The Next Truth

Young People Science

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A Glimps Into the Variety of a Wonderland Called “Science“

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Science is Not Dusty and Boring!

Welcome to the very first publication of The Next Truth; Young People Science magazine. I am very excited to present this new, bi-monthly publication to you and hope that it provides you with compelling content and inspiring and thought-provoking topics.

Young People Science is focusing on the next generation male and female doctors, engineers, teachers, psychologists, chemists, physicists, among others, and to unlock their fiery enthusiasm and thus their brilliant minds. In other words, we have created this magazine for...**YOU…**to let your imagination roll free, to explore the wonderland of science and to let your inner genius escape.

The first "Young People Science" contains articles dealing with a few of the many different scientific fields out there and are written by scientists and citizen scientists in a funny and understandable language. These brilliant minds are showing you that this idea of science being boring is (obviously) a superficial surface level thought. How can science be boring when by, for instance, simply using an equation written in a single line, you can predict that 'stuff' can happen?! **Science is definitely not boring.**

The most interesting people I have come across are these brilliant man and woman who are known worldwide, working hard and are conducting jaw-dropping research, and experiments, out in the field or in laboratories. Some of them even conduct research on the North Pole, on the bottom of the Ocean or in a space station…that is soooo cool! Unfortunately the fact is, like it or *not*, the majority of people consider it to be *so*. But that is not what you are thinking… right?

Our goal with The Next Truth; Young People Science is to let your excitement and curiosity explode every two months when you read your next issue. And, as we continue to evolve the magazine, we ask you to email us when you have conducted a super fun experiment with your classmates, when you have visit an amazing exhibition with your school or maybe you have met a very famous scientist, just to name a few examples, so that we are able to meet and exceed your expectations.

Email The Next Truth your experiences, stories and photo's via **info@nexttruth.com** and we will publish it for you to show your parents, teachers and friends.

As you open your first inaugural issue of The Next Truth; Young People Science, it is my sincere hope that you are inspired by the diversity science has to offer. Enjoy this magazine which is created just for you.

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Q&A

What is science?

Science is the pursuit and application of knowledge and understanding of the natural and social world following a systematic metho-dology based on evidence. Scientific metho-dology includes the following: Objective observation: Measurement and data (possibly although not necessarily using math as a tool)

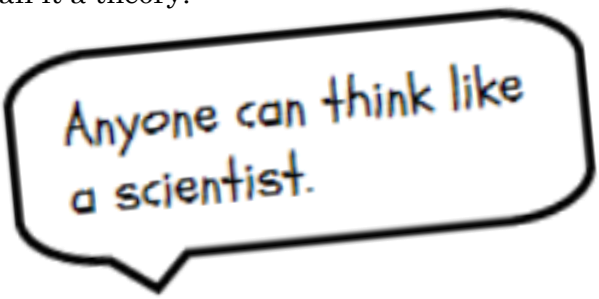
- Science is not just a tidy package of knowledge.
- Science is not just a step-by-step approach to discovery.
- Science is more like a mystery inviting anyone who is interested to become a detective and join in the fun.

What is the difference between a theory and a hypothesis?

Anyone can have an idea about how nature works. Some people think their idea is correct because "it seems right" or "it makes sense."

But for a scientist (who could be you!), this is not enough. A scientist will test the idea in the real world. An idea that predicts how the world works is called a hypothesis.

Hmmm. Is my hypothesis correct? If an idea, or hypothesis, correctly predicts how something will behave, we call it a theory. If an idea explains all the facts, or evidence, that we have found, we also call it a theory.



What is a scientist?

All scientists wear white coats and look through microscopes in labs all day long, right? Well, not exactly. While it's true that some work in labs with microscopes, there are many other scientists who are out exploring and investigating to learn about all kinds of science.

A scientist is a person who is trained in an area of science and whose job is to do research and solve science problems. Let's just say scientists are very curious about stuff and they want to figure it out. But there's just too much information for one type of scientist, so they have to choose what they are most curious about.

For example, there are scientists who study the rainforest searching for new plants and animals. And there's different scientists who work deep in the ocean observing sharks. And yet another type of scientist who analyzes rocks from the moon so we can learn more about our universe.

There are more than 50 different kinds of scientists! However, all of these scientists work within three main branches of science. The three main branches of science are:

- Earth science - the study of the Earth and space
- Life science - the study of all living things
- Physical science - the study of the physical world around us

Q&A

Why do your legs go wobbly when you're scared?

You may have heard of the fight-or-flight response. Well actually there's a third component to that, which seems to have got lost in general usage, which is the fight, flight or *freeze response*. When you are presented with a threat your body can respond in different ways. One of the ways it can do, and this will happen subconsciously, is you could decide whilst this is a threat, I reckon I can defeat it and your body pumps out hormones to make you better able to fight and you will attack it.

Equally you may look at the threat and think whilst this is a big scary threat, I can probably run away from it and you will run away. The third form is that you may freeze, because there is a chance if you freeze it's better than moving. The predator or the threat may not see you and you might get away from it. The wobbly legs is probably a manifestation of this freezing response, because you don't actually want to give yourself away. And it's interesting that size is a very important part of how you perceive threat. Children are small so they're much more likely to have the freezing response to a threat which would manifest in a slightly less extreme form than wobbly legs. But the truth is there's nothing actually wrong with your legs. They're perfectly able to work, it's your brain telling them how to behave.

Why do people sneeze multiple times in a row?

There are a few theories about it, but to sort of think about we need to think what are we doing when we're sneezing. What happens when we're sneezing, and why we sneeze, is because there is something that is got into our nose that's irritating the nasal mucosa. This triggers the release of a chemical called histamine, and that signals the nerves that initiates the sneeze reflex. What we're trying to do is expel this 'thing' that shouldn't be in our airways, out of our airways. And so if it's something that's actually irritating us like an allergen or something, we may have to sneeze repeatedly to actually get it out of the nose and stop irritating us. The interesting thing is that some people who may sneeze two or three times in a row, other people may actually end up in these huge sneezing fits of 10, 15 sneezes in a row.

Do polar bears cover their noses when hunting?

The answer isn't really that clear. There are several descriptions of the behaviour but many naturalists believe it to be myth. Barry Lopez, in his book Arctic Dreams - Imagination and Desire in a Northern Landscape, describes seeing polar bears cover their noses and paws with snow when stalking seals but Polar Bears International, a group founded with the conservation of this elegant hunter as its sole purpose, believes this to be a major misconception. Similarly Ian Stirling, a Canadian naturalist, has spent several thousand hours observing the behaviour of polars bears and never seen one cover their nose. But the debate could ramble on because for everyone one who claims to have seen it, there is another who claims that it could not possibly happen. In the interest of fun though, it could be true!

Did you know that a polar bear's fur is not white? It's actually clear transparent, it only appears white because it reflects the Rays of the Sun.

Contributors

Frank T. McAndrew (Galesburg, Illinois)

Frank McAndrew is the Cornelia H. Dudley Professor of Psychology at Knox College and is well-known as a purveyor of psychological science to lay audiences. He is regarded as one of the "key individuals" in the history of environmental psychology by researchers in that field. Prof. McAndrew is a winner of the Caterpillar Faculty Achievement Award and has been nominated for the prestigious CASE U.S. Professor of the Year Award. He is an elected Fellow of the Association for Psychological Science, the Society of Experimental Social Psychology and a Charter Fellow of the Midwestern Psychological Association. **www.frankmcandrew.com**

Seth Shostak (San Francisco Bay Area)

Dr. Shostak have developed an interest in extraterrestrial life at the tender age of ten, when he first picked up a book about the Solar System. This innocent beginning eventually led to a degree in radio astronomy, and now, as an Senior Astronomer, Dr. Shostak is an enthusiastic participant in the Institute's SETI observing programs. He's co-authored a college textbook on astrobiology, has written three trade books on SETI and has published more than 400 popular articles on science including regular contributions to NBC News MACH. **https://www.seti.org/our-scientists/seth-shostak**

Nick Pope (Tucson, USA)

Author, journalist and TV personality Nick Pope used to investigate UFOs and other mysteries for the British government, and is the world's leading expert on UFOs, the unexplained and conspiracy theories. Nick used to run the British Government's UFO project. From 1991 to 1994 he researched and investigated UFOs, alien abductions, crop circles and other strange phenomena, leading the media to call him the real Fox Mulder. **www.nickpope.net**

Graham Seal (Perth, Australia)

Graham Seal is Professor of Folklore at Curtin University and a leading expert on Australian cultural history. He is director of the Australia-Asia-Pacific Institute, director of the Australian Folklore Research Unit and convenor of the Australia at War and Peace Research Group. His research activities are extensive and involve working with industry, government, community and academic partners throughout Western Australia, Australia and internationally. Besides being the general editor of the 'Studies in Australia, Asia and the Pacific' research monograph series, Prof. Seal best-selling author of popular history and folklore, a musician and an awarded and recorded songwriter in the folk tradition. **john.curtin.edu.au** **www.sealsongs.blogspot.com**

Fiona Ruth Cross (New Zealand)

Fiona Cross is an Arachnologist with a background in Psychology. She is a postdoctoral researcher and did both her MSc and PhD theses at the University of Canterbury in Christchurch, New Zealand. Dr. Cross has worked in the School of Biological Sciences at the University of Canterbury and is a Visiting Scientist at the International Centre of Insect Physiology and Ecology (Mbita, Kenya). She is using jumping spiders to investigate topics relating to animal cognition. **www.doctorspider.net**

Jonas Grinevičius (BoredPanda Staff)

Jonas is a Bored Panda writer who previously worked as a world news journalist elsewhere. After getting his bachelor's degree in Politics and International Relations at the University of Manchester, he returned home and graduated from Vilnius University with a master's degree in Comparative Politics. Jonas enjoys writing articles ranging from serious topics like politics and social issues to more lighthearted things like art, pop culture, and nature. In his spare time, Jonas writes books and short stories and likes to draw lighthearted illustrations. **www.boredpanda.com**

Justinas Keturka (BoredPanda Staff)

Justinas is a photo editor at Bored Panda. He was fascinated with visual arts and arts in general for as long as he can remember. He was obsessed with playing and making music in his teens. After finishing high school, he took a gap year to work odd jobs and try to figure out what he wanted to do next. Finally, around 2016, he started learning how to use Photoshop and hasn't stopped since. He started working as a visual advertisement producer in 2017 and worked there for almost two years. **www.boredpanda.com**

Marc Bekoff (Boulder, Colorado)

Marc Bekoff, Ph.D., is professor emeritus of Ecology and Evolutionary Biology at the University of Colorado, Boulder, and co-founder with Jane Goodall of Ethologists for the Ethical Treatment of Animals. He has won many awards for his scientific research including the Exemplar Award from the Animal Behavior Society and a Guggenheim Fellowship. In 2005 he was presented with The Bank One Faculty Community Service Award for the work he has done with children, senior citizens, and prisoners. In 1986 he became the first American to win his age-class at the Tour du Haut Var bicycle race. **www.marcbekoff.com**

Rachel Brittliff (Australia)

Besides being a lawyer, Rachel is the founder of Curious Kids' Science. Her desire to foster her 4 year old daughter's (Lily) natural curiosity and love for science led Rachel to establish the website Curious Kids' Science. Over the period of a year, she worked with approximately 20 children aged between 4 and 10 years old. The idea that this enthusiasm with young people could be squashed made her feel very determined to make them aware that they can do whatever they put their minds to. 'Gender simply should not be an issue!' Rachel says. **www.curiouskidsscience.com.au**

Harriet Dempsey-Jones (London, UK)

I am a researcher in the field of cognitive psychology at University College London. I look at how our brains and particular cognitive processes cause our subjective psychological and perceptual experience. In my PhD at the University of Queensland I looked at how our brains combine sensory inputs from our eyes, ears, skin, among others, to form a coherent perception of the world and our bodies. My undergraduate studies were in psychology where I covered a diversity of topics related to perceptual, cognitive, social, neuroscience, business and statistical aspects of psychological research. **www.ndcn.ox.ac.uk**

Kevin Bennett (London, UK)

Kevin Bennett, Ph.D., is a social-personality psychologist and Associate Teaching Professor, the coordinator of the psychology program and runs the Personality and Human Performance Lab at The Pennsylvania State University, Beaver Campus. He earned his Ph.D. in Psychology from City, University of London in the UK and degrees from University of Michigan (B.A., Psychology) and the University of New Mexico (M.S., Experimental Psychology). His research, *personality science at the intersection of urban design and mental health*, has been published in leading journals in psychology, education, and urban design. **www.klb480.wixsite.com**

Simon Cox (Aberystwyth, Wales)

Professor Cox researches the behaviour of fluids and how they are shaped by surface tension. He studied Applied Mathematics at the University of Warwick and then his PhD research at the University of East Anglia looked at mathematical models of waves breaking against sea walls. He is now at Aberystwyth University, where he is excited about bubbles and foams, for example how the interactions between many bubbles in a foam influences how the foam flows and why that makes foams useful. **users.aber.ac.uk/sxc/**

Iztok Kramberger (Maribor, Slovenia)

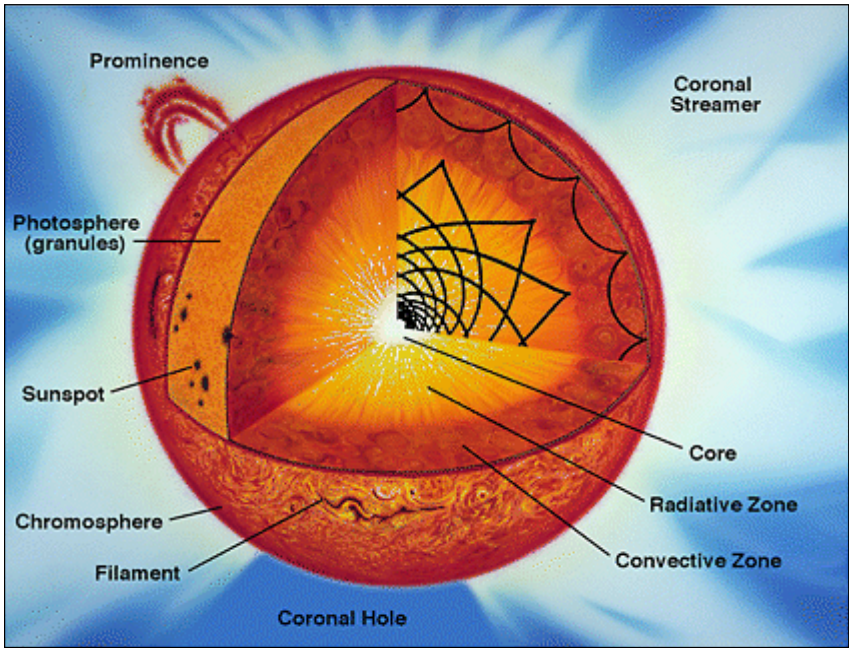
Assistant Professor Iztok Kramberger has received his B.Sc., M.Sc., and Ph.D. from the University of Maribor, Slovenia, in 1997, 2001, and 2003, respectively, all in electrical engineering. He has experience in embedded system design, programmable logic devices, and electronic systems. Since 2009, he has been the Head of the Laboratory for Electronics and Information Systems, Faculty of Electrical Engineering and Computer Science, University of Maribor, where he is currently an Ass. Prof. His research interests include computer vision, brain –computer interfaces, and space technologies. **www.skylabs.si**

Jay Hall (Texas, USA)

Professor Hall is Assistant Mathematics Professor at Howard College in Big Spring, Texas and has been an origins activist since the 1970's. He has an M.S. in Mathematics and has 53 credit hours of Science courses in various disciplines. He has written Calculus is Easy and his new book YES – Young Earth Science defends a young earth from History, Geology, Biology and Philosophy. Search yes jay hall on Google or Amazon to find the book.
www.youngearthsciencebook.com

What is a Star and Where Do They Come From?

