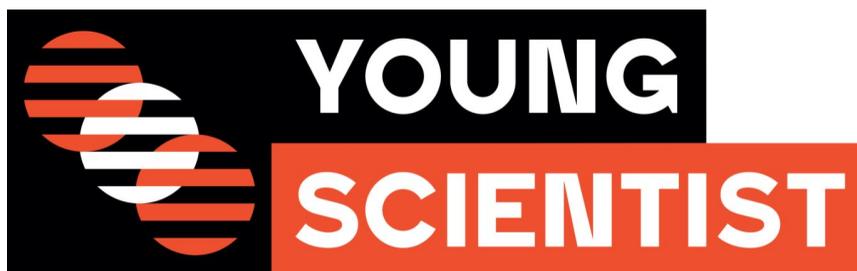# STANSW YOUNG SCIENTIST AWARDS

## Virtual Presentation Ceremony Awards Booklet

### Monday 16th - Thursday 19th November 2020



*Connecting school and society through the active promotion of Science, Technology and Mathematics*

**STANSW Young Scientist Awards:**

**A major project of the Science Teachers Association of New South Wales**

# Program

## Monday 16th November - 7pm

**Welcome message**

Anjali Rao, STANSW Young Scientist Awards Coordinator

**Presentation of Awards**

STANSW Scientific Investigations - Primary

STANSW Scientific Investigations - Secondary - Biology

Australian Society for Biochemistry and Molecular Biology (ASBMB)
Award

STANSW Scientific Investigations - Secondary - Chemistry

Royal Australian Chemical Institute (RACI) Chemistry
Encouragement Award

National Measurement Institute (NMI) Awards - Science

## Tuesday 17th November - 7pm

**Welcome message**

Ann Hanna, STANSW Young Scientist Awards Committee

**Presentation of Awards**

STANSW Scientific Investigations - Secondary - Earth &
Environmental Science

Primary Environment Award

STEP Environment Award

STANSW Scientific Investigations - Secondary - Physics

AARNet (Australia's Academic and Research Network)
Communications Awards - Science

Australian Institute of Physics (AIP) Most Outstanding Physics
Award

Rowe Scientific Depth Study Awards

## Wednesday 18th November - 7pm

**Welcome message**

Firth Garth, STANSW Young Scientist Awards Committee

**Presentation of Awards**

OSHClub (Primary) Inventions and Innovation Awards

Secondary Innovations and Engineering Design Awards

AARNet (Australia's Academic and Research Network)
Communications Awards - Technology

National Measurement Institute (NMI) Awards - Technology

Sebel Testing Awards

STANSW Most Promising Awards

## Thursday 19th November - 6pm

**Welcome message**

    Daisy Kong, STANSW Young Scientist Awards Committee

**Presentation of Awards**

    MANSW Working Mathematically Awards

    AARNet (Australia's Academic and Research Network) Communications Awards - Mathematics

    National Measurement Institute (NMI) Awards - Mathematics

## Thursday 19th November - 7pm

**Message from the President**

    Margaret Shepherd, Science Teachers Association of NSW

**Presentation of Awards**

    Australian Water Award

    NSW Student Nominees for the 2021 BHP Foundation Science and Engineering Awards - Primary and Secondary

    NSW Nominee for the 2021 BHP Foundation Science and Engineering Teacher Award

    Budding Young Scientist (K-2)

    Primary Young Scientist (3-6)

**Keynote Address**

    Dr. Cathy Foley, Chief Scientist, CSIRO and Chief Scientist, Australia (January 2021)

**Announcement of Grand Awards**

    Broadcom Honourable Mention

    Broadcom Representative to 2021 (virtual) Broadcom Masters Program

    ISEF Finalists

    Young Scientist of the Year

# Acknowledgement of Country

*We at the Young Scientist Awards would like to pay our respects to the Traditional Custodians of this land on which we work, learn and live. We recognise Country includes but transcends land and borders, being both belongingness and a way of being.*

