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**I = Interviewer**

R = Respondent

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**Welcome to IFL Science The Big Questions, the podcast where we invite the experts to explore the biggest mysteries of science, with your host, Dr Alfredo Carpineti.**

**I: For decades, scientists and engineers have been concerned by the issue of space junk. Bits of rockets and old satellites continue to orbit around the earth. There has even been a camera and a spatula lost by astronauts. While whimsical in some cases, this sort of pollution is a risk. It's dangerous to astronauts in space as well as other satellites that we depend on for our daily lives, from weather prediction to disaster relief. Since 2018 the number of satellites has massively increased, led by the deployment of mega constellations such as SpaceX Starlink and others. These satellites are affecting the darkness of the night sky for all. In this episode, we are going to be discussing the impact of space junk and how to make space safe, secure, and sustainable with our special guest, Professor Moriba Jah. Welcome to the show. To kick things off, you call yourself a space environmentalist. What does that mean?**

R: So, when I talk about space environmentalism, I am really looking at orbital space as a finite resource, because where we put satellites is in very specific locations and these orbital highways can only take so much traffic. When things die, they keep on going at very fast speeds and they don't return to Earth any time soon – some things never come back. So the amount of orbital space is limited and the highways are becoming more and more packed, and so, in looking at orbital space as a finite resource for humanity's use, if we are good stewards of it, space environmentalism is looking at it as an environment in and of itself that is in need of protection.

**I: Thank you very much for that. It's clear from what you are saying that space junk is an issue. Can you tell us exactly why it's such a big deal? What are the risks of letting the space junk problem just get worse and worse?**

R: As I was saying before about the orbital highways becoming more congested with objects, most of the objects up there are defunct or dead. So, they are debris that is pretty much pollution that's just orbiting at very high speeds. The problem with that is because these dead objects are taking up physical space, they are also able to collide with satellites that are working, that are providing services and capabilities that we depend upon critically, like position, navigation, timing, communications, Earth observation, you know, we have a war in Ukraine. So, these robots in the sky that we call satellites are very useful to humans. Humans know more about humanity and the Warth because of data provided by satellites than by any other means and none of these satellites are protected or shielded against harm. Harm can come from the pieces of junk, and the number of junk is growing.

**I: Thank you for that explanation. Do you think that the current drive to the increased commercialisation of space is making the problem of space junk worse?**

R: Absolutely. I think that commercialisation of space in and of itself isn't the problem. It's only a problem because it's not approached holistically. One of the things that I firmly believe in is what I call ancient tek and when I say tek, I don't mean tech, I mean t e k. Traditional ecological knowledge. These are principles or tenets that come from Indigenous people that believe that all things are interconnected and that the only way for humanity to thrive is by having a successful conversation with the environment through stewardship. Stewardship asks us to be responsible for things whereas ownership tries to exercise rights and that sort of stuff. So, by and large, humanity has abandoned this intergenerational contract of stewardship and because of that, and not seeing all these things as interconnected, we have a lot of the problems that basically we have today.

**I: Wow, that was wonderfully said. What kind of endeavours are currently in the works to make space more sustainable, for example?**

R: One of the things that I believe, and I'm all for commercialisation of space, it's not a bad thing, it's just not done holistically and it's not done with this ancient tek and one of the things that we need to do and part of the problem is that we don't let mother nature let us know what the unintended consequences of our actions are. What I mean by that is that I remember years ago, a busy year for launches was one launch a month, was a busy year. Right now, on average, we are launching more than twelve satellites per week. That's a lot. That's very different than before and I can tell you that at this rate, we have no idea what the unintended consequences are of launching so many objects so frequently. When we take our foot off the gas pedal, mother nature is very good at providing us feedback and that's part of the principles of ancient tek is, don't behave in ways that will basically prevent yourself from being sustainable in the future. I think that applying these principles of ancient tek would help for space sustainability, but also, I believe in a circular space economy that focuses first and foremost on trying to minimise single use satellites. Meaning, can we make rockets and satellites useable and recyclable, first and foremost. If we can do that, then that minimises the number of things that we're launching for sure, and for the things that we can't make reusable and recyclable, can we then do responsible disposal? Meaning, forcing the object to re-enter, burn up in the atmosphere, but design it with materials such that when it burns up in the atmosphere it's not polluting the atmosphere itself? I think we can do that. I remember, I think Japan was developing a satellite made out of wood, for instance which I found to be interesting. So, these are the sorts of ideas that I believe we can all implement. Governments can get behind it and that would definitely go a long way in achieving space sustainability.

**I: That is fantastic. I remember the Japanese idea of a wooden satellite which is absolutely fascinating in itself but in the context of just how much stuff we are putting out there, the risk of pollution really makes you think that we could do more. You mention a lot about the stewardship and I think that for most people, they would expect the government, inter-governmental agencies, and even space agencies to be the stewards of space. We have seen that they're not exactly doing that. What do you think they could do to change the current approach? How can they be more effective or how can they**

**implement rules, regulation, or just a good example, good behaviour to actually change the current approach we are having about sending stuff into space?**

R: On the one hand I can say that I was part of a team under the World Economic Forum that started something called the Space Sustainability Rating, which is now being led in its second phase by the École Polytechnique Fédérale de Lausanne in Switzerland as a mechanism to get more and more space operators and even governments involved and use that as a basis to drive or incentivise sustainable behaviour in space. So I think if governments and industry embrace the space sustainability rating then I think the outcome of that will certainly be improved space sustainability. But the other thing too, which there are governments which I advise, and one of the advice that I give them is you should have, as part of your advisory board or group of people that provide you advice, you should recruit Indigenous people or first nation people to give you their opinion about how to approach the use of space as a finite resource and how to do it successfully because these Indigenous people have been able to achieve that over tens of thousands of years. So, we should listen to them, and its back to the ancient tek informing how to use high tech.

**I: That is a fantastic message too and our chat, thank you so much for your time and thank you so much for telling us all about space environmentalism.**

R: Thank you so much.

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