FUTURUM
PODCAST

Dr Sarath Janga

In this podcast, **Dr Sarath Janga** discusses the applications of RNA biology and the importance of taking an interdisciplinary approach to your studies.

Break the podcast down:

01:20: What's your favorite place to travel to?
I usually like to travel to Switzerland with my family.

What's your favorite sport to watch or play?
I love basketball. I play, but I'm not so good! I love watching it.

If you could be any animal, what animal would you be, and why?
A turtle. A turtle is very good at protecting itself. It takes its steps cautiously and thinks in the long run not in the short run. And we know growing up as kids the tale of the turtle vs. all animals. Just because you are going slow doesn't mean you are going to fail the race. You are just being cautious.

02:15: You are part of a committee that has been set up by the National Academies of Sciences, Engineering, and Medicine that focuses on RNA biology. Can you give us an idea about why this committee has been set up and a background on RNA biology?
Most of the work in the field of science has been at the DNA level. DNA is a static molecule, RNA is a dynamic molecule in most cells. For the lack of technologies, we have not been able to do due diligence and justice to this molecule for a long time. In the last ten years or so, we have started understanding that 1) RNA is very dynamic, 2) there are changes in RNA. What we read in textbooks in school is that RNA is composed of four nucleotides. What the committee report summarises is that there are dozens and dozens of modifications and changes to this RNA that continuously happen in the cell. At first, these changes were thought to be not so important or maybe don't have any value or function. What dynamic and other things we have been learning in recent years that have a lot of relevance is that these modifications have very important roles.

For example, the vaccine that was developed for COVID uses one of the RNA modifications to increase the stability of the vaccine. I don't know if you recall that during the pandemic, the vaccines had issues for transfer and transport of the vaccine in cold storage. RNA degrades very easily, any RNA vaccine gets degraded. So if you are able to make a small change to the RNA vaccine that increases the bioavailability and stability of this RNA and decreases the immune reaction to humans, that's a game changer between whether you have a vaccine or don't have a vaccine which is available to millions of people around the world. Thankfully, the technologies came at the right time for us in the pandemic to be able to design a vaccine, and much to the disbelief of a lot of people, RNA vaccines were the ones that actually did the trick.

These kinds of developments have pushed our understanding of how these modifications and changes in RNA can be exploited for therapeutic benefit. On the flip side, we as a committee also understood that around the world, there are groups that have been exploiting these modifications for improving crop yields. One study showed that you can increase the size of a potato with a simple change because of RNA modification. And there are some studies showing that you can start designing drugs against cancer by targeting one particular RNA modification or enzyme that causes the modification.

So, there are a number of studies around the world that have been tapping into this untapped potential of the RNA molecule and we didn't appreciate RNA for a long time. And just in the last five to ten years, we have been putting resources to understand better. So, we should plan for the future. If we want to come up with new therapeutics, we need to start investing in understanding better how this molecule behaves and works across the species and in individuals.

05:40: I didn't realise there were so many applications for these RNA modifications. It sounds like a really exciting field to be part of and quite a new field as well. What advice could you give to students who are thinking about studying RNA biology and pursuing RNA biology as a career?
The good signs and the future of the workforce is going to be multidisciplinary. And we are seeing again and again that a lot of kids are fascinated about AI and some kids are like, okay, if I know AI I can solve every problem. But AI is not just one field, for instance you need to be good at computer science and statistics and integrate the skills into some applied field. You need to apply AI to either health, biology, engineering, or manufacturing. You need to be able to apply it.

My advice for young folks would be the traditional schools of thought, where you learn only biology or only math and separate them as 'biology is different and math is different', is not going to be the future. Because I'm sure that across the world, kids are put into silos – if you are good in biology, chemistry and physics you go one route, if you are good in math, physics, and chemistry you go one route, and the biology and math, maybe they interact somewhere down the line. I feel that the future workforce most likely will be, 'I understand reasonably well the math, I understand reasonably well the biology and I want to be able to integrate these'. Those are probably the new types of fields that will evolve.

