

# CAREERS WITH STEM™ JOB KIT



# GREEN CHEMIST

Design safer chemicals to protect lives  
and preserve our future

SUPPORTED BY



MONASH  
University



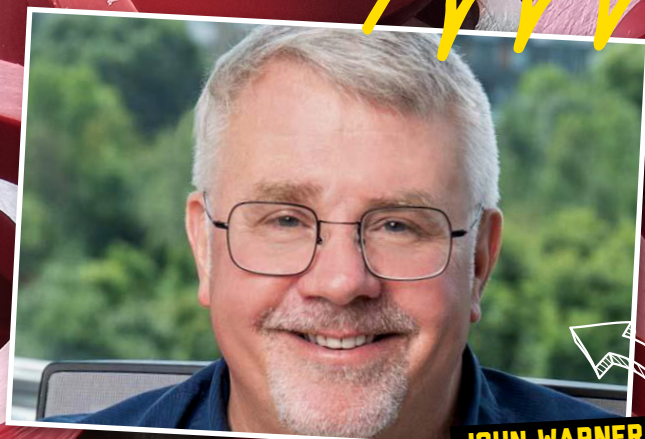
**FUTURE  
INNOVATORS  
WANTED**

**Lead the transformation  
of chemical industries.  
Become a pioneer in  
developing sustainable  
solutions.**

Learn about Green Chemistry  
at Monash.



# HEALTHY QUESTIONS



**JOHN WARNER**  
GREEN CHEMISTRY  
CHAMPION

The work of chemists is all around us, which is why it's so crucial chemists are trained to question the impact of what they help produce

**"I REALISED SOMETHING WAS MISSING IN MY EDUCATION"**

**W**hen I was in school I used to think the world was divided into two types of people. There were artists and there were scientists. And because I was marginally good at music, I was an artist. When I got into a research lab and saw that chemists created, designed, and made materials, I realised I had it all wrong.

I started my career as a musician, became a medicinal chemist, then a polymer chemist, then went into academia, before being an entrepreneur. Chemistry provided me with the springboard to do all of these things.

Every job that deals with materials has something to do with chemistry, and the work of chemists is all around us. The foods we eat, the clothes we wear, the electronic devices we use, and the cars we drive, are all made up of chemicals. And yet many chemists are never taught to question or plan for the impact of what they create on the environment or human health.

I confronted this reality when I lost my 2-year-old son to a birth defect. Lying in bed the night of my son's funeral, I wondered if something I had touched in the lab caused my son's birth defect and ultimate death. I realised something was missing in my education.

For some strange reason when we describe the properties of a material, we leave out toxicity and impacts on the environment. So in 2001, at the University of Massachusetts, I started the world's first PhD program in green chemistry.

The first PhD student, Amy Canon, went on to start an organisation called Beyond Benign that supports green chemistry education. It also established the Green Chemistry Commitment, where it asks universities to bring in programming to train future students about green chemistry. Monash is the first university in the southern hemisphere to sign this commitment.

Green chemistry is a paradigm shift. While many people can talk about what is sustainable, or why we need sustainability, it is chemists that can explain how to achieve it, and that's why we need all chemists to be green chemists.

**John Warner**  
Distinguished Professor of Green Chemistry

BACHELOR OF SCIENCE (CHEMISTRY), UNIVERSITY OF MASSACHUSETTS

PHD CHEMISTRY, PRINCETON UNIVERSITY

EXPLORATORY AND MEDIA RESEARCH, POLAROID

PROFESSOR OF CHEMISTRY AND PLASTICS ENGINEERING, UNIVERSITY OF MASSACHUSETTS

DISTINGUISHED PROFESSOR OF GREEN CHEMISTRY, MONASH UNIVERSITY

INVENTOR

CO-FOUNDER, BEYOND BENIGN - GREEN CHEMISTRY FOR A SUSTAINABLE FUTURE

PRESIDENT AND CEO, THE TECHNOLOGY GREENHOUSE

Check out [CareerswithSTEM.com](https://careerswithstem.com) for more insights, information, inspiration and advice about chemistry careers!

