



2022 ACTIVITY AND RESOURCES KIT

for Canberra Women
of Science and Art

A National Science Week (ACT) event


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Innovate
Communicate

 **national
science
week 2022**



An Australian Government Initiative

Inspiring
AUSTRALIA



Canberra Women of Science and Art showcases Canberra women doing amazing things!

This booklet includes information about the Canberra Women of Science and Art event (part of National Science Week 2022), resources and fun activities. Some of the activities are provided by the authors, our speakers and supporting partner organisations.

This Activity and Resources Kit is for kids (from baby and up), teenagers, families and anyone interested in curiosity and creativity going hand-in-hand.

Three events in 2022

We ran three separate events for different audiences & levels of interactivity:

1. Lunch + 'fireside chat' @CBRIN (Wed 17 Aug 12:30pm-1:30pm)
2. Little people + all @Woden Library (Fri 19 Aug 10:30am-11:30am)
3. All-ages workshops @ANU (Sun 21 Aug 10:30am-12:30pm)



Find out about Canberra Women of Science and Art and other National Science Week events: <https://www.innovatecommunicate.com/national-science-week/>

Check out the videos from the event by visiting the Innovate Communicate YouTube Channel: <https://www.youtube.com/channel/UCJfkGublokFDNcSS0IxxU4Q>



What invention could an artist and a chemist come up with?

Who are we talking about?

CANBERRA WOMEN OF SCIENCE AND ART

<https://bit.ly/CbrWSA>
#CbrWomenSciArt
#scienceweek



Katie Vidal



Naomi Duckworth



Dr Chloe Lim



Claire Harris



MC: Dr Phil Dooley



More...

Read more about our Canberra Women on the [website](https://www.innovatecommunicate.com/national-science-week) (<https://www.innovatecommunicate.com/national-science-week>):

- Katie Vidal: Education lead with She Maps. Katie teaches children and teachers how to fly drones.
- Dr Chloe Lim: Science storyteller, molecular biologist, career coach and balloon artist. Chloe's also written a book introducing children to genetics.
- Naomi Duckworth: Engineering Manager with Department of Defence. Naomi is a systems engineer and is working on Australia's future Navy ships. Naomi also loves design, renovations and thinking of creative ways to solve problems.
- Claire Harris: Entrepreneur and Founder of Innovate Communicate. Claire helps scientists tell their stories and she's also fascinated by robot technology, 3D-printing and creating a tribe of robot-art Brave Bots.
- Dr Phil Dooley: Business founder, science writer, videomaker, science performer and science communication trainer. Phil will be MC.

Different backgrounds and interests = different pathways to get where they are today. Trained in different fields of science, technology, engineering, communication and education.

But... they all have a common thread of being curious about people and the world around us.

They are *driven to make a difference* and they use creativity and determination mixed with science and art to achieve it.

Our why?

We created Canberra Women of Science and Art to:

- engage and inspire people in Canberra and beyond
- challenge stereotypes around who can be involved with and work in science, technology, engineering, art, mathematics (STEAM)
- show the beneficial connections between STEM and creativity/arts
- demonstrate alternative career pathways
- provide tangible next steps for children and adults e.g. resources, links to other organisations
- deliver experiences for all ages to enjoy.

“ In their words

“I have been a teacher for 20 years now in primary education, but five years ago, I caught up with a friend for dinner. And she said to me, you're a teacher? Do you want to fly drones? And I couldn't say no.”

- Katie Vidal



“I've always enjoyed learning about science and how our body works. I gravitated towards science subjects like medicine and ended up getting into medical science.

I think it's because I feel like I can make a big difference in the lives of people through medicine.



I also published a children's book called what makes you unique and I have party entertainment service business that specialises in balloon twisting. So, what I've done is combined my love for balloons and science and storytelling together to create a science show based on my book.”

- Chloe Lim

“Why did I get involved in STEM? It was because of my dad. He's an electrical engineer. We have a very similar mindset; the way we approach problem solving. We were always together doing things together, and it was sort of a natural progression for me.

He never pushed me into doing it; it's just something that I was always interested in, and good at, as well, in terms of science and maths, and that kind of sort of methodical and logical way that I think about things.

- Naomi Duckworth



“Science and technology disciplines rely on creative thinking. And creativity and art, in its various forms, can provide windows into exploring, understanding and contributing to research, development and commercialisation. I believe that anyone can be involved with science, technology, engineering, the arts and mathematics (STEAM) if they want to be.

