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THE UNIVERSITY OF
SYDNEY



2019 edition

Science Alliance

Programs and events



Cover image: Abstract tendrill particles



2019 edition

Science Alliance

Programs and events

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What is Science Alliance?



Science Alliance brings science at the University of Sydney out of the lab and into your world.

With programs ranging from public lectures and HSC workshops, to teacher seminars and holiday camps, we aim to make science exciting and accessible.

Read on to find out how you can get involved in 2019.

For the latest news from Science Alliance, join us online at:

- Facebook: [sydneyscience](#)
- Twitter: [@sydney_science](#)
- sydney.edu.au/science/outreach

High school programs

Sydney Science Experience

You are approached by the authorities about a body. A deceased body. A deceased body that has perished under unusual circumstances... it will be your job to find out what happened, or more probably, who dunnit?

Come and give us your best Sherlock impression as you help solve a murder mystery on campus. You will employ real science through hands-on laboratory and workshop sessions in a variety of disciplines. Work with your fellow detectives to review evidence, eliminate and cross-examine suspects to solve the crime!

Mega Maths Day

No matter what you choose to do in the future, mathematics will be a part of it: 'modelling' latest fashion trends, classifying species of animals and diseases, determining how your customers really feel about your business, predicting hurricanes, and even folding origami.

Discover how maths is involved in pretty much every area of life at Mega Maths Day. Jam-packed with diverse workshops across a range of disciplines, Mega Maths Day will encourage your students to appreciate how important a solid maths background is to a huge array of disciplines and career pathways. The day is ideal for Year 10 students as they consider their future directions and HSC subject choices.





International Science School

The International Science School (ISS) is an amazing, all expenses paid two weeks of science at the University of Sydney. Join 140 other top young scientists from Years 11 and 12 from around Australia and across the world for inspiring talks by leading researchers, tours of scientific labs, hands-on experiments and activities, and a packed social program.

The ISS lectures are given by leading research scientists from Australia and overseas. In addition, Dr Karl Kruszelnicki – Julius Sumner Miller Fellow and renowned TV and radio science guru – is a regular ISS guest, presenting some of his *Great Moments in Science*™.

Beyond the lecture theatres, the ISS gives you a chance to explore real research labs, get your hands dirty on a wide range of experiments and activities, and meet a hoard of like-minded, science-mad students from all over the world. For more information, visit:

– sydney.edu.au/science/iss

Camden Open Day

Explore the fascinating world of agriculture, environment, science and veterinary science at the University of Sydney's Camden Open Day. A variety day of activities, ecological talks and meeting Camden scientists conducting cutting-edge research, plus a talk by our science ambassador and worldwide entertainer, Dr Karl Kruszelnicki.



Spectacular Science

Take a journey into the fascinating world of science, with a day trip to Spectacular Science.

Meet a real scientist, or “Spectacular Speaker”, as they outline a day in the life of a science researcher and share their passion for their field of expertise. Then jump into a laboratory or workshop to experience a dose of the science disciplines of your choice. Finally, finish the day off with smoke and sparks with our Spectacular Science Show!

Spectacular Science is open to Years 7 to 11, and will foster student understanding and interest in the diversity of science as they experience some of the intriguing and important areas that scientists are working in.

Dr Karl Kruszelnicki

Dr Karl Kruszelnicki, author and Triple J science presenter, is also the Julius Sumner Miller Fellow in the School of Physics at the University of Sydney. Why not catch a free Dr Karl *Great Moments in Science*™ talk during your next University of Sydney visit? Or, if you can't get to the University, Karl is also using Skype to beam into classrooms across the world!

You can also join Dr Karl and special guests for weird facts and amazing conversation in his latest podcast *Shirtloads of Science*:

- bit.ly/shirtloads-apple
- bit.ly/shirtloads-android

Virtual Visits

Have a mathematics researcher take over your classroom for a one-hour virtual visit! Your students will be introduced to the role of mathematics in careers, including a shallow dive into a current field of research and hands-on puzzles designed by the visitor themselves. Ask anything from ATAR tips to HSC maths subjects and university life.

Virtual Visits are free and a great way to energise your class into considering mathematics for future subject choices and career paths.

These visits are suitable for Years 9 and up, and can be tailored to suit a range of skill levels and interests.

Unearthing Science

Energise the budding scientist in your Year 9 and 10 students with this all-materials-included teaching package that introduces students to the concept of independent scientific investigation. Your students will be tasked with designing their own science investigation, carrying it out in small groups, collecting data from their own local environment or community, and presenting their work to their peers in a variety of communication pathways.

Along the way, students will be inspired by a virtual Q&A with a current science researcher and given personalised tips from experienced scientists at the University.

Teachers are given the flexibility of following our recommended lesson plans, or tailoring it to suit the needs of their classroom. Unearthing Science is exclusively available for high schools from rural regions of New South Wales, is free and available throughout the year.