*Recognising this, we pay our respects to Aboriginal peoples past, present and to those of the future who are our knowledge holders and teachers. As we share information, teaching, and learning, we remember to appreciate and value the knowledge embedded forever within the Aboriginal custodianship of Country. "*

**YOUNG SCIENTIST**

2020 STANSW Young Scientist
Awards Presentation Ceremony

**STA NSW**
SCIENCE TEACHERS
ASSOCIATION OF
NEW SOUTH WALES

# Message from the President

This year COVID-19 cannot stop us. Whilst we will miss attending our amazing awards ceremony in person, we still continue to acknowledge and celebrate the very talented young scientists who are the best of 855 entries into the Science Teachers' Association Young Scientist Awards Program for 2020. All students in NSW have access to this competition and we are very happy to see entries from all school sectors and both girls and boys. We commend all the teachers of these schools for their commitment to their students and passion for scientific research.

The Science Teachers' Association of New South Wales is very proud to have this amazing state program that truly incorporates all STEM subjects and brings together the professional teaching associations. As President of the Association, I would like to acknowledge and thank our Young Scientist committee and its hard working convenor, Anjali Rao. This is the third year Anjali has committed to being convenor of this project for the Association. There are also a large number of sponsors of our YS program that support this STEM initiative and I would like to thank them for their commitment to the future scientists of Australia. There are also hundreds of teacher and non-teacher volunteers that are required for this ongoing initiative to succeed so well and the program could not occur without their support.

Can I request all schools consider sending a teacher along to gain experience judging the student projects? It is a wonderful accredited professional learning opportunity, through which teachers can read for themselves some of the amazing research projects being developed by high calibre students across the state. So next year when the judging notice is sent out, think about coming along. You will be impressed.

So congratulations to all students who reached this level of the YS Awards. That is an achievement itself. Congratulations also to the winners. Well done.

Best wishes from STANSW
**Margaret Shepherd President 2020**

## STANSW Young Scientist Committee

The STANSW Young Scientist Committee is a group of dedicated volunteers who work to develop innovative STEM strategies for supporting NSW teachers.

Anjali Chandrasekar-Rao (Coordinator)
Leonard Cheung
James Cleaver
Firth Garth
Stuart Garth
Ann Hanna
Edwina Hine
Daisy Kong
Matt McKenzie
Philippa Miller
Elizabeth O'Connor
Sian Ware

## ISEF Judging Panel

The ISEF Panel is a highly experienced judging panel, who review the top 20+ projects and select the STANSW Young Scientist of the Year and the finalists for the International Science and Engineering Fair.

Dagmar Arthur McCloughan (Judging Chair)
Dr Melissa Thompson (Science Education Expert)
Associate Professor Kerry Hitos (Biomedical Scientist)
Sandra Woodward (Science Educator-Physics)
James Cleaver (IBM)
Stuart Garth (SRC Chair)

# Message from the Coordinator

What an incredible year 2020 has been for our country and for the whole world. The challenges of the global pandemic to the way we live, work and learn meant we had to adapt at every stage to a new normal this year.

After months of supporting our ISEF 2020 finalists to refine and finalise their projects, we switched to helping them prepare for a virtual experience online. Our wonderfully talented students continued to make their mark in this format as well (See Stuart Garth's description below). ISEF 2021 has already been announced as a virtual (competitive) fair and we look forward to working with our team over the next six months.

We were also overwhelmed by the number of entries we received this year despite the very real challenges all students would have faced because of the lockdown earlier in the year and COVID-19 restrictions. In a year when the role of science and the advice and counsel of well informed scientists has been so significant in our lives, the commitment that the students have shown in persevering with their investigations, design projects or inventions has been so heartwarming to see. The Young Scientist Committee would like to congratulate and commend each and every one of our participants. It is also a mark of the times that so many projects had an environmental concern at their core.

Our hard working committee has also demonstrated creativity and adaptability in meeting the challenges of an entirely online program. Along with the rest of the education system, we have moved relatively seamlessly to a virtual world which has brought some wonderful benefits with it. We have been so pleased to welcome many more of our rural and regional colleagues to the judging teams now that distance from Sydney is no longer a barrier. My thanks to all of the members of the committee as well as the executive committee of the STA NSW for their support and encouragement. Lastly, I would like to acknowledge the work of Lachlan Bolton - multiple YS award winner and ISEF Finalist 2018, in putting together our online awards presentation.