- Claire Harris



Look at all the photos from the Canberra Women of Science and Art events on Facebook: <https://www.facebook.com/CbrWomenSciArt>

What new app could be designed by a mathematician and a musician?

fun activity



DNA in a shoebox

You have deoxyribonucleic acid (DNA) in nearly every cell of your body. It contains the information that made you become you!

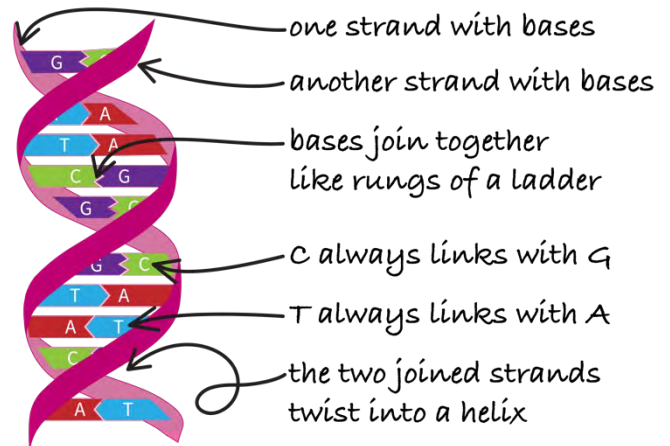
Small differences in our DNA give us different coloured eyes or hair.

But 99.9% of our DNA is identical with other humans.

The amazing thing is the information in DNA is a code made up of only four different molecules:

- adenine (A)
- thymine (T)
- guanine (G)
- cytosine (C)

It is the sequence of these nitrogen bases that provides the information your cells need. The complete DNA instruction book, or genome, for a human contains about 3 billion bases. Groups of bases are known as genes and we have about 20,000 of those.



Credit: Kathryn Carter

Make your own double helix

Step 1: Find a shoebox, or small box, to attach the ends of your model to.

Step 2: Cut two long, flexible strands slightly longer than the box.

You might use string, pipe cleaners, liquorice straps, or paper strips.

Step 3: Gather small objects in four different colours.

You might use beads, paperclips, jellybeans, or plasticine balls.

Step 4: Attach the small objects together.

Remember the same colours always go together.

You might thread them on string, toothpicks, cardboard strips, or pipe cleaners.

Step 5: Attach the pairs of small objects to the two strands so that it looks like a ladder.

Step 6: Twist the strands to make the helix and attach them to the sides of the box.



OVER HALF OF OUR DNA IS THE SAME AS THE DNA IN A BANANA.



Hands-on activities from Double Helix Magazine!

Check out the many fun and exciting activities from CSIRO's [Double Helix magazine](#). Sign up to [Double Helix Extra](#) and receive a free fortnightly e-newsletter with the latest science news, a hands-on activity and quiz.

Kite mayhem

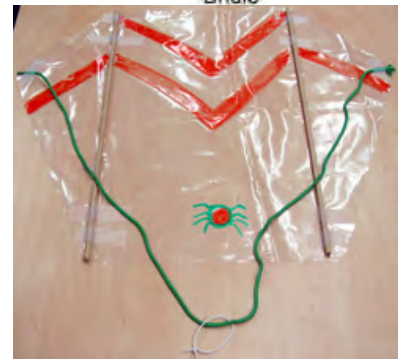
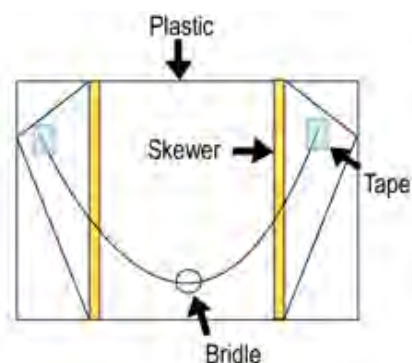
Kites are a great way to combine science, playfulness, patience and imagination. So grab a some simple household items and start building! (<https://blog.doublehelix.csiro.au/kite-mayhem/>)

You will need

- Plastic or a large garbage bag
- Skewers (without pointy ends), or dowel (thin wooden rods)
- Tape
- Scissors
- Ruler
- String or fishing line
- Marking pens, felt tip pens or paints (optional).