Tea Composition Program

You and your students are invited to participate in this practical, real-world research project that evaluates the decomposition process in relation to local soil properties simply by using a tea bag. Our researchers need the help of schools all around New South Wales to develop a state-of-the-art digital map of soil health across the state.

With lesson plans designed by teachers for teachers, students in stages 3, 4 and 5 will be engaged in practical activities, including field tests, laboratory-style experiments, classroom analyses and digital reporting. The project and optional extension lessons have specific and integrated links to the learning areas of science, mathematics and agriculture.



This program is free and includes a field test kit and educational resources and lesson plans for teachers and students. Sign up before June to participate in this spring program.

National Mathematics Summer School

If you are a talented young mathematics student, you will enjoy the two-week National Mathematics Summer School sponsored by the University of Sydney. Held in January each year in Canberra, you will study three topics in higher mathematics and attend guest lectures, plus attend a special lecture at the Australian Academy of Science. Students should be in Year 11 when they apply and are selected and ranked by the mathematics teachers association in each state.

– <https://nmss.edu.au/>

Mathematical Enrichment, the Mathematical Olympiad and the Tournament of Towns

The Australian Mathematical Olympiad Committee offers a variety of activities ranging from training programs to mentorships run with the assistance of academic mathematicians throughout Australia.

These programs, which are presented in a carefully sequenced arrangement of enrichment activities, offer valuable tuition and resources to students. The most gifted students may be selected for more specialised training directed towards the Mathematical Olympiad and the Tournament of Towns.

MadMaker Embedded Systems Design Challenge

MadMaker is a six-week online course aimed at Year 9 students with a goal to educate them about embedded systems and their use in everyday life. It involves using Arduino Esplora boards to investigate fun and interactive ways to use science, technology, engineering and maths to solve real-world problems.

This program includes teacher training workshops on demand. No programming experience is required.

For more information, visit:

– madmaker.com.au

Activities in engineering and information technology

Engineers, project managers and information technology professionals develop innovative, creative and sustainable solutions that promote positive change worldwide.

Throughout the year, we invite high school students on campus to experience what it's all about. Students can participate in fun, interactive workshops, challenges and competitions, tour our facilities and talk to our academics and current students about study options, job opportunities and life at the University of Sydney.

During the workshops, students might get hands-on with the user-friendly microprocessor platform Arduino, create an avatar, build a railway or a prosthetic leg.

Girls' Programming Network

The Girls' Programming Network (GPN) is a programming club developed and run by female students for high school girls interested in learning or improving their computing skills. GPN is a unique opportunity to meet other girls with similar interests, find a mentor and learn about university life from female university students. No programming experience is required.

NCSS Summer School

The National Computer Science School (NCSS) brings together talented young people for an intensive 10 days of computer programming, robotics, web design and related activities at the School of Information Technologies at the University of Sydney. NCSS is a residential school and open to all students in Australia in their penultimate high school year. No programming experience is required.

NCSS Challenge

The NCSS Challenge is a five-week programming competition designed to educate participants about computer science. The challenge involves participants solving interesting but simplified computational tasks.



Unlike existing competitions, the challenge is designed to cater for both beginners and advanced students.

The challenge will be particularly valuable for science, mathematics and computing studies students. No programming experience is required.

The Paper Pilots

The Paper Pilots are the world's first educational paper plane sports team. Not only are Dylan Parker and James Norton the inspiration behind the hit Aussie movie *Paper Planes*, but they are touring the country teaching the science of flight through their awesome paper plane workshops. The Paper Pilots offer half or full-day packages to both primary and secondary schools, delivering multiple 'Flight School' workshops.

The full-day package can cover up to 120 students and has been developed in consultation with teachers and the new national science curriculum. A visit from the Paper Pilots will serve as an excellent tool to engage students around topics such as forces, transport and a variety of other curriculum focuses. The workshops culminate in a variety of interactive paper plane activities where students demonstrate and refine their understanding of the topics covered, while sparking a love for physical sciences.

For more information about the Paper Pilots, visit:

– www.paperpilots.com.au



Project Management Winter Camp

Designed for students in Years 10, 11 and 12, our two-day intensive workshop, held in July, will give students a head start in project management and show where this dynamic field can take them.

Cyber Security Challenges

The Cyber Security Challenges are designed to introduce students to modern cybersecurity issues, including online data sharing, cryptography and cyber attacks. Students will learn to protect themselves and each other by working through interactive activities.

They'll get hands-on experience with cybersecurity risks by working through activities involving 'hacking' accounts in a fake social network, coding and breaking cryptographic ciphers, and SQL injection attacks to learn the practical and real-world implications of poor data management and security practices.

