

Michelle Simmons
Doctor of Science
Durham Cathedral, 5 July 2019

What does Crocodile Dundee, The Seekers, Evonne Goolagong, Dawn Fraser, Cathy Freeman, and Professor Michelle Simmons have in common?

All have been named Australian of the Year, and many have inspired generations of young women. Unlike the rest, Michelle Simmons is one of our very own.

Michelle attended a “pretty rough school” in London, before coming to Trevelyan College to study Physics and Chemistry of Materials in 1985. She then moved to St Aidan’s to study for her PhD in Professor Andy Brinkman's II-VI semiconductor group, where she started her career by designing and building solar cells.

A Durham PhD became a passport to the world. From here she moved to Professor Mike Pepper's group in the Cavendish Laboratory in Cambridge, to learn about the “weird physics that emerges when dealing with [the] world as it gets very small (down to the size of individual atoms).”

And then she wanted an even more ambitious project to work on.

Specifically, she “was drawn to the technological challenge of trying to create new devices that had never been made before, where each atom had to be put in place to engineer a particular effect – in essence, to create electronic devices at the atomic scale.”

And so she moved to Australia, to be a founding member of the Australian Research Council Centre of Excellence for Quantum Computer Technology at the University of New South Wales.

Over the next decade, Professor Simmons pioneered a radical new technology for creating atomic-scale devices, which is now opening up the capability to control the quantum world. To this end, her research is now demonstrating, atom by atom, the

best way to build quantum integrated circuits – the smallest components of a quantum computer – a new type of computer that exploits the laws physics at very small dimensions in order to provide an exponentially fast speed up in processing times.

People told her team them they couldn't do it, but the team persisted nonetheless.

Her research has produced the first electronic devices in silicon where atoms are placed and measured with atomic precision. This ground-breaking work has opened a new frontier of research in electronics globally. It has provided a platform for redesigning conventional transistors at the atomic-scale, and for investigating alternative architectures as the semiconductor industry continues transistor miniaturisation to the ultimate limit.

The creation of these novel, atomic-scale devices was only possible because of a decade of research in which Professor Simmons and her group systematically assembled all the necessarily building blocks – both technological and intellectual – for making these things happen. Her achievements are placing her and her team in pole position in the international race to build a useful quantum computer, and the field is highly competitive – nicknamed the space race of the computing era. In 2018, she established a company, Silicon Quantum Computing, to commercialise the results of her research.

Michelle's ambitions are seriously bold. She aims to not only encourage more talented women into science and technology, but also encourage more of us to set and voice big and audacious goals. She believes all students – male and female – should be taught to have high expectations of themselves. The bar should be set high, especially in science education, and students told that we expect them to jump over it. She has said "It is better to do the things that have the greatest reward; things that are hard, not easy."

Michelle Yvonne Simmons (born 14 July 1967) is a Scientia Professor of Quantum Physics in the Faculty of Science at the University of New South Wales. She has twice been awarded a Federation Fellowship and now a Laureate Fellowship, the

Australian Research Council's most prestigious awards of this kind. She is the Director of the Australian Research Council Centre of Excellence for Quantum Computation & Communication Technology and is recognised internationally as a pioneer and leader in atomic electronics and quantum computing.

She has received a long list of honours and awards over the years of her illustrious career.

In 2005, she was awarded the Australian Academy of Science Pawsey Medal.

She was, upon her appointment in 2006, one of the youngest fellows elected to the Australian Academy of Science and is one of only a handful of Australians inducted into the American Academy of Arts and Sciences. In 2011, she was named NSW Scientist of the Year by the NSW Government Office of the Chief Scientist. In 2015, she was awarded the Thomas Ranken Lyle Medal, and was the winner of the Eureka Prize for Leadership in Science. In 2016 she was awarded the Foresight Institute Feynman Prize in Nanotechnology and was recently recognised by the American Computer Museum as a pioneer in quantum computing. She is Editor-in-Chief of Nature's partner journal Quantum Information, and was named the 2017 L'ORÉAL-UNESCO Asia-Pacific Laureate in the Physical Sciences, subsequently being profiled in a short documentary on France24 TV. In 2018 Professor Simmons was elected as a Fellow of the Royal Society of London. In addition, she was named Australian of the Year in 2018 for her work in quantum physics.

Chancellor, I present Michelle Yvonne Simmons to receive the degree of Doctor of Science, *honoris causa*.

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