Time

We would like to dedicate this newsletter to the truly amazing Dr Grist who inspired us all with our Chemistry and will never be forgotten within the walls of King's High.

Thank you, Dr Grist

Time

Café Scientifique Newsletter

Spring Term

Contents:

Welcome to Café Scientifique's Spring Term newsletter. As British Science week falls within the Spring Term, we chose Science Week's theme of 'Time' as the central focus of this newsletter. This edition of the newsletter features articles on the application of time in the various different fields of Science and an update on some of the British Science Week event that took place between the 7th and 17th of March.

Café Scientifique Podcast!

We would also like to take the opportunity to remind you to listen to the 'Café Scientifique Podcast' which can be accessed via Planet eStream using this link:
https://warwickschools.planetestream.com/View.aspx?id=109052~60~9vmsVaEZSqbd

Time spent on Science at King's

During the Spring Term, many events were held at King's High to celebrate British Science Week. Two of the most notable events were the King's High and Warwick School Science Fair and the talk given to KS4 and KS5 pupils by Professor Miriam Gifford. This section of the newsletter will provide further details about these two events.

MAKING TIME FOR SCIENCE WITH THE SCIENCE FAIR

The 8th March saw the annual Science Fair held at Warwick Hall, with amazing and wide-ranging projects on display.

The Science Fair was a joint event between King's High and Warwick School, so there were many projects to visit from both schools. Tommy in Year 9 at Warwick School produced a project on extracting strawberries from DNA. It was a really intriguing project, particularly as DNA is the building block of life itself. It was very interesting to learn therefore that we share 60% of our DNA with a strawberry.

Dylan, Tony and Anson built a model catapult out of popsicle sticks, elastic bands, superglue and a bottle cap to test how 3 different factors affect the distance travelled by a projectile in their catapult. They looked at 3 different factors which were the mass of the projectile, the height the projectile was launched from and the angle of the projectile launched from.

Dylan stated: 'I have enjoyed learning about catapults and working with others in a scientific and fun way. I have learnt about the physics behind different materials and how different factors vary the distance a projectile travels when being launched by a catapult.' Tony enjoyed the 'atmosphere of Science'.

Overall, this was a very interesting project. Also on the theme of Physics, Oliver in Year 9 looked at logic gates and made a 4-bit binary adder. This project received lots of positive feedback.

Issy and Helena in Year 7 produced a fascinating project on the development of a baby inside and outside of the womb, including their early childhood, illnesses that babies can get and the food which they have. Time management was very effective in the formation of this project, as despite only having a week to complete it in full, the final product was eye catching.

Sophie, also in Year 7, produced a very topical project, spanning both Science and Computer Science on whether AI could take over the world. She used theoretical concepts and experiments to present her project, finding the Turing test particularly interesting. This is a concept that helps to deal with the question of whether machines can think. For more information, here is a website:

https://plato.stanford.edu/entries/turing-test/

Clara in Year 8 completed a project on our taste buds, using flavoured drinks as an example. The project centred around whether, without seeing the drink, we could work out what flavour it had. This project was very engaging, with Clara providing samples of these drinks to test our taste buds. She also talked about the process of sterilising water for sale and how in the UK it is illegal for people to not have access to safe drinking water.

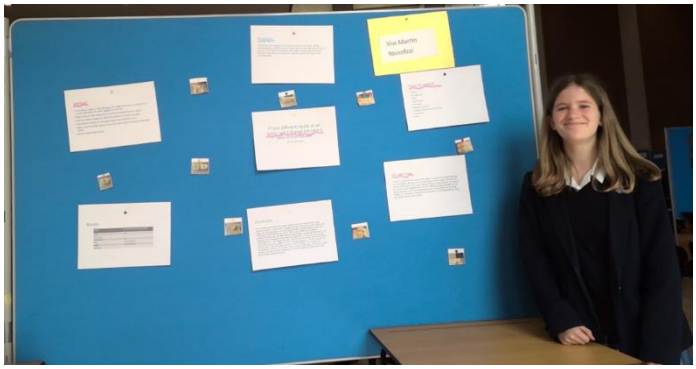
We also visited Sasha in Year 7's very colourful and eye-catching Science fair project board. Her project was on the viscosity of household materials based on their particle arrangement. She completed her practical live which meant we were able to watch it too. Tomato ketchup, honey, shampoo and conditioner were used, and it was interesting to hear her thoughts on the effect of temperature on viscosity and how honey was more viscous than shampoo.

Finally, Vivi did her project on the effect of different liquids on the discolouration of apples, including liquids such as honey. Her results were very well-presented and it was interesting to see how different liquids had an effect on the time it took for discoloration of the apple. I did not know that an apple could discolour itself so quickly!