More information

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Learn more about our high school programs and activities at:

– sydney.edu.au/science/outreach

HSC revision programs

Kickstart Science HSC Workshops

Kickstart Science Workshops offer HSC students and teachers the opportunity to access equipment and expertise that may be hard to find in a school laboratory. These workshops are designed to enhance students' understanding of challenging parts of the syllabus.

From 2019, our workshops have been updated with new content to support the new Science HSC syllabus.

These useful and flexible workshops are available all through the year, and are offered in:

- biology
- chemistry
- physics.

Kickstart on the Road

Kickstart on the Road takes our science HSC workshops to regional areas between March and May. In 2019, we will be visiting Northern and Central Western NSW.

Agriculture HSC Seminar

Spend a day on targeted revision for the HSC Agriculture course at the University of Sydney's Agriculture



HSC Seminar. The day revises key concepts in the HSC Agriculture course and provides current case studies of research that students can use in their extended response answers. In 2019, classes can join us at either of our seminar locations in the northern suburbs of Sydney or in Camden, or catch up with lecture recordings afterwards.

More information

Learn more about our HSC revision programs at:

- sydney.edu.au/science/outreach

Science Extension Program

Science Extension Workshops

Both teachers and students can get a kickstart on the Science Extension HSC course with our Science Extension Workshops. The workshops focus on the concept of the scientific process and how to begin designing a scientific investigation, as well as mathematical tools for analysing data.

The workshop is run by leading science education researchers and mathematics educators. Learning resources and other materials from the workshops can be found on the website and are freely available for teachers and students.

The Science Extension Mentoring Program

The Science Extension Mentoring Program provides one-on-one support to students from trained PhD student mentors throughout their whole science investigation project. Each student is linked with a suitable mentor, who can then offer personalised suggestions and tips on how to:

- design their scientific investigation
- carry out data collection
- analyse data
- approach arising challenges throughout the investigation
- draw meaning from their results.

More information

Learn more about our Science Extension Program at:

- sydney.edu.au/science/outreach





“What an amazing time to be studying and learning science. In the classrooms and university laboratories of this country, we are building the future for Australia, Asia and the world.”

Adam Spencer

Mathematics and Science Ambassador,
The University of Sydney

Primary school programs

Dr Karl Kruszelnicki

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- bit.ly/shirtloads-apple
- bit.ly/shirtloads-android

Australian Digital Technology (DT) Challenges

The DT challenges are a collection of two-week and five-week courses for all students in Australia to learn programming. They are hosted on the Grok Learning platform, which provides intelligent automarking of questions and interactive course notes, as well as lesson plans, teacher notes and support materials.

There are 18 courses already released with materials for Years 3 to 8, covering the trajectory from beginner programming to expert. There are also DT+X courses which genuinely integrate programming with other school learning areas, supporting subject integration and STEM projects.





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- www.paperpilots.com.au

Museums

Anatomy in the J.L Shellshear Museum

The J.L Shellshear Museum is the only museum dedicated to physical anthropology in Australia and holds collections of human skeletons, other primate skeletons, vertebrate skeletons and casts for the study of human evolution. The museum is open to small school groups, in addition to functioning as a teaching collection for the Discipline of Anatomy and Histology, and research collections for bona fide researchers. Workshops provide students with a unique opportunity to observe the structure of human skeletons and compare them with those of primates and our human ancestors through handling bones and casts.

The Ainsworth Interactive Collection of Medical Pathology (Pathology Museum)

The Ainsworth Interactive Collection of Medical Pathology is situated on the ground floor of the Charles Perkins Centre on the Camperdown Campus. It houses more than 1600 pathological specimens on permanent display.

The collection originated in the Anderson Stuart Building in 1889 and was designated the “Museum of Normal and Morbid Anatomy”. The collection has a very long history within the University of Sydney and has grown over many years. Scientific instruments and equipment of historical interest were added to the collection in August 1986 by the Dean of the Faculty of Medicine, Professor RS Gye.

The most prized exhibit on display in the collection though, is a flask of broth prepared by Louis Pasteur for the culture of bacteria.





Nicholson Museum

The Nicholson Museum is the largest public antiquities museum in Australia with a collection of archaeological artefacts from Egypt, the Middle East, Greece, Italy and Europe. Guided visits to the Nicholson Museum focus on the role of science in archaeology and examining the use of scientific dating methods, conservation practices and precise archaeological recording of ancient materials.

Chau Chak Wing Museum – opening 2020

In 2020, the Nicholson Museum of antiquity, the Macleay Museum of natural history, ethnography, and science, and the University Art Gallery will be coming together under one purpose-built roof. Modern learning and display facilities will enable visitors to explore the collections in a new light.

More information

The Chau Chak Wing Museum will bring new educational opportunities. Keep up-to-date online at:

– sydney.edu.au/museums



Competitions

Photo credit: Salty Dingo



Competitions

Sleek Geeks Science Eureka Prize short film competition

Win a share of \$10,000!

