in knowing that even people who are rejected or forgotten or who are not part of big places can contribute in an impressive way, can surprise the bigs by bringing to the table a contribution that is unique that nobody else could do.

Dan Seed ([18:47](https://www.rev.com/transcript-editor/shared/HvH4khKB5jKzGDKfCl_8sm2N2O2ynsyBvO5vb_ryvwSrAxX7vxQ6qYXalLGJKVA9WhJk-efgWM20TEbr2BXtxDg9dCI?loadFrom=DocumentDeeplink&ts=1127.76)):

This is an onsite telescope, right? You're going to have to travel somewhere. Is that accurate?

Andrea Banzatti ([18:53](https://www.rev.com/transcript-editor/shared/r10H-IRtXh4nzeRpYlmMm6FN7grF5aJY_B-WScLarF1Swcqk5GHmzGF6eQLDT7VkbBxdfn87qc2rZS-hGmDGaomovWI?loadFrom=DocumentDeeplink&ts=1133.1)):

No, no, no. This is a space telescope. So we request observations that are then performed by the control room in Baltimore at the Space Telescope Science Institute, and they deliver us the data when they're taken.

Dan Seed ([19:08](https://www.rev.com/transcript-editor/shared/oJSwEx0AX7_qsuyyTT0Idw78QJ0eDXThPfw4_IiUyTy5Pj9sN69zM4hqIdR9_nrqTRemA2h4WYRft5vBkMRk6Cb3PHY?loadFrom=DocumentDeeplink&ts=1148.88)):

Okay. And so to that point then, what is it that you're looking for? What is your research? What are we pulling in here? What's the end game?

Andrea Banzatti ([19:16](https://www.rev.com/transcript-editor/shared/DNhHuDfl3KEZn4pg3ubYQcQRFTvMXj60NxzQwdg5ULcIffN8t8BloUB7CdsJb7dWaBcy2MiNQRUUDzgT62yrEC4wrg4?loadFrom=DocumentDeeplink&ts=1156.56)):

So what will happen is that we tell space Telescope Science Institute what data to take. So we give the technical description and information and the details. They perform the observations by controlling the telescope, and then they send us the data. And so our story then begins when we get the data and the data in astronomy, they always have to be prepared for science. So there is a process that is called data reduction where we take the data from the telescope and we prepare them to be ready to be analyzed. And then there is the analysis of this data. So that will be our role.

Dan Seed ([19:53](https://www.rev.com/transcript-editor/shared/kmgIl-IxNmHewis6im3f2pwVVwvtohmPpGLO99O8Uvb1xV5v9U-4UDsuaZACQ6K3nDwbpCOv3QsPKU5L52HIJOrsBvw?loadFrom=DocumentDeeplink&ts=1193.43)):

What is the question? The scientific goal of the program here?

Andrea Banzatti ([20:00](https://www.rev.com/transcript-editor/shared/pBg670zCk6ddgFkMxlqe6A59HTVbIGFyOc331aI6jTgLIXHJpqvmYh9WIa0fgr0SuEx3J6grf40EXwU2g2_9POuS5ZU?loadFrom=DocumentDeeplink&ts=1200.42)):

This connects well with the story that I said earlier about planet formation and how that's a hidden story. Our program tackles exactly this point, the fact that planets form hidden to our site. And so we are trying to be creative and smart in the way we use telescopes to learn more about that story. Our program is exactly on that. And so let me tell you briefly how planets have to assemble from both solids and gas in these discs that rotate around young stars. Unfortunately, we cannot see, as I said, that happening in real time. And we cannot even our sharpest eyes, our largest telescopes cannot see through these discs and see the protoplanets we call them depending on the size, planetesimals pebbles that are aggregating into a larger planetesimal and then a planetary core and then a planet. Or there are steps that have to happen from the really dust grains that are just going around to become large enough to become a core of a planet.

([21:13](https://www.rev.com/transcript-editor/shared/6AkDwOQK8LtY_dM52qPK7EV1DJEQ6hHCZwdn2FlBWurVAL5rFZe9q5QzR-1vai7oWzS6mGo5cZ_7DVllZrkkdR9bhpQ?loadFrom=DocumentDeeplink&ts=1273.33)):

We cannot see that happening. Our sharpest eyes cannot see that. So in our program, we told this story, let's use water as a way to trace these formation of planets. And this is why. So these disks are illuminated and heated by the central star, so close to the star, they're hot and it's all gases. But as you go farther out from the star, the temperature cools down and molecules freeze because it's very cold in space. So water, which is one of the most common molecules in space, believe it or not, together with H two and co carbon monoxide and molecular hydrogen, there is a lot of water there, but it's mostly frozen out. It's frozen into the outer colder, these regions. And as it's frozen, it's mostly invisible to us. But these frozen grains, they collide, they aggregate and they form larger pebbles. And these pebbles then migrate slowly through the disc and they go towards the star.