Overall, the Science Fair this year had some amazing projects on display. If you are feeling inspired by these projects, perhaps you can start thinking about a project you may want to do for next year's Science Fair.

Feedback collected by Lucy and Amelia

Feedback written up by Lucy



TALK WITH PROFESSOR MIRIAM GIFFORD: TESTING TIME – RESEARCH INTO THE PLANT'S CLOCK

On Wednesday 13th March Professor Miriam Gifford gave a fascinating talk, delving into the research her and her team do at Warwick University. Research science involves building upon discoveries already made, and Gifford described it as a jigsaw puzzle with missing pieces. When doing the research, they also investigate the real-world impacts of it and how they can address global challenges.

Gifford led us through the details into the research of legumes and a specific protein, called the CLE protein, a signal protein which sends messages around the plants, and they are then recognized by a receptor. This protein is found in 99.7% of legume species, and scientists had previously done research on a legume which just so happened to not contain the CLE protein, meaning the research was not accurate to all other legumes! Gifford and her team did an experiment on the legume Medicago which contained the CLE protein and were looking for genes acting as a stop signal (they stop protein synthesis happening within a cell).

The plants were placed into three different nutrient filled soils: poor soil, average soil, and rich soil. These contained a bacteria called rhizobia bacteria which works in symbiosis with the Medicago plant and found that the plant controls the amount of symbiosis (which is when two different species work together to benefit each other) between itself and the bacteria. In another test they did they found that some genes are higher, or expressed in the daytime, whereas others where higher at night; an example of this is the petunia flower which emits volatile scent compounds at night to attract nighttime pollinators.

This symbiosis links to the plants clock as the plant is amazingly able to coordinate the exchange of nutrients and the plant and bacteria's activities (the bacteria are housed in nodules of the plants roots!). In another experiment the researchers mutated the plants clock by having 24 hours of sunlight then 24 hours of darkness for example, and changed the plants rhythm and found that when mutated the roots were affected. The nodules in the roots (where bacteria are found) were smaller, and therefore impacted the symbiosis of the plant and bacteria!

This was an incredibly interesting talk by Professor Miriam Gifford, and it was a fantastic opportunity for people to discover more about what researchers do and how cool and clever plants really are!

Student Article by Bella

Q&A WITH PROFESSOR MIRIAM GIFFORD

Question: What A-levels and degree course did you take?

Answer: I took Biology, Chemistry and Physics, then studied Biological Sciences with a specialism in Plant Science. I originally was going to specialise in Genetics but then became fascinated by plants in the first year at University!

Question: What advice would you give to aspiring students looking to study and have a career in Science?

Answer: Reading popular science magazines like New Scientist or listening to podcasts such as The Life Scientific can help you explore your interests and give you great up-to-date knowledge that you can talk about. Importantly this also helps you see links with different subjects which will help you work out which direction to take – despite the fact that biology is the most interesting subject (of course) it is useful to see how it can be used with chemistry, for example, to develop new antibiotics.

Question: When did your interest in plant responses and the plant circadian clock begin?

Answer: Since University I was interested in how plants respond to extreme and challenging environments, despite being relatively fixed in position!

I started studying genetic 'plasticity' – how different genes can be quickly controlled so that plants can do this. When we studied how quickly they adapt we discovered the link to the plant's timing mechanism, the circadian clock, which has opened up a new area of research for my group.

Question: Could you provide me with an example of where your field of expertise is evolving in response to new scientific theories and discoveries?

Answer: One of the areas we study is how plants work with microbes in the soil; this can increase their growth. If we can understand this better we can use it to increase crop production – something very important – but the microscopic nature means it is hard to pinpoint what is doing what. In the last few years the methods to identify which microbes are in the soil have advanced dramatically, meaning this is now becoming possible.

Question: This year's theme for International Women's Day was 'Inspire Inclusion'. What can be done to increase the representation of women in STEM and decrease the global gender gap in this field?

Answer: This is a great question and exactly what colleagues across STEM are trying to do. In the study of Undergraduate-level biology we