Anjali Rao
STANSW Young Scientist Awards Coordinator 2020

**YOUNG SCIENTIST**

2020 STANSW Young Scientist
Awards Presentation Ceremony

**STA NSW**
SCIENCE TEACHERS
ASSOCIATION OF
NEW SOUTH WALES

# NSW Young Scientists make Virtual Impression! ISEF 2020
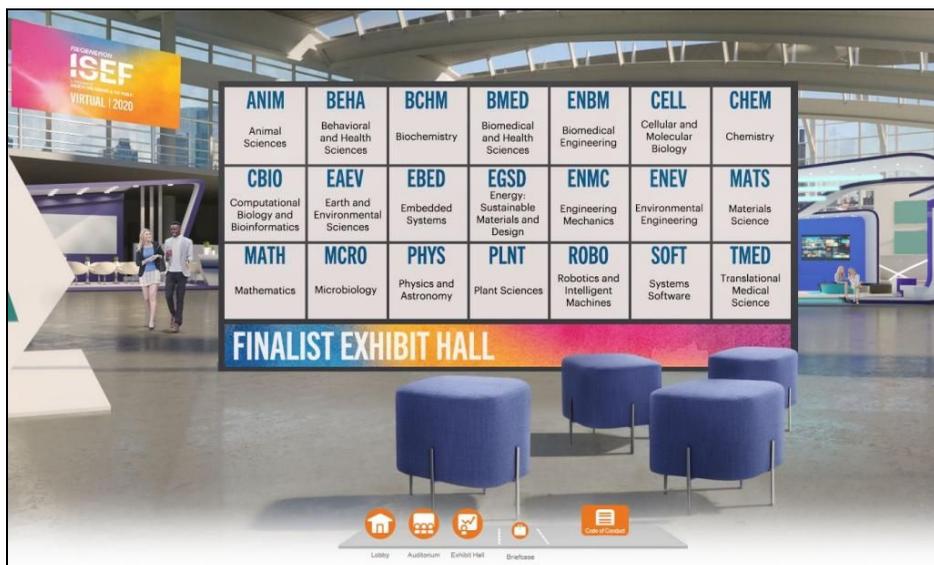


ISEF 2020 ended up being a virtual event. Our 9 Young Scientist ISEF finalists took part in a week-long virtual event which included an Opening Ceremony and a Finalist Exhibit Hall, where all of our projects were on display for a few weeks. All of their official abstracts can be found on the ISEF Archives webpage by clicking on Australia, "2020 Virtual ISEF" and "All Abstracts Matching Criteria" to see our 9 Young Scientist and 5 BHPFSEA ISEF finalists.

The highlight of the week was a number of panel discussions where panellists answered three to eight video-recorded questions that were chosen from the 1200 finalists. Our Young Scientist team was very well represented with Eleanor Clifton-Bligh, Emma Leggett-Budden having a question selected and Molly Dixon had two separate questions selected for different panels. Eleanor's question which related to the COVID-19 virus highlighting the challenges of globalisation was discussed for 13 minutes by Nobel Prize Laureates on the Excellence in Science & Technology Panel.

2020 STANSW Young Scientist
Awards Presentation Ceremony

STA NSW
SCIENCE TEACHERS
ASSOCIATION OF
NEW SOUTH WALES

# Presentation Night 3: Wednesday 18th November

## Category Awards - Technology Projects

### OSHClub Inventions and Innovations K-2

**Thaddeus Candra, Redeemer Baptist School,** *My Robodoz3r On the Surfaces*

Thaddeus assembled and programmed a Robodoz3r robot. It has three gears with a caterpillar track and it can help Thaddeus to tidy up his scattered toys. Thaddeus then went on to investigate the effect different floor surfaces affect the speed at which the robot would move.

