

Tackling two global challenges with one research focus

Dr Nasim Amiralian is an engineer who wants to do her part in creating a better future. Not only is she doing so by developing biomaterials from waste products to replace the use of plastics, but also by celebrating diversity and mentoring the next generation of science, technology, engineering, and mathematics (STEM) leaders. Let's get to know more about her!

What area do you work in and what is your research on?

My research focuses on the development of biomaterials made from agricultural waste, such as that from sugar cane, banana and pineapple production. By using agricultural waste products to make new materials, my research adds value to waste while also reducing the use of plastic in products.

The biomaterials that I am developing are currently for packaging, resource recovery, biocomposite, and biomedical applications. Not only does my research group look for new materials from which to make these products, but we also work with our collaborators including industry partners to determine additional properties we want the materials to have. We then focus on finding and testing for biomaterials that fulfil these needs. An example of this process is our search for biomaterials with anti-microbial properties for use in medical face masks. Masks made from materials with these properties can provide additional protection against bacteria and viruses.

It is the structure of the materials at the molecular level that gives them specialised properties. We focus our research on materials made of cellulose polymer backbones, which form long, thin and strong fibres. Differences in the chemical composition and orientation of this backbone can change the property of the fibres, which we can then use to our advantage.



Dr Nasim Amiralian

Discipline: Nanomaterials (materials where a single unit is sized on the nanoscale, 1-100 nm) engineering

Organisation: Australian Institute for Bioengineering and Nanotechnology (AIBN), The University of Queensland (UQ)

Degrees:

- Bachelor of Engineering in Textiles
- Master of Engineering in Textiles
- PhD in Nanomaterials Engineering

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- Plastic reduction
- Cultural collaboration
- Gender equity

Social media:

- Twitter: @AmiralianLab
- www.linkedin.com/in/nasimamiralian/

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How did you get to where you are now?

I started in textile engineering in Iran. I was interested in art and that field allowed me to use STEM to explore art through learning about fibres and dyes.

After completing my bachelors, I applied to do a PhD in Australia. Originally, my research was on the chemistry of a compound, a resin that is found in a grass which grows all around Australia. However, I turned the investigation towards the fibres in the grass and how its properties helped the plant survive the harsh Australian climates. This new angle allowed me to use my previous expertise and return to skills which I had previously developed.

After that, I decided that I wanted to take part in solving the challenge of reducing the use of plastics. I want to do my part no matter how small and make things better for future generations.

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What are your most memorable STEM moments?

If you had asked me this a few years ago before I led a group, I would have talked about my discoveries, research, awards and grants. They are still important to me, but when I reflect, I am now most excited about the achievements of my staff and students.

Their successes make me happier than my own because not only can I consider them my own achievements, but I also get to work with a group and see them develop the skills to become the next generation of scientists and leaders.

What is your hope for future generations?

In the next five years, my goal is to establish a centre focused on adding value to agricultural waste and creating a range of materials with innovative applications. As part of establishing this facility, I would be able to recruit a lot of people, including young students who can address the big global

challenges we are facing.

For the next generation of STEM students, I hope there is a better understanding that people have different backgrounds and experiences. The path that I took is not going to be the path that others will have to take. It's important to find the talent in each person and then mentor them so they can achieve their goals their own way. By doing this, I also believe we can encourage more people into STEM.

What advice would you give young people who are looking at going into STEM now?

Honestly, STEM is fun, though I might be biased because in nanomaterials engineering I get to make some really cool things. However, it's not easy. Never think a great job will be easy. But my advice is to never let giving up become an option. If you are going to dream, go get it! There will be some ups and downs, but there is always a way if you believe in what you are doing.

What is a question you would love to answer but aren't often asked?

As someone who comes from Iran and belongs to a culturally and linguistically diverse background, I have developed a unique perspective and a genuine passion for fostering inclusivity, celebrating diversity, and promoting cross-cultural dialogue. I have shared my experience and the approaches to overcoming challenges in various settings. Australia is a great place. You can always find people who are happy to support you and it's important to look for them, but to do that you need to have the conversations. I'm not afraid to talk about my challenges because we are all human and those are part of the journey to become successful. So, let's talk more about that and support each other.

You won the Queensland Women in STEM Prize. How did this benefit you?

Winning the Queensland Women in STEM Prize benefited me a lot and was incredibly important in launching my career. In the year I received the award, I had already made the discoveries, which helped me win, but I did not have the recognition.

Through winning the award I got to meet a lot of Queenslanders, and industry professionals, giving me the opportunity to get the recognition as the individual who had made those discoveries. The prize also allowed me to move towards research in areas of sustainability.