

Your future in STEM: A-Z

Where might **science** take you?

Please can you introduce yourself and tell us a bit about your job?

My name is Rachel Owen, and I'm an Immunologist at the University of Southampton. My research focuses on two fascinating cancers affecting an endangered marsupial carnivore: the Tasmanian Devil. These cancers, called Devil Facial Tumour 1 (DFT1) and 2 (DFT2), have the remarkable ability to spread between animals when they bite each other, making them two of only three known contagious cancers affecting mammals. We would expect the immune system of the Tasmanian Devil to recognize and ultimately destroy the "foreign" cancer cells on transmission, and why this doesn't happen is currently unclear. My lab group is interested in understanding how the cancer cells have evolved to effectively hide from the immune system of host Tasmanian Devils, and whether it is possible

to improve the host immune response to the cancers through the development of a vaccine.

I'm a lab-based scientist, and most of my work is performed on Tasmanian Devil cells originally isolated from wild animals which we continue growing in the lab, allowing us to work on an endangered Australian species right here in the UK. We use standard lab to look at the expression of genes and proteins which are essential to the functioning of the immune system in both cancer and healthy Tasmanian Devil cells, to identify differences which might be aiding the spread of DFT1 and DFT2 in the wild. We also look at how the expression of these genes and proteins is affected by extracellular signals, such as inflammation, by treating the cells with different cytokines. We can then start to build up an understanding of how these tumours are evolving to evade immune destruction when they spread between genetically distinct animals.



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Immunologist

How did you get into this line of work?

When I was younger, I wanted to be a vet - or the next David Attenborough! So, an interest in animals has been there for as long as I can remember. There were also a few years where, as someone who was good at science, a lot of people suggested going into Medicine, but it never felt quite right to me. As I grew older and studied, I developed a love of molecular biology and research as opposed to the more clinical careers of being a vet or a doctor. I was particularly interested in cancer, and cancer immunology is a hot topic right now, so when I was searching for PhDs, I focussed on projects about those. Incredibly, a cancer immunology project on these two remarkable contagious cancers appeared whilst I was searching, and it perfectly blended my interest in molecular biology and cancer immunology with my long-standing love of animals! ►



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What qualifications did you study or what experience did you gather to enable you to become an Immunologist?

I took four subjects at A-levels; Biology, Chemistry, Physics and Maths. I then went on to do a bachelor's degree in Biochemistry at Cardiff University, which included a year working in industry at a major pharmaceutical company. I then undertook my PhD at the University of Southampton studying the immunology of DFT1 and DFT2, where I'm still working as a Research Fellow today.

Are there any particular science practicals, teachers, or other moments in school you fondly remember to this day?

I am still very fond of my school Biology teacher. I was a bit of a pain in school, getting me to keep on top of my homework was a full-time job! My Biology teacher, Mrs. Bowdery, was always brilliant at encouraging me to put in the work and more importantly to really push and challenge myself. I'd say she's a major factor in why I ended up doing a Biology based degree. A specific practical I remember from my school days with her was dissecting an eyeball, which was just not in any way how I would imagine an eyeball to be.

I also fondly remember a practical on microbiology from my undergraduate degree. It was on horizontal transfers of antibiotic resistance genes in *E. coli*. I enjoyed how clearly you could see the uptake of resistance genes; it was a nice experiment. I did,



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quite famously, get part of this experiment quite wrong and mixed too many of the bacteria together on one plate, accidentally forming a strain which was resistant to all the antibiotics we tried. Thankfully it wasn't a virulent strain of *E. coli* and I disposed of the resistant strain safely.

Were there any moments or events that inspired you and led you down this path, either as a child, a student or since entering work?

I'm not sure I ever had a specific "moment" of realisation. My career path has always been a series of steps following what just feels right and exciting to me at the time. I've been quite lucky in that I've always known I loved science, which has certainly made things easier. I was also lucky that my PhD project on Tasmanian Devil cancer immunology popped up when it did. At that point in my studies I had no idea that animal immunology was an option and had focussed all my energy on more human focussed research. The project popping up when it did was a great moment for me to keep my new molecular skills and interests and combine it with my lifelong interest with wildlife.

