The BRAINWAVES Club

Term 2 2021: Einsteins – Years 3 and 4
Venue: North Curl Curl Public School
Term Fee: $285.00

EINSTEINS' ENVIRONMENTAL EVOLUTIONS

Some of our most amazing technologies have been inspired by nature. The Speedo swimsuit was inspired by shark skin and the Japanese Shinkansen (bullet trains) were inspired by Kingfisher birds. The dessert fog water filters were inspired by beetles and Velcro was discovered by Georges de Mestral when he observed the burrs from burdock plants attached to his dog's fur… *Voila* – the inspiration for Velcro. More and more designers are seeking sustainable engineering solutions from our natural world. We have before us more than a three-billion-year history of evolution by natural selection! Using our understanding of this science we will create our own inventions to solve real-world issues. This semester, Einsteins will dive into the world of biomimicry and learn about the significance of biodiversity, adaptations, physiochemistry and nature-inspired designing.

1 May
Meeting 5: Breaking the Tension
Focus: Physiochemistry, Biology
Water is the ultimate life giver and, in this meeting, Einsteins will look at the inner working of organisms in and how their survival depends on the chemical and physical properties of water. How does large tree manage to get water from kilometres below the ground, all the way to the topmost branches? Why do water droplets stick to flower petals and leaves? How do water striders float on water? We will investigate adhesive and cohesive forces in nature and consider some real-world examples where people have put these forces to use in technology. Einsteins will conduct experiments on the surface tension of different liquids and then draw inspiration to create a useful product.

15 May
Meeting 6: Save the World!
Focus: Genetics, Forensics, Environmental DNA (eDNA)
Our understanding of genetic data is changing all aspects of life. We use it in solving crimes, conservation and finding a cure for cancer. It is only recently that we have been able to determine the exact order of the 50,000,000 to 300,000,000 base pairs in human chromosomes and Einsteins will learn about the incredible scientists that have done this and how to search their database. We will extract DNA from real samples and learn how DNA is replicated. We will also learn about techniques like DNA fingerprinting and solve some puzzles with DNA sequences. Finally, we will pick genetic sequences from a gene pool and create unique patterns on a butterfly.

29 May
Meeting 7: Small Progress is Still Progress
Focus: Experimental Design, Probability, Statistics, Maths
The periodic table as we know it today hasn't always looked this way. It has undergone many iterations as our understanding of atoms grows. The testing phase in science is crucial. Whether it be a theory or a new design, everything gets tested, with improvements along the way. In this meeting, Einsteins will test a hypothesis and draw conclusions, gaining an understanding of the scientific method. We will explore different theories and test them all out after analysing them for confounding factors, using replicates to find the best possible solution. It all sounds very scientific, doesn't it!? We will also conduct a statistical analysis to see if we have a significant result. Einsteins will learn about real-life scenarios and experiments where hypothesis testing is crucial!

19 June

Meeting 8: Imitation is the Highest Form of Flattery

Focus: Biomimicry, Sustainability, Design thinking

In this meeting, we will try to achieve what scientists take year to do in just one session. Einsteins will learn more about nature-inspired product designs and steps to create their own design. You will decide on a problem that they want to solve, form a hypothesis, determine a solution in nature, adapt it to their set problem and finally design their own solution. At the end of this intense session Einsteins will present their creations to the group and explain how their design will solve the problem they set out to fix. It's a tough ask but if anyone can do it, Einsteins can!

What to bring:

Please bring a notebook and a well-stocked pencil case to each meeting as well as a hat, drink and snack for the break (no nuts please).

About the Club Leader: Anu Vijayan

Anu Vijayan is a Science Outreach Officer for the NSW Government. She has double Master's in Conservation Biology and Research. She has worked as an assistant researcher in Behavioural ecology at Macquarie University and Program Presenter at Taronga zoo. She is passionate about all things with fur, feather and chlorophyll. Anu worked as a VFX artist for a decade with various studios around the world before changing careers to follow her dream of saving the world. Anu aims to make science fun and interesting to young minds while encouraging them to be problem solvers and world changers!