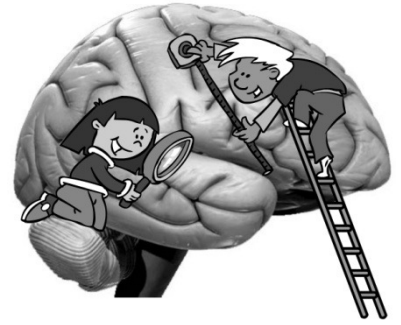




THE BRAINWAVES CLUB



Semester 1: The Einsteins – Grades 4 and 5

Venue: Ivanhoe Grammar School

Strain Your Brain

Meeting One: Sceptical Skeptics

In this first meeting I will aim to get your “head top computers” ready to work for the rest of the semester. There will be lots of challenge, crazy ideas and things to think about. We will discuss a range of topics to challenge the way that you think and to hone your brain into a scientific brain. Scientists are skeptics and they will say “Before I believe you, you need to prove it to me using the scientific method.” Today we will explore some of the following: UFOs; ghosts; ESP; telekinesis; fortune telling; spoon bending.

Practical, bring your own spoon!

Meeting Two: Scientific Blunders One

Science does not always get it right either! Over the centuries even scientists have made some great blunders. Things that sound ridiculous now, were well regarded in the past - beliefs such as “Of course the world is flat. You just have to look at it!” Please bring along your own example of a scientific blunder for us to discuss and investigate. We will look at things like: the flat earth theory; perpetual motion; Phrenology; Plus rabbits, foxes, sparrows, starlings, cane toads, blackberry bush – can you think of any others?

Meeting Three: Scientific Blunders Two

More good science gone bad! This meeting we will explore the medieval hypothesis that rotten fish as a cause of leprosy; a quantum leap to the wrong conclusion; SV40 near miss.....We'll also look at some really scary stuff. This session will make you glad that you live in 2012.

Meeting Four: The Atom Before Quantum Theory

All that stuff before it goes crazy! The development of the concept of the atom was one of the biggest breakthroughs in modern (last 120 years) physics. You will go on an adventure following the scientists and the theories that explain how the world works at the atomic level. We will look at concepts from the earliest times to pre quantum mechanics and the structure and relationship to the Periodic Table. We will do some simple experiments to demonstrate elements, compounds and mixtures. You'll also research a REALLY unusual element.

Meeting Five: The Atom After Quantum Theory

Wow!!!! Just when you thought that you understood how things really worked at the atomic level the quantum physicists changed all that. And they changed it forever. You will tiptoe through a world so strange that you will not believe it. But it is there in every atom of your body! We will explore Planck, orbitals and the quantum, Bohr, Heisenberg, Schrödinger. We'll also discover what Einstein got wrong and what String theory (1967+) is.

Meeting Six : Mathematical Vignettes

This meeting we'll have fun with a series of unconnected, amazing maths stories/exercises (not the usual maths that you learn at school!). Again you'll strain your brain to bursting point, trying to understand all of this! Some of the topics we will investigate are: early North American Maths; Triskaidekaphobia; the work of Emmy Noether, an eminent female mathematician; Lewis Carroll and the maths of fantasy; Pascal's useful triangle.



Meeting Seven: Biotechnology – the old way

Biotechnology sounds like a fancy new science but it is actually as old as the Egyptians. They developed two separate processes for producing the following organic molecule – $\text{CH}_3\text{CH}_2\text{OH}$. We may even try an experiment to make this compound ourselves! Dr Geoff's definition of a compound is "Anything with a big and a buck in it". You will learn what this means and also delve into a weird world of strange living things that are so unlike us. We will look at the Egyptians and fermentation. We will also investigate fermentation parameters by completing a prac at home, discussing the up regulation of penicillin as an example of non-cloning. We'll also taste test of some conventional biotech products.

Meeting Eight: Biotechnology and Cloning – the modern way

Now we are getting somewhere. We will look at how "gene jocks" clone genes, why they would do it and what they are able to produce. Dr Geoff would like to clone a magic pudding! We will make a model of the insulin molecule and explore *Escherichia coli* and cloning. We'll also touch on the current biotech products and bio ethics.

What to Bring:

- Spiral bound A4 notebook to record information
- Pens, pencils, erasers etc.
- Scientific calculator but it does not need to be programmable
- Sticky tape and scissors
- A keen enquiring mind and enthusiasm, and
- A hat, snack and drink.

About The Presenter:

Dr Geoff Crawford is a scientist (microbiologist), researcher, consultant and science communicator who loves to discuss science and the imagination. His aim is to engender in children a love of learning and discovery, and an appreciation of the world of thinking and wonder. He has been presenting programs at G.A.T.E.WAYS for over ten years in the broad areas of science, maths, problem solving, history and crime.