A star is a huge glowing ball of hot gas, mainly hydrogen and helium. The temperature is so high in its core that nuclear fusion occurs, producing energy. The outward pressure of gas heated by fusion is balanced by the inward pull of gravity, leaving the star in hydrostatic equilibrium. This balance of forces lasts for most of a star's life, maintaining its steady temperature. Radiation and convection carry the energy from the core out through a star's atmosphere. When the energy gets high enough in the atmosphere that the region above it is transparent, it escapes out into space as light of all wavelengths, as well as stellar wind. Though stars may appear static, they rotate and vary in luminosity. There are hundreds of billions of stars in the Milky Way Galaxy alone. Among them is our Sun, the closest star to Earth.



Where do stars come from?

Every star forms in a huge cloud of gas and dust. Over time, gravity causes the cloud to contract, drawing the gas closer and closer together. As more gas accumulates at the center, it becomes denser and pressure increases. This causes it to heat up and begin to glow. Its gravity continues to pull in gas and dust, further increasing its mass, and thus its pressure and temperature. Eventually, the center reaches millions of degrees Celsius—hot enough to fuse hydrogen nuclei and generate intense energy. The heat generated by nuclear fusion causes the gas at the center of the star to expand, exerting an outward pressure. When hydrostatic equilibrium is reached, a star is born. Nuclear fusion powers the star until it eventually runs out of fuel and dies.

Most stars form in tightly packed groups called star clusters, from which the majority are eventually ejected.

How do stars differ?

Though stars may look like similar points of light from our perspective on Earth, they actually differ from each other in many ways. Stars vary in their mass, size, temperature, color, luminosity, and age. They differ in their distance from Earth, and some orbit one or more other stars. They also change over the course of their lives. A star's mass determines its temperature and luminosity, and how it will live and die. The more massive a star is, the hotter it burns, the faster it uses up its fuel, and the shorter its life is. The hottest and most massive stars are blue and bright, while the coolest and least massive stars are red and dim.

Why are stars important?

Without stars, we wouldn't be here at all. At the beginning of the universe, the only elements that existed were hydrogen, some helium, and trace amounts of lithium. All other naturally occurring elements were formed during the life and death of stars. At the end of a star's life, much of its matter is blown into space, where it provides the gas and dust for building new stars, planets, and everything on them including our bodies. Closer to home, when our Sun was born, its gravitational force held gas and dust in orbit, allowing for Earth's formation. Now the Sun holds the planets in their orbits, heats the surface of Earth, drives Earth's dynamic climate, and fuels photosynthesis. ›››

How do scientists study stars?

We can see stars with the naked eye. But to observe them in detail, we depend on technology on the ground and in space. Ground-based telescopes enable scientists to see visible light, radio waves, and some infrared light. Satellites that orbit Earth, orbit the Sun, or journey through space allow scientists to observe light at all wavelengths, free from the blurring and obscuring effects of Earth's atmosphere, and also enable them to sample the solar wind.

In the lab, scientists conduct experiments to infer atomic and molecular properties of stars, and to investigate how nuclear fusion works. Finally, scientists use theoretical modeling and computer simulations to compute how the properties of stars (such as density, pressure, velocity, or composition) change over time.

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How to Build a Telescope at Home?

A telescope is an instrument that makes a far away object look closer. To do this, a telescope has a device that collects light from a distant object (objective lens or primary mirror) and brings that light (image) to a focus where a second device (eyepiece lens) magnifies the image and brings it to your eye. With your telescope, you should be able to see the moon and some star clusters as well as terrestrial objects (i.e. birds).

What do you need:

- Two magnifying glasses - perhaps 1 - 1.5 inches (2.5-3 cm) diameter (it works best if one is larger than the other)
- A cardboard tube - paper towel roll or gift-wrapping paper roll (it helps if it is long)
- Duct tape
- Scissors
- A ruler, yard stick, or tape measure
- Sheet of printed paper - newspaper or magazine will do

How to build your telescope:

1. Get the two magnifying glasses and a sheet of printed paper.
2. Hold one magnifying glass (the bigger one) between you and the paper. The image of the print will look blurry.
3. Place the second magnifying glass between your eye and the first magnifying glass.
4. Move the second glass forward or backward until the print comes into sharp focus. You will notice that the print appears larger and upside down.
5. Have a friend measure the distance between the two magnifying glasses and write the distance down.
6. Cut a slot in the cardboard tube near the front opening about an inch (2.5 cm) away. Do not cut all the way through the tube. The slot should be able to hold the large magnifying glass.
7. Cut a second slot in the tube the same distance from the first slot as your friend wrote down. This is where the second magnifying glass will go.
8. Place the two magnifying glasses in their slots (big one at front, little one at back) and tape them in with the duct tape
9. Leave about 0.5 - 1 inch (1 - 2 cm) of tube behind the small magnifying glass and cut off any excess tube remaining.
10. Check to see that it works by looking at the printed page. You may have to play slightly to get the exact distances between the two glasses right so that the image comes to a focus.

For more incredible scientific fact or maybe you like to try out how fast you can solve a puzzle:
www.science.howstuffworks.com

Growing crystals

What you'll need: Salt, water, a piece of wire.

Experiment: To grow crystals, you need to prepare a super-saturated salt solution. The concentration of salt should be such that, if you add any more, it won't dissolve. Make sure that the solution remains warm. To make the process run more smoothly, you'd better use distilled water. When the solution is ready, pour it into a new container — to get rid of dirt traces that are always present in salt. Now you can take a piece of wire, make a small loop at one end, and lower it into the solution. Put the container in a warm place, so that the liquid won't cool down right away. After a few days, beautiful salt crystals should grow on the wire. If you get the hang of it, you can grow quite large crystals and even make patterned handicraft by twisting the wire into various shapes.

How it works: As water cools down, the solubility of salt decreases. This leads to precipitation, with salt crystals forming on the container walls and on the wire.

Lava lamp

What you'll need: Salt, water, one glass of vegetable oil, a few food colourings, a large transparent glass or jar.

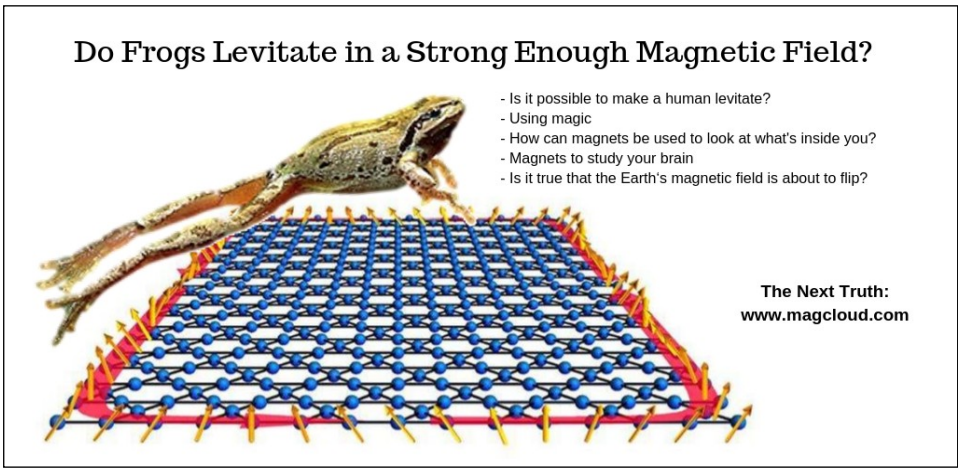
Experiment: Fill the large glass 2/3 full of water. Pour the vegetable oil into the water. The oil will float on the surface. Add food colouring. Finally, slowly poor one teaspoon of salt into the glass.

How it works: Because oil is lighter than water, it floats on the water surface. When salt is added to the glass, the salt grains drag the oil to the bottom. Then, once the salt grains have dissolved, the particles of oil are free once again to rise to the surface. The food colouring helps to make the experiment visually exciting.

Do Frogs Levitate in a Strong Enough Magnetic Field?

Some things like iron nails are known for their magnetic properties, but why should frogs levitate in a magnetic field? The trick is to get the magnetic field right – you can't just use any old bar magnet to make a frog levitate.

Frogs, like everything around and inside us, are made up of millions and billions of atoms. Each of these atoms contains electrons that whizz around a central nucleus, but when atoms are in a magnetic field, the electrons shift their orbits slightly. These shifts give the atoms their own magnetic field so when a frog is put in a very strong magnetic field, it is essentially made up of lots of tiny magnets. And there's nothing special about frogs. All materials – including strawberries, water and gold – are 'diamagnetic' to some extent, but some are more convenient to levitate than others.



Frogs are convenient not only because they have a high water content, which is a good diamagnetic material, but also because they fit easily inside a tube-shaped Bitter electromagnet. Bitter electromagnets use a very large electric current to create an extremely strong magnetic field which magnetises the frog in such a way that its magnetisation is in the opposite direction to the applied field. This means that the magnetised frog is pushed up from a region of high magnetic field into one of lower field, and levitates.

Is it possible to make a human levitate?

Like frogs, humans are about two thirds water, so if you had a big enough Bitter electromagnet, there's no reason why a human couldn't be levitated diamagnetically. None of the frogs that have taken part in the diamagnetic levitation experiments have experienced any adverse effects, which bodes well for any future human guinea pigs.

But many a magician has made their lovely assistant levitate without the need for huge magnetic fields, so how do they do it?

Using magic

Most levitation tricks use optical illusions and misdirection to focus your attention away from what is really happening. One classic trick, called Balducci levitation, is often performed by street entertainers. By standing at a certain angle so that the audience can see only one foot and the back heel of the other, the entertainer can then stand on the tip toes of the hidden foot, lift the visible foot completely off the ground and pretend to be levitating.

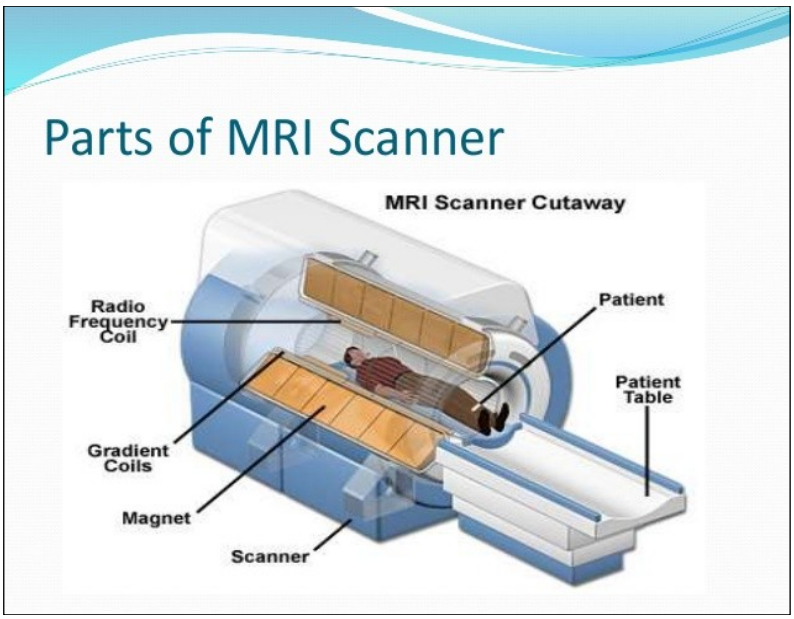
Smoke and mirrors

Levitating a reclining assistant is another oft-repeated trick that also relies on optical illusion and misdirection, as well as more than a bit of physics. The lovely assistant comes on stage with a flourish and lies down on a couch. The magician then covers them in a cloth from head to toe before 'levitating' them up and across the stage. As the audience are still reeling from the wonder of seeing the lovely assistant floating in mid air, there's a flash of light and a crack and the magician whisks the cloth away to reveal nothing – the assistant has gone!

This is Asrah levitation and the 'magic' is that an assistant shaped shield is placed over the assistant along with the cloth. The couch is hollow and once the cloth and shield are in place, ›››

the assistant conceals themselves inside the couch which is then taken off stage. The shield and cloth are levitated using wires, threads and pulleys which are almost impossible to see against the carefully chosen dark stage background. Finally, as the cloth is whipped away, the shield, which is made up of very thin black material, collapses and goes unseen as the magician waves his arms and points to the assistant who has magically reappeared at the back of the auditorium.

Magicians don't often give away their secrets, but when they do, the 'magic' that they reveal is often just physics – magnets, lights, smoke, pulleys – which is used to confound your senses.



How can magnets be used to look at what's inside you?

If you went to have an MRI (Magnetic Resonance Imaging) scan at hospital you would find yourself lying in a large doughnut-shaped magnet. This magnet is very strong and great care has to be taken to ensure that all moveable metal objects are away from the scanner before it's switched on – otherwise keys, paperclips and, if unlucky, larger items could whizz though the air towards the MRI scanner.

Lying inside a magnet

MRI scans create two and three dimensional images of the different types of tissue inside of you that can then be examined by a radiologist to see if there is any damage or disease. This is possible because the fat and water in your body is 60% hydrogen. When you lie inside the magnet, each hydrogen nucleus lines up with the magnetic field like a needle on a compass.

A short pulse of radio waves then gives the hydrogen nuclei enough energy to briefly change direction. As the nuclei go back to their original orientation, they give off energy in the form of radio waves. The location of these radio waves and the type of tissue they belong to are detected up by the scanner which can then build up a detailed map of the inside of your body.

Magnets to study your brain

MRI can also be used to detect changes in your brain as you perform different tasks and experience different emotions. This application is called functional MRI (fMRI) and it works by detecting which parts of the brain are being supplied with higher levels of oxygenated blood compared to others. This can help neuropsychologists understand the function of different brain areas as well as helping the treatment of brain damaged patients.

Is it true that the Earth's magnetic field is about to flip?

Like football teams at half time, geophysicists think that the Earth's magnetic poles could soon switch ends with the magnetic north pole becoming south, and the magnetic south pole becoming north. Fortunately, when they say 'soon' geophysicists are thinking in geological timescales and they actually mean sometime in the next few thousand years.

It's thought that the Earth's magnetic field is generated by the molten iron core at the centre of the planet. The molten iron has currents of its own, just like an ocean, and these moving currents create the magnetic field. But the currents are not consistent and the Earth's magnetic field moves around, with the magnetic north pole currently drifting by about 10 miles a year.

Poles flip completely

But this movement of the field is small compared to a complete flip so what is there to suggest that one is imminent? Geophysicists have been studying the lava that has seeped up from the core and through a ridge on the floor of the Atlantic Ocean. As lava cools and solidifies, it preserves the direction of the Earth's magnetic field so looking at the rock that has formed over time gives us an idea of what has happened to the ›››

magnetic poles in the past. These studies show that the poles switch ends every half million years or so – and that we're due for another switch in the next few thousand years.

There's also evidence to suggest that before the Earth's magnetic poles switch, the magnetic field slowly fades out before reappearing with the poles reversed. And our magnetic field has depleted by 5% over the last century.

Fading magnetic fields

So do we need to worry? Well, birds, sea turtles and bees may get confused as they seem to use the magnetic field to navigate. More drastically, since the Earth's magnetic field protects us from potentially harmful radiation from the Sun, gives us an idea of what has happened to the magnetic poles in the past. These studies show that the poles switch ends every half million years or so – and that we're due for another switch in the next few thousand years. There's also evidence to suggest that before the Earth's magnetic poles switch, the magnetic field slowly fades out before reappearing with the poles reversed. And our magnetic field has depleted by 5% over the last century.

Fading magnetic fields

So do we need to worry? Well, birds, sea turtles and bees may get confused as they seem to use the magnetic field to navigate. More drastically, since the Earth's magnetic field protects us from potentially harmful radiation from the Sun, as it fades we could well be faced with a disaster on a global scale. Fortunately, there's no evidence in the fossil record of a magnetic field switch causing a species to die out.

For more cool stuff on physics, **www.physics.org**

Making a cloud in a jar

What you'll need: a one gallon size glass jar, matches, a rubber glove, a rubber band, flashlight or lamp, food coloring, and water.