SHUTTERSTOCK

# Making our world safer and more sustainable

Chemistry is a door opener to a world of career options, and green chemistry skills provide the edge employers are looking for.

**C**hemists use their expertise to work at the cutting edge of science, inventing and formulating new materials and products as well as analysing chemicals and materials to understand their composition and potential uses.

They may work in laboratories, but they're just as likely to be found in the boardroom using their expertise to advise company executives. They're also found working in the field, for example in agriculture or water management, and can serve industry, research or government agencies.

"The world needs chemists and particularly chemists trained in green principles as everything around us that we enjoy and sometimes take for granted comes from some area of chemical manufacturing," says Monash University chemistry Professor Tony Patti.

"Chemistry is essential to the lives of everybody and we need to do it better - the way to do it better is to use green chemistry and sustainable approaches," he adds.

Green chemistry focuses on making all products that come from chemical manufacturing in the safest and most sustainable manner. It's about ensuring new chemicals are non-toxic, don't lead to environmental problems, and use renewable resources in their production — all while providing economic and social benefits to society.

As green chemistry inventor John Warner says: "It is the ability not to just learn to effectively deal with and regulate the use of hazardous materials but to think outside the box and create products without using hazardous materials."

## Watch

Professor Tony Patti chat about green chemistry with inventor John Warner.



## CHOOSE YOUR PATH

Combining chemistry skills with another expertise area is an excellent way to supercharge your career. For example, some of the **highest paid chemists** are actually lawyers with a background in chemistry.

Some **GREEN CHEMISTRY+X** areas to consider include:

**GREEN CHEMISTRY+RESEARCH**  
= Research scientist, sustainability

**GREEN CHEMISTRY+BUSINESS**  
= Green chemistry startup founder

**GREEN CHEMISTRY+ENGINEERING**  
= Green chemical inventor

**GREEN CHEMISTRY+ENVIRONMENT**  
= Environmental chemist

**GREEN CHEMISTRY+HEALTH**  
= Medical researcher, human health, synthetic chemist, pharmaceutical formulator

**GREEN CHEMISTRY+MANUFACTURING**  
= Polymer chemist, materials designer

**GREEN CHEMISTRY+AGRICULTURE**  
= Synthetic chemist, formulator, field adviser



## MONASH UNI COURSE OPTIONS\*

### UNDERGRADUATE DEGREES

Bachelor of Science  
(Chemistry)

Bachelor of Science  
(Biochemistry)

### DOUBLE DEGREES

Bachelor of Science  
(Chemistry)/Bachelor of Arts

Bachelor of Science  
(Chemistry)/Bachelor  
of Commerce

Bachelor of Science  
(Chemistry)/Bachelor of  
Engineering

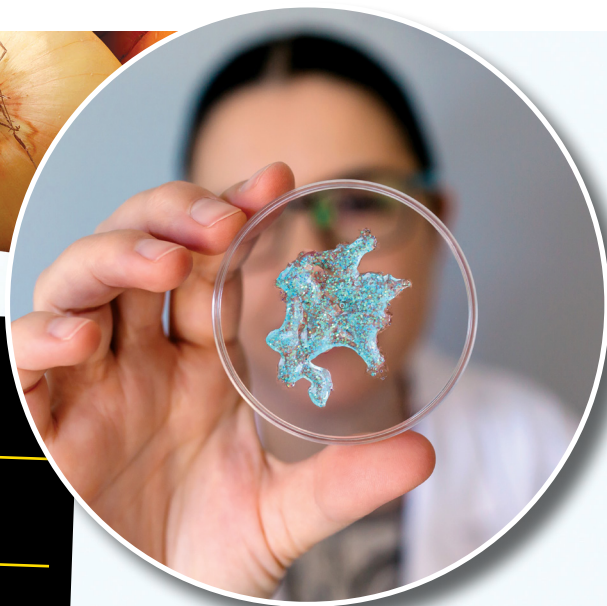
Bachelor of Science  
(Chemistry)/Bachelor of IT