The University of Sydney Sleek Geeks Science Eureka Prize will be offered in 2019 to primary and high school students nationally. If you have a passion for science and for communicating ideas, then enter this competition by telling a scientific story via a short video piece. We're looking for the next generation of Dr Karls and Adam Spencers!

The idea is to communicate a scientific concept(s) in a way that is accessible and entertaining to the public, while painlessly increasing their science knowledge – or, as the Sleek Geeks like to say, “learn without noticing”.

More information

For more information and to enter, visit:

- sydney.edu.au/science/sleek-geeks-eureka-prize

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Teacher resources



Australian Computing Academy

The Australian Computing Academy (ACA) provides primary and secondary educators with the resources and skills required to implement the Australian Digital Technologies curriculum effectively.

The academy creates educational resources for Year 3–8 students in Australia, delivered through online courses and unplugged activities aimed at teaching programming, cyber security, and wider digital technology concepts. Resources include support materials, lesson plans, notes,

hints and videos. The ACA also run professional development workshops for teachers across the country.

Over 70,000 students have already signed up to participate in the Australian Digital Technologies Challenges and this year's NCSS Challenge, where students learn to solve problems with code and combine technology with science, maths, and English curriculum outcomes. New Cyber Security Challenges will be released in November.

– www.aca.edu.au

Science Extension Program

The program includes on-campus workshops, a mentor program and online learning resources designed to support both teachers and students participating in the Science Extension HSC course. For more information please see page 12.

STEM Teacher Enrichment Academy

The STEM Teacher Enrichment Academy at the University of Sydney offers knowledge, skills, resources and support to enable teachers to make a real change in their classroom teaching of science, technology, engineering and mathematics (STEM) subjects. The academy is the first of its kind in Australia and is helping to build the nation's STEM capability by inspiring teachers through enrichment-focused professional development.

The STEM academy runs NESA-accredited residential and non-residential programs for teachers of STEM that focus on themes embedded in the Australian curriculum F-10. Facilitated by the University's leading academic specialists from the Sydney School of Education and Social Work, the Faculty of Science, and the Faculty of Engineering and Information Technologies, the program aims

to provide schools with the opportunity to evaluate teaching and learning practice in primary and secondary education.

Participation in the program is through partnerships with schools. Becoming a partner school of the University brings benefits to teachers, students and your school as a whole.

It creates the best opportunities for new classroom approaches to emerge by:

- enriching your teachers' knowledge of content and pedagogy and inspiring them to develop STEM units of learning within and across disciplines
- introducing and supporting exciting and effective approaches to learning
- developing a community of practice for teachers, with ongoing support and engagement through mentoring, online forums, newsletters, seminars and events
- opening opportunities for your students to learn more about STEM-related research and programs at the University, and STEM career pathways.

For more information about the program, visit:

- sydney.edu.au/stem/academy

Events

In addition to our activities and workshops, we also run many free public events throughout the year, to which schools can make group bookings.

Sydney Science Forum

Our free, one-hour Sydney Science Forum lectures give you an opportunity to hear about the latest research, ideas and innovations from our brightest scientific minds.

After various talks, we also feature hands-on activities and demonstrations where you can experience science in a way that's informative and fun.





Full details of our 2019 program will be available in early 2019. Follow us on social media to stay up-to-date on new public events, and visit our website to reserve your seat.

- sydney.edu.au/science/outreach/whats-on
- facebook.com/sydneyscience
- twitter.com/sydney_science
- instagram.com/sydney_science

Sydney Science Festival

The University of Sydney celebrates Sydney Science Festival as part of National Science Week (10–18 August). For a full range of public events and programs, please visit our website and get involved!

- sydney.edu.au/science/outreach/whats-on

Important dates 2019

9–11 January

Sydney Science Experience

1 February

Sleek Geeks Science Eureka Prize entries open

February

Careers Advisers and Teachers Day

5 April

Mega Maths Day

May

Year 10 information evenings

3 May

Sleek Geeks Science Eureka Prize entries deadline

6 June

Agriculture HSC Seminar – South

7 June

Camden Open Day

End of June

Tea Composition Program applications close

10–18 August

National Science Week

31 August

The University of Sydney Open Day

September

Tea Composition Program begins

November

Science Extension Mentoring Program begins

20–21 November

Spectacular Science

Stay updated on final dates and locations for the following events, at

- sydney.edu.au/science/industry-and-community.html
- Kickstart on the Road NSW
- Agriculture HSC Seminar - North



We hope you will join us for one or many of our exciting and educational events or programs in 2019.

The University of Sydney Science Alliance

sydney.edu.au/science/outreach

science.alliance@sydney.edu.au



sydneyscience



@sydney_science



@sydney_science