**Emily Fowler, PLC Sydney,** *Banana in Pyjamas Seed Tape*

Emily was shocked when she learnt that 80% (by weight) of every banana goes into landfill. This inspired her to invent a seed tape from the discarded banana material. She successfully produced a seed tape and grew healthy pea plants and reduced landfill at the same time!

**Allegra Tsoupis, PLC Sydney,** *Curly, Whirly Soccer Ball*

Allegra loves soccer and wanted to learn the best way to kick a curve ball. She conducted a series of investigations including: Where on the soccer boot is best to kick to curl the ball? How hard do we need to kick the ball to make it curl? Does it matter how much air is in the ball to make it curl? What type of shoe is best to kick the soccer ball to help it curl? She used her findings to create markings on a soccer boot to help other children with their training to curl a soccer ball.

## OSHClub Inventions and Innovations 3-4

**Austen An and Jordan Ahmed, Knox Grammar Preparatory School, *AMT (Automatic Moving Trolley)***

Austen and Jordan constructed the AMT, a robotic shopping trolley for people who may not be able to push a shopping trolley because of injuries, disabilities or age. The trolley is controlled powered by a Robit that is programmed using a micro:bit. The controller also uses a micro:bit inside a custom made case that was 3D printed.

**Oscar Fairhurst, Bowen Gozdzialski and Christian Strumendo, Knox Grammar Preparatory School, *Koala Saver Bot***

Oscar, Bowen and Christian, had seen on the news that one result of the bushfires was that Koalas had been hurt and had lost their forest habitat. They wanted to help, so they constructed a model rover with a trailer that could carry koalas from fire threatened areas. The robot model (programmed by the boys) has sections which were 3D printed, had rugged wheels, and they included eucalyptus leaves in the trailer to attract koalas.

**Declan McManus, Knox Grammar Preparatory School, *SecurityBot***

Declan built a rover called the SecurityBot is a rover, it has a camera that can take videos from around the home, and can be connected at all times to an app via wifi. The homeowner can save all photos and videos to their phone, and they can easily control the bot by Phone, iPad or computer and laptop.

## OSHClub Inventions and Innovations 5-6

**Matthew Alt, Castle Cove Public School,** *COVID-Tracker - Contact Tracing Device*

The Australian government has produced the COVID safe app but people do not trust it and it doesn't work very well on some phones. Matthew made a prototype of a contact tracing device for pandemics that uses Bluetooth as a way of telling who someone has been in contact with. He tested the prototype at different distances and at different locations and found the device recorded the distance between those wearing the device using the strength of a Bluetooth signal recorded by the prototype.

**Jasmine Civardi & Zara Portolesi,** *St Ambrose Catholic Primary School Concord West, Fresh Desk*

Jasmine and Zara understand that in a school there can be many germs transmitted between students because there are so many people in a confined place. During this pandemic, sanitising students' desks takes time from the school day. If it is not done properly by the student it will not work to get rid of the germs. They constructed a school desk that will properly sanitise itself automatically utilising correctly positioned mirrors and a UV light.

**Christian Shibaia & Angel Obeng,** *Sacred Heart Catholic Primary School, Captain Covid*

With Covid-19, Christian and Angel thought about the importance of social distancing but observed younger students at school not able to stay apart from one another. This led them to ask: How can we prevent Kindergarten students from touching others (to reduce the spread of germs)? They encoded the Arduino sensor embedded into badges. When each student in Kindergarten wears a badge and comes within 1.5m of each other, the ultrasonic sensor detects a person by emitting soundwaves. The badge buzzes to remind the students to take a step back.

## Innovations and Engineering Design 7-8

**James Barratt, Barker College,** *Drone scanner and autonomous flight plan generation for detecting animal holes*

James aimed to create a prototype that can increase the yield of farms by locating animal holes and an efficient autonomous flight path that can be generated by user input. This was achieved by wiring an Arduino board to the sensor shield attached to a drone.

**Jonathan Caprarelli, Clancy Catholic College,** *Detecting UV to minimise risks from sun exposure*

Jonathan coded a simple-to-use UV-A and UV-B exposure sensor for international usage. He went further to test the accuracy of his sensor's UV measurements to best determine where his sensor should be worn should the prototype go to market. He determined the sensor is most accurate if worn on the head (placed on a hat).