Experiment: Pour boiling water into the jar , just enough water to cover the bottom of it. Swirl the water around inside so that it covers the sides of the jar. Put the rubber glove wrist around the mouth of the jar with the fingers pointing downward and put your hand in the glove. Once your hand is in the glove, move it upward so that you pull the fingers of the glove up. You'll notice that nothing happens to the water. Take the glove off the jar for just a moment, light a match and drop it in the jar. Stretch the glove back over the jar, with the fingers pointing down. The water at the bottom of the jar will put out the match, and smoke will form inside the jar. Slide your hand into the glove and pull it outward again.This time, a cloud will form in the jar. When you put your hand back inside the glove, the cloud will disappear. This will last for 5-10 minutes. When you shine a flashlight at the jar, you can see the clouds better.

How it works: The air is full of warm water vapor molecules inside the jar. The glove compresses the air because the glove takes up some of the space inside the jar. Pulling the glove fingers out of the jar releases some space in the jar and the air cools.The smoke from the match acts as a vehicle to which the water molecules can attach. They stick to the smoke particles, condensing into cloud droplets. If you want colored clouds, add a few drops of food coloring to the water in the bottom of the jar before adding the match.

Dancing coin

What you'll need: A bottle, a coin large enough to cover the bottle's mouth, water.

Experiment: Place the empty uncapped bottle in the freezer. Keep it there for a few minutes. Take the coin and dip it in water. Remove the bottle from the freezer and put the coin on top of the bottle, so that it covers the bottle's mouth. After a few seconds, the coin should start jumping on the bottle's rim, accompanied by curious clicking noises.

How it works: Hot air takes up more space than cold air. When you take the bottle out of the freezer, the air inside the bottle begins to warm up and expand. It rushes out through the bottle's mouth, making the coin "dance".

For more awesome experiments that will entertain your friends
www.brightside.me

"Is a Young Earth Possible?"

Professor Jay Hall Weighs In on His Latest Book

By Maria Anna van Driel, www.nexttruth.com

Have you ever wondered what the true age of the Earth is or asked yourself the questions of 'when' did the written history truly began and… who started it?

Earth is a planet teeming with vitality and is home to billions of plants and animals that share a common evolutionary track. How and why did we get here? What processes had to take place for this to happen? And where do we go from here? The fact is, no one has been able to come close to knowing exactly what led to the origins of life. After billions and billions of years of Earth's formation and evolution, the evidence may have been lost. But scientists have made significant progress in understanding what chemical processes that may have led to the origins of life.

Earth scientists have long been concerned with deciphering the history of this active planet and over the past ten decades, they have made great strides in understanding Earth's workings. Scientists have ever-improving tools to understand how Earth's internal processes shape the planet's surface, how life can be sustained over billions of years, and how geological, biological, atmospheric, and oceanic processes interact to produce climate and climatic change.

However, Earth is the only planet we know of that can support life. This is an amazing fact, considering that it is made out of the same matter as other planets in our solar system, was formed at the same time and through the same processes as every other planet, and gets its energy from the sun.

Still, at the core of the evolutionary theory lies this big assumption that life somehow arose from non-life, which by pure chance and the right chemicals happened to be in the right place, in the right arrangement, at the right time, under the right conditions, and by some mysterious, still unknown electrochemical process BANG! Life created itself like an unabridged dictionary is resulting from an explosion in a printing shop.

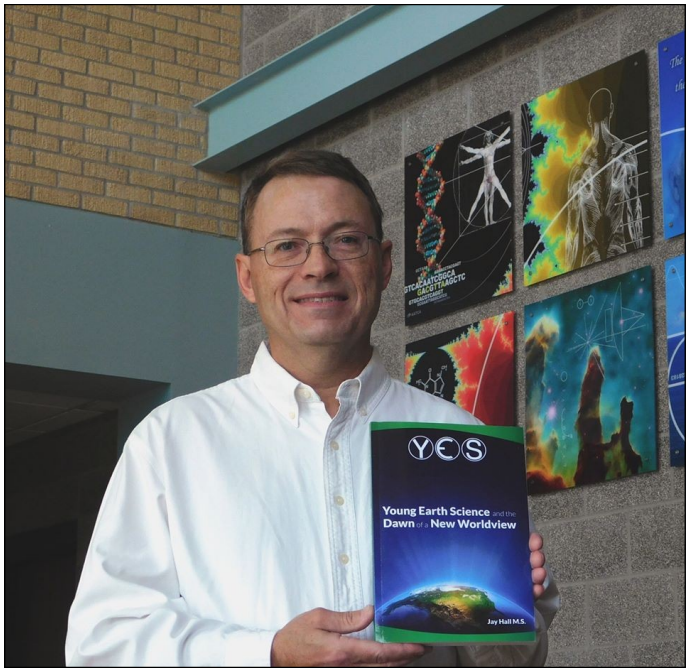
Indeed, the history of evolution is a strange phenomenon as soon as you place it under a magnifying glass. Events suddenly overlap each other and dates contradict each other. They seem not to match up with what you always have thought of being correctly calculated. And by looking through a looking-glass as such, the time-line of human evolution is starting to look…um, well…pretty messy.

Here is, as far as we know, what happened after this primordial mud was immensely heated; Earth began to form over 4.6 billion years ago from the same cloud of gas (mostly hydrogen and helium) and interstellar dust that formed our sun, the rest of the solar system and even our galaxy. Proximus 4.1 billion years ago, the Earth's surface began to cool and stabilize, creating the solid surface with its rocky terrain. For the next 1.3 billion years (3.8 to 2.5 billion years ago), the Archean Period, first life began to appear and the world's landmasses began to form.

Toward the end of the Archean Period and at the beginning of the Proterozoic Period, about 2.5 billion years ago, oxygen-forming ›››

photosynthesis began to occur. By the end of the Proterozoic Period, Earth was well along in its evolutionary processes leading to our current period, the Holocene Period, or Anthropocene Period, also known as the Age of Man. Thus, about 525 million years ago, the Cambrian Period began. During this period, life "exploded," developing almost all of the major groups of plants and animals in a relatively short time. It ended with the massive extinction of most of the existing species about 500 million years ago, making room for the future appearance and evolution of new plant and animal species.

About 498 million years later — 2.2 million years ago — the first modern human species emerged and is called Homo Habilis (handy man), the first of the homo genus. Long story short, we are pretty new around here.



Assistant Mathematics Professor Jay Hall teaches at the Howard College-Big Spring, Texas and is the author of the books "YES: Young Earth Science and the Dawn of a New WorldView" & "Is a Young Earth Possible?"
www.amazon.com

With that being said, one can ask if some kind of critical thinking can be applied to the scientific fields of Anthropology and Petrology. Is the Earth misdated? Do we have to re-think the evolutionary theory? Howard College (Big Spring, Texas) Assistant Mathematics Professor Jay Hall says that we can. In his book "Is a Young Earth Possible?" he is, among others, explaining how radioactive rays, coming from the sun, did have and still have a tremendous influence on some of the Earth's elements and how Big Science could have misdated the earth's age due such cosmic bombardment on the fragile nature of Earth's environment.

In order to gain some clarification on this question, I reached out to contact Professor Jay Hall and gained the privilege to learn more about his vision on the evolutionary theory.

Q: Welcome Professor Hall, I appreciate the time you are taking for this Q&A. Can you tell us about yourself? Who is Professor Jay Hall?

Prof. Hall: I love math - it was the only thing I got an award for in high school. My major was Geology before I switched to Maths. I live in the Permian Basin in West Texas which is a huge source of petroleum. I favor all the energy sources: coal, nuclear, solar, oil, wind etc. I also think we should be good stewards of this planet - I recycle aluminum and we are installing solar panels on our house. The actuarial field has often been rated at the top and I worked in that area for a number of years.

Q: What does "YES" stand for? Is this an organization and if so, which information is the organization providing the general public?

Prof. Hall: YES is short for *Young Earth Science*. Often words subtly influence how we think. People may oppose "welfare" but favor "assistance to the poor." It is not an organization, but points to a positive defense of the young earth view from history and science. The young earth idea is often connected to the flat earth concept and I wanted to make a clear demarcation.

Q: What inspired you to write the book "Is a Young Earth Possible?" and how do you think your book will make a difference?

Prof. Hall: I want to reach a broad audience in the popular science field. There are a number of similarities to my previous work *YES - Young Earth Science*, but the style in *Is a Young Earth Possible?* is different and I added more topics. I talk about President Eisenhower and his interest in old maps. One chapter connects Darwin with depression and deals with the meaning of life.

The section on the planets shows how they seem to be young too (even Pluto). Clearly, the age-of-the-earth controversy affects our approach to urgent environmental matters such as climate change. ›››

Q: Did you wrote your book with a particular audience in mind or is it be accessible for anyone who is interested in a mathematical view of history?

Prof. Hall: Some basic science background is assumed, but nothing too advanced. A number of concepts I explain in the text for those not familiar with certain scientific nomenclature. As for the Math, ...while discussing the Sumerian King List, I bring out that the Babylonians used a Base-60 number system. Regarding the growth of the Neanderthal population, I apply some curve fitting

Q: How do you conduct the research for your books? Where do you find/ gather the information you use in your books?

Prof. Hall: Our college allows access to academic journals online. I am very much a fan of books. You may be familiar with C.S. Lewis' great paper "On the Reading of Old Books." The ancients have wisdom we should learn from as well as scholars who wrote in 1900. Alternative search engines like DuckDuckGo and StartPage are helpful. Some of my colleagues will let me borrow their books. Occasionally I will obtain a book via interlibrary loan. Project Gutenberg is a good resource.

Q: What evidence do you present in your latest book to indicate that there is a possibility the earth being much younger than we initially think?

Prof. Hall: The ocean floor in many places is covered with Manganese nodules (Mn) which are somewhat like pearls. The measured growth rates of these nodules indicate an age of only thousands of years. Why are there not multiple layers of these nodules if the oceans are truly millions of years old? I also cover soft tissue and DNA in fossils, human footprints, gold and Neanderthals.

Q: What does the future hold for your writing career?

Prof. Hall: My next big challenge is biological essentialism. If you do a search on this topic you may hit gender topics such as Toronto professor Jordan Peterson's work on the differences between men and women. I mean "biological essentialism" in the sense of Aristotle's writing on distinct kinds: "like begets like." Melvyn Bragg hosted an episode of *In Our Time* (BBC) with three academics on Aristotle's method of biological investigation **(https://www.bbc.co.uk/programmes/m0002cfd).**

I take essentialism and natural kinds as the rational alternative to Atoms-to-Astronauts evolution. Chapter nine of *Is a Young Earth Possible?* explores the stasis of Essential Types of Life (ETL's). A Helicoprion (a fish known for their tooth whorls) and a platypus never had a common ancestor.

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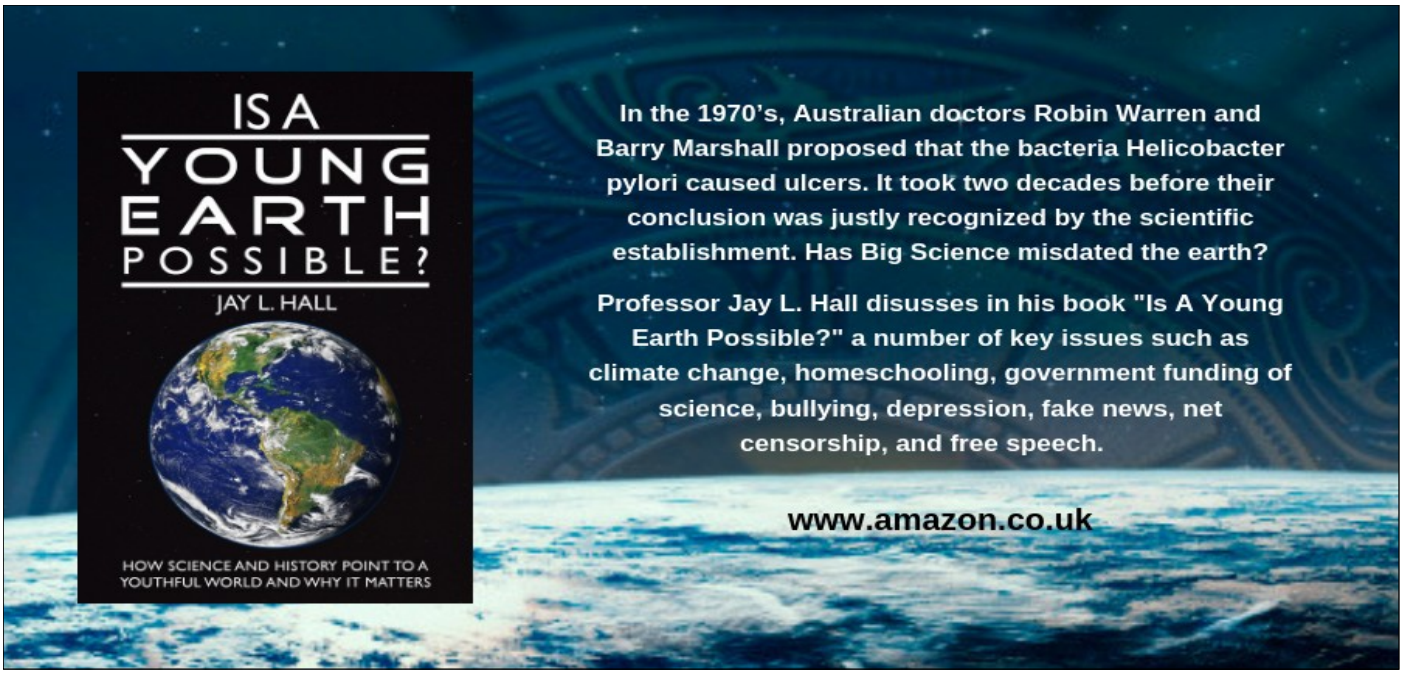


You Do the Math!

Turn the page 180 degrees for the answers

How can you add eight 8's to get the number 1,000? (only use addition)

Answer: 888 + 88 + 8 + 8 = 1,000

Two Fathers and Two Sons Riddle

Two fathers and two sons sat down to eat eggs for breakfast. They ate exactly three eggs, each person had an egg. The riddle is for you to explain how

Answer: One of the 'fathers' is also a grandfather. Therefore the other father is both a son and a father to the grandson. In other words, the one father is both a son and a father.

How do you go from 98 to 720 using just one letter?

Answer: Add an "x" between "ninety" and "eight". Ninety x Eight = 720

Add me to myself and multiply by 4. Divide me by 8 and you will have me once more. What number am I?

Answer: Any number!

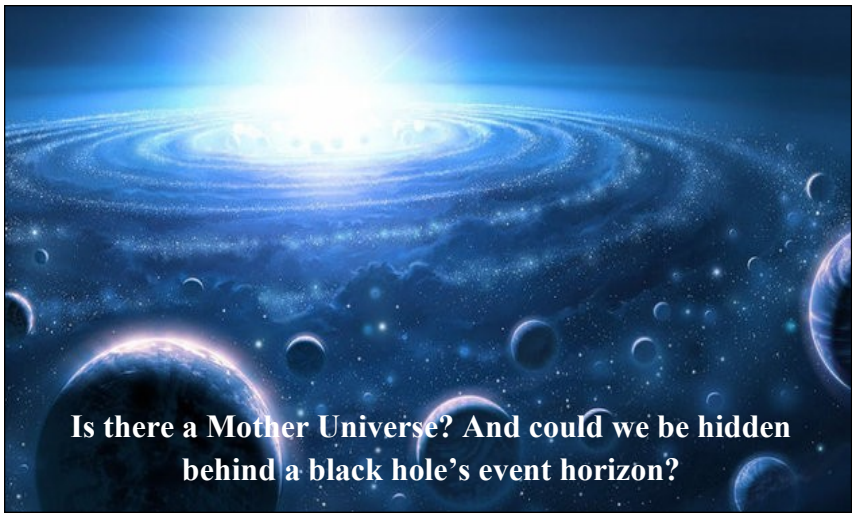
Me: What's 5Q+5Q?
- 10Q
Me: You're welcome
- ???
Me:

Was There More Before the Big Bang?