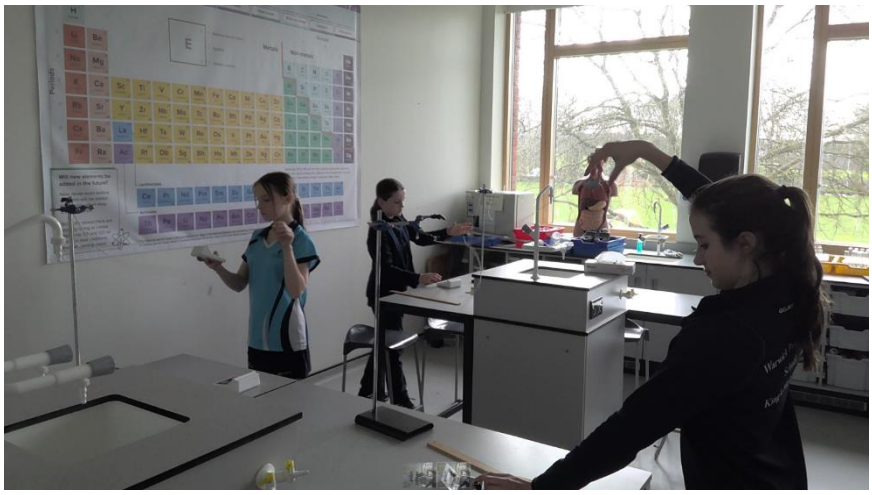
tend to have a larger percentage of female students than in the past, which is good to see, but we also need them to stay in scientific research. Highlighting scientific discoveries made by women can help to inspire others and at Warwick we make sure there is a lot peer mentoring at early career stages to help women to realise the impact that they can have.

Q&A by Lucy and Professor Miriam Gifford

KS3 SCIENCE CLUB

On Friday 15th March in the KS3 Science club we had to try and create a pendulum that swung at every second. To do this we had to change different factors such as the length of rope, the weight of the blue tac, the height we dropped it from etc.

After tackling this we move onto two seconds. We then continued to change the factors but this proved much harder than one second!



Time in Chemistry

This section of the newsletter focuses on how time is relevant to the field of Chemistry. It also includes an exploration of how a key Chemistry concept has evolved with time.

THE THEME OF TIME IN CHEMISTRY

Time is an abstract concept spanning both Philosophy and Science. In Science, it is essential to most experiments and for Chemistry, the development of the Periodic Table of elements.

There are many uses of time in Chemistry, these include:

1. Calculating rates of reaction

The idea of time is really important in order to calculate how 'fast' a reaction occurs. It allows us to work out how much product is used up or reactant is formed.

2. Half-lives

A half-life of an element is how long it takes for half the atoms in a substance to decay. This has many uses, including in carbon dating.

Carbon isotopes are used for carbon dating. Carbon 14 is a radioactive isotope with a half-life of 5730 years. Once living material dies, the radioactive carbon will break down. The age of the organism can be found by working out the difference in samples.

3. Mass spectrometry

This is important in the identification of isotopes. After molecules or particles are ionised, they are given the same kinetic energy, and these ions drift towards a detector. The time the ion takes to drift down this tube determines the peaks produced by isotopes.

4. The elements themselves

Elements have a unique History spanning multiple periods of time, from 9000BCE to modern day. We are still discovering more elements!

Student Article by Lucy

HOW HAS OUR KNOWLEDGE OF THE ATOM EVOLVED OVER TIME?

Our knowledge of the atom, and its structures, has evolved a lot over time. It started out with the Ancient Greeks, who theorised the atom, and actually named it. The word 'atom' means indivisible, which went alongside how the Ancient Greeks defined the word. They theorised that everything is made of atoms, which are indivisible and invisible spheres of matter which have infinite amount of type and number. Obviously, we know some of this information to be false now, but they created the fundamental idea of the atom, which was scientifically proven thousands of years later.

The first major modern theory to do with the atom, was made by a man called James Dalton in 1803. Dalton published a book which shows one of the first applications of atomic theory to Chemistry. In Dalton's model, he suggests 4 fundamental rules for the atom. These are: all matter consists of extremely small particles called atoms; atoms are indestructible and resist charges; elements are characterised by the mass of their atoms; and when atoms are involved in chemical reactions, they combine in small whole number ratios to form what are now called molecules. Some of these facts have been proven wrong now, but these theories provided some of the most fundamental atomic theory applications to Chemistry.

Over 100 years later, in 1904, a man named J.J. Thompson made a major discovery to atomic theory. He discovered that the atom is divisible, disproving some of Dalton's theory. Thompson did this by carrying out an experiment on the atom using negative cathode rays found in a discharge tube. He found that these rays were attracted by positively charged metal plates, but were repelled by negatively charged ones, so the rays must be negative. He discovered that the particles were present in many types of atoms by changing which metal the cathode was made from. He named this particle the 'corpuscle' (wider known to us as the electron). His model was known as the 'Plum Pudding Model' which envisioned the atom as a sphere of positive charge, with electrons dotted through.

Then, in 1911, a newer model was proposed by Ernest Rutherford. Rutherford devised an experiment where he fired positively charged alpha particles at a thin sheet of gold foil. The alpha particles were so small they could pass through the gold foil. According to Thompson's model, they should do so with little deflection.However, what Rutherford found was that a minuscule number of particles were largely deflected from their original paths.

