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

I: Maths, love it or hate it you can't escape it. While many love the subject, some will have almost traumatic memories when it comes to arithmetic and geometry. Numbers and the way we use them underpin every aspect of our daily lives, even if some might prefer to think that they left maths behind when they left school. For this brand new episode of the Big Questions, our probably controversial question is the following, "Is maths the greatest subject in the world?"

I am Dr Alfredo Carpineti and today I'm joined by the fantastic British mathematician, Professor Nira Chamberlain. Hello, Nira, thank you so much for joining us.

R: Thank you very much indeed, it's very nice to be here.

I: Thank you, can you start by telling us a little bit about yourself?

R: Okay, well as you said, my name is Nira Chamberlain. I'm a professional mathematician. My expertise is mathematical modeling, and what does that mean. I look at any problem, convert it into mathematics, solve the mathematics, and then apply the solution back into the real world. I have been working in many different areas in terms of engineering, aerospace, cars, retail, and that's me. I'm very much an out and out mathematician. Also, I'm a maths communicator so I wear quite a number of different hats being a mathematician.

I: That is absolutely fascinating and I do like your wide range of expertise because I think you can help us tackle the question at hand, mostly because I feel that the world is divided between people that enjoy and love maths, such as myself, and people that maybe in school have struggled with maths. They see it as something that is either too complicated or maybe something that is not something they use in everyday life. The fact that you apply complicated maths to real life is really exciting. The question is, "Is maths the greatest subject in the world?"

R: Is Maths the greatest subject in the world? I would refrain that, I would change that question. I'd say that Mathematics is indisputably the greatest subject in the world. It is indisputably, there's no other subject that comes close to it. Mathematics is indisputably the greatest subject in the world.

I: Okay, I think you need to qualify why it is indisputably the greatest subject in the world.

R: Well Mathematics, there's a nice saying that if you go down deep enough into anything you will find mathematics. Mathematics is all around us, mathematics is an exciting, beautiful powerful subject. I can speak to somebody who we don't share anything in common, not language, but we talk about Mathematics, we can communicate through the language of Mathematics, Mathematics is powerful. Some people think that Mathematics is very mechanical, $1+1=2$, you know and you're either right or wrong. That's not true. Mathematics is a very creative subject, very creative. Yes, there are rules but through those rules you can go into so much endless creativity, it's a very creative subject. It's not a boring whole dull subject. It is creative and even if you look at the way that the world is going now, the world is turning much more data-driven, much more digital and everybody talks about artificial intelligence -- guess what, artificial intelligence would not exist if it wasn't for mathematics. If people are thinking I will not use mathematics ever again, yes you do. Let's go down to the basic level, anytime you're making a cup of tea and say I don't use algebra, please go through the steps of you making a cup of tea without using the language of algebra and see what you're going to do with that.

I saw a good joke one time where somebody says to, like a fairy, please give me... The fairy said to the person I want to give you three wishes and the person says to that fairy, okay my first wish is I wish that Mathematics doesn't exist, phoosh, and then says to the fairy, well what happened to my other two wishes, I had two wishes. They say, sorry, that shows you the value of mathematics.

I: Thank you very much for that. Clearly you are preaching to the converted already but given how polarising Maths is, what do you think we can do maybe in terms of education to get more people to enjoy and also appreciate more just how important mathematics is?

R: Yes, I think we have to explore not only the workings of mathematics but also the creative side of mathematics and seeing how mathematics is actually linked to every single subject around. I mean one time I went to school to do a workshop and I stood up in front of the children and they said, oh we think that mathematics is boring, away we go. I did this workshop called Saving Aston Villa. Now Aston Villa is my football club, that's my team and I just showed them the mathematics of working out the probability of Aston Villa being relegated or Aston Villa getting promoted and actually showing how we could use mathematics in this very creative way. I could see people say, wow, we wish that all mathematicians could be like that now. I'm not saying every single mathematical lesson is going to be like that but we have to show how mathematics is. When you link mathematics to real-world problems and show them how creative it is. It's not a case of I add this, add this. It's about, as Einstein said, mathematics is the poetry of logical ideas. When you actually go and do that, the poetry of logical ideas, that's where you'll get more pupils, more people appreciating mathematics. Like, say for instance if I go to France and go to Paris, and I look at the foot of the Eifel Tower, I can see the names of mathematicians written on the side of it.

That's what we should do. Maybe we should start a campaign to have the name of mathematicians written on the side of Big Ben, there you go. That's one thing we could do.

