

## Breaking Down Forever and Giving Back

To Dr Katrina Wruck, aka Dr Kat, being a scientist isn't just about the research, it's about getting the facts, the knowledge, and herself out into the community where she can reach important decision makers and young people still exploring their possibilities.

Dr Kat is a proud Mabuigilaig and Goemulgal woman with ancestral roots in the saltwater people of Mabuig Island in the Torres Strait Islands.

### Can you tell us about what you do?

Currently, I'm a Postdoctoral Research Fellow working at the University of Melbourne on secondment from the Queensland University of Technology (QUT). My research project is focused on the destruction of forever chemicals of concern for an Antarctic Research Base.

Forever chemicals are particularly of concern as they do not break down very easily and when they do, they are not safe molecules. One of the key forever chemicals of concern is PFAS or per- and polyfluoroalkyl substances of which there are around 10,000 known molecules.

The carbon-fluoride bonds in these chemicals are one of the strongest known, which is what makes these chemicals difficult to break apart. They essentially exist "forever" unless we use science to destroy them.

Antarctica is a relatively untouched, so there are strict limits on the concentration of PFAS permitted in the ocean water around Antarctica to protect the unique and undiscovered organisms.

In addition, there are biosecurity considerations. Some of types of fungi and bacteria can break down PFAS molecules but we can't introduce them to Antarctica as they foreign organisms and may impact other native organisms.

I developed a method to break down PFAS using electrochemistry, initiating a chemical reaction with the help of a catalyst. A catalyst is a special material



### Dr Katrina Wruck

**Discipline:** Industrial Chemistry

**Organisation:**

- School of Chemistry and Physics, Queensland University of Technology (QUT)
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**Degrees:**

- Bachelor of Applied Science (Chemistry)
- Bachelor of Science (Honours) in Chemistry
- PhD in Industrial Chemistry/Process Engineering

**Key words:**

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- Green chemistry
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**Prize:** Queensland Women in STEM Prize 2022 – Judges Award



that facilitates the reaction by overcoming the high energy required to break apart chemical bonds, such as the carbon-fluoride bond in PFAS. The process involves a positive and negative terminal, and in between there is a compartment where Antarctic melt water can flow through. The terminals pass electricity through the water, supplying energy to generate free radicals – unstable and energetic molecules prepared to react with all PFAS molecules. The free radicals created in the water then break apart PFAS into fragments, eventually releasing them into their smallest structural units of fluoride ions and carbon dioxide gas.

## **Tell us about a STEM moment that is important to you.**

One of those moments would be winning the Queensland Women in STEM Prize. I had organised to go to a conference in Spain, returning right before the awards ceremony. I didn't even know if I was going to make it, because with international travel, anything can happen. While I was incredibly jetlagged, I made it there. And then I won.

It was such an amazing experience, because I thought *if* I won, I would win the award that I applied for, which was the Breaking Barriers Award. When they didn't call my name for it, I believed I hadn't won anything at all. Then they announced the winner for the Judges' Award. I remember sitting there for a couple of seconds in amazement. That was a pivotal moment for me. As I read my acceptance speech (written on a plane) in a haze of emotion and exhaustion, I realised that this achievement was not just about me but a celebration of resilience and the unwavering support that propelled me forward.

Winning the award was not just a personal victory; it was a victory for my Mob, breaking barriers, defying expectations, and embracing the unforeseen.

## **What has been some of your biggest challenges?**

Being an early career researcher can be a challenge. I'm still trying to find out what my area of expertise is and what my niche is. I also spend my time volunteering to assist the STEM community reviewing policy documents, serving on committees and working on reconciliation action plans for corporate companies.

Time management is a part of this challenge because I need to schedule myself and make sure that I get the science done while also completing my other commitments.

It's also a challenge to hear about others' experiences, especially those of young people. I was in Cairns leading a workshop and afterwards, two boys in year six or seven came up to me and told me that they couldn't believe that I am a Torres Strait Islander and that I also work in science. They told me that I was the first Torres Strait scientist that they had ever met. To me it was heart breaking and it made me really think about how, as academics, we can really make a difference by sharing what we've been through.

**“ I don't need it to be easy. I just need to be able to make a difference. ”**

It's simple to decide that everything was easy for me by looking at the end result, but most don't realise what I had to do to get here. None of it was easy, but I told those boys that they could do anything as long as they worked hard and put their mind to it.

Stories like this aren't uncommon; it's hard to be what you can't see. It was like that for me too, with few female role models in science and even less First Nations people in academic institutions.

I know academia can be a hard career choice. I don't need it to be easy. I just need to be able to make a difference.

## **You won a Queensland Women in STEM Prize. How did this benefit you?**

Winning the prize has afforded me invaluable opportunities to enhance my understanding of the academic profession and elevate my academic profile.

Through participation in workshops facilitated by the award, I've gained access to knowledge and insights that would have otherwise remained beyond my reach.

I am also planning a trip to a school in the Torres Strait Islands, my ancestral homelands. During the trip, I will be running curriculum aligned workshops focusing on STEM concepts, sharing my journey into research and navigating career pathways after school.