What to do

1. Flatten the plastic out on a table and cut out a rectangle approximately 40 cm by 50 cm.
2. Cut two triangles away from the short sides of the rectangle (see diagram).
3. Tape the skewers or the dowel to the plastic down the length of the shape, starting at the top corner of each triangle as indicated by the diagram.
4. Cut a piece of string 1 m long, and firmly tape each end to one of the triangular points on the sides of the kite.
5. Now all you need is the kite's bridle. Tie a small loop with a diameter of around 2 cm around the 1 m string loop. The loop needs to be able move along the long string freely.
6. Tie your kite string to the loop bridle.
7. If you wish, decorate your kite with marking pens, felt tip pens or paints.
8. You are now ready to look to the sky, test the wind and fly your kite!



What's happening?

The science behind flying a kite is actually quite similar to aeroplane flight. They are both affected by the movement of air and the forces of gravity, lift, thrust, and drag. Kites achieve lift because of the angle they fly into the wind. As air hits the kite it is deflected downwards. If air is being pushed downwards, according to Newton's third law where every action has an equal and opposite reaction, the kite is pushed upwards. This upwards lift is able to overcome gravity.



A kite cannot produce its own thrust and relies on being held in place while the wind moves past it. In some cases, this is helped by running into the wind with the kite. As you hold onto the kite string, this allows the wind to move over the kite and in effect, generate thrust.

Any kite will have friction with the air – known as drag. Drag can be created by giving a kite a tail. Air flows through the kite tail, pulling the bottom of the kite into the wind. This helps the kite continue to point into the wind and continue flying.

Real-life science

Humans have been flying kites for a very long time. The ancient Chinese were great kite builders. Legend has it that lightning was discovered to be electric during a do-it-yourself science experiment by Benjamin Franklin holding a kite in a storm – not one to try at home though.

Test out different kite designs and materials to see how this affects your kite flying success! Tell us about your designs below.



Propellers

Did you know that the propellers on drones can move air in different directions to move it (propel it). Drone propellers work by spinning from the force applied by the motor. The higher air pressure on the bottom of the propellers creates lift for the entire drone. Their rotation also keeps the drone stable and propels it to move forwards. Some drones don't have blades but rather have 'impellers'.

What other ways can you think of to get a drone to fly?

Watch the video from our event at National Science Week to learn more about drones from Katie Vidal and see the spinning propellers / helicopters made by the people that participated!

fun activity



Make a spinning helicopter

NASA's Ingenuity helicopter has made history by flying on Mars.

To celebrate the first flight of a copter on another planet, here's a simple unpowered helicopter you can build at home!

[\(https://blog.doublehelix.csiro.au/make-a-spinning-helicopter/\)](https://blog.doublehelix.csiro.au/make-a-spinning-helicopter/)

You will need

- A4 paper
- Pencil or pen
- Ruler
- Scissors
- Paperclips

What to do

Step 1: With a pencil and ruler, draw a line 4 cm in from one of the short sides of the paper.

