The BRAINWAVES Club

Term 1 2021: Einsteins – Years 3 and 4
Venue: Canberra Girls Grammar School, Grey Street, DEAKIN
Term Fee: $285

Invent the World

Have you ever flown in a helicopter, driven in a car, or gone scuba-diving? You might not know that the ideas behind these machines of the air, land, and sea came from the creative mind of famous 16th Century inventor and artist, Leonardo da Vinci. Da Vinci was fascinated by the world around him and was always thinking up new machines to allow us to explore and travel through our environment. This semester, we will explore some of Da Vinci's fabulous inventions and how the scientific principles of pneumatics, electronics, and steam-power can give us the ability to reach from the depths of the sea to the distant stars.

Meeting 1: Under Pressure!
Focus: Physics/Pressure

Our planet, with water and atmosphere, is a unique and amazingly perfect self-sustaining system. Did you know that a sheet of A4 paper resting on a tabletop has over half a tonne of air pressing down on it? This amazing downwards force is created by the air in the Earth's atmosphere. In the ocean, pressure works the same way, but instead of just having a column of air over you, you also have the weight of all the water above you, pressing down on your lungs. In today's meeting we will explore the phenomenon that is pressure. We will construct and build a 'Heron's fountain,' an invention of Heron of Alexandria, the 1st century CE inventor, mathematician, and physicist who studied the pressure of air and steam.

Meeting 2: Engineering Music
Focus: Physics/ Wave Theory

"If I were not a physicist, I would probably be a musician. I often think in music. I live my daydreams in music. I see my life in terms of music." — Albert Einstein

In today's meeting we will focus on oscillating air columns and the magic they produce that we know as *music*. We'll delve into some of the concepts of wave theory with a focus on standing waves and interference. Then, by building various types of wind instruments, we will explore properties that influence both pitch and tone.

Meeting 3: Say "cheese"!
Focus: Technology/ Physics/ Optics

Engineers use their knowledge of light to help mobile phone companies produce more and more precise and sensitive phone cameras. We know that light travels in straight lines until an obstacle stops its pathway. But something weird happens to light when it passes through a tiny hole. Today we are going to learn about the behaviour of light as it travels through lenses. We'll go back in time over four centuries ago to when photography started and then create something really neat – our own little camera obscura.

Meeting 4: Chain Reaction
Focus: Chemical Engineering

What does energy produced in a nuclear power plant, and energy produced in a plastic bag, have in common? They are both products of chain reactions! In today's meeting we will work like problem-solving engineers trying to determine how we can maximise the conversion of stored energy into kinetic energy! We'll model and explore the mechanics of chemical chain reactions by making a cobra weave. A cobra-weave – an effective large-scale presentation of the events taking place during chain reactions on a molecular level.

What to Bring

For every session, members will need a notebook and a well-stocked pencil case that includes writing materials, textas, scissors, sticky tape and a glue stick.

About the club leader: **Suzana Djakovic**

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.