Were there any people who have inspired you into this line of work?

As a child, David Attenborough was a massive inspiration for igniting an interest and love for wildlife and science. I think my school Biology teacher deserves a shout out here too. She was the first person to really get me considering scientific research as a career path, rather than the more widely known "science" trajectories like Medicine. She was always supportive and got me very excited about the prospect of a career as a lab scientist. In a similar vein, I've been lucky throughout my career to have had several supervisors who have been understanding of my own needs, strengths and interests, and who have encouraged me to follow my own path. My PhD supervisor (who I still work with) has particularly been wonderful. She's always pushed me to improve on my weaknesses and has been invaluable in encouraging me to further my career as a wildlife immunologist, even though it's perhaps not what a standard immunology career might look like. ►

How has your line of work changed from when you first started as an Immunologist to now?

The academic research environment is notorious for being high pressure and stressful, but there has been an increase in the importance of looking after your mental health within the academic community. This has resulted in far more effective support structures for people working within it and makes pursuing a career in academia more viable than it used to feel. There's also been a significant effort to diversify academia and research, which is improving year after year and hopefully opens barriers for those who have perhaps never considered a career in research.



The recent COVID outbreak has been by far the biggest change, and the biggest challenge, of my career. As a lab-based scientist, enforced social distancing and remote working significantly affects my research, as I'm currently unable to work in the lab. This feels like it may be a turning point for academic research, as contracts and

research are forced to become more flexible to support staff who cannot work during this time. Thankfully, my university and my supervisor have been incredibly supportive and are doing the best to allow me to continue my work for now, but it is likely that for the foreseeable future I will need to build more bioinformatics and computer/modelling based research into my work whilst it is still unsafe to regularly go to the lab.

How has studying Science at school prepared you to become an Immunologist?

The way science is taught at school is good for giving you a broad view of science. Particularly as a biologist, where there's so many kinds of biology and the research going on is so varied. It's great that the curriculum does what it can to cover lots of different aspects of biology in the limited time. Having that breadth of knowledge and covering lots of different areas at school is really important in helping students who want to pursue a career in the biological sciences get an idea of what they might like to follow on with.

Were there any obstacles or factors that put you off this route at any point?

I actually never really liked immunology at school or university! It sounds odd to say it now, but the field is so huge and diverse that on any course you can only be taught so much of it, and I just didn't particularly gel with the areas that I was taught. It wasn't until I did my industrial placement year at a pharmaceutical company that



I realised immunology is far more than memorising cells and receptors. Through that placement, and my final year project, which was on cancer immunology, and ultimately my PhD in immunology I started to not only understand the importance of immunology within research, but I also found a niche of immunology that I was fascinating to me. The fact that I'd historically never enjoyed it made me think twice about taking on a PhD with such an immunology angle to it. Now I proudly call myself an immunologist.

I also think that going on to do a higher degree carries a lot of pressure, and "imposter syndrome" can make a career in academia particularly challenging. I always took failures and rejections very hard and started my PhD with not much confidence in my own abilities. Back then, the idea of following a career path in science was terrifying, but with a good support network I've started to overcome those fears and anxieties and really believe in my own abilities. Immunology research feels like the right path for me! ►



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What advice would you give to someone thinking about going into the same line of work as you?

Be flexible and be willing to open yourself up to new ideas. Biology is vast and it's ok to start off not sure which parts you like the best. If you start your degree doing immunology and realise during your first year that you prefer evolution or zoology, that's ok. Follow your own interests and strengths to find the area of biology that's right for you and be willing to let that path change when it feels right.

What advice would you give to others thinking about a career in STEM?

Go for it! People can often fear pursuing a career in STEM, or think that they're not right for it, but if you have an interest in STEM subjects then you're right for it. It's a rewarding and exciting career path.

What was the reaction from friends and family when you shared your desire to become an Immunologist with them?

"What is an immunologist?"
– I often find people outside of biology have a lot of questions about specific disciplines, but everyone's been very supportive, and my family and friends are always interested in hearing about my research.



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