

# The **BRAINWAVES** Club

**Term 3 2021 | Einsteins | Years 3 and 4**

**Venue: Canberra Girls Grammar School – Junior School, Grey St Deakin**

**Term Fee: \$285.00**

## **Engineering Is Everywhere!**

Principles of design and engineering are found everywhere in the world around us. They're in the buildings we live in and the roads we travel on, in the planes and helicopters we use to fly through the air and the boats we use to float on the water. You see them when you switch on a light or when you watch a movie or even hear them when you listen to the radio. Can you explain how all these examples really work, though? This semester, the Da Vincis will build on their knowledge of engineering and the design process to model and explore them for real to draw their own conclusions and come up with their own explanations for how they work!

### **Meeting 1: Let's Do Some Heavy Lifting**

**Focus: Physical Science and Mathematics**

How strong are you? Could you lift an elephant with just one hand? What if I told you the answer was... yes! In this session, we will investigate the power of the pulley, a simple machine which is useful for lifting things. A famous mathematician and inventor from ancient Greece once said, 'Give me a place to stand, and I shall move the world'. Archimedes was actually referring to the conservation of energy and the relationship between force, distance and effort (work done). We will investigate this principle and learn how simple machines make work easier. Then get busy creating your own pulley system to see how much heavy lifting you can do!

### **Meeting 2: Just Keep Paddling!**

**Focus: Force, Motion and Energy**

Have you ever had the peaceful experience of Canberra by paddleboat on Lake Burley Griffin? A pedal boat uses your feet to power the boat by moving a paddle wheel. In this session we will investigate engineering design concepts that enable a paddle boat to move by changing stored energy (potential energy) into motion energy (kinetic energy). We will explore the forces we want to use as well as the ones we want to eliminate when engineering working models. What's the biggest a paddle can be so that it reaches the water and drives the boat but is not slowed down by the water resistance?

### **Meeting 3: Dragonfly Helicopter**

**Focus: Laws of Motion**

What do dragonflies and helicopters have in common? They are both great examples of Newton's famous Third Law of Motion – that is to say, for every action (like the pushing down of air when a dragonfly beats its wings or a helicopter's rotary blades spin) there is an equal and opposite reaction (the dragonfly or helicopter moving upward). In this session we'll explore the contact and non-contact forces involved, and explain the contribution made by each of these forces with these magnificent flying things!

### **Meeting 4: The Sounds of Robotic Science**

**Focus: Sound**

Don't you just love the way Wall-e and R2D2 sound? A talk box is one of the most interesting sound effects around – and it's been in existence since the 1930s. It is, essentially, a small, self-contained amplifier and speaker assembly comprised of two main parts – a speaker and a tube - which are connected in such a way that the air being moved by the speaker travels down the tube to distort the sound of our voices! In this meeting, we'll design our own versions of the talk box to illustrate the finer points to the science of sound.

**What to bring**

Members need to bring a well-stocked pencil case that includes scissors, glue and a small roll of sticky tape.

**About the Club Leader – Suzana**

Suzana is an experienced Mathematics and Science teacher (MSc Teaching Physics and Chemistry) with rich international experience working with gifted and talented students. She has designed and run Science clubs in The British School and American Embassy School in New Delhi, India, and worked with gifted and talented students in the fields of Physics in her home country, Serbia, where her students achieved significant results in state competitions. Suzana is well known for choosing appropriate and fun hands-on activities and getting her students to understand the scientific concepts involved.