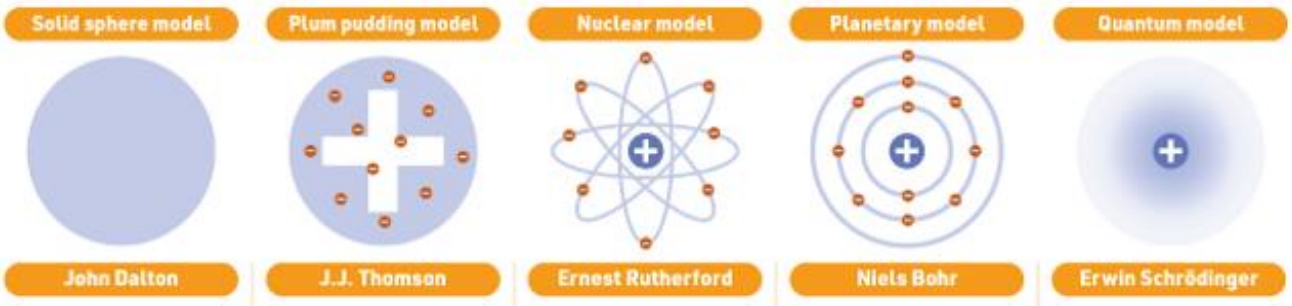
The only explanation for this was if the positive charge was not spread though the atom but concentrated in the centre- in the nucleus. This caused Rutherford to propose that the electrons orbit the nucleus. This model had 1 major flaw. Why did the electrons continue to orbit, rather than spiraling into the centre?

Just 2 years later, Niels Bohr proposed a new model. Bohr realised that classic Physics could not explain why everything was happening like theorised, so he used Quantum Physics to try and explain things. Bohr's model suggested that electrons exist in energy levels (shells) and could only be found there. It also suggested that electrons could move between energy levels but had to do so by absorbing or emitting energy. This model still left problems in the theory. It cannot explain the heavier elements, and also violates the Heisenberg Uncertainty Principle. Although it was not hypothesised until years later, it states that we cannot know the exact position and momentum of an electron at the same time. Ignoring these facts, Bohr's model is the most commonly used model.

Ernest Schrodinger proposed – in 1926 - that electrons could behave as waves, as well as particles. He did this by using a series of mathematical equations to come up with a model for the distributions of electrons in the atom. However, his model only shows the nucleus being surrounded by a cloud of electrical density. These are clouds of probability, meaning that we don't know exactly where each electron resides, however, we do know where the most likely position for them to occur in is in a shell. Later on, in 1932, James Chadwick made a major discovery to atomic theory. He discovered the presence of a neutron. His model did not differ from Schrodinger's model, only adding the addition of the neutron to the nucleus.

The model of the atom has been evolving ever since. Lots of discoveries have been made in Quantum Physics. These discoveries show that particles such as protons and neutrons (but not electrons) can be broken down into even smaller particles called quarks. These quarks are the smallest building block of matter, and the smallest possible particle.

Student Article by Sally



Time in Technology and Computer Science

Technology is constantly changing and improving, and we are sure to see many further changes during our lifetime. This section of the newsletter will focus on some of the modern technological advancements of the last few decades including AI as well as an overview of where time is relevant in the field of computer science.

HOW HAS SCIENCE AND TECHNOLOGY CHANGED OVER TIME?

Mr Lewis, a Science teacher within the Foundation, gave a very interesting talk during British Science Week about time, technology and how the world has changed in just 50 years.

Mr Lewis began his talk by looking at a 1970s classroom. The 21st Century interactive whiteboard was replaced by a chalkboard. There were no laptops, nor iPads, just books and encyclopaedias. He also amusingly explained that discipline consisted of the throwing of the chalk or blackboard rubber at a misbehaving pupil.

He then focused on the change in technology and the issues surrounding the black and white television with only 3 channels. In particular, watching sports such as snooker with multicoloured balls proved to be a challenge. It was not until May 9th, 1973, that there was the first broadcast in colour and this was only on BBC1. There remained 3 channels until the 2nd November 1982 when Channel 4(known now for being the channel which the Great British Bake Off is on) aired for the first time. This is in extreme contrast to the multitude of channels existing today from streaming services such as: Sky, Netflix, Disney + and Prime Video to name just 4.

The telephone was the next point of discussion. In the 1970s, this was often on a special table in the hall with no privacy. In order to dial, your finger had to spin the numbers in the middle, and if you made a mistake, you had to start all over again. It was not until 1985 that the first mobile telephone was seen. It was seen as a status symbol even though it was as large as a brick and had little functionality. Of course, in 2007, this was replaced by the smartphone.