By Maria Anna van Driel, www.nexttruth.com

Once upon a time … a little spot, smaller than the dot at the end of a sentence, was hovering through the Universe. This charged particle could have sparked the production of every other particle it encountered, not to mention every galaxy, solar system, planet, and … our species. That tiny spot exploded in a place being pitch black. It exploded into an almost inaudible illuminating flash of everything!

In these divine moments, life was not bigger than an electrical spark of light … a weak light having the prospect of becoming the most discussed and fought for part of life. Rapidly, it started to find its way to mature in this dark emptiness that would soon be filled with a chaotic order of strange particles, each struggling for the right to exist.



Is there a Mother Universe? And could we be hidden behind a black hole's event horizon?

This little electrical spark accelerated with the speed of lambda times nu, better known as the speed of light. It accelerated faster and faster through wormholes, black holes, universes, cosmoses…everything exploded! Sooner or later, it is coming right back to where we are struggling to explain the "Theory of everything," and it is going to implode on itself where it will vanish forever. What a weird story this is.

Walking up to the globe of the European organization for nuclear research (CERN) in July 2017 set in motion a crazy quest for me in understanding the origin of evolution and thus the Universe. So, exploding with tense curiosity, I recently went back! Now, whether you would expect it or not, it is an impracticable task not to enter a bipartite dimension in this overwhelming and spellbinding place known as CERN; it is a place that awakens the deepest depths of your soul. It's a strange, tenuous dimension in where space, time, and existence itself has the capability to let your inner genius roam free as your brain desperately scans the area for the latest innovative technologies science has to offer. This almost-sinister-feeling dimension can let your imagination roll inside the biggest and most complex machine ever created by man as you walk inside of it and talk to brilliant and ambitious minds.

Their theories contain, as they are to some, out-of-the-box considerations that have not that much to do with spirituality or religion but more to do with science that points to a possibility that life itself may not be an understandable miracle after all, but a logical sequence, where the urge of an organism or species to survive the whims of nature is the guiding principle.

Although this "matter" has not been found yet, our galaxy alone is so replete with earth-like planets that, mathematically speaking, one of them must hold life, even if it is just the microbial variety spawn from electroweak and/or inflationary epoch.

Electroweak epoch: the period in the evolution of the early Universe when the temperature of the Universe was high enough to merge electromagnetism and the weak interaction into a single electroweak interaction. *(Source: Wikipedia)* Inflationary epoch: the period in the evolution of the early Universe when, according to inflation theory, the Universe underwent an extremely rapid exponential expansion. *(Source: Wikipedia)* ›››

Let us rewind the clock shall we? Like all big events in our world, they start small, almost like a microscopic idea of nature itself. Remember what the Big Bang theory says? The Universe began as the size of a grain of sand that was unimaginably hot, unfathomably dense, and packed tight with matter and energy. But up until now, even as scientists probe the origin of the Universe, the position of the birth of this expanding place has not been found … yet. The reason for this could lie in a plausible fact that the rapid expansion of matter that created our universe is a result of many previous Big Bangs, making the cosmic Microwave Background radiation of the original Big Bang untraceable.

Many of you will have a strong urge to imagine while reading the words Big Bang that it had to be an enormous and ear-deafening explosion. But the plausibility of this event not starting off as an explosion at all, but in a tranquil and soundless merging of two black holes, whereby the original "seed" had already undergone many transformations, is being seriously discussed by some scientists. Take a dandelion for instance; it grows, and as it transforms into a fluffy state, the wind will blow its seeds away. What is left of the first and original flower dies … it is gone forever!

Fortunately, many different dandelions start growing at several different places containing the same code of the original flower, but due to external elements (soil, temperature, light), it will be slightly different in its appearance. So why not with the Big Bang? Meaning ... is the Big Bang we know as the beginning of our universe really the first one of its kind? Or is it a result of previous ones that planted seeds, even if we can't see them anymore?

Now, what if we change these dandelion seeds into electrons (e-) and positrons (e+), whereby every electron, as well its antiparticle the positron, in a young universe were all the same exact particles carrying the same code.

There is an idea that suggests all of the Universe's electrons are actually one particle. The theory apparently was first put forth in 1940 by theoretical physicist John Wheeler. It is a simple, elegant idea leading to a very interesting hypothesis of this particle forever traveling backwards and forwards in time, possessing a plausible key in solving some of physics biggest mysteries concerning the Universe.

The points at which it switches from one to the other we perceive as an electron/positron pair (e-/e+) that either mutually annihilate or spontaneously come into existence. This became known as the "one-electron universe postulate" and has an incredibly nice consequence: It explains why all e-/e+ pairs in the Universe have the same physical properties…there is just one of them! A single e-/e+ pair…but what about before that?

Did these particles spawn from MeV photons emitted from a black hole accretion flow and materializing as e-/ e+ pairs in the black hole magnetosphere as they collided with each other? Or should we take a closer look at the centrifugal Force, whereby a strange light (a2+), produced by an even stranger nuclear fission in a black hole, can be considered as photonic light (Y) that is being pressed against the borders of the inner shell of a black hole? And can we see this photonic light transform into and start acting as an e-/e+ pair just on the outer shell of a black hole, ›››

whereas the neutrino is absorbing the pre-Big Bang information and exchanging this galactic code with other particles? Well, it still remains a puzzle to many scientists, as well as many physicists who say there is no "before that." Time began ticking, they insist, at the instant of the Big Bang, and pondering anything earlier is not in the realm of science.

But is that a true fact? Did the universal clock really start at this well-known explosion? Or was our time already in motion by means of the merging of two (or more) black holes containing a much older binary code? Will we ever truly understand what the pre-Big Bang reality was like, or what it was formed of, or why it exploded to create our universe?

Well, until science finds undeniable proof whether the clock started ticking after or before the accepted theory of the Big Bang, the plausibility that we might be the product of another, older universe, call it our mother universe, could be as real as the food on your dinner plate.

The search for the seeds this mother universe could have forged inside a black hole may have had its big bounce 13.8 billion years ago, and even though our universe has been rapidly expanding ever since, we could still be hidden behind a black hole's event horizon. However, such notions are yet beyond human understanding.

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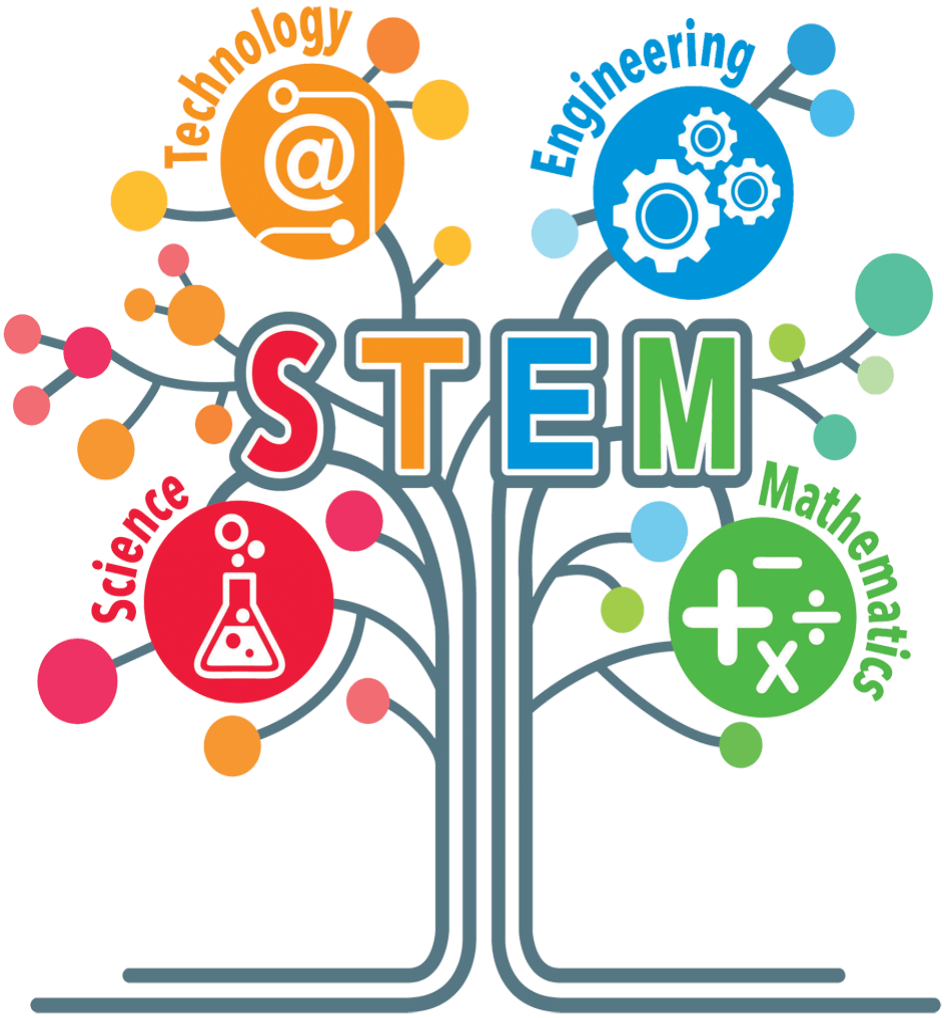

In an ever-changing, increasingly complex world, it's more important than ever that our nation's youth are prepared to bring knowledge and skills to solve problems, make sense of information, and know how to gather and evaluate evidence to make decisions. These are the kinds of skills that students develop in science, technology, engineering and math—disciplines collectively known as STEM.

Source **www.ed.gov/stem**

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- Saturn's rings
- Mars geomorphology and spectroscopy
- Survival of microbes under extreme conditions

For more information about the program at SETI Institute: **www.seti.org**

Intergalactic Light Beams Might be Just the Ticket for Making Contact With Space Aliens

The "Trillion Planet Survey" aims to search the sky for signs of light — and life.

By Dr. Seth Shostak, www.seti.org

For more than a half century, we've been scanning the skies for radio signals that might be evidence of an alien civilization. Now physicists at the University of California, Santa Barbara are trying a different approach: scanning the skies for light beams that are monstrously intense. It's a promising approach that could uncover aliens that have equipped themselves with the mother of all laser pointers.

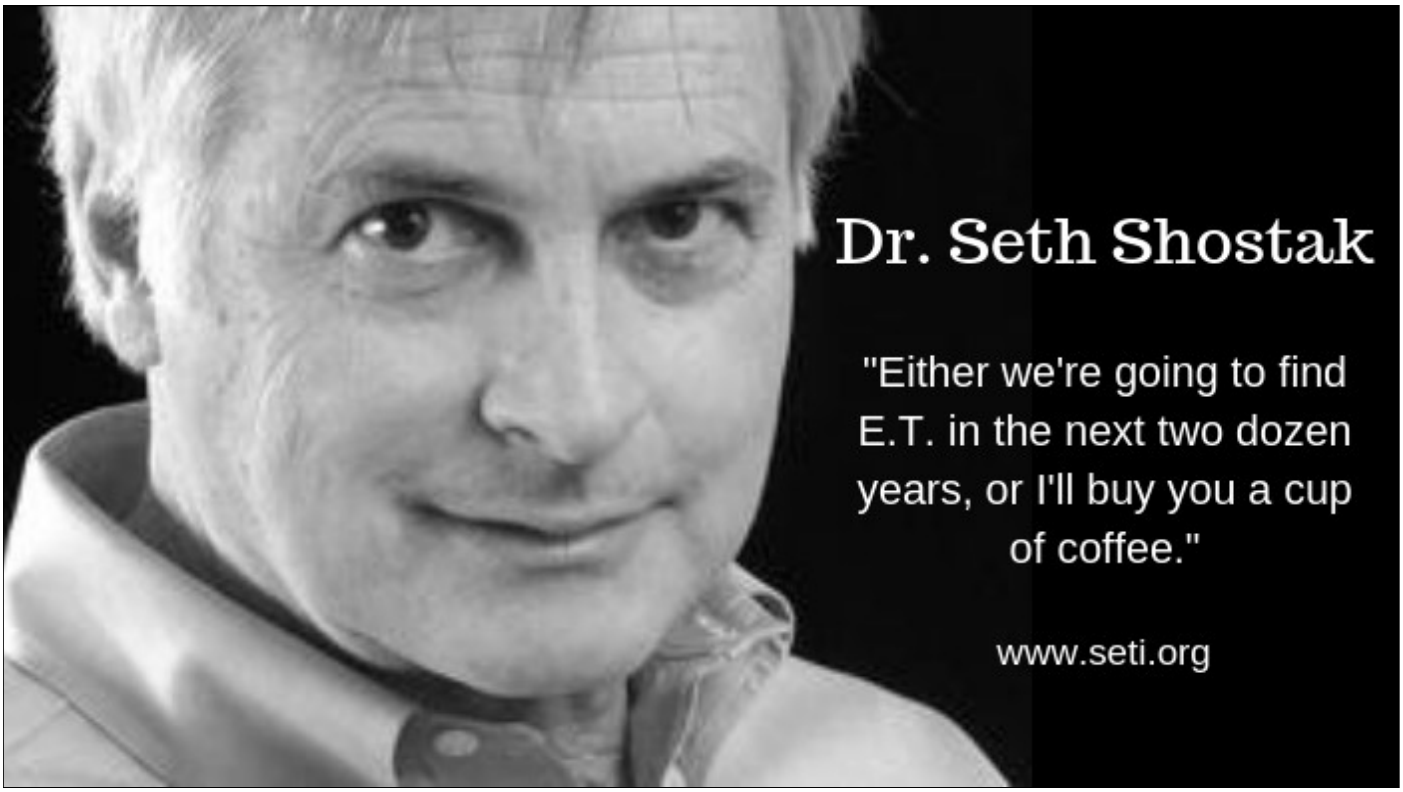
The idea of using light beams to signal from one world to another isn't new, even the Victorians considered it. In 1874, the Finnish mathematician Edvard Engelbert Novius proposed wiring up 22,000 light bulbs and using curved mirrors to focus their glow on Mars, thereby alerting Red Planet residents that they had neighbors on the third rock from the sun. He did not get the funding.

The Santa Barbara plan is to reverse Novius' scheme and look for aliens who might be signaling us.

Or, more accurately, inadvertently spilling light in our direction with a light source brighter than a blowtorch. The scientists plan to search for such high-tech luminaries camped out in the Andromeda Galaxy, which at 2.5 million light-years away is the nearest large galaxy to our own Milky Way.

This effort is an offshoot of another project developed at the university. Several years ago, faculty physicist Phil Lubin suggested syncing up a phalanx of high-powered lasers to produce a truly blinding light source. His idea was to use this super-laser to kick matchbook-sized space probes to nearby stars at roughly 20 percent the speed of light. This is difficult, but not impossible, and Lubin's plan is now getting financial support from NASA and Breakthrough Starshot,

a private initiative funded by venture capitalist Yuri Milner. It's exciting to think we could send probes to the nearest stars fast enough that the probes reach their destination. ›››



project scientists will still be alive when the probes reach their destination.

But Lubin and his students also cooked up an ancillary experiment: a search for alien societies so advanced that they've already built powerful lasers for their own interstellar launches. These light sources would be easy to see even at astronomical distances. Indeed, by some reckonings, if you were looking down the beam of such a laser even from very far away, it would outshine stars, quasars, supernovae and — well — anything in the universe. You would notice.

The Santa Barbara team plan to use small telescopes to repeatedly take photos of Andromeda. Then they will compare these pics with older photos to see if any new "star" has appeared — possible evidence of a non-natural source. The process will be automated, and the survey can go on as long as there are interest and support.

Why Andromeda? The reason is simple: choosing a nearby galaxy means the project can quickly reconnoiter a vast swath of extraterrestrial territory.