Bachelor of Science  
(Chemistry)/Bachelor of Laws

**POSTGRADUATE STUDY**  
Graduate Certificate of Green  
Chemistry and Sustainable  
Technologies

Master of Green Chemistry  
and Sustainable Technologies

\*CRICOS PROVIDER: MONASH UNIVERSITY 00008C  
MONASH COLLEGE 018



## BE COOL WITH CHEMICALS

**CHEMIST JACKSON MOORE IS AT THE CUTTING EDGE  
OF CREATING CHEMICALS IN A SUSTAINABLE WAY**

At school Jackson wanted to be an engineer and although he studied chemical and materials engineering at uni he really disliked his early chemistry studies. "I liked the engineering chemistry but I disliked the pure chemistry. Nowadays though, I need to know a lot of the pure chemistry and I'm finding it much more enjoyable," Jackson says.

The change came when Jackson settled into his career as a chemist, working with chemicals every day to deliver products that he has helped perfect.

"There's an aspect of optimisation, of creativity," Jackson says. "You're trying to think of new ways to use a chemical, what you should mix with it to make it work, what's the best dosage of this or that, and then you go back to all of your scientific testing principles, methods and specifications to test what you've made," he adds.

In his job as a senior chemist in research and development at chemical manufacturer DKSH, Jackson gets to apply his

green chemistry skills to products used in agriculture.

It's a tricky task given the need to keep costs down and at the same time ensure the product works as effectively as before.

"I'm always keeping my eyes out for new, green raw materials and trying to find good uses for them," Jackson says.

### Chemical is not a bad word

Jackson says once you realise chemicals are everywhere and "chemical is not a bad word" you can really get into the materials science aspect of chemistry, exploring how different chemicals work together or in different doses to achieve different things. Sort of like solving a complex jigsaw puzzle. "For me, that's really enjoyable," Jackson says.



**DR JACKSON MOORE  
SENIOR CHEMIST**

BACHELOR OF ENGINEERING/MASTER OF ENGINEERING,  
CHEMICAL AND MATERIALS ENGINEERING, UNIVERSITY OF QUEENSLAND

PHD, ORGANIC AND PHYSICAL CHEMISTRY,  
MONASH UNIVERSITY

RESEARCH AND DEVELOPMENT  
ASSISTANT, AXIO

SENIOR CHEMIST,  
RESEARCH AND DEVELOPMENT, DKSH

# CLIMATE-FRIENDLY SCIENCE

**CASSANDRA YARDLEY SEES GREEN CHEMISTRY AS A WAY TO SOLVE PROBLEMS, ESPECIALLY WHEN IT COMES TO OUR CLIMATE AND THE ENVIRONMENT**



**CASSANDRA YARDLEY**  
GREEN CHEMISTRY  
STUDENT

MASTER OF GREEN CHEMISTRY AND SUSTAINABLE TECHNOLOGIES. MONASH UNIVERSITY (UNDERWAY)

**A**fter finishing her undergrad degree in biochemistry, Cassandra wanted to understand how to make chemistry greener.

"I wanted to have a bit more in-depth understanding of how to actually apply that into our world and make effective change," she says. That led her to studying the Masters of Green Chemistry and Sustainable Technologies at Monash University.

Cassandra thought her course at Monash would be quite focused in a lab, but she soon realised there was a big economic aspect as well.

"It definitely forced me to think outside the traditional chemistry box...to utilise basic chemistry and biology knowledge that I had," Cassandra says.

"A couple of units I've done focus on the economy and how science is applied to that."

Cassandra is currently in her second year of her Masters and in the longer term plans to use her knowledge of green chemistry to work as an

environmental consultant, which you can check out a bit about on the next page.

