Ali Hyder:

Even though you're uncertain, you're still working at the very frontiers of knowledge. Everything is uncertain. That's how the first steps are taken, and that's where, in fact, most of your creativity is very well spent, because you can be creative in the gray.

Speaker :

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Michael Holtz:

Welcome to Further Together the ORAU podcast. As ever, it's me, your host, Michael Holtz from the Communications and Marketing Department at ORAU. And regular listeners to this show know that I love to talk to scientists about the research that we're doing, and one of the programs that we manage for NASA is the NASA postdoctoral fellowship program, and I am pleased and honored to welcome Ali Hyder, who is one of the current NASA postdoctoral fellows, to the show to talk about where he is, what his research focuses on, how he got here, all the things. So Ali, welcome to further together. I'm so glad that you're here.

Ali Hyder:

Glad to be here. Thank you, Michael.

Michael Holtz:

So Ali, tell me where you are and where you are in your fellowship and what your research focuses on.

Ali Hyder:

Sure. So I am currently at NASA JPL, that's the Jet Propulsion Laboratory, and I started not too long ago. This is I think my second month, actually.

Michael Holtz:

Okay.

Ali Hyder:

So I've just started my journey as a NASA postdoctoral fellow, and this is also my first postdoc. So many firsts this time.

Michael Holtz:

I love it.

Ali Hyder:

And I graduated from NMSU, New Mexico State University. I defended my dissertation this summer. So everything's happening very quickly.

Michael Holtz:

Yeah.

Ali Hyder:

And very pleased to be here. And JPL is a fantastic place to be. I've been interacting with numerous scientists. You read a paper, you find a name that you're like, "Oh man, I would like to collaborate with this person." It turns out they're probably in the next building over, so it's a very cool and collaborative environment to be in.

A lot of my work has been in atmospheric fluid dynamics, what we call hydrodynamics, generally, so I do theory and modeling and primarily apply all that to the atmosphere of Jupiter, the biggest planet in the solar system. And as such, I work fairly closely with the Juno Mission. So typically, most of my science is done in support of that mission or supplementing that data using my models and bringing in experiments and theory together.

Michael Holtz:

Very cool. Ali, why is it important to understand the atmospheric dynamics on Jupiter?

Ali Hyder:

So one of the main things is that gas giants in general offer us a laboratory for fluid dynamics that gives you a perspective of scale that's just not accessible on Earth.

Michael Holtz:

Okay.

Ali Hyder:

Jupiter has no surface, so the atmospheric fluid dynamics actually occur in their most uninhibited form, in a sense, so it gives you a significant insight into what the physics of those processes are and allows us to dive deeper into a more generalized theory of planetary climatology, and that will certainly in the future be providing more information about the climate of Earth, as well.

Michael Holtz:

Gotcha. And it has to be cool, because as you said, there is no surface, so there's no friction, right? There's no having to deal with mountains and valleys.

Ali Hyder:

Yeah, and so that's the boundary layer for Earth or any terrestrial planet or terrestrial [inaudible 00:04:48].

Michael Holtz:

Right.

Ali Hyder:

And that can... It's interesting because it's like a blessing and a curse, because with a boundary condition, at the very least, you know that the atmosphere ends.

Michael Holtz:

Right.

Ali Hyder:

So there's a limit to what you can model. But with gas giants, the uninhibited nature of the fluid dynamics really comes in full force, because you don't know if it just ends. We don't actually even know if Jupiter has something akin to a core. We know it has an over density, kind of like a fuzzy core, but it's a really complicated thing, because oftentimes, you have to assume a lot of things about the interior model and then work backwards.

So like I said, it's a blessing and a curse because of course, when you have a boundary condition, although you know that the atmosphere is limited, you get hit with computational issues.

Michael Holtz:

Sure.

Ali Hyder:

It's harder to model from that end.

Michael Holtz:

Gotcha. Ali, what was your trajectory getting to the NASA postdoctoral program?

Ali Hyder:

Yeah, so I did my undergraduate in New York at Hofstra University in physics and math, and one of the main things was that I was fairly interested in science very early on.

Michael Holtz:

Okay.

Ali Hyder:

Like even in my sophomore year, I went to the academic counselor and I was like, "Okay, is there an astrophysicist on campus?" And they looked into the job register of their university and realized that yes, there were, and pointed me in that direction. I went to them and I was like, "Mentor me and teach me basically how to be a scientist." And that's where they kind of took me in their small research group and I worked with them and it was a wonderful time. That was my first exposure to science. I was baby stepping into it.

Michael Holtz:

Sure.