([22:14](https://www.rev.com/transcript-editor/shared/nF-nLttTcGO0IZVKywqbQMgvLv1PQdVGWGwwzIXpd3iAjPH169KmRFV4eQ2vcvA5jWsig-sXyyQMePs1CBko-pY-Eoc?loadFrom=DocumentDeeplink&ts=1334.02)):

As they go to grow the stars, they are bringing solid material to form planets close to the star. Exactly where we see super earths rocky planets surround other stars. A way that we can follow these migration of ice from the outer cold regions to the warming regions is to use James we and observe gases water emitting from the warm inner part. So this is exactly, and very scientifically, I'm being a little technical here, but this is exactly the technical point of our program, is to measure how much water gases water is in this inner region of the disc and transform that into an ice mass that has been delivered from the outer these regions all the way to the rocky plant formation region. That's material that we know is building these planet ALS and planetary course and planets. So if we can give a measurement of how much water is there and how much ice has been delivered to the planet formation region, we can say how much mass is available to foreign planets.

([23:22](https://www.rev.com/transcript-editor/shared/n5Iqt3RE04XNkzRPGO0XRVLEZyIS7S9AN7QG3LDbwvTcLDMxmzVsCDAJCgz8P3C6XG2CG_XNoKaxddoenMp2oBZUWuU?loadFrom=DocumentDeeplink&ts=1402.48)):

And there are researchers from Europe and the US in our team, there is particular one team from Sweden where they study how to translate a mass that is delivered a mass of solid and ice that is delivered to the rocky planet for region, to the type of planets that can be formed. Which means that if we are able to measure how much water is there, how much gas ice has been delivered, we can then say whether that star, that disc is forming small rocky planets or large super earths and also through following the path of ice. And this is water delivery, really water delivery to those rocky plants

([24:07](https://www.rev.com/transcript-editor/shared/4tWewdqTv_oEQgnRS24Ghwm3Oo-zvv789-ts3MnHdj3bSJy1E5kx4-vWd_bRbWpS-0-yBriAQ_NKUTbarWq6j5Bu92s?loadFrom=DocumentDeeplink&ts=1447.16)):

Models can also try to tell us how much water is then available on those planets that are forming. And therefore now it's a long shot. But we can address the question of then could there be life on planets like this forming in that disc? Understand would we have enough water? Would there be the right conditions for water to develop? It's a big question. So we address the beginning of that question and we leave the rest. That is very complex to answer to a worldwide effort in astronom. It's really requires the joint effort of many groups to tackle this big question. But we do our path. We try to measure how much water is there, how much ice has been delivered, and therefore how much mass is available for those planets.

Dan Seed ([24:54](https://www.rev.com/transcript-editor/shared/6QlUGCt0lGBw0QYX6qZ7_u3FY0h5Is0uwItIU2dc5dSLCWgW6pWN_1lK-Y6OeD2X9D0f_ib8n2rC3WgSnRaKmkbR_JY?loadFrom=DocumentDeeplink&ts=1494.62)):

Well, doing your part is very important obviously, in terms of how you've described this, and it's very fascinating, folks like yourself, Dr. Zaia, I look at and I marvel at the way that you folks do this stuff and how you study this and the passion that you bring to your field. So thank you so much for joining us and congratulations on this honor.

Andrea Banzatti ([25:18](https://www.rev.com/transcript-editor/shared/LFeh92wblsVLPhqIsGXfGndSpm3DX2Qdb3gV5H9HCnTsfk8cmf4oS00bhI6AG6-oI4loBCZk_5NqHKGNRQ2Lr-Gw2Mc?loadFrom=DocumentDeeplink&ts=1518.11)):

Thank you. Thank you. I'm very, very happy to share this story to Texas State University, to the community inside and outside the university. I think it's worth knowing.

Dan Seed ([25:27](https://www.rev.com/transcript-editor/shared/GuP7em1of4GOcI706_uh2-5t5UHC-HAvWs4d-z_gN3RoP-Fd7IUXLqLtcdQT2A1uDY6nZJZcgo0_HgWJdmuqebDmIDM?loadFrom=DocumentDeeplink&ts=1527.2)):

I would certainly agree, and you describe everything so well that hopefully our audience is able to take a better understanding of such a complex idea and distill it down. And you did an excellent job of that, and we thank you for that. And thank you to our audience for listening and we hope that you'll listen in next month, download and tune in. And until then, stay well and stay informed.