In doing her degree at Monash, Cassandra may have found a way to link her passion to her job.

"We did a consultancy unit last semester – focusing on the circular economy and recycling as well as considering biodegradable or compostable parts or looking at retrosynthesising chemicals – these are the areas I'd want to pursue," Cassandra adds. — *Jaina McIntyre*

**I WANTED TO APPLY CHEMISTRY TO MAKE EFFECTIVE CHANGE"**



BACHELOR OF BIOCHEMISTRY.  
DEAKIN UNIVERSITY

# GREEN CHEMISTRY CHAMPIONS

Anmol Vaidya wants to use his love and skill for chemistry to help change the world

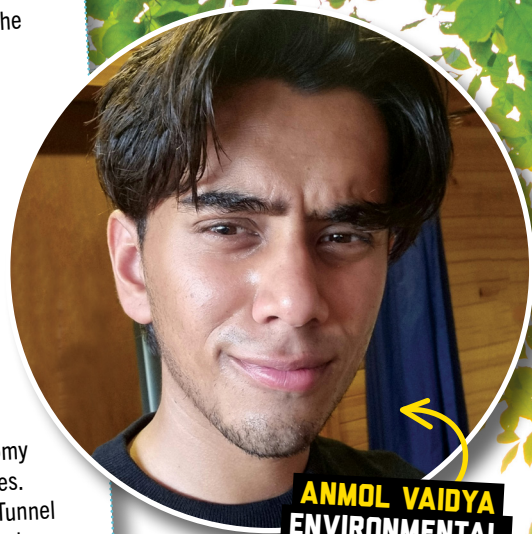
Before moving to Australia at the end of his undergrad degree in 2022, Anmol started doing some digging on how to combine his skill for chemistry with his new found passion for environmental science. That's when he found the Master of Green Chemistry and Sustainable Technologies at Monash University.

Anmol says he chose Monash for its more sustainability-oriented subjects.

While studying, Anmol worked as an environmental consultant at an engineering firm, learning about the need to "clean-ify the process in advance, rather than having to filter it later".

"For example, if you make industrial processes green, you don't have to fix the pollution after because it's already green – the industry can benefit by applying sustainable practices such as circular economy and green chemistry principles," he continues.

Having already worked on the West Gate Tunnel Project and the Northeast Link Project around Melbourne, Anmol is well and truly on his way to influencing a greener future. But it took him a lot of work to get there. In high school, Anmol studied physics, chemistry, biology and mathematics, subjects which he says really helped him in uni and still help him in his career. — Jaina McIntyre



**ANMOL VAIDYA**  
ENVIRONMENTAL SCIENTIST

## EMPLOYER VIEW

Anmol's employer Ricardo is a global engineering consulting company with a big focus on the need for chemical recycling to see waste destined for landfill redirected into more valuable and useful products. That's why it recruits people with green chemistry qualifications like Anmol.

Shaun Scallan, associate director of business development with Ricardo, says "Green chemistry is a key skill to unlock value from these waste streams in a sustainable way".

"There is no waste in nature, nature uses everything and cycles and upcycles the resources that flow through nature," Shaun adds.

"Green chemistry uses these principles to create sustainable solutions to seemingly impossible waste management problems, enabling a transition to a circular economy in very real ways."