Ali Hyder:

But yeah, I have always been interested in it, and I guess I had a sort of natural affinity towards it, because I thought to get out.

Michael Holtz:

Right, right. Well, and the gutsy move of like, "Hey, find me an astrophysicist."

Ali Hyder:

Yeah. Because I knew this is exactly where... This is the ecosystem that I wanted to be in.

Michael Holtz:

Right.

Ali Hyder:

Like something to do with the universe, and then I found my way to planetary science.

Michael Holtz:

Very cool. Was science kind of always in the background, even when you were a kid?

Ali Hyder:

In a sense, I was raised in a really liberal household, and they were very encouraging.

Michael Holtz:

Cool.

Ali Hyder:

Perspective, just being curious. And most of my family is artists, actually.

Michael Holtz:

Okay.

Ali Hyder:

That sense of creativity and wonder was always one of the main focus of growth, I would say.

Michael Holtz:

Cool. So you're just approaching wonder from the scientific side as opposed to the arts.

Ali Hyder:

Exactly. I would say that it's the same thing.

Michael Holtz:

Yeah.

Ali Hyder:

It's just the other side of the coin.

Michael Holtz:

Right.

Ali Hyder:

So it's really interesting to see the scientific process. And now that I have become a professional scientist, it's cool to see my own trajectory in that light, as well, and how we evolve in our creative thinking. And science is also, I would argue, an art because you have to be creative in a very specific sort of way.

Michael Holtz:

Well, speaking of creativity, having grown up in an artistic kind of creative, do you have creative outlets that are not scientific?

Ali Hyder:

Sure. Yeah, I'm also a musician.

Michael Holtz:

Okay.

Ali Hyder:

So yeah, early on I started dabbling in music, generally guitar, and that was encouraged by my family, as well, so they were always very supportive of any endeavors which were creative. And so I think if you're an inquisitive person, that will naturally lend itself to better growth because you're exploring creativity in various channels: you have art, you have mathematics, you have physics, and I was able to not approach any of those subjects with fear, but rather just an inquisitiveness.

Michael Holtz:

Yeah. I love it. And not knowing them, I love your parents for that sort of...

Ali Hyder:

Me, too. Me, too.

Michael Holtz:

That openness and that ability or that encouragement to go out there and forge your path and all of those things, so that's amazing. You talked a little bit about the collaborative process. Tell me a little bit more about that. I mean, I know you're working on the Juno project. And science doesn't ever happen in a vacuum, so you have to rely on and be relied on by other people and other scientists.

Ali Hyder:

Yeah. So that's the really interesting thing about JPL, and really any NASA center, and I would argue probably every national lab has this sort of collaborative environment, because you come in, you bring in an expertise in a very specific niche. You are essentially the world expert in that very hyper-specific thing, but you're surrounded by world experts in their niche area.

Michael Holtz:

In their...

Ali Hyder:

Exactly. And so the collaborative ethos here is really interesting, because you go to the cafeteria and you'll just run into somebody that's working on something kind of adjacent, but approaching it from a completely different perspective, and you end up having coffee with them and a paper comes out of it. So it's a very unique place to be from that perspective.

But that also is a testament to the type of talent that's available here and at NASA centers in general, where people are performing at the frontier of science.

Michael Holtz:

Sure.

Ali Hyder:

They're facing the unknown every day, and that's where a lot of the synergy between these various scientific concepts becomes apparent and you get to put it all together and out comes a paper.

Michael Holtz:

Right, right. I love that. So you're two months into your fellowship. Where do you hope to go? Dreams of staying with NASA? Continuing? And again, I realize it's early.

Ali Hyder:

Yeah. No, but I have a little bit of the workings of a plan. I have interests in staying in the academic setting, but at the same time, I also understand that NASA headquarters, it's a very interesting place to be because they work on a lot of the policy related issues and ensuring that NASA continues to function smoothly, and I have a pretty strong interest in that, as well, so I've thought about getting familiarized with that ecosystem, as well, and seeing if my talents could be applied there, as well.

Michael Holtz:

Very cool. So multifaceted, even in the place where you are now.

Ali Hyder:

Yeah, but I think that's important. It's important to be that way particularly because the scientific landscape evolves very quickly, as well. And it's really cool to interact with the people here and also get to hear about their issues, as well. What are the sort of niche problems that can be fixed by policy changes and everything? So in a sense, in my mind, that's like a grassroots approach, right?

Michael Holtz:

Yeah, for sure, right? Because the folks who set policy and who pass laws need to understand at the ground level what the policy implications are so that you can continue to do what you're doing.