**Tim Wilson, Barker College,** *Roof Cleaning System for Demountable (modular) Classrooms*

Tim designed and built a roof cleaning robot for demountable (modular) classrooms to remove build-up of debris on the roof to prevent roof damage. His robot uses two methods to clean roofs. The first is a blower which blows away large debris, the second is a pressure washer which can clean off lichen, moss, algae, and ingrained dirt or decomposing matter.

## Innovations and Engineering Design 9-10

**Akhil Akku & Zohaib Khan, Redeemer Baptist School, *Drowsy Detector***

Despite the efforts made by multiple professions in order to lower Australia's road death toll, there is one cause of death that is almost unpreventable by police officers or speed cameras. Fatigue. This investigation aims to find how lack of sleep effects blink rate and the average duration of participants blinks and the data will then be used in a device that can be placed in cars to prevent fatigue related accidents.

**Tim Barth & Devon O'Connell, Homeschool-Danthonia, *Water? Can the sun solve our shortages***

Water is one of the most valuable resources on the planet. Because water is essential to life, in dry climates like ours (and many other places) a reliable supply of fresh water is a pressing issue. Tim and Devon's solar water distiller takes undrinkable bore water and purifies it into clean, potable water. They hope their invention could help solve the worldwide problem of water scarcity, by purifying contaminated water using only the energy of the sun.

**Harshan Someshwar, James Ruse Agricultural High School, *Ionic Flood Detector***

Harshan proposed a model to test if using an incomplete circuit, which is completed through the ionization of rainwater, could alert residents in surrounding areas and emergency services whether flooding is an imminent threat. A model was developed in which 25% and 75% levels of rainwater could be detected and wirelessly messaged to those in the surrounding vicinity.

## Innovations and Engineering Design 11-12

**Liam Davies, Gosford High School, *CycleHub - Cycling Safety Product***

Being an avid cyclist, Liam is well aware of the dangers that cyclists have to face when travelling on our roads. Horns, bells, trip computers, front and rear flashes are safety accessories that are commonly used but are all separate. Liam has designed and built a 3D printed product that mounts on your bicycle and houses everything you need to cycle on the road safely. The CycleHub incorporates a front and rear lighting system with six programmable settings, ultraviolet glow wheels and many more features, all controlled by a touchscreen trip computer.

**Lexie Kennard, Wenona School, *Automated Mange Treatment for Wombats***

Mange is a deadly parasite, present in 90% of the local wombat population in the Southern Highlands. As a volunteer for the local wombat rehabilitation centre, Lexie has a strong motivation to protect Australia's most vulnerable animal. She designed a frame, upon which sits a chemical treatment, with an ultrasonic Arduino movement sensor, that delivers a measured dosage of Cydectin every time a wombat enters or leaves its burrow. Able to store 10 doses of Cydectin, her invention promises to be manageable and self-sufficient.

**Safi Wheeldon, Wenona School, *Cold Cap for Chemo***

Cancer is a terrible disease that has personally impacted members of Safi's family over the last 5 years. As well as coping with the disease, patients have the added trauma of dealing with hair loss due to chemotherapy treatment. To reduce this hair loss, mechanical cold capping systems are used which narrow the blood vessels that reduce the amount of chemotherapy chemicals that reach the scalp. Safi has designed a stylish, yet portable cold cap using a peltier device, that provides autonomy for the patient to travel home after treatment, instead of waiting for a further 3 hours in the hospital seat.

# Sponsored Awards

## AARNet Communication Award

*For best use of electronic communications in Working Technologically*

### Primary: Leo Carlisle, Knox Grammar Preparatory School, *My Sports Reward*

During isolation, school sports suffer but Leo came up with this idea when the ability to train was minimised. #MySportReward is an app which can be used by coaches to send players notifications on cricket drills and a camera in the middle stump attached to a Raspberry Pi can track any action for feedback.