Mr Lewis' favourite TV show was Knight Rider. This show centred around a car named Kit which had the ability to talk, think for itself and drive independently. It even had its own version of a satnav. Who would have thought that today, we would have a car in the form of a Tesla which can drive itself and has a multitude of integrated technologies

Finally, Mr Lewis looked at Quantum Computing. For more information, please see the article on "The theme of time in Computer Science and Technology" by Amelia Kanwar.

The first computer was seen in the 1960s and was called the IBM709. It cost £2.3 million. The current computer we often see in the 2020s is the Intel I7 which has a cost of around £900.

Mr Lewis left us with one final thought. The internet, mobile phones, self-driving cars, smart TVs, smart speakers and smartphones have all been invented in his lifetime. What is going to be invented in ours?

THE THEME OF TIME IN COMPUTER SCIENCE AND TECHNOLOGY

Computer Science and technology are fields that heavily rely on maths and specific timings. Three areas where time is important in Computer Science include:

Real Time systems:

Real time systems are used in robotics and air traffic control to process data and events, with the hardware and software components operating within specific and predictable time constraints. This allows for coordination between different critical parts of the software and hardware. These systems are also used in gaming, autonomous cars, missile launching and other safety critical technologies.

Quantum Computer Science:

Quantum Computer Science is a rapidly developing field that uses the laws of quantum mechanics to solve problems that are too complicated for humans, normal computers and even supercomputers. Instead of data being stored as bits the data is stored as quantum bits (quibits). Bits that are used for representing data in a normal computer are in a fixed state of 1 or 0 whereas quantum bits are the superposition of 1s and 0s.

Clock Speed:

Clock Speed is the rate at which the CPU executes instructions and carries out fetch-decode-execute cycles. Clock speed is measured in hertz and varies across devices. Most laptops will have a 3.2GHz clock speed (3.2 billion instructions processed in a single second) and currently the fastest laptop clock speed is 5.4GHz (5.4 billion instructions processed in a single second!)

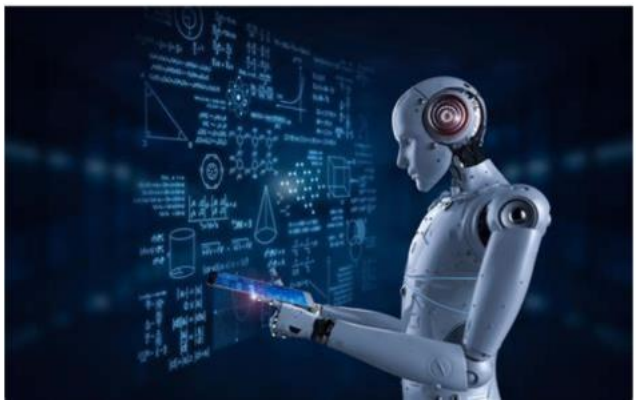
Student Article by Amelia

AN ENCOUNTER WITH ARTIFICIAL INTELLIGENCE- PETER VARNISH OW OBE

On Tuesday 23rd February, Peter Vanish provided the students and teachers with an illuminating insight into the world of Artificial Intelligence. Firstly, Mr. Varnish addressed the prevalence of AI in everyday life, including its application in smart fridges, cars and quadruple monitor setups. Furthermore, robots are used widely in large chains and independent restaurants across the country. For example, Wendy's employ robotic servers in order to deliver food to customers and cook food.

Considering its relevance in modern society, we should not, however, fully trust artificial intelligence. It is evident that AI systems can already outperform humans at highly specialised tasks, for example, Deepmind's AlphaFold can predict protein structure, going beyond texts. AI, however, is not fully effective and can be remarkably dangerous.

Killer robots are poised to become a reality due to the rapid development of AI technology. Moshen Fakhrizadeh, a heavily guarded head Iranian scientist for Nukes was targeted and attacked by a robot which used satellites to determine his position while he was travelling. AI will be a fundamental pillar of economic, military and geopolitical power in the 21st Century.



AI will be a fundamental pillar of economic, military and geopolitical power in the 21st Century.

It is surely, however, a significant privacy risk. A constantly listening system, AI stores an individual's data and incorporates it, this is how AI artwork is created. Through social media, Artificial Intelligence holds the duplicitous power to influence many people. For example, deepfakes are particularly sinister when created with menacing intent. Explicit images of Taylor Swift on twitter, or videos of PMs have been utilised to spread false news. Fundamentally, according to generative AI, ss systems get better at impersonating humans the more likely people are to believe them.

AI will be a fundamental pillar of economic, military and geopolitical power in the 21st Century. Indeed, language models perform well at recognising and following patterns, however, they lack logical reasoning. This is important in considering how a human headmaster appointed a robot, Abigail, as its principal head teacher.