ENVIRONMENTAL CONSULTANT, RICARDO PLC

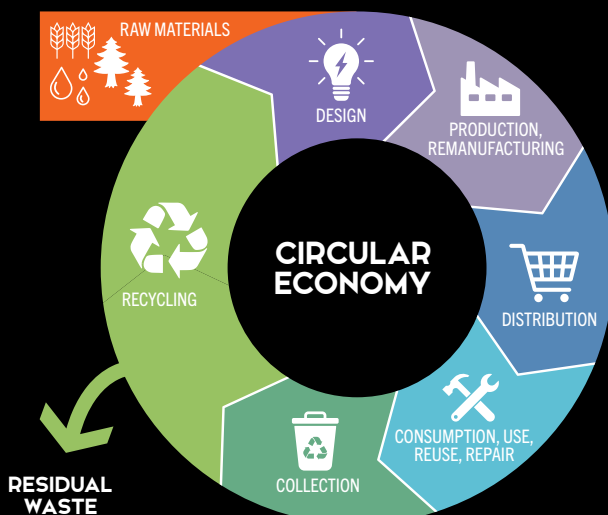
GRADUATE ENVIRONMENTAL SCIENTIST, EP RISK MANAGEMENT

MASTER OF GREEN CHEMISTRY AND SUSTAINABLE TECHNOLOGIES, MONASH UNIVERSITY

BACHELOR OF CHEMISTRY, ENVIRONMENTAL SCIENCE AND ZOOLOGY, ST JOSEPH'S UNIVERSITY

## WHAT IS THE CIRCULAR ECONOMY?

Unlike a traditional economy, a circular economy aims to stop waste being produced in the first place and keep resources and materials in circulation for longer. It needs green chemistry at the design phase.



**IF YOU MAKE PROCESSES GREEN YOU DON'T HAVE TO FIX POLLUTION LATER"**

SUPPLIED / SHUTTERSTOCK

# Get the job!

Keen to kick off your career in green chemistry? Start here...

## GET CONNECTED

**Networking is the secret weapon for graduates looking to land internships and eventually jobs in science. One good place to start is LinkedIn. Create a profile and give these companies a follow to get started.**

- **BASF** This chemical production firm works in many markets including petrochemicals, food, agriculture and energy.
- **Bayer** This global chemical manufacturing firm specialises in health and nutrition.
- **Dow** One of the largest chemical manufacturing companies in the world, Dow serves customers in the packaging, infrastructure, mobility and consumer goods industries.
- **Pfizer** A pharmaceutical manufacturing firm currently working on the latest treatments for cancer.
- **Syngenta** An agriculture technology company working on seeds and pesticides for use by farmers.
- **Unilever** They manufacture everything from deodorant to ice-cream and hire chemists in quality control.



## BEYOND BENIGN

**beyondbenign.org is a hub for green chemistry education and an excellent starting point for connecting with green chemistry educators and professionals**

@beyondbenign



**CHECK OUT ALL YOUR OPTIONS MONASH.EDU/CHEMISTRY**



Green chemistry education is at the core of a sustainable future.

## Choose this career if you...

- ✓ Love solving puzzles
- ✓ Are curious about what stuff is made of
- ✓ Want to help protect the planet

## WATCH AND LISTEN

**Check out these shows to learn more about chemistry**

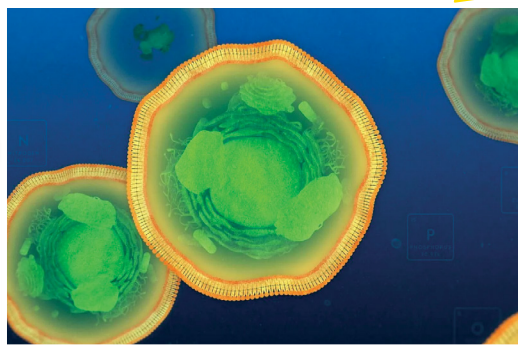
### Entertainment TV: Mythbusters

A show busting myths and urban legends using a combination of scientific method, ingenuity and sometimes explosive experiments!

### Documentary: The chemical world

An ABC Science show on how chemistry shaped our planet and gave rise to all life on earth.

[iview.abc.net.au/show/chemical-world](http://iview.abc.net.au/show/chemical-world)



### Education: Why do green chemistry?

An explainer on the case for green chemistry from the Yale Center for Green Chemistry. [bit.ly/DoGreenChemistry](http://bit.ly/DoGreenChemistry)

### Podcast: Brought to you by chemistry

An award-winning podcast series from the UK's Royal Society of Chemistry. Search for it on your fave podcast platform.