### Primary: Christian Shibaia & Angel Obeng, Sacred Heart Catholic Primary School, *Captain Covid*

In response to COVID-19, Christian & Angel created a device that buzzes when Kindergarten students get too close to one another to remind them of social distancing. They encoded the Arduino sensor embedded into badges which buzz when the ultrasonic sensor detects a person within 1.5m.

### Secondary: Liam Davies, Gosford High School, *CycleHub - Cycling Safety Product*

Liam has designed and built a 3D printed product that mounts on your bicycle and houses everything you need to cycle safely. The CycleHub incorporates a front and rear lighting system with six programmable settings, ultraviolet glow wheels and many more features, all controlled by a touchscreen trip computer.

### Secondary: Shirley Wang, Meriden, HEROsafe: *Smart Helmet for Firefighters and Miners*

Shirley designed, built and tested a Smart Helmet for Firefighters and Miners, mounted with circuit sensors that detect extremely high concentrations of toxic gases, very low lighting and extreme ambient temperatures. The Arduino Lilypad board was linked to a microcontroller with sensors showing a proof-of-concept.

# NMI Measurement Award

*Awarded to entries in the category of Working Technologically that demonstrate an excellent understanding of measurement*

## Thomas Harper, Barker College, *The optimal length of a propeller duct*

Aeronautical engineers seek to increase efficiency of propellers by surrounding them with a cylindrical duct. Research indicates an increased length of ducting enhances the effect of an aerofoil. Thomas examined whether this in fact was the case. Output air velocity was measured for five different duct lengths from 5cm to 11cm for a standard three blade, 12.7cm diameter propeller, through both 3D Computational Fluid Dynamics simulations and a practical analysis of 3D printed prototypes. The results consistently demonstrated that as the duct length was increased, the produced air velocity also increased until a maximum point (around 9.5cm length), from where air velocity decreased again.

## Matthew Alt, Castle Cove Public School, *COVID-Tracker – contact tracing device*

Matthew made a prototype of a contact tracing device for pandemics that uses Bluetooth signal strength as a way of telling who someone has been in contact with. He tested his prototype, which works without using a mobile phone, at different distances and at different locations and found that as the distance gets bigger the signal strength gets weaker, explained by the "Inverse Square Law". Using his data, he worked out a threshold which can detect when one of his contact tracing devices comes within 1.5 meters of the other. In conclusion, Matthew recognised that his prototype for contact tracing could be developed into a marketable purpose-built device.

## Sebel Testing and Evaluation Award

*Based on the high level of quality control that Sebel displays in the design and manufacture of their products, they are looking for students who display the same meticulous and rigorous testing of their results or final products*

### Karmichael Candra, Redeemer Baptist School, *Ripeness After Harvest?*

Unlike other fruits, literature states that grapes don't ripen when removed from the vine. Karmichael tested this claim by using a refractometer to measure the sugar content of triplicate red and green grapes over seven consecutive days. He found that they do in fact ripen and he also used controlled and meticulous colorimetric techniques to show that skin colour also darkened over time.

### Stephanie Herbert & Godnah Johnson, Redeemer Baptist School, *Cool it! A study of thermodynamics and its effects on the cooling of liquids*

Stephanie and Godnah wanted to find out whether typical household liquids such as milk, soup, water and gravy cool down at different rates after being heated to boiling point in a microwave, stove or an oven. They conducted 4 trials of each of the 4 liquids in each of the 3 heating devices - a total of 48 experiments, each with a cooling time of 30 minutes. All measuring equipment was calibrated and an ANOVA statistical analysis was performed.

### Neomi Verma, Abbotsleigh, *Saving strawberries from spoilage*

Neomi wanted to find an effective treatment method for delaying mould growth on strawberries. She used rigorous experimentation and found the most effective treatment method was treating strawberries with aloe vera juice and keeping them refrigerated. Neomi conducted a total of 16 experiments and for each experiment she had two tubs containing 5 strawberries each to make her investigation very reliable.