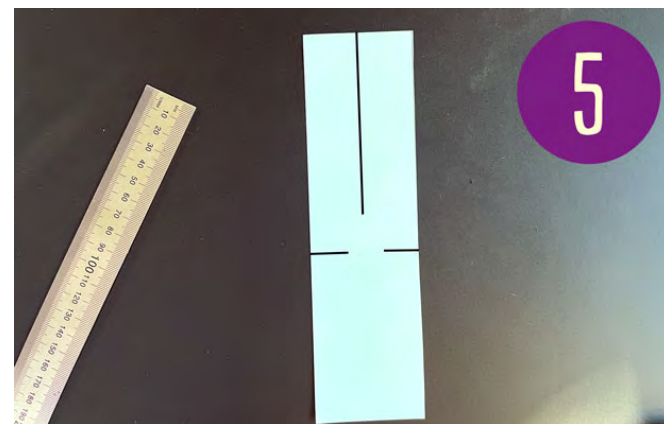
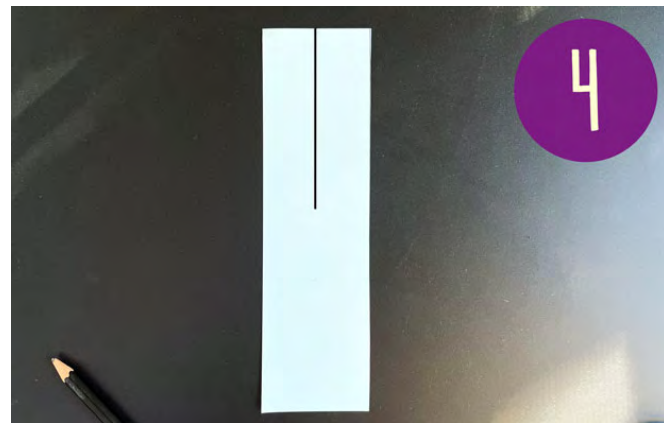
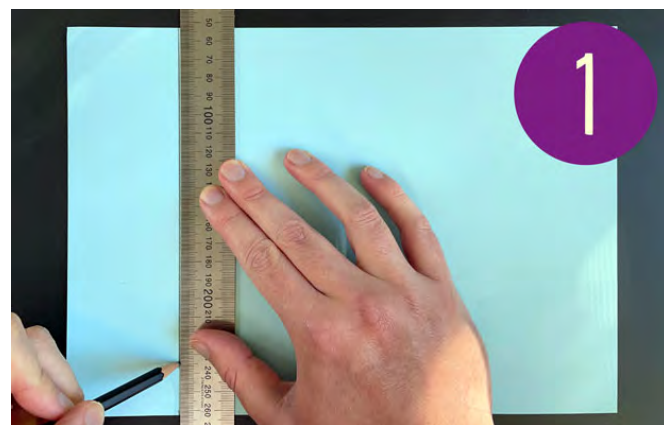
Step 2: Use scissors to cut along the line.

Step 3: Take the strip of paper you've cut, and check the length of its sides. It should be 4 cm wide and 21 cm long. Put it on the table so the short sides are top and bottom.

Step 4: Measure halfway along the top edge, and rule a line running down to the middle of the paper – it should be about 10 cm long.

Step 5: About 2 centimetres below the middle of the paper, rule lines coming in from the two sides. Make these lines about 1.3 cm long.

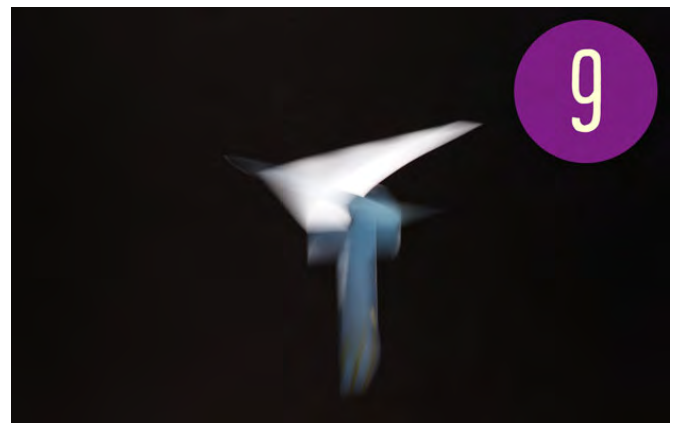
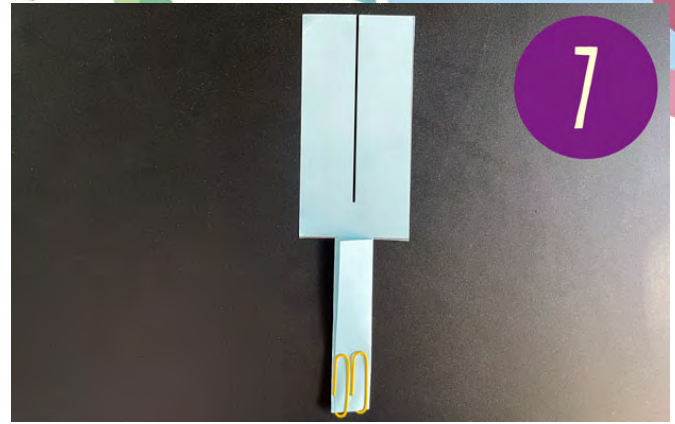
Step 6: Cut along the lines you've drawn.



Step 7: At the bottom of the paper, fold the two sides into the middle. Put a paperclip or two on the bottom to hold the flaps in place.

Step 8: At the top, fold one strip towards you and one away.

Step 9: Your copter is now finished! Hold it up above your head, with any paperclips at the bottom, and drop it. The copter will spin gracefully to the ground.



What's happening?