Andromeda, like the Milky Way, is thought to contain a trillion or so planets, a fact that led the Santa Barbara physicists to inventively dub their effort the Trillion Planet Survey. Most conventional searches for E.T. look for signals from nearby star systems one at a time. By examining an entire galaxy at once, the Santa Barbara scientists aim to greatly increase the chance of finding something.

There are some worries. Even if Andromeda contains a society whose super-bright lasers

routinely stab the sky, the rotation of their home planet might cause this beam to sweep over Earth very quickly. If so, it could easily be missed. It's also worth noting that Andromeda — which you can check out yourself with binoculars — has been studied nearly as much as the Bible. No one has ever seen any puzzling bright lights. In addition, astronomers hunting for supernovae have surveyed millions of other galaxies with automated telescopes. They've found many exploding stars, but no super-lasers. Of course, failure to find these things doesn't prove they're not there.

The search for aliens has always assumed that advanced beings will either transmit an unnatural-looking signal or construct some artifact large enough to be seen with a telescope. But few searches have eyed as much cosmic real estate as the Trillion Planet Survey plans to do. And who knows? It just might turn up some society that's truly enlightened.

■ ■ ■

Dr. Seth Shostak is senior astronomer at SETI (Mountain View, California) and host of the radio program "Big Picture Science"

www.nbcnews.com

Military Ghosts

By Nick Pope, www.nickpope.net

People commonly associate ghosts with old houses, castles, pubs and churches, but there are numerous ghost sightings at military bases. Understandably, because the public don't generally have access to such sites, these sightings don't generate much publicity. When I investigated UFO sightings for the Ministry of Defence (MoD) I was drawn into other mysteries and got to hear about numerous ghost sightings.

Ghosts have been seen at numerous current or former military bases, with three of the most haunted sites being Devonport Naval Base, Priddy's Hard Armaments Depot in Gosport and Coalhouse Fort in East Tilbury, which was used as a wartime Royal Navy base. There are very detailed stories surrounding many of the ghost sightings, often linking them with executions, or violent deaths in munitions explosions and aircraft crashes.

Journalist and TV personality Nick Pope is one of the world's leading experts on conspiracy theories. He has discussed the subject on numerous TV shows, and written news stories and features about conspiracy theories including tie-in publicity material for the second X-Files movie, and extensive material for tru-TV's Conspiratorium.

Many classic signs associated with hauntings were present in these cases, including unexplained cold spots and guard dogs growling - with their hackles rising - at the locations concerned. Perhaps the oddest report I received was an animal ghost story. During the Second World War, Wing Commander Guy Gibson (who led the famous Damn Busters raid) had a dog that was knocked down by a car and killed, shortly before the raid. The ghost of this dog has been seen several times at RAF Scampton.

From time to time the MoD and the military have co-operated with organisations such as the Ghost Club of Great Britain, allowing access to sites such as Coalhouse Fort and the Master Ropemaker's House in Plymouth, with investigators using equipment such as infrared camcorders, motion detectors and electro-magnetic field meters to try and find evidence of hauntings.

On occasion the military themselves have been involved. In 2002, following his involvement in the Ceremony of the Keys, a sergeant in the RAF Regiment spent the night in the Salt Tower in the Tower of London, armed with a video camera, a torch and a book about ghosts. This is reputedly the most haunted area in the Tower of London, where several ghosts have been seen. The sergeant had a sleepless night but saw no ghosts himself. He was sponsored by many of his colleagues and his ghost-watch raised several hundred pounds for charity.

Numerous ghost sightings came to light as a result of a letter published in Focus (MoD's in-house magazine) in October 2003. An MoD Police officer described a ghost he'd witnessed while on a night patrol at St. Luke's church at Haslar Hospital. He'd seen an elderly woman walking towards the church, but when he returned less than a minute later, she had disappeared. There was nowhere she could have gone. An hour later, the hospital mortician told him about the body he'd dealt with earlier that day. The description exactly matched that of the woman the police officer had seen.

The editor of Focus asked for other stories and ›››

over the following months further letters were published detailing sightings of ghosts at locations including RAF Ely, RAF Wittering, and two bases in Germany: RAF Laarbruch and RAF Bruggen. The latter story involved the ghost of a headless airman seen by an armourer who was so traumatised that he had to be sent home to the UK. "The story was hushed up", the letter concluded.

It's not just military bases. Ghosts have also been seen in MoD buildings in London. The sixth floor of Metropole Building (a former hotel requisitioned by the Ministry of Munitions in 1916) is reputedly haunted by the ghost of a chambermaid who was murdered in the hotel and whose body was hidden in a cupboard.

Even MoD Main Building is supposedly haunted. Built on the site of the old Whitehall Palace, which dates from the 12th century, the basement still contains an old Tudor wine cellar dating from 1529.

The wine cellar is now used for social functions, but I've spoken to some of the security guards who patrol the building at night, and they tell me they've seen ghosts in that area of the building. One guard told me that he'd seen what he presumed to be an intruder walk across the corridor from one room to another. He issued a challenge but on reaching the spot where the figure had been seen, found there were no doors - the figure had apparently walked through the walls.

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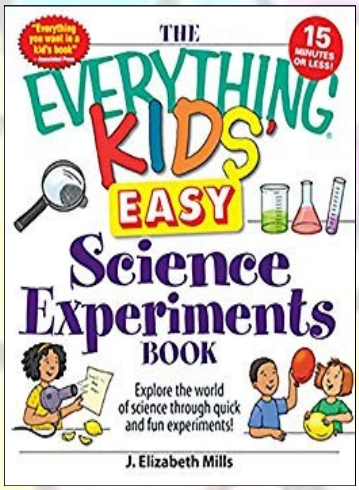
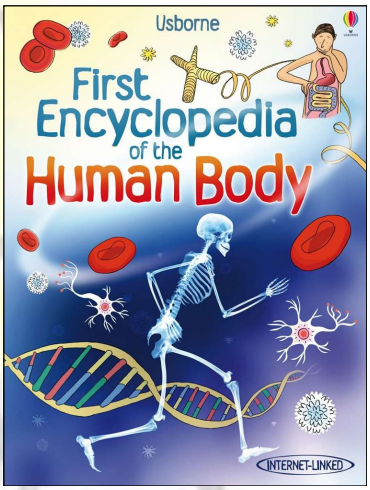
Let's Play Science





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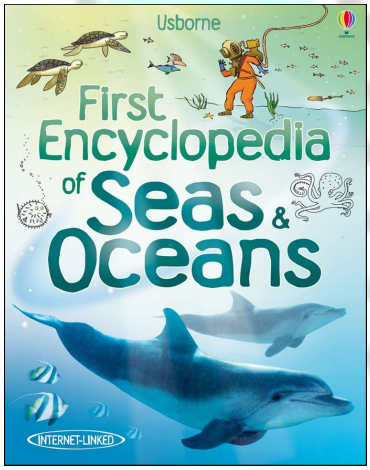
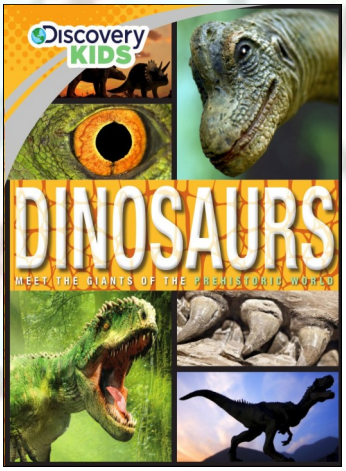
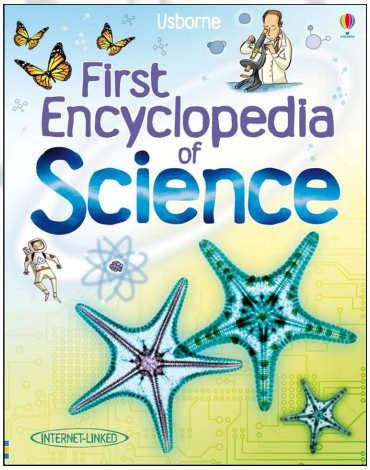






Why Old People Hate New Music

By Professor Frank T. McAndrew, www.frankmcandrew.com

Why do we think that today's music is not as good as the music from our youth?

When I was a teenager, my parents were not terribly interested in the music I liked and thought that it just sounded like "a lot of noise." Meanwhile, my father regularly referred to the music that *he* liked as "beautiful music."

This attitude persisted throughout his life, and when he was well into his 80s he turned to me during a TV commercial featuring a 50-year-old Beatles' tune and said: *"You know, I just don't like the music of today*." The fact that he thought of a 50-year-old song as being "the music of today" speaks volumes about when his interest in new music ended. And it turns out that my father is not alone.

As I've grown older, I've often heard people my age say things like "today's music sucks" or "they just don't make good music like they used to." So, what is it with old people and new music?

Older People Really Don't Like New Music

We know that musical tastes begin to solidify as early as age 13 or 14, and that they get locked into place pretty firmly in our early 20s. Studies indicate that most of us stop exploring new music entirely by the time we turn 33, and if a song was released when you are in your early teens, that song is likely to remain quite popular among your age group throughout your life.

Curiously, men are even less likely than women to explore new music and listen to new artists as they get older.

Why does this happen?

For starters, there is evidence that the brain's ability to make subtle distinctions between different chords and other musical elements gets worse with age, so new, unfamiliar songs may in fact sound more alike to older ears than to younger ears. But I believe that the aversion that older people often have to new music also has a simpler explanation.

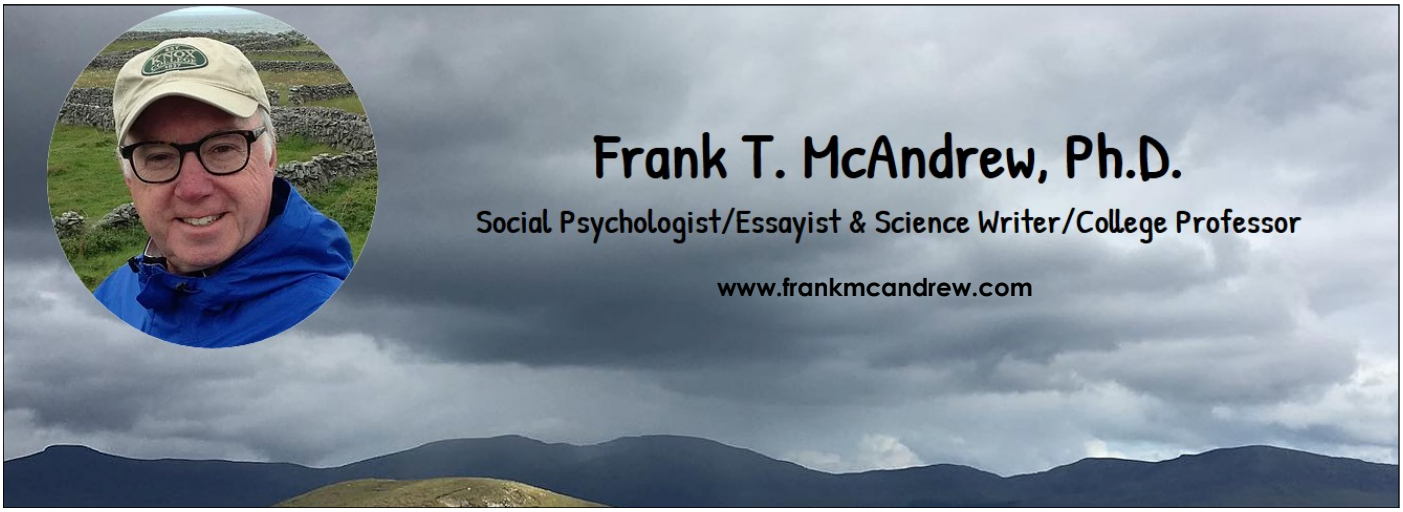
Prof. McAndrew's research has appeared in dozens of professional journals and is regularly featured in popular media outlets such as The New Yorker, NPR, the BBC, The New York Times, The Atlantic, and NBC's Today Show.

The Mere Exposure Effect

One of the most reliable laws of social psychology is something called *the mere exposure effect*. In a nutshell, this means that within certain limits, the more familiar we are with something and the more often we are exposed to it, the more we tend to like it. This works for other people, consumer products, and yes, even for songs.

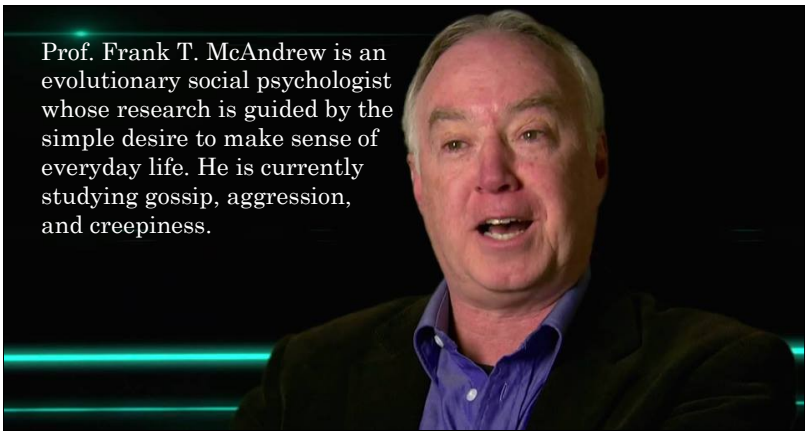
When you are in your early teens, you probably spend a lot of time listening to music, discussing it with your friends, and watching music videos. The songs and artists who are popular during this time become familiar, comforting parts of your life.

For most people over 30, life is too busy to allocate much attention to discovering new music. Advancing one's career and raising a ›››



family eats up most of the available time, and so we tend to listen to comforting old favorites that connect us to a simpler time and place. And with familiar songs, we can fill in words and sounds that elude us even when there is a lot of background noise or other factors that prevent us from hearing the song clearly.

Consequently, we prefer familiar music, and it is the music that we hear when we are young that is most familiar to us.


Prof. Frank T. McAndrew is an evolutionary social psychologist whose research is guided by the simple desire to make sense of everyday life. He is currently studying gossip, aggression, and creepiness.

Most Popular Music is Written for Young People

Let's face it; one of the reasons why older people don't like a lot of popular music is that it is not written for them. In fact, it is often written for the explicit purpose of riling up older listeners. Punk, rap, hip-hop, heavy metal, anti-war folk music, and many other genres of music began as a youthful rebellion against authority figures and outdated ways of doing things, and this resonates more successfully with younger audiences. On top of this, many popular songs feature themes such as young love and peer rejection that are less relevant to older individuals.

The Teen Years are an Emotional Time

The teen years are famously turbulent, which is why so many TV shows and movies revolve around high school. "Beverly Hills 90210," "Glee," "Love, Simon," and "Eighth Grade," all revisit the turmoil of these years.

The emotions that we experience as teens seem more intense than what comes later, and strong emotions make for strong memories and strong likes and dislikes - including the music we listen to.

These strong emotions are clearly related to changes in the brain's sensitivity to certain types of information during adolescence. Emotions signal the brain that important events are happening, and the teen years are chock full of important social feedback about one's skills, attractiveness, status and desirability as a mate.

So, there is nothing wrong with your parents because they do not like your music – it is the natural order of things. Having said this, I can say from personal experience that I developed a fondness for the music I was hearing when my own children were teenagers, so it may be possible to rehabilitate your parents after all.

And it may even be that listening to new music can help them avoid stagnation in one small corner of their life and it may also be good for their continued personal development.

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You can follow Prof. McAndrew on
www.psychologytoday.com or Twitter **@FTMcAndrew**

Parlari – The Speech of Fairground Folk

By Professor Graham Seal, www.gristlyhistory.blog

The collection of sideshows, amusements and diversions that appear on parks, commons and other open areas from time to time are usually known as *fairs*in Britain and as *carnivals*in America. Fairground folk in Britain have their own language, known as *parlari*(*parleyaree*, *polari*), probably spoken since the earliest formation of travelling fairs.