**YOUNG SCIENTIST**

**2020 STANSW Young Scientist
Awards Presentation Ceremony**

**STANSW**
SCIENCE TEACHERS
ASSOCIATION OF
NEW SOUTH WALES

# 2020 STANSW Young Scientist
# Paper Plane Challenge

300 hundred students took part in our online 2020 STANSW Young Scientist Paper Plane Challenge. Due to COVID-19, we were unable to hold our usual State Championships at the University of Sydney.



The 300 entries were from 76 schools around Australia and one international school from Iran. The 2020 STANSW Young Scientist Paper Plane Challenge had winners from Iran (click on the image above for Mowood Poursafar's throw), Queensland, Victoria, Australian Capital Territory, Western Australia and New South Wales. Over 25% of all schools who entered were regional schools and 40% were public schools.

To enter, students had to upload video evidence of their airtime or distance throws and a running leaderboard for each age group made for a competitive and entertaining competition. All winning students received a medal and a certificate.

# Most Promising Awards

## STANSW Most Promising Awards K-6

*Awarded to highly commended students who show particular promise and are encouraged to pursue further development*

**Sienna Donat, Sophie McAndrew & Sofia Nesci, Gib Gate,** *Miraculous Mulch*

Sienna, Sophie and Sofia investigated what type of mulch will have the biggest effect on saving water. Three different types of mulch (lucerne, pea straw and sugar cane) were tested over three trials and compared against a control pot. Pea straw mulch and sugar cane mulch were the most effective in saving water.

**Ashleigh Du, Castle Cove Public School,** *Effect of humidity on moisturisers*

Ashleigh investigated how varying humidity levels affect how well different moisturisers and hand creams containing humectants keep human skin moist. The Palmolive Oil Infusions Cream was definitely the best cream to use in humid conditions because it contains more oil and water than other creams.

**Robert Walker, Wyvern House Preparatory School Newington College,** *How does temperature affect the bounce of cricket balls?*

Robert's research into cricket balls found that when a ball is dropped from a height of 2.0 m it lands at a speed of 6.26 m/s, regardless of the weight of the ball and bounces to about one third of that height (0.67 m). In his experiment he found they bounce to 76cm when heated and 56cm when cooled.

**Hannah Yap, Abbotsleigh Junior School,** *Detecting pesticides in strawberries: A consumer comparison and construction of a robotic detection device*

In this study, Hannah used the Reneka Bio pesticide kit for detecting pesticide levels in strawberries and found that samples from supermarkets had higher levels of pesticide than an organic food shop and home-grown strawberries.

## STANSW Most Promising Awards 7-12

### Trisha Chari, Meriden School, *Animal detection and warning system for roads*

Trisha's invention features an ultrasonic sensor on a road sign that detects the presence of an animal ahead on the side of the road. Specific coloured blinking lights indicate the distance to the animal, warning oncoming drivers. Her desire is to set up multiple signs on a stretch of highway to protect native animals.

### Louis Denton, Albury High School, *Gravity Bank*

For his HSC Design and Technology major project, Louis designed a portable mobile phone charger that works by gravity alone. Ideal for camping you attach the Gravity Bank via a carabiner to a branch, hook up a weighted back-pack to the beaded chain and gearing mechanism and allow its weight to produce mechanical energy that utilises a 6V motor to convert to electrical energy.

### William Munday, Cranbrook School, *Comparing the filtration of activated charcoal and filter paper and its effectiveness to purify different sources of water, judged by a series of purification tests*

Compared to other filtration techniques, William found that powdered activated charcoal, with its adsorbing capacity, was best at converting impure samples of pool and pond water from unsafe to drinkable water. His final samples actually met the World Health Organisation's gold standard safe levels of turbidity.

### Veda Patibandla & Aran Yoganandha, Redeemer Baptist School, *Space M&Ms: Developing a light fixture to help image and identify micrometeorites using a compound microscope*

In samples of roof dust, Veda and Aran found several metallic spherules that could possibly be micrometeorites, but school microscopes weren't able to get clear images for identification. Using a collection of metallic spherules and microscopic crystals as test subjects, they worked to develop a light attachment to use with a compound microscope to obtain clear images for identification.