Kissinger writes that AI will have a profound impact on every facet of our lives. The general consensus, however is that if left unchecked, with no precautions, AI possesses considerable dangers to society at large. Regarding the military, drone warfare in Ukraine demonstrates that low-cost unmanned systems are already revolutionising warfare. It can be argued, however, that if militaries attempt to use machines to replace human performance, they are likely to secure only a fraction of the possible benefits.

Notably, the UK Supreme Court has ruled that "an inventor must be human". This means that one is not at liberty to patent creations made by AI. Regarding the 'AI gold rush' by the year 2023, $1.5 trillion in market value is expected to be created. IMF declared that this could impact 60% of jobs in high income nations. Multiple professions, therefore, will be greatly exposed to AI, however this technology will be complementary to work, rather than serving as a replacement. Peter Vanish concluded his speech with a claim that all AI chip manufacturers must be forced to include a kill switch in their designs and manufacture.

Headlines in London Papers 2024:

◦ Loner could unleash pandemic with Amazon Lab and AI

◦ AI watermarks may protect election against DeepFakes

◦ Meeting of military minds first shot in AI arms race

◦ Google has sent internet into spiral of decline says AI

Student Article by Henrietta

Time in Physics

This section of the newsletter focuses on how time links with Physics and focuses on the presence of time in various physics concepts and how our understanding of concepts like quarks have changed as time moves on.

THE FOURTH DIMENSION

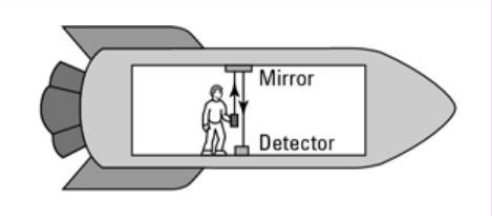
What is time? We see it as a constant. It may vary in different parts of the world, but it always moves at the same speed.

But, as we've seen in movies, it's possible for astronauts to leave Earth for a whole 7 years whilst only an hour has passed for them. As fictional as this may seem, it's actually true.

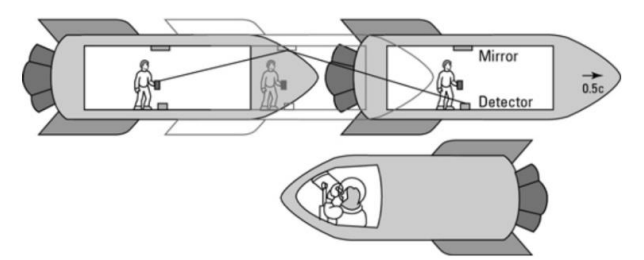
Special relativity links space and time. The universe can be viewed as having three space dimensions (x,y,z) and one time dimension (the 4th dimension = space-time continuum). If you travel fast enough through space, your observations on space and time will differ from the observations of people moving at different speeds.

A simple example of this is if you were in a train and jumped upwards. Through your perception you would go straight up and then down. But the person watching you from outside the train will see you jump forward and land further away. This is the same with light and therefore time when at very high speeds

Now you're in a spaceship holding a laser. If it's aimed to shoot directly up to strike a mirror on the ceiling which will send the light beam back down to strike a detector.



If there was another observer in a diferent spaceship, they'd observe the light beam completely differently.



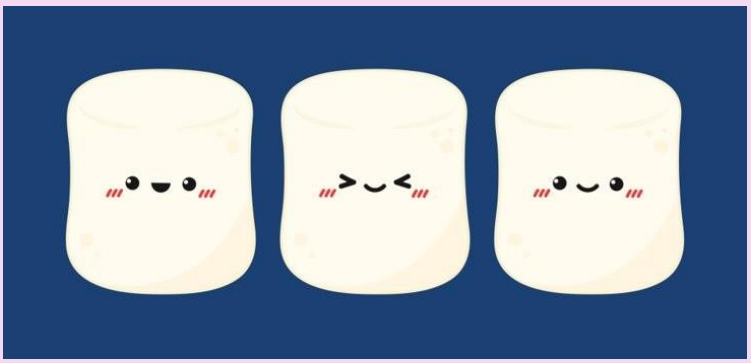
This means the paths viewed are both different lengths, as the speed of light is the same for all observers, and therefore the time taken for the beam to travel to the detector must also be different. (speed = distance/time) . So if you're travelling closer to the speed of light, time will appear shorter.

Student Article by Krithi

HOW HAS OUR KNOWLEDGE OF QUARKS CHANGED OVER TIME?