Strolling players, mountebanks, mummers and other such entertainers, often referred to disapprovingly as *knaves,*were on the roads of Britain in medieval times. Sometimes difficult to distinguish from sundry beggars and other itinerants, these acrobats, jugglers, fire-eaters, rope walkers, actors and the like performed wherever and wherever they were likely to earn a crust, preferably before the local authorities moved them on. These venues might be in properly built or makeshift theatres, at fairs and festivals or just on a street corner.

St Bartholomew's Fair, George Cruikshank

The nefarious reputation of fairs continued over time. A report from eighteenth century Essex tells of performers being jailed for 'dancing, conversation pieces, tumbling, and fiddling and, by means of a pretended lottery and other subtle craft, deceiving and imposing on many unwary subjects of his Majesty…'.

The most famous of the many fairs was Bartholomew's Fair, held several times a year in London until 1855. Southwark Fair was another London favourite, especially popular with sailors. In the seventeenth century it featured monkeys, then very exotic animals, an ass that walked a suspended rope and an Italian dancing girl.

In 1800 a continental visitor described one Bartholomew's Fair, claiming it was unique in Europe. The booths were many, all featuring a noisemaking crew referred to as a 'band'. Strolling musicians from the streets added their skills to the din, which was further amplified by the shouting of those who pretended no musical abilities at all.

There were menageries, roundabouts, open air shows and theatres, many of them converted local houses, where unusual plays were performed. The Punchy and Judy shows were there, of course, along with crowds of prostitutes. Bartholomew, and other fairs, were also frequented by men and women of the respectable classes looking for a little lowlife titillation. By most accounts, they usually found it. Many fairs of this kind were gradually shut down, or carefully regulated, by concerned local authorities and respectable citizens during the Victorian era.

But travelling fairs have a rich and continuing history in Britain, despite regular predictions of their demise. Writing on the history of fairs in 1874, Thomas Frost claimed that: 'The Nation has outgrown them and the last showman will soon be as great a curiosity as the dodo'.

Frost did not take into account the ability of show people to adapt to change, a talent that saw them rapidly adopt moving pictures after their introduction in 1896, as well as other good ideas from abroad. The popular fair attraction known as the 'Wall of Death', in which motorbikes are ridden in perpendicular fashion around circular walls, derives from the United States where it seems ›››

to have originated early in the twentieth century. The close-knit character of the fairground community was expressed in their special language.

In Britain, fairground language is often called *parlari* and has been spoken by show people for as long as anyone knows. In some versions it includes more than a smattering of Romany, Shelta and words borrowed from a variety of western European languages. The fairground itself is known as a *gaff*, cheap shows being known as *penny gaffs*.

Graham Seal is a writer, musician and historian. As Professor of Folklore at Curtin University, he has been interested in the relationship of history and folk tradition to Australian cultural identity. **www.verandahmusic.blogspot.com**

A *gaff*may also be a game that is designed to cheat its players, a usage also found in American carny. The *gaffer*is the boss of a fairground, a term that has passed into general English slang and used with the same meaning in American circus talk. A *gaff lad*is a male staff member resident at the fair and a *skippy*is a female staff member.

Erecting a tent is a *buildup*, accomplished with *kingpoles*, while the top or roof of a tent is a *tilt*. A *paper house*is a performance where most of the audience have been given free entrance to fill otherwise empty seats. A *spot*is a particular performance or act. A *Dobby*or *Dobby Set*is a merry-go-round with fixed seats, or a *galloper*if all the seats move up-and-down. *Dukkering*is fortune-telling. The word *slang*may be used as a verb meaning to perform, or as a noun, meaning a sideshow or circus tent. To *spiel*is to introduce an act or to announce information to the audience. This word also turns up in American carnyspeak and in Australian show lingo.

The close connection between the rumbustious entertainment of the fair and various forms of chicanery was one continued until almost to the present day. Crowds attracted pickpockets, thimbleriggers and other tricksters anxious to separate dull yokels up from the country or unwary townsfolk from their possessions.

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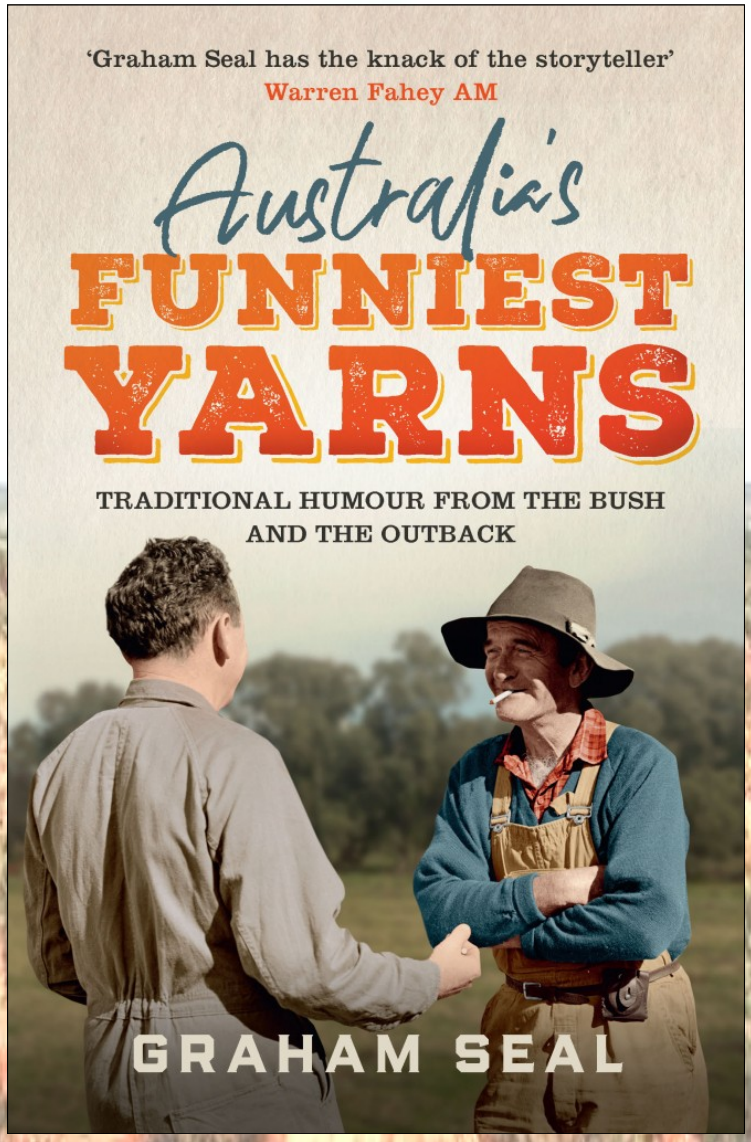
For more on the rich history and culture of fairs go to the National Fairground and Circus Archive **www.sheffield.ac.uk**



Australians traditionally like their humour irreverent, crude and with very sharp teeth.

Perhaps you've heard of the vicious drop bears that fall on unsuspecting tourists as they walk through the bush? Or the hoop snakes that put their tails in their mouths as they roll down the hill towards you? Or how about the Citizenship Test for Aspiring Australians which begins with this question about an essential life skill: 'How many slabs can you fit in the back of a Falcon ute while also allowing room for your cattle dog?'

The bush is the source of traditional Aussie humour. Pioneering, settlement and battling fire, flood and drought have produced yarns of tough cocky farmers, shearers, bush workers, swaggies and dreadful cooks. Much of this humour relates to the resilience and fortitude necessary to endure the realities of rural life. Australians took this sensibility with them to war and to work in the cities, and the tradition continues today.

Whatever the circumstances, Australians have always found something to laugh about, laugh at or laugh off.

www.allenandunwin.com

Working with Spiders

By Dr. Fiona Cross, www.doctorspider.net

When I grew up, I knew that I wanted to be a Zoologist (a scientist who studies animal biology), but I never thought I'd ever work with spiders! I used to be very afraid of them. A fear of spiders is known as arachnophobia, and I used to scream every time I saw one of these animals. Over time, though, I gradually learned more about spiders and now I like them a lot. I no longer feel afraid of them. In fact, I am currently working as an arachnologist (a scientist who studies spiders) at the University of Canterbury.

Learning about spiders can help us to better understand how important these animals really are. The world would be a very different place without them! There are over 45,000 known spider species around the world, living on every continent except Antarctica.

Dr. Fiona Cross: 'I am a prime example of someone who can overcome a fear of spiders and become fascinated by them!' **www.doctorspider.net**

There are lots of interesting spiders in New Zealand, but most of my work at the moment is actually based on studying the behaviour of some jumping spiders that live in Kenya. These animals may be very small and have tiny brains, but some use amazing strategies to capture their prey.

Even people who are afraid of spiders may agree that jumping spiders are actually rather cute. These little animals are harmless to people and they have eight eyes, including two big eyes at the front. There are over 5,800 known species of jumping spider and they are found in most places around the world, even Mount Everest! They vary in shape and size, and some are even covered in amazingly bright colours. But regardless of what a jumping spider looks like, there is one good way of telling you have found one. All you have to do is stare at a spider. If it turns and looks back at you with its two big eyes at the front, you have spotted one!

These two big eyes are called 'principal eyes'. Most other spiders see very poorly, but principal eyes help jumping spiders to see in some detail. This means that when a jumping spider turns to look at you, it really can see you! The other six eyes are called the 'secondary eyes'.

Secondary eyes are smaller and help jumping spiders to see movement.

We have jumping spiders in New Zealand and they can be found in many places such as in our backyards, schools and parks. Many New Zealanders are familiar with the 'house hopper' spider (scientific name: *Hypoblemum albovittatum*) which, as you may have guessed, is often found around houses. This means that it's possible to learn about jumping spiders right where we live!

Finding and catching jumping spiders

One of the joys of being an arachnologist is going into the field to collect spiders. It's just like going on a treasure hunt. Sometimes, you find many spiders and even new species. Other times, you don't find many spiders at all. It does take some time and patience to search for spiders and here are some tips for how we collect jumping spiders.

Mornings are usually the best time to go collecting, since jumping spiders may be less active ›››

and harder to find when it gets hotter later in the day.

A good spider to search for in New Zealand is the 'house hopper', which you may notice running across the outside walls of buildings. Other times, you may spot little silken nests in the nooks and crannies on outside walls. A house hopper may be resting inside one of these nests. I have also had success with finding house hoppers on a wood pile in my backyard and on the long leaves of some plants, such as an *Agapanthus*. You may prefer using disposable gloves if you are searching for spiders on plants, especially if you suffer from allergies.

Move very slowly and be gentle if you want to capture a jumping spider. They have good eyesight and will run away if they notice sudden movement.

Be especially gentle if you want to coax a spider out of its nest. I find it very helpful to use a small paint brush to lightly touch the nest. You may notice a small dark shape moving around inside the nest. The spider will escape its nest if you keep touching the silk.

A small paint brush is also very useful for brushing a spider into a small container. Hold the container in front of the spider and then gently brush the spider from behind.

After collecting a spider, it's a good idea to also put a small leaf in the container. The leaf can provide the spider with some moisture, which is helpful if you're going to be outside for a long period of time.

You might also like to watch how a jumping spider captures its prey. Most jumping spiders don't build webs but they actually hunt for their prey just like tiny cats. To see this, put the spider in a large jar and try collecting an insect, such as a fly, that is not bigger than the spider. Once you have put the insect in the jar, watch how the spider stalks and then pounces on its prey. This may take some time, but you will see how jumping spiders got their name!

Once you have finished looking at the spider you have collected, it is best to release it back where you found it.

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You can follow Dr. Fiona Cross via Twitter **@drspidernz** and Face Book **Fiona Cross - "Doctor Spider"** or visit her website **www.doctorspider.net**

Meet The Harpy Eagle, A Bird So Big, Some People Think It's A Person In A Costume

By Jonas Grinevičius and Justinas Keturka, www.boredpanda.com

Wow, now that's a big bird! That's the way most people react when they see a harpy eagle for the first time, whether in person or in a picture. The massive bird is, well, absolutely massive. Fierce. Proud. Majestic. Larger than life. With a steely glint in its eyes that practically says, "You'd better not mess with me, kiddo, I eat folks like you for breakfast."

"The harpy eagle is a bird of prey that lives in the rainforest, and it is *huge*!"
Photo credit: leon_moore_nature_experience

The harpy eagle is so peculiar that from one angle, it seems a bit like a person cosplaying a bird straight from the Uncanny Valley. From another, it looks like a Pokemon (please tell me that you see it too). While from a third, it looks like something that might have been kept in a secure cage somewhere in Area 51, after crash-landing in an alien spacecraft that was heading to Earth from Blargon-7.

Harpy eagles are popular on the internet. For example, one compilation photo of the harpy eagle got over 91,600 upvotes in less than 20 hours on Reddit. While the same picture got more than 120,000 views on Imgur in a similar time-frame.

Now, harpy eagles aren't to be taken lightly. They are, after all, birds of prey.

There are two kinds of harpy eagles: the American and the Papuan types.

Harpy eagles are the largest, most powerful raptors to be found in rainforests around the globe. What's more, they are among the very largest species of eagles on planet Earth. Their wingspan can reach up to 7 feet and 4 inches (224 centimeters), but they weigh only 8.5-20 pounds (3.8-9 kilograms).

Harpy eagles usually live in the upper canopy layer of tropical lowland forests. Unfortunately, due to the destruction of its habitat, it's nearly eradicated in Central America. There are fewer than 50,000 of them left worldwide. In Brazil, the harpy eagle is also known by another name (which might be even cooler): the royal-hawk.

According to Fact Zoo, harpy eagles eat larger prey than smaller birds: "Monkeys, tree porcupines, sloths, coatis, birds, snakes, lizards, etc." We're just glad that 'people' aren't on that list!

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Jonas and Justinas's article was first published on the website of Bored Panda, **www.boredpanda.com**

Harpy eagles look incredibly serious and goofy at the same time

Photo credits: Bjørn Christian Tørrissen
www.commons.wikimedia.org

The eagle's talons are nothing to laugh at!

Photo credits: Decorah Pagent
www.photobucket.com

This majestic bird can spot its prey from miles away thanks to the species' keen eyesight. After they set their sights on their intended target, the eagle will swoop in at great speeds, snatching them from trees mid-flight. In other words, if you're a monkey, these eagles are pure nightmare fuel.

www.hindustantimes.com

The bird has a very peculiar face

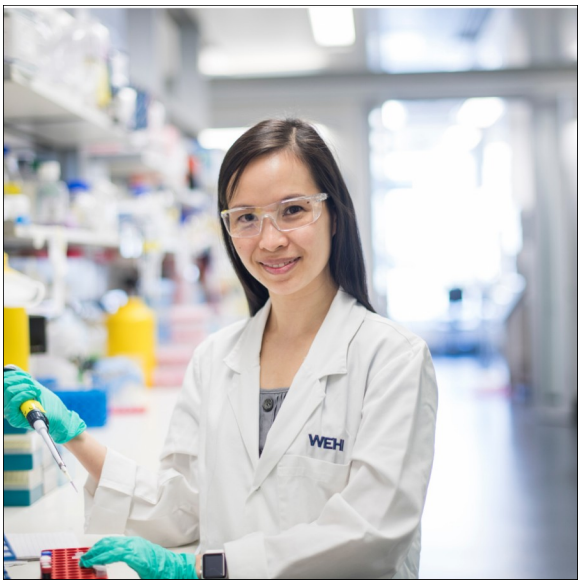
Photo credits: Colin Hepburn
www.flickr.com

Dr. Charis Teh - Immunologist and STEM Superstar

By Curious Kids Science, www.curiouskidsscience.com.au

Early life

Growing up in Borneo, Malaysia, Charis fondly remembers her family trips to the rainforest reserves and walks observing the wildlife including bats and monkeys. Ballet and piano were activities Charis pursued for more than 10 years. She was inspired by many people in her life including; her piano teacher, a wildlife conservationist, a doctor and a dedicated school teacher. All these people, key in the shaping of Charis's STEM career, were incredibly passionate about their work. Charis's wanted to have this passion in her own work.