Ali Hyder:

Exactly. And NASA HQ does, of course, a fantastic job. They collaborate, of course, with the AAS, the American Astronomical Society, and particularly for someone in planetary science, that has really big impact on how the science community's thinking. And it goes hand in hand, the sort of interplay of policy and the scientific landscape and the emerging ideas that come out of that.

Michael Holtz:

Cool. Have there been in your... To get to where you are, have there been any significant obstacles that you've had to overcome, in addition to marching into the counselor's office and saying, "Show me the astrophysicist?"

Ali Hyder:

Well, yeah, it's been tricky, obviously, because this field isn't easy. It takes a lot of effort. It takes a lot of sacrifice and time to develop the understanding enough to the point where you have good intuition about physics, and that takes practice, really. It just takes sitting down and doing the mathematics out.

Michael Holtz:

Right, right.

Ali Hyder:

And talking to people that are significantly more experienced than you and getting their insight, and you get to learn how to think about these problems. And so it is a significant and non-trivial challenge to understand how to do that properly. And then of course, there's non-academic challenges, as well. I am an immigrant. I came to the US when I was 16 in 2012, so 12 years now, I guess. 12 and a half. We immigrated and I became a citizen in 2019, so that whole process. I was familiarized with both cultures.

Michael Holtz:

Sure.

Ali Hyder:

I came at sort of a formative age and got to learn about the culture here, but I still had a foot in the Pakistani culture and the transition to the Western way of thinking, I suppose.

Michael Holtz:

Right. Sure.

Ali Hyder:

And get further ahead in that.

Michael Holtz:

And a little bit of culture shock, I'm sure.

Ali Hyder:

Yeah, absolutely. And it was cool to have one foot in both cultures because you can look at the similarities in the two and take all the good from both and try to [inaudible 00:16:47] that.

Michael Holtz:

Right. Right. And as you mentioned, you're emigrating in your formative years.

Ali Hyder:

Yeah.

Michael Holtz:

Right? So that comes into play, as well.

Ali Hyder:

Yeah, absolutely, and I think that had a pretty important impact in how I got accustomed to continually changing environments. It made me more comfortable with uncertainty, and I think that has to be one of the most important things in science. Right? Like, you live in uncertainty.

Michael Holtz:

Right. And it has to be empowering, right?

Ali Hyder:

Yeah, yeah.

Michael Holtz:

To have come from and sort of live in this uncertain world, but then you're studying an uncertain world, as well.

Ali Hyder:

Yeah, yeah, absolutely. And it is empowering because within the uncertainty, there's a gratification that comes from it, because you know that even though you're uncertain, you're still working at the very frontiers of knowledge. Everything is uncertain.

Michael Holtz:

Right.

Ali Hyder:

That's how the first steps are taken, and that's where, in fact, most of your creativity is very well spent, because you can be creative in the gray.

Michael Holtz:

Oh, I like that. That might be the title of this episode.

Ali Hyder:

Creativity in the gray.

Michael Holtz:

Being creative in the gray. I like it. Ali, what do you tell young scientists who may be following in your footsteps?

Ali Hyder:

Don't be afraid to take risks, creative risks, and even personal risks, as it was a tricky thing to just walk in and demand to be mentored.

Michael Holtz:

Make this work for me.

Ali Hyder:

Yeah, exactly. And you know what that ended up with, was getting on a Hubble proposal as an [inaudible 00:18:58].

Michael Holtz:

Wow.

Ali Hyder:

So it worked out. Approach things with an open mind and don't be afraid to lose, because it's okay to lose. You are going to lose. That's most of science, is making sure that you've tried everything that doesn't work, and then the one thing that does still has an error bar on it, and then you...

Michael Holtz:

Exactly. Ali, last question for you: what brings you joy?

Ali Hyder:

What brings me joy? I would say my family and making them proud of the work that I do, because it is difficult to sometimes justify the work that science does in the face of the challenges the rest of the world faces, and particularly as someone that comes from Pakistani roots, that's ever increasingly loud.

Michael Holtz:

Right.

Ali Hyder:

So it's an important thing to recognize that the people that support me and have supported me to get to where I am, I find immense gratification at the fact that I got here and I am doing good work and that matters to them.

Michael Holtz:

Awesome. I love that answer. Ali Hyder, thank you so much for spending this time with me. I really have appreciated getting to know you and hope that you can come back at the end of your fellowship and talk about what you've learned and what you know about Jupiter. I think that would be fascinating.

Ali Hyder:

Yes, absolutely. Thank you so much for having me.

Michael Holtz:

Absolutely.

Speaker :

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