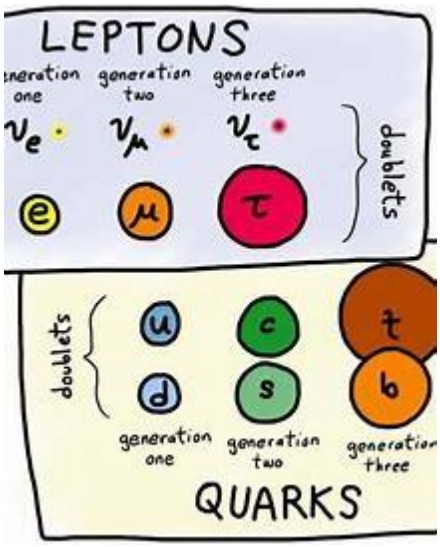
Introduction to Quarks:

Quarks are one of the fundamentalist or elementary particles. That means they have no internal structures, and can't be broken down. But a bit like humans, quarks don't like to be on their own and are normally found in pairs or threes.



Types of Quarks:

There are 6 types of quarks:
Up
Down
Strange
Charm
Top
And Bottom



The Proton:

Baryons contain 3 quarks, and the proton is a well-known type of a baryon. The proton is in the nucleus of every atom and was thought to only be made of 2 up quarks and a down quark.
However, new studies have suggested that protons may also contain charm quarks.
And since a charm quark is heavier than a proton, that would mean, something heavier than a proton, makes up a proton

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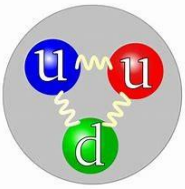
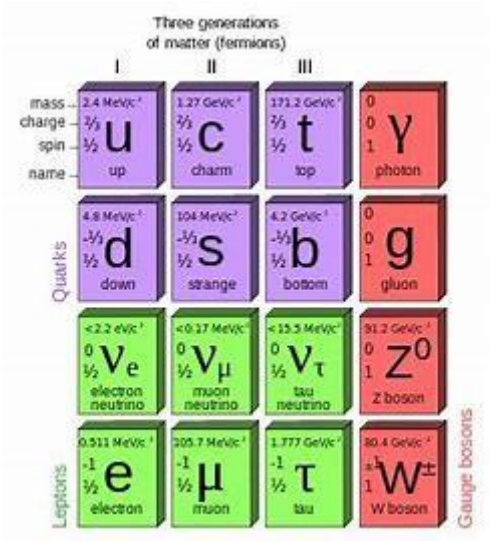


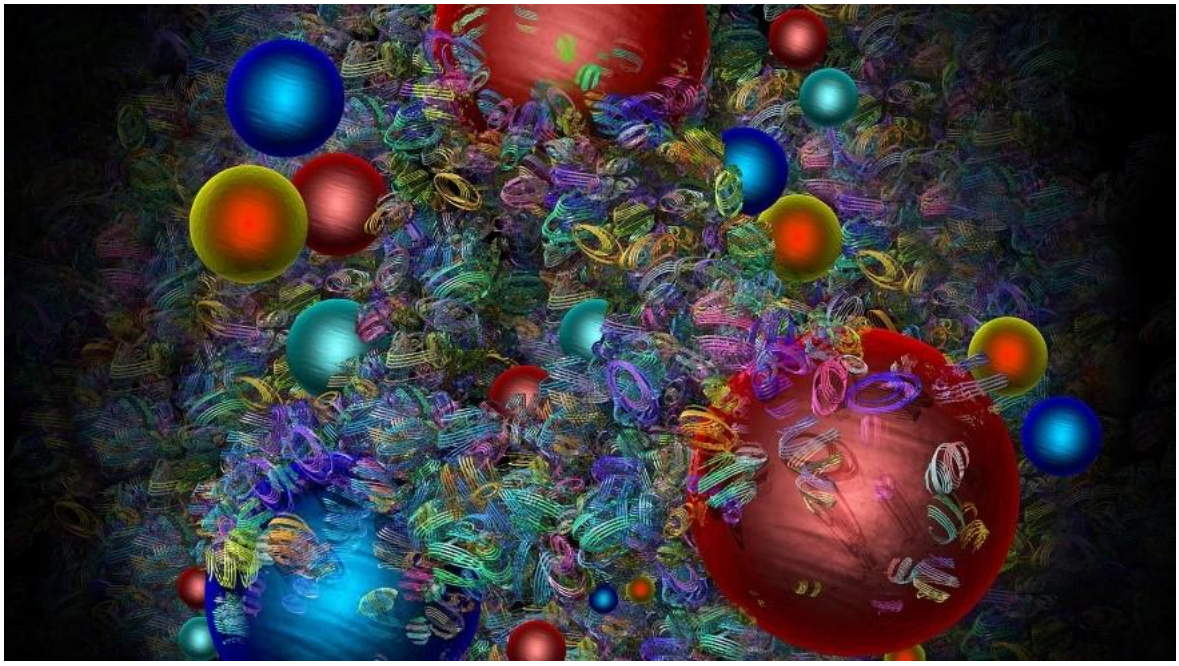


The History of Quark Discoveries

1968 – The Up and Down Quark was first observed at the Stanford Linear Accelerator Center
1974 – The Charm Quark was discovered at Brookhaven National Laboratory and the Stanford Linear Accelerator Center
1974 – The Strange Quark was discovered