Dr Charis Teh is a Senior Postdoctoral Fellow (i.e Trainee Scientist) thriving in the field of immunology. Even from a young age, Charis's creativity, involvement with nature and love of science were what she most enjoyed exploring.

Illness and its impact on life shaped some distinct memories from a very young age. Charis as well as other children she knew experienced infectious diseases like malaria, dengue and hand foot and mouth disease – diseases we barely hear about in developed countries! These experiences helped to shape Charis's commitment to forging a healthier future.

Starting a career

But how would she make a healthier future? She had a fear of blood and needles, and thought that meant she wouldn't make a good doctor. She began studying Science in University, not completely sure of what she wanted to do after school. At this point, Charis was only 17, and had taken an 8-hour flight to move to Australia all by herself.

In her first year of university, Charis was lucky enough to work with Dr Carolyn Behm who she felt connected to because of their common Malaysian ties. Most importantly, this opportunity opened up a whole new world of science research she had never known existed. They worked on a small project studying worms. Together, they made parts of worms glow green so they could look at their inner workings and this made her eager to do more research.

Finding a niche

Charis's interest in "making a healthier future" led her to the field of immunology. She wanted to impact many diseases across the globe that affected first to third world countries. The immune system is at the heart of so many diseases, so it was the perfect field for her to follow her passion. Every creature, from the simplest sponges to complex humans are hard-wired with an immune system. It elegantly orchestrates a complex defence response to invading entities like viruses and bacteria. Charis was fascinated by the millions of different cells that act together in the immune system and how it can sometimes go wrong. She has had a chance to be involved in projects that study the immune systems in relation to diabetes, infections and most recently blood cancers.

Currently, Charis works with a multidisciplinary of team clinicians (doctors), biological scientists and bioinformaticians with a common goal to try and match blood cancers to the best treatments. Charis understands the weaknesses of the current "one size fits all" approach to cancer ›››

treatment and that what may work for one patient, may completely fail another. The team is working towards an exciting era of "personalised medicine". This will see a shift in their capacity to tailor more accurate drug combinations for each patient. To achieve this, Charis's team gets a small tube of blood from patients and look for clues that tell them why the cancer cells keep growing and do not die. They try to work out what the best drugs are to kill the cancer cells.

This huge movement is only in its early days but with the cooperation of many teams working around the world, will hopefully soon become the reality of cancer treatment.

Travelling for work

An experience in her career that particularly stands out for when she decided to move to the USA and worked at Stanford University. Just like every person and job is unique, each place to work has a unique culture and holds the possibility of meeting lifelong friends. This already amazing experience was made even better through her exploration of Silicon Valley that was in close proximity to the university.

Silicon Valley is home to companies including Google, Apple, Facebook, Microsoft and Tesla all of which have drastically changed the world in some shape or form in the last 10 years. These companies introduced us to the phenomena of social media, e-mails, Google maps and electric cars, many of which we use on a daily basis. This was a place Charis saw her passion grow.

Passion is contagious and she felt amazed at living in a place where people invested in discovering and inventing new ideas. Simply buying a coffee or taking the bus to work was made enjoyable as Charis could overhear conversations of people discovering the ways they wanted to make a difference.

Charis puts a lot of faith in the brilliant minds and talents of people working in STEM and believes through their cooperation, they make big differences in the way we do things. She was able to master a unique technology that allows us to study millions of cells from patients, and reveal where they have been and who they have been talking to. She has now brought the knowledge back to Melbourne and is using it better match blood cancers to its treatment.

Looking to the future

Charis's aim for the future is to make the world a healthier place for her 1.5 year old daughter and her generation. Charis dreams big and works even harder to reach those goals. She hopes that her influence will be beyond the lab bench, instead, making an international change. Charis knows her journey is just beginning and she feels excited that so many people share her desire to make a healthy change. To young people interested in a career in STEM, Charis begs you to explore things that excite you "*use Google, ask your parents and people around you, reach out to experts on Twitter. Foster your passion*".

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This article was original published on the website of Curious Kids Science, **www.curiouskidsscience.com.au**

Space Place Experiment Center

What type of experiment would you like to do?

The Space Place Experiment center will help you conduct real life science experiments and learn how the world works. Whether you were sent here by your teacher or you found this on your own, you're going to have some fun! **www.spaceplace.nasa.gov**

Baking Sunspot Cookies

Even when the sun appears to be shining as brightly as ever to us, it sometimes has some dark spots. They're called **sunspots**. They can happen when the magnetic field of the sun changes slightly in some places. These spots are a little colder and darker than the surrounding area.

The **sunspots** can last for a few days or even a few months. During that time, they move across the surface of the sun and change in size, growing and shrinking as they go. But the sunspots eventually go away. Now you can make sun cookies with little sunspots on them. Real sunspots aren't made of chocolate, but on these sunspot cookies they are. And they're delicious.

For the cookies:

3/4 cup flour, plus extra for rolling out the dough
1/2 teaspoon baking powder
1/4 teaspoon salt
1/4 cup unsalted butter, softened
1/4 cup sugar
1 egg yolk
1/2 teaspoon vanilla

For the icing:

1 1/2 cups powdered sugar
3-5 teaspoons milk

Go to **https://spaceplace.nasa.gov/sunspot-cookies/en/** and find out how to make these cookies. Enjoy your delicious sunspot cookies with family and friends.
Don't forget to tell them what sunspots are.

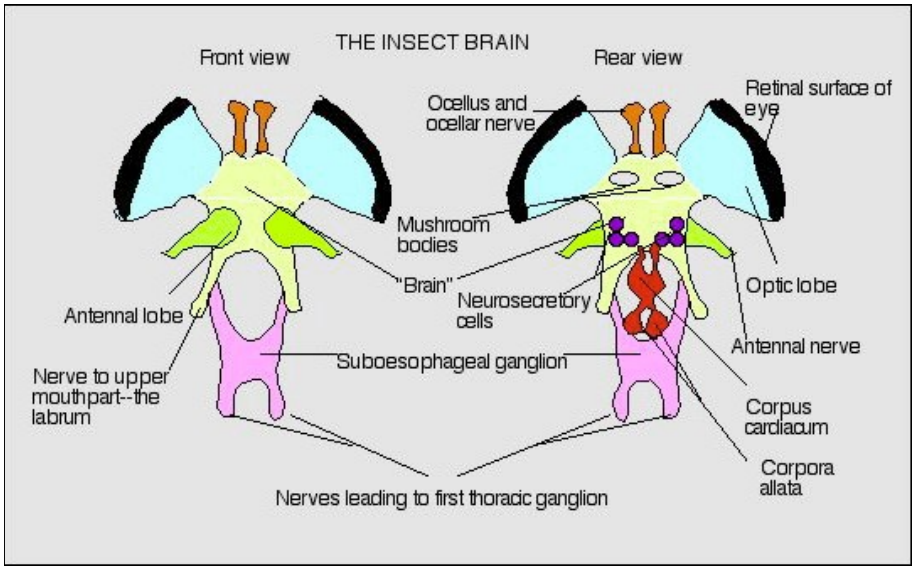
Insect Brain Capable of Conscious Subjective Experiences

By Professor Marc Bekoff Ph.D. www.marcbekoff.com

If insects could talk to us what would they tell us about consciousness?

I love receiving information about what some might call "surprising" scientific discoveries. A recent essay called "If insects have consciousness, what then?" by renowned philosopher Peter Singer came across my screen and I am thrilled that it did. I also wrote about this topic in "What Does It Feel Like to Be a Honeybee?"

Numerous researchers and non-researchers are interested in the evolution of consciousness and want to know the taxonomic range among nonhuman animals (animals). While a few scientists and others still wonder if other animals really are conscious, the consensus is that they are and that the important and most interesting question at hand is not *if* they are conscious but rather *why* consciousness has evolved (please see for example, "Scientists Conclude Nonhuman Animals Are Conscious Beings" and other essays about The Cambridge Declaration on Consciousness).



Even among those who are willing to grant some form(s) of consciousness to mammals and other vertebrates, many stop short of attributing consciousness and subjective experiences to invertebrates. But this might be a very narrow view of the taxonomic range of consciousness in nonhumans. In the essay mentioned above, Dr. Singer writes, "Insects have a central ganglion that, like a mammalian midbrain, is involved in processing sensory information, selecting targets and directing action. It may also provide a capacity for subjective experience." He relies on an essay by Drs. Andrew Barron and Colin Klein called "What insects can tell us about the origins of consciousness" published in the prestigious journal *Proceedings of the National Academy of Sciences.*

The abstract for this groundbreaking essay reads: How, why, and when consciousness evolved remain hotly debated topics. Addressing these issues requires considering the distribution of consciousness across the animal phylogenetic tree. Here we propose that at least one invertebrate clade, the insects, has a capacity for the most basic aspect of consciousness: subjective experience.

In vertebrates the capacity for subjective experience is supported by integrated structures in the midbrain that create a neural simulation of the state of the mobile animal in space. This integrated and egocentric representation of the world from the animal's perspective is sufficient for subjective experience.

Structures in the insect brain perform analogous functions. *Therefore, we argue the insect brain also supports a capacity for subjective experience. In both vertebrates and insects this form of behavioral control system evolved as an efficient solution to basic problems of sensory reafference and true navigation*. The brain structures that support subjective experience in vertebrates and insects are very different from each other, but in both cases they are basal to each clade. Hence we propose the origins of subjective experience ›››

can be traced to the Cambrian. (my emphasis) So, just when we think we know it all, along comes a serious discussion about the evolution of consciousness that should motivate us all to reconsider just who is conscious and why it has evolved. And, of course, the question also arises what should we do with this information in terms of how we treat them. If insects could talk to us they just might be saying treat us with more respect and stop harming and killing us, by the countless billions.

Please stay tuned for more on this fascinating and very important topic. While we are unique in certain ways, it's becoming clearer that we are not the only conscious beings and that many other animals share the capacity for subjective experiences.

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This article is original published on Psychology Today, **www.psychologytoday.com**

What is the brightest star in the sky?

The brightest star in the sky is Sirius, also known as the "Dog Star" or, more officially, Alpha Canis Majoris, for its position in the constellation Canis Major. Sirius is a binary star dominated by a luminous main sequence star, Sirius A, with an apparent magnitude of -1.46. Sirius A's apparent brightness can be attributed both to its inherent luminosity, 20 times that of the Sun, and its proximity. At just 8.7 light years away, Sirius is the seventh closest star to Earth.

www.skyandtelescope.com

How are stars born?

A **star is born** when atoms of light elements are squeezed under enough pressure for their nuclei to undergo fusion. All **stars** are the result of a balance of forces: the force of gravity compresses atoms in interstellar gas until the fusion reactions begin.

www.scientificamerican.com

What are stars?

Stars are giant spheres of super hot gas made up mostly of hydrogen and helium. Stars get so hot by burning hydrogen into helium in a process called nuclear fusion. This is what makes them so hot and bright. Our Sun is a star.

www.ducksters.com

Can You Train Yourself to Develop 'Super Senses'?

By Dr. Harriet Dempsey-Jones, www.ndcn.ox.ac.uk

Wouldn't it be great to be able to hear what people whispered behind your back? Or to read the bus timetable from across the street? We all differ dramatically in our perceptual abilities – for all our senses. But do we have to accept what we've got when it comes to sensory perception? Or can we actually do something to improve it?

Differences in perceptual ability are most obvious for the more valued senses – hearing and vision. But some people have enhanced abilities for the other senses too. For example, there are "supertasters" among us mere mortals who perceive stronger tastes from various sweet and bitter substances (a trait linked with a greater number of taste receptors on the tip of the tongue). It's not all good news for the supertasters though – they also perceive more burn from oral irritants like alcohol and chilli.

My research looks at how we can enhance our sense of touch through repeated exposure and training, known in the field as 'tactile perceptual learning'. **www.ndcn.ox.ac.uk**

Women have been shown to be better at feeling touch than men. Interestingly, this turns out not to really be a gender thing at all, but rather down to having smaller fingers. This means touch receptors that are more closely packed together, and therefore the possibility for perception at a finer resolution. Thus, if a man and woman have the same sized fingers, they will have equivalent touch perception.

Perceptual learning

The sensory receptors on our body largely set a limit on what we can perceive. However, this is not the end of the story. Our perception is much more malleable than you might expect. The scientific field of "perceptual learning" is helping us to understand perception and, therefore, how we can enhance it. This research reveals that, in the same way we can train to improve skills such as sports or languages, we can train to improve what we can see, hear, feel, taste and smell. In a typical sensory training, the trainee is presented with a range of sensory stimuli that vary in how easy they are to perceive. Taking touch as an example, these might be bursts of vibrations on the fingerpads that vary in frequency (how fast they pulse).

The trainee usually has to make a judgement about the two stimuli, such as whether they are the same or different. Typically, this starts with easy comparisons (very different stimuli) and gets successively harder. Feedback on whether a response is correct or not significantly improves learning, as it allows people to match what they see/feel with the properties of the actual stimuli.

It was long thought that you could only improve your perception by this explicit training, but it is also possible boost perception without actively doing anything or even realising it is happening. In one incredible example, scientists trained participants in a brain scanner to generate a pattern of brain activity matching what would be seen if they were looking at particular visual stimuli. They gave them feedback on how well they were generating this pattern – a process known as "neurofeedback".

By the end of training, participants were asked to identify various visual stimuli including the one they had "seen" in training. It turned out they were faster and more accurate in reporting the stimulus from the training despite having not physically seen it. Talk about inception. ›››

Dramatic results

But how much can we expect our senses to improve? That largely depends on how long and hard you train, and how effective your training is. It can be substantial: in our studies, touch training has produced improvements of up to about 42% of participants' original acuity, from just two hours of training. What is surprising is that some studies report enhancements of perception into a range beyond what the sensory receptors should allow – into the "hyperacuity" range.

For example, in vision, people are actually able to see at a finer resolution than the spacing between individual receptors in the eye. You can think about this in the terms of pixels in a photo – the more pixels you have, the more details you can see. In the case of hyperacuity, people can see better than the pixel resolution should permit (with similar findings across the senses, including touch and audition).

Some superpowers can even be learned: Echolocation, for example, is the ability to sense where objects are in space by detecting how sound bounces off them. Bats and dolphins have this ability, and so do humans.

Photo credit:
Pesky Monkey/Getty Images

So how on Earth can this occur? It's due to clever processing in the brain: our brains look across the whole grid of receptors to determine where the "centre of gravity" of the image falls – revealing position and shape by the spatial clustering of information on the grid. In fact, a surprising amount of perception turns out to be determined less by the receptor organ than by the brain.

For instance, training your vision to improve does not do anything to alter the photoreceptors in your eye. While all the same sensory information is getting into the system through these receptors, the training allows the brain to filter out noise and more effectively "tune into" the sensory signal.

Another piece of evidence that learning can't be happening at the level of sensory receptors is that sensory learning *spreads*. For instance, if you train perception to improve on one finger of the hand, this learning miraculously spreads to other fingers that are linked in the brain.

The fact that we can train our brains to improve the way we extract sensory information from the world really is good news for all of us. Not least because our sensory perception declines as we age.

On the upside, savvy tech developers and scientists alike have been hard at work franchising this idea – using concepts of perceptual learning to create brain training apps. These apps cannot *overcome* the problems of sensory degradation caused by faulty or ageing receptors (and some are ineffective or based on dubious science). However if designed correctly, they can give you a significant boost. There is even some evidence that such sensory training programmes can translate to real world benefits, such as visual training boosting baseball performance.

Some are already available on the web, such as UltimEyes – an app designed by perceptual learning researchers at University of California in Riverside. The also have an auditory training prototype in crowdfunding, and other groups are following suit. Maybe soon we will have the power to modify our own sensory perception in the palm of our hand (well, in the phone in the palm of our hand).

With rapid scientific progress we move towards fantastic opportunities to maximise the function of our senses, aid rehabilitation for people who've experienced sensory loss and just generally become more awesome.