This spinning helicopter is great fun, but how does it work? There are two competing forces involved – gravity and air resistance.

When you let go of the copter, it's pulled to the ground by gravity. However, the flaps at the top push lots of air out of the way on the way down. At the same time, the air is pushing against the flaps, slowing the copter's fall.

This air resistance also has other effects. First, it bends the flaps back, making the whole copter more streamlined, and letting it fall faster. It also spins the copter, because the flaps are bent in different directions.

As the copter spins, the flaps are pulled outwards by the spinning. As they spread out, the copter starts falling more slowly, because the flaps are catching more air. Catching more air makes it spin faster too!

If you watch carefully, you can see this entire process unfold in just a second or two.

A thought experiment

You might wonder what would happen if you dropped this spinning helicopter on Mars. The red planet only has one third the gravity of Earth, so the copter would fall slower at first.

Then, Mars only has 1% of the density of Earth's atmosphere. That means there wouldn't be much air resistance slowing the copter or making it spin!

fun activity



Wrapped-up DNA

Participants at the Canberra Women of Science and Art event with Chloe Lim made their own DNA craft.

Use pom poms (histones) and pipe cleaners (DNA strands) to create this wrapped-up form of DNA, called chromatin.



Extract DNA from a banana!



Visit Double Helix to learn how to do this experiment.

(<https://blog.doublehelix.csiro.au/extract-dna-from-a-banana/>)



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Float your boat

Put a ball of steel in water and it will sink to the bottom.
But the ships of the Royal Australian Navy are made using steel and they don't sink!

It is not just what materials you use; the shape is very important. Having the right shape means that you can use dense (heavy) materials.

The right shape also means a boat won't tip over when you put weight in it.

Your challenge

Design a plasticine boat that will safely transport a convoy of marbles.

What you will need

- 50g of plasticine
- 4 marbles
- bucket or sink with enough water to test your boat
- cloth to dry your plasticine after tests



Extend yourself. Managed the challenge? Why not test yourself further?

- ⇒ Built for speed
 1. Improve the design so that it moves faster through the water.
 2. The fairest test would be to make two models using the same amount of plasticine then line them up and give them both the same push.
- ⇒ Lopsided
 3. Make a ridge in the middle of the boat and only put marbles on one side.
 4. How many can you manage to put in before the boat tips?
 5. What can you change about your design to make it more stable?
- ⇒ Artistic
 6. Create a floating plasticine sculpture.

Foil boats!

At the Canberra Women of Science and Art events in Canberra, Naomi Duckworth, an engineer with Defence, ran an activity building boats out of foil. She ran a competition.

Participants guessed how many 5c coins could be put in the boat she constructed before it would sink!



Canberra STEAM/STEM activities and resources

There are a number of activities on in Canberra. Here is a selection to investigate. Note that some are free and others have a cost. (This information may not be current.)

Provider	Description	Link
Canberra Youth Theatre	In-school / after-school drama workshops delivered in primary schools across the ACT. They also run holiday programs.	https://canberrayouththeatre.com.au/workshops/for-young-artists/schools/
The National Dinosaur Museum	Exhibits and parties	https://nationaldinosaurmuseum.com.au/visit-us/
The National Arboretum Canberra	Cultural programs, including talks, tours, and workshops.	https://www.nationalarboretum.act.gov.au/visit/whats-on
The National Botanic Garden	Guided inquiry and hands-on learning experiences.	https://parksaustralia.gov.au/botanic-gardens/schools/
Tidbinbilla Nature Reserve	Threatened species, nature walks and early pioneer heritage + art exhibitions	https://www.tidbinbilla.act.gov.au/learn
Mulligans Flat Nature Reserve	Visitor Centre / guided tours	https://www.mulligansflat.org.au/visit
Canberra Reptile Zoo	Offer exhibits, talks, opportunities to pat animals, outside fossil digging space plus a mobile van available	https://reptilesinc.com.au
Geoscience Education	In-house and virtual exhibits plus activity bank and videos	https://www.ga.gov.au/education
Ediius	Offer programs for teens who have the aspiration to start their own business.	https://www.edii.com.au/our-programs/
Australian Academy of Science	Provides free online science resources to students in Years 7 to 10.	https://www.sciencebydoing.edu.au/
Australian Maths Trust	Camps and mentoring program for girls in years 9 and 10. They also run summer schools.	https://www.amt.edu.au/curious-minds
Robogals Canberra	Student run non-profit organisation offering a range of engineering / tech programs	https://www.robogalscanberra.org/
Block Crafters	Engineering, prototyping, game design etc - coding and robotics centred.	https://www.blockcrafters.com.au/clubs/
Bricks 4 Kidz	LEGO and robotics	https://www.bricks4kidz.com.au/act-northside/program-events/holiday-programs/
E2 Young Engineers Canberra	Range of STEM programs using LEGO models	https://canberra.young-engineers.com.au/
Mount Stromlo Observatory	science exhibits, kids zone, heritage trail, public events	https://rsaa.anu.edu.au/observatories/mount-stromlo-observatory/information-for-visitors-activities