I: That is very good. I do like that refrain of how mathematics should be taught, adding more creativity. Something in my experience in education was that my teacher always had a little fun fact about the mathematician that created the theorems, and it really made it feel real, like these were real people trying to solve real problems, and now, after centuries, we have extrapolated these big logical rules that we apply to mathematics.

Continuing on the subject of education, especially for people that want to have a career in mathematics, we often see, especially here in the UK and in the US, professionally, maths appears to be dominated by cisgender white men. What can the subject do and how can the education of it be improved to be made more inclusive, so that everyone can feel that not only do they have a chance, but that they can succeed in becoming a professional mathematician?

R: Well okay, there's two things really, there's external and internal. If we talk about internal, about the mathematics community, mathematics is very much a collaborative science. If you have an idea, if I have a mathematical idea I have to bounce it off somebody. It has to be challenged and then if somebody says well if you're coming from a different perspective, and say I miss that, then that's how I improve as a mathematician, by collaborating as a mathematician: having somebody to challenge my ideas, say I don't think so, try this logic, try that and away we go. For the mathematicians themselves, the question is who do you collaborate with? Is your collaborator diverse or are the collaborators just somebody that just looks like you. If the collaborators just look like you then there's a film called *The Matrix*, the baddies in *The Matrix* all look the same. Now come on, do we really want the mathematics community to be like that, where we look like we're from *The Matrix*, or some film, no way. Also, we have to recognize, for the mathematics community, we can make mathematics stronger by making it more inclusive. People will come up with different experiences, different ideas and it will improve you as a mathematician and the mathematics community will improve. For established mathematicians out there, the question is who do you collaborate with, who do you mentor, who do you sponsor?

I remember one time, and I'm going back 10-15 years. I remember one time I went to a conference, a mathematical event and in front of me there was this mathematical professor, he was a white guy, and I looked at him, he looked at me and we had absolutely nothing in common, nothing in common and then all of a sudden we just started talking mathematics, and then he punched me in the shoulder and said, that's how you do mathematics. We were just talking mathematics. That's the way it should be, do you know, what I mean? I felt encouraged and inspired just having that conversation. We were just talking mathematical ideas because we have a passion about mathematics. Yes, I'm sure that he got something out of it as well from my ideas and my perspective. It does start with the mathematics community, who do you collaborate with, who do you work with, who do you mentor, who do you sponsor and if that group is not diverse, guess what? The mathematics community will never become diverse.

I: Wonderful that was a great answer, thank you very much. I was wondering if you have a last message to leave us, something maybe like what should the general public know about mathematics?

R: What does the general public need to know about mathematics? I think, we talked about mathematicians and how you can become a mathematician. Sometimes there's this stereotype about mathematicians. They [the general public] believed that mathematicians are people that'll see a question like '256 times 256' and they'll be able to times that number in their head within 0.001 seconds and are some sort of genius, they can solve everything in very quick seconds, very fast. Guess what? That is not true.

When I was studying, mathematicians, especially some of the top mathematicians, they all have this common theme and it's this: A mathematician is not someone who necessarily finds mathematics easy. A mathematician is someone that sees a problem and never ever quits. That's a mathematician. I'll repeat that again. A mathematician is not necessarily those who find mathematics easy. A mathematician is someone who sees a problem and never, ever quits. That's my first point and my second point is also what my dad said to me. I remember when I was a school I went to see my career teacher. The career teacher said to me 'Nira, what would you like to be when you grow up?' and I said, 'Oh, I wouldn't mind doing something that involves mathematics and logic,' and my career teacher said, 'Nira, you've got the physique of a boxer, so you should become a boxer.' When I went home and told my parents that, this is what my dad said to me – not only did my dad say this to me, he says it to everybody out there: you don't need anybody's permission to be a great mathematician, and I'll repeat that again. You don't need anybody's permission to be a great mathematician. Those are my two points that I'd like to say.

I: That is a wonderful message. Thank you very much for your time today.

R: No problem it's been great chatting, and good talking to you.

I: Thank you, bye, bye.

R: Bye, bye.

I: I hope whatever opinion of maths that you came into this episode with, it has brought something new to you, even a little bit of extra love or a little bit less hate.

Thanks for listening to IFLScience the Big Questions. Head over to IFLScience.com and don't forget to sign up to our newsletter so you don't miss out on the biggest stories each week. Until next time.

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