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This article was original published on The Conversation, **www.theconversation.com**

Inspiring Technology That Came from Copying Nature

By Maria Anna van Driel, www.nexttruth.com

The natural world is full of incredible feats of engineering and well-adapted structures and materials honed to near perfection over geological time through natural selection. Given nature has the benefit of millions of years of trial resulting in tackling problems such as self-healing abilities, environmental exposure tolerance and resistance, hydrophobicity, self-assembly, and harnessing solar energy, it is logical that human construction can benefit in drawing from its influence.

The Pyramids, skyscrapers, airplanes, the electrical car, and Velcro tape…believe it, or not, some of the tools, vehicles, and products that you see, and use, on a daily basis have been inspired by animals and nature, innovations that have changed the world for the better and have made your life a little bit easier.

The modern concept of the robot began to be developed with the onset of the Industrial Revolution but despite the incredible ingenuity and engineering ability we have demonstrated during our existence, we are continually looking for new inspiration and ways to improve our designs so that we can manufacture our own versions of these biological marvels.

This approach to human innovation, via emulating nature, is called "biomimetic design" and has inspired many of our greatest creations. In short, biomimicry is the process of taking the innovations that exist in nature and applying them to technology. It seems that nature has a solution for almost everything.

"Looking at the engineering of nature, there is no creature born with wheels what makes the contemporary wheels exploration based robots lesser in its effectiveness when reconnoiter unknown environments. That's why we selected an eight legged robotic device which is meant for exploration of extraterrestrial objects like asteroids," Ass. Prof. Iztok Kramberger, PhD, explained The Next Truth magazine during an interview at the Space Tech Expo 2019 in Bremen, Germany.

Ass. Prof. Iztok Kramberger is an electrical engineer from the University of Maribor. His work includes many contributions, original scientific articles, socio-economically relevant achievements and patents. He has received the Best Researcher Award, according to the Economics of the University of Maribor. **www.um.si**

Electrical engineer Ass. Prof. Iztok Kramberger (47) is heading the Laboratory for Electronic and Information System at the Faculty of Electrical Engineering and Computer Science at the University of Maribor and is the mastermind of a spider-looking-like robot 'SARA' (Slovenian Arachnid Robot Adventurer) from both an artistic point of view and a hardware engineering point of view.

SARA (Slovenian Arachnid Robot Adventurer) is still in the phase of being a prototype but the unbeatable get-up-and-go mentality of the researchers from the Slovenian research institute Skylabs pushed them in working day and night on the complex electronics of this incredible spider robot, what is based on a biomimetic design, for the past 7 years. SARA's skeleton construction is nature inspired and its algorithms for the optimization of the structures and, when completely stretched, has a diameter that can reach over 2 meters.

"The joint ratios of SARA have been evolved from Theraphosidae spiders, where the central body is more or less an oval form with a larger ›››

diameter of 40 centimetre. Each leg, when stretched fully, measures up to 90 centimetre. Nevertheless, it is not all about its dimensions as it can be scaled to an applicable size using more or less same intelligence," Ass. Prof. Kramberger said.

Still, even the scientific research conducted in the field of electronics and communication technologies at Skylabs, have been pushing the boundaries in the art and science of designing and building an amazing biomimetic apparatus since 2012, some technological and funding setbacks what, to a small degree, prevented SARA's progress, where for Ass. Prof. Kramberger and his team no unusual experience. These setbacks where not forming a solid brick wall for the researches at Skylabs, it encouraged them to focus on evolving and improving the project even more.

"There were and are still several problems to be solved before SARA will be able to walk nature wise and completely autonomous. One of the challenges were to construct an appropriate skeleton and to solve the control by a fully distributed data handling system, while consuming lots of energy remains an issue," Ass. Prof. Kramberger explains later in an email.

The integration of the main intelligence including Time-of-Flight and visual cameras of the head for purpose of autonomous orientation and navigation is targeted for mid of 2020. *Photo credits: Skylabs*

To address the second challenge of congenital natural movements Skylabs research team focused on distributed control algorithms using a fully distributed data handling system being based on SkyLabs' PicoSkyFT technology.

"PicoSkyFT, Ass. Prof. Kramberger continues, is an ultra-small and high performance Fault Tolerant microcontroller processing core what provides the capability to integrate the control intelligence into all joints and interaction sensors of the platform giving it the ability of fully synchronous control operation. Merge it with the central Artificial Intelligence or the main brain of SARA, including additional imaging sensors for environmental awareness, we get a completely autonomous legged walker."

The third biggest challenge, so explained Prof Kramberger, is the power consumption. While comparing it to general rovers the power consumption is much bigger.

On the strength of the torrent of ideas and experiments Skylabs researchers have run over the past 7 years with robots whose appearance has nothing in common with those as though of as if they came from the dollar store and flap their little arms like beetles stuck on their backs, the spider-looking-like robot SARA can move through rough terrain effortless. Also, its communication skills is pointing toward a connection with any known wireless technology ranging from personal area networks to wide area networks and is tested in an, by Skylabs created, environment, similar to that of Mars, for a future swarm based exploration of extra-terrestrial bodies.

"The selection of the wireless communication technology depends on the target application," As. Prof. Kramberger continues to write in his mail. "When discussing swarm based exploration missions we are combining the developments SkyLabs' inter-satellite communication modules providing robust and Fault Tolerant communication between the devices and an orbital gateway like the Moon Gateway."

Currently the research team from the Slovenian institute Skylabs is developing SARA's head ›››

which will be full of cameras in order for the biomimetic apparatus to scan its environment in a similar manner as natural evolved spiders can. When asking Ass. Prof. Kramberger if he has calculated the possibility for his eight legged spider robot to undergo an evolution in behavior through machine learning and therefore gains the capability to act territorial as real animals do in nature, he assured us that a though as such lies more in the realm of science fiction.

"We are targeting SARA's first unmanned mission to an extra-terrestrial body like the moon providing more deep autonomous swarm based exploration by putting several interlinked devices to Moon acting as robot based population but AI can only be as smart as people are. They can be faster but will posses not more intelligence," Ass. Prof. Kramberger responded.

It seems that these incredible robots of the future are going to be the best possible user interface for, among others, AGI systems to interact with humans and interact with the world. But AI will not be restricted to biomimetic designed robots. AI will "live" in all sorts of embedded devices and the Internet of Things.

It will go into space and down to the bottom of the ocean before we humans will physically set foot on the surface of a new moon or planet. We need to have some data about its environment first what is a logical line of thought. A pre-exploration with low-cost biomemitec designed robots, which do not require water and converts sunlight into energy, is by far the safest way in assisting research institutes like ESA, NASA, Roscosmos, JAXA and CSA, for example, and guiding future astronauts during their deep space missions.

Indeed, it's been an uphill struggle for decades but robots and artificial intelligence (AI), scary as it sounds, has become part of the furniture in engineering and our daily activities and researchers are rapidly learning how to control these biomimetic systems so that they function in a manner similar to swarms of bees or colonies of ants while exploring any new terrain which is out there in the cosmic freezer but yet unknown to us.

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For more information on Skylabs and SARA: **www.skylabs.si**

What Happens When We Prejudge the New Emotional Robots?

By Professor Kevin Bennett Ph.D. www.beaver.psu.edu

Can research psychologists use traditional measurement techniques to measure personality, group behavior, and other typical "psych things" on robots? Yes. And it turns out that many of the perceptions we form and biases we hold in creating first impressions also apply to the world of robots.

Recent research suggests that we project personality characteristics on to robots based on physical characteristics, how they sound, and what function they serve. In general, when we anthropomorphize, or give human-like qualities to an inanimate objects, we feel emotionally closer to that machine. But this only works up to a point. In some cases, animating an object does not work in the long run. Remember "Clippy" the Microsoft Office Assistant (also known as the Microsoft paperclip)? He was cute for several moments until he quickly became utterly unbearable.

So why do we not just build a robot that looks just like a human, but without the nuisance factor? One difficulty is that eventually you run the risk of falling into the uncanny valley. This is a spot on a graph at which the robots seem so human-like it becomes eerie. Up to a point we prefer human-like traits in robots until the robot becomes almost indistinguishable from humans (e.g., clowns are sometimes scary).

Prof. Kevin Bennett, PhD, is a Teaching Professor of Social/Personality Psychology at The Pennsylvania State University, Beaver Campus. He is the coordinator of the psychology program and runs the Personality and Human Performance Lab (PHPL) on campus.

Measuring Psychological Features of Social Robots

As of 2018, a little over 1000 studies have been conducted on meaningful robotic-human interactions (i.e., social robots). According to findings presented at the 2018 Technology, Mind & Society Conference by Stanford University researcher Jeff Hancock, nearly all of these studies focus on one robot at a time. His research team, including Sunny Liu and directed by Byron Reeves, looked at 342 robots in a single study and asked people to evaluate the personality of each robot.

Based on photographs, participants assigned personality ratings to robots.

Some were cute, some were furry, some were very metal and mechanical. Robots come in all shapes and sizes, and this was the first known study to show all 342 "social robots" together

Viewing Robot Personality Through a Stereotype Lens

The Stereotype Content Model (Fiske, 2002) proposes that across cultures people initially classify others along two dimensions of personality (warmth and competence). Research by Fiske et al. (2002) suggests that we use two broad dimensions to evaluate people during typical interactions: warmth and competence. This groundbreaking research that helped psychologists understand how we form perceptions of others is now being applied to the psychology of robot personality.

For example, a very talkative and physically ›››

cute robot is likely to be seen as friendly and approachable. Another robot might look strong and physically imposing. Based on this, we ascribe personality traits. It turns out that the way in which we ascribe personality to robots matches up closely with the way that we classify people when we use stereotypes.

When subjects were asked to rate the robots along dimensions of warmth and competence, the researchers found that perceptions differ depending on how they look. Combinations of scores on the warmth and competence dimensions produced four categories of personality.

Prof. Bennett's research, *psychological science at the intersection of urban design and mental health*, addresses three big questions: **(1)** What are the meaningful ways in which people differ in personality, emotion, and decision making across physical spaces? **(2)** What are the root causes of these individual differences? **(3)** What are the important outcomes of all this?

A combination of warmth and competence, the gold standard in robot design, was associated with desirable social partners. Robots in this category were agreeable and they seemed to know what they were doing so they could function appropriately to accomplish goals.

Other robots were lacking in warmth, but they were perceived as very competent. These are very muscular looking robots who look like they could execute a physically demanding task with ease. Some robots were lacking in competence but they made up for it in warmth. These are cute, cuddly, sometimes fuzzy robots. Often with big eyes and a child-like features, they do not seem overly competent but they sure are warm and cuddly.

The final group is lacking in both warmth and competence. They were perceived as lazy and disinterested in others. Mechanical in disposition, but without any real function, these robots look like weird, useless devices.

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This article was original published on Psychology Today, **www.psychologytoday.com**

How do Ripples Form and Why do They Spread Out Across the Water?

By Professor Simon Cox, Aberystwyth University

When I was playing "splash rocks", I noticed that when I threw the rock into the river it made a circle shape, which got bigger. How does it make the ripple? Why do the circles spread out further and further? Why do they stop? – Rowan, aged six, UK.

Hi Rowan, these are good questions, and a fun experiment to do. When you throw a rock into a river, it pushes water out of the way, making a ripple that moves away from where it landed. As the rock falls deeper into the river, the water near the surface rushes back to fill in the space it left behind.

The water usually rushes back too enthusiastically, causing a splash – and the bigger the rock, the bigger the splash. The splash then creates even more ripples that tend to move away from where the rock went into the water.

When water is in its calmest, lowest energy state, it has a flat surface. By throwing the rock into the river, you have given the water some energy. That causes the water to move around, trying to spread out the energy so it can go back to having a still, flat surface.

This follows a powerful principle of physics, which is that everything seeks to find a state where its energy is as small as possible. One way energy can move around is by forming waves. For example, the waves you see at the beach are formed by energy from the wind.

Light and sound also move in waves, though we can't see that directly. And the ripples that you see in the river are small waves carrying away the energy from where you threw the rock.

Up and down

You might already know that everything you can touch is made up of lots of tiny molecules, which are themselves made up of even smaller parts called atoms.

Prof. Simon Cox is head of the Department of Mathematics at Aberystwyth University, UK. Photo credit: Learned society of Wales

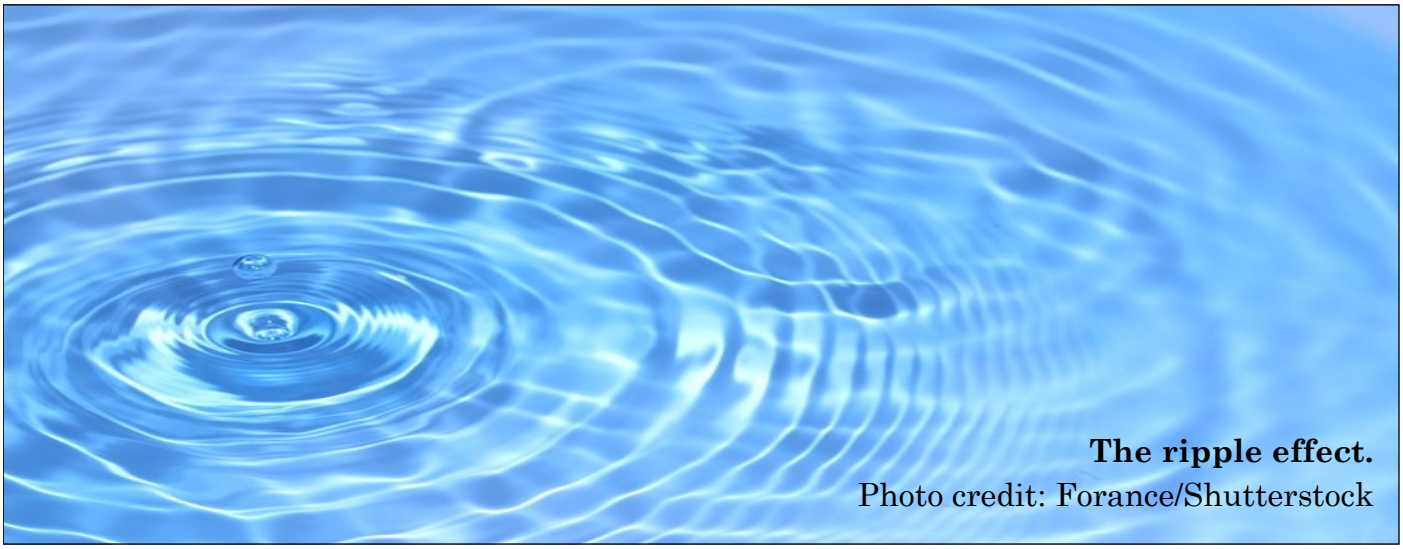
Water is also made of molecules. But during a ripple, the water molecules don't move away from the rock, as you might expect. They actually move up and down. When they move up, they drag the other molecules next to them up – then they move down, dragging the molecules next to them down too.

That's what creates the peaks and troughs you see on the surface of the water. And that's how the ripple travels away from your rock – a bit like a human wave around a stadium.

Dragging neighbouring water molecules up and down is hard work, and slowly uses up energy, so the ripples get smaller as they get further away. Eventually, the ripples use up all the energy from the rock and the splash, and shrink until we can no longer see them.

Rippling out

Ripples often spread out in circles, but this ›››



The ripple effect.
Photo credit: Forance/Shutterstock

isn't the only possibility. If you throw a stick into the water it will create straight ripples on the sides, and round ripples near the ends. So your rock probably made circular ripples because the rock itself was quite round.

But something else is happening too: different waves move at different speeds. Waves with a lot of energy move more quickly. For example, really big tidal waves, or tsunamis, race across the ocean as fast as a plane flies (up to 800 kilometres per hour).

When you throw a stick into the water, the ripples from the middle of the stick eventually catch up with the ripples from the ends, because of the different ways they spread out. So far away from the stick, the ripples are round … just like they were for your rock.

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