There are a number of national / online resources and one we recommend is the Office of the Chief Scientist's STARportal: a collection of STEM activities and providers, searchable by your postcode (<https://starportal.edu.au>).

Scholarships, internships and job programs

Australian National University

Provides a range of scholarships, including for students from rural, regional or remote areas, experiencing financial hardship and experiencing challenges. Find out more: <https://www.anu.edu.au/study/scholarships>.

Here are some examples:

- ANU Science, Health and Medicine Indigenous Undergraduate Scholarship: \$10,000 per year for students of Aboriginal or Torres Strait Islander descent.
- ANUSA Parents & Carers Grant: \$250-\$1000 to assist undergraduate ANU students who are carers.
- Australian National Scholarship: \$8000 per year, for talented students from disadvantaged backgrounds.
- Ben Williams Student Support Grant: \$14,000 per year, for students with special difficulties such as mental illness, sickness, disability.
- Christina Richards Scholarship: \$5000 per year, offered to assist in overcoming barriers such as financial hardship, having carer or sole parent responsibilities or living in a regional, rural or remote area.

University of Canberra

Scholarships are available from the University of Canberra to help students with challenging circumstances. Read more here: <https://www.canberra.edu.au/future-students/support-at-uc>.

Some examples include:

- Rotary Club of Ginninderra Hockley Scholarship: \$6000, awarded to financially disadvantaged recent school leaver from a school in northern or western suburbs of Canberra and one who demonstrates a spirit of community engagement and voluntary activity.
- Rotary Club of Belconnen Nursing Scholarship: \$5000, for financially disadvantaged Nursing students who can demonstrate community engagement and an interest in working in rural and/or indigenous nursing fields.
- Rotary Club of Belconnen Scholarship: \$5000, for financially disadvantaged students who have demonstrated community engagement.
- Salthouse Leadership Scholarships for Women: \$5000, for female students with a disability and/or chronic health condition to enable them to develop their leadership potential.
- UC Foundation Refugee Scholarships: \$3000, for financially disadvantaged refugee students.
- UC Foundation Scholarship for Students with a Disability: \$3000.

Australian Catholic University

You could be eligible for one of the hundreds of scholarships ACU Canberra awards every year. More here:

<https://www.acu.edu.au/study-at-acu/fees-and-scholarships/scholarships>.

Some examples include:

- Aboriginal and Torres Strait Islander Accommodation Scholarship.
- ACU Equity Scholarships: \$2000, to financially assist students from low socio-economic backgrounds.
- Community Engagement Scholarship: \$5000, for students who demonstrate a commitment to ongoing development of their knowledge and skills in community engagement, outside of their course requirements.
- DOOLEYS Lidcombe Catholic Club Undergraduate Scholarship: \$4000, to financially assist undergraduate students, suffering financial hardship, to continue their studies.
- Mary MacKillop Scholarship: \$4000, for undergraduate students who can demonstrate support and involvement in Aboriginal and Torres Strait Islander communities.

Canberra Institute of Technology

Assistance includes scholarships and grants for youth with diverse backgrounds needing assistance due to factors such as: mental health, refugee status, financial background, Aboriginal and Torres Strait Islander background.

More information:

https://cit.edu.au/study/course_fees_and_assistance/scholarships.

Defence Science and Technology

- STEM Cadetship Program, see <https://www.defence.gov.au/jobs-careers/student-pathways/stem-cadetship> (with a great video on there!). This program pays students while they study and gives them industry experience for the last 1-3 years of their degree and flows into an ongoing job at the end of it all.
- Defence Industry Internship Program (DIIP) offers industry based opportunities for students while they study. <https://diip.com.au>.

Thanks to our incredible supporting partners...



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