07:20: So, having a multidisciplinary view of something, when a problem arises, if you can look at it from more than one angle, like COVID for example, you are more likely to be able to solve that problem. In doing so, you're collaborating with other people and creating new ideas. That sounds pretty exciting. I'm wondering if there are any particular personality traits or characteristics that you feel you have that helped you in your career and that you would encourage young scientists to foster in themselves.

I think having a passion, having a commitment for whatever you choose and working towards it despite all the odds is going to provide you with great dividends down the line. You will see a lot of challenges because when you go in unconventional directions and less sought-after areas, there will not be a clear path. There will probably be no path so you will have to chart your own path. And if you emerge from these kinds of challenges, you will be the winner. The winner takes it all!

08:31: It can be scary if you're not sure where you are going. Keep going and if you are really passionate about something, follow that and eventually you'll end up where you need to be.

Get a mentor. When I say there are not many people, it doesn't mean there is nobody. There are a few experts. If this is what you want to go after, find a mentor and get the mentoring. Forty years ago, it was probably easy for people to say, 'I don't know how to reach out, I can't connect'. Now, with so many ways you can interact with people, you can read blogs, you can interact, you can email, you can have a simple Zoom call. There is a lot of expertise on these online platforms where you can gather information to chart your own direction.

09:30: You have worked and studied in a few different places around the world. What has it been like travelling around the world, experiencing and working in all those different places and how has that impacted you as a person?

Each culture and each place that I studied came with different challenges and opportunities. I moved from India to Mexico then Germany. I worked in Germany for some time and in Mexico for some time, actually for several years in Mexico, before I ended up doing my PhD in England at Cambridge. Then I was in Urbana-Champaign here in the US at the University of Illinois for a couple of years. I spent some time in Canada as well, working with some groups at the University of Toronto.

All these experiences provide you with what makes groups of people be at their best. The exposure across cultures. You cannot try to fit 'one size fits all', that's not how things work. People come with different backgrounds and there are unique challenges that come from people from different backgrounds. The more you travel and interact with different groups, it provides you unique perspectives on how you can see from their point of view so that you are at maximum potential.

10:50: It's similar to what you were saying about students taking a multidisciplinary approach. There's also this aspect of it being a multicultural collaboration between scientists from around the world, I think that is really exciting. What advice could you give to help students who have grown up in one part of the world, potentially diverse, potentially a not very diverse place? How can you become better at collaborating with people from around the world, different cultures, and different ideas?

This question comes up to me all the time, a lot of youngsters ask me this. Not everybody may be fortunate financially to be able to travel, but you should at least try to join virtually some workshops and interact with people. The pandemic has lost a lot of these interactions between people. When you lose that personal interaction, you don't appreciate how important one-on-one interaction is for intellectual growth and simulation. Humans are social animals so we need to do more of this, and you could do it on different scales. You could be within your own small group in your own community in your own city. You may have some perspective of what is life and what is good science and what is good work and so on. But when you travel and see other cultures, you may see that it's actually exciting. They are probably partying after two o'clock in that culture, but they are still able to get work done! Or maybe their social life is different, and they are better or maybe they are not getting depression. There are some aspects that you appreciate when you interact with different cultures.

So, I would say that youngsters should take every opportunity they get to travel and do internships. That opens more doors for you. Maybe your home country is not where you want to work, maybe you want to work in a different country, I know that a lot of people do that. Doing it early opens up doors. It is one thing is to hear from parents and one thing to hear from teachers that 'Europe is great' or 'going to Latin America is great'. These stories that you hear are one thing but when you actually go and explore yourself as a youngster, you have appreciation not just for the people but the flora and fauna and all the things that these different environments offer. And that may bring you a fresh perspective. You may decide that is why you need to do multidisciplinary science. You need to go beyond your comfort zone to be innovative.

So, that is my advice to youngsters. Try to do more internships, explore different parts of the world and different areas of science before you commit to your long-term area of work that you want to choose. At least have some flavour.

13:45: Do you have any final advice for students who are listening?

Have fun. Enjoy whatever opportunities you can get. Travel, if possible, early in your career. Have an open mind for areas that you want to explore. That is what I would advise.