

The BRAINWAVES Club

Term 2 2021: Neutrinos – Years 5 and 6

Venue: Bondi Public School

Term Fee: \$285.00

WHY WE CARE ABOUT SCIENCE

The universe has a language that we can, to some small but fundamental degree, interpret. This we call science. Science has a hierarchy; knowing this and seeing how everything unfolds helps us find and understand our place amid what the ancients dubbed *chaos*. This semester, the Neutrinos will embark on an exploration of how we know what we know about science and why it matters. What matters the most, though? Science has a hierarchy but there is no definitive starting point. After all, if the universe is infinite (and that's a pretty big *if* to ponder) then *everywhere* is its centre! This term, we will pick four points to orientate our investigation—Chemistry, Geometry, Biology & Physics – because we have to start somewhere in order to translate some of the phenomena that we see every day! Join us to discover the universal truths these phenomena bespeak.

1 May

Meeting 1: Be Careful, It Burns!

Focus: Chemistry

(The study of Acids & Bases with respect to mixtures, solutions, reactions, saturation, supersaturation, separation, distillation, and chemical testing.)

Chemistry is, you could say, the third science – essentially applied physics. And, as it turns out, it is also a LOT of fun! In our first session together we will look at the different ways we can combine things. Sounds simple, right? But sometimes putting two (or more) things together can create *phenomenal* results! Of course, we have to be careful, as things like acids and bases can burn, but things like acids and bases also happen to create the best reactions! It takes a little daring to peer over the edge of the beaker, test tube or dish and into the Unknown of our discoveries.

15 May

Meeting 2: Take Care at The Edge

Focus: Geometry

(Members will investigate Dimensions and their effect on spacetime, curvature, geodesics, non-Euclidean Geometry, “flat-Earth” theories, and the mathematical model of the universe.)

Geometry wouldn't be counted as a science at all in terms of its role in unravelling the mysteries of the universe. But rather than decrying it as 'just an area of maths', as many are wont to do, experts will tell you that instead Geometry IS the universe itself. From the observance of Geometry comes Maths, the “Queen of all Sciences,” or what we could call our “first” science. So, if we are going to be daring enough to “peer over the edge into the Unknown,” Geometry should be our platform from which to do so. When we're talking about the geometry of the universe, we're talking about a place where 4th dimensional objects do surgery on us with no cuts, where time is one dimension and eternity another, where triangles don't add up to 180°, where gravity moves through infinitesimally small dimensions that run right through us, and where the fastest path between two points *isn't* always line... Be careful of that axiom, Euclid!

29 May

Meeting 3: **Do Animals & Robots Care?**

Focus: **Biology**

(Members will study the Brain & Consciousness as they relate to animal intelligence, artificial intelligence, lab-grown brains, lucid dreaming, brain games, illusions, Roger Penrose's theories).

Biology—*i.e.* Chemistry applied—the “fourth” science, is the study of life, and life studying itself. Even in its very existence is there something of a fractal nature to Biology. But oh, how deep the rabbit-hole goes! As we learn all of these facts about ourselves as scientific subjects, what exactly is happening *in us*? We hear new knowledge, we observe events, we feel the world around us and interact with all of our senses, but what's *actually* going on? Don't tell me this is all just really *electrical signals in our brains*? What ARE our brains, anyway? Animals have brains, too, but do they think about these things as well? Do they even think? Is there, like, a dolphin G·A·T·E·WAYS we don't even know about? What about robots, AI and computers? If they are electrical signals going through silicon-based media and our brains are electrical signals going through carbon-based media, where does the line get drawn for what is “thought,” what is “life,” and what is “consciousness”? Oh, and oops, the brain is easily tricked. Prepare to have your mind blown in this session!

19 June

Meeting 4: **Be Careful with That Cat, Mr. Schrödinger**

Focus: **Physics**

(Members will be introduced to the ideas of Quantum Mechanics, including Feynman Diagrams, quarks, the fundamental forces of the universe, bosons, the Uncertainty Principle, photons and the double-slit experiment)

Finally, we come to Physics, known by some as the “King of all Sciences”, and Maths' successor. Most people would imagine that being so close to the centre of what's happening in the universe would mean we would be closer to understanding how it all works. Wrong! There's heaps still to explore, and the more you know, the more you'll find there is still to know. What if I told you that everything started from an explosion (maybe) that created all of the chemical components of the universe at once - but that at the same time, said “explosion” was really (maybe) the *annihilation* of all the chemical components nested within a region of an entirely different universe that (maybe) folded in on itself? Get ready to stretch your brain one last time and leap through several dimensions - it's going to be a funky ride into and out of (maybe) a quantum world where nothing makes sense (definitely).

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 Presenter: Sandy Wong is a chemist and science communicator with a keen interest in making science accessible and interesting to a diverse range of audience. She has a degree in Medicinal Chemistry and recently completed a Doctor in Philosophy (PhD) in Chemistry. Sandy has enjoyed 8 years of teaching science and curriculum development at both secondary and tertiary levels, bringing how things work in labs and everyday life into the classroom.