1977 – The Bottom Quark was discovered at Fermi National Accelerator Laboratory.
1995 – Two independent groups of scientists at the Fermi National Accelerator Laboratory reported that they had found top quark

Student Article by Joana



AN INTRODUCTION TO THE SEASONS

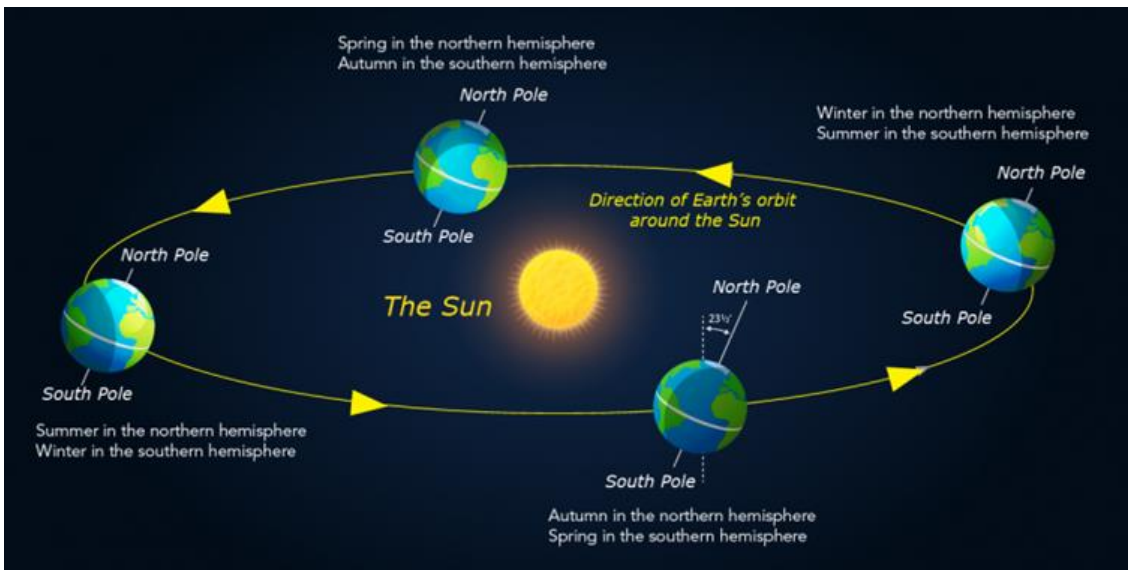
First of all, there are 2 main reasons why seasons exist. One reason is due to the earth spinning at an axis; however, this is not vertical. Instead, it is tilted at an angle of 23.5°. The tilt of the earth will never change as it is stabilised by the moon and it will remain in the same direction as our planet orbits the Sun.

However, not all places on the Earth experience distinct seasons like Summer, Autumn, Winter and Spring instead they may experience seasonal variation in factors such as rainfall, temperature and day length.

An example of this would be the fact the Arctic Tundra experiences a phenomenon called "polar nights", where there is 24 hours a day of total darkness for the latter 6 months of the year.

However, in the summer, the arctic tundra experiences 24 hours of daylight, this is called "midnight sun". This is once again due to Earth's tilt during its rotation around the Sun for the first 6 months of the year.

Seasons could also vary between the northern and southern hemisphere. This means that seasons around the world do not happen at the same time. However, it is important to note that the tilt of the earth remains the same throughout, but it is the part of the planet that gets the most direct sunlight that changes. The northern hemisphere is tilted away from the Sun during September to March; this means it receives less sunlight than the southern hemisphere during the same period. This explains why Christmas in Australia takes place in their summer whilst Christmas in Britain is always during our winter.



FUN FACT!

Did you know that other planets also have seasons? If you lived on Mars, you would have to wait twice as long (6 months) before the seasons change. Like Earth, Mars also has a tilted axis of 25° right now. However, the tilt of mars is not stable like the earth. This can cause different parts of Mars to receive varying amounts of solar radiation, which means that there will be seasonal differences of temperature and weather patterns across the planet.

Mars also has a more elliptical orbit around the Sun than the Earth. This means that there are variations between the distance between Mars and the Sun at different points in the orbit.

Student Article by Jashany

Time in Biology

In this section of the newsletter, we explore how important time is in in numerous fields of biology from dental hygiene to wildlife conservation. This section of the newsletter also marks the first time an article by a Warwick Preparatory School student features in the newsletter!

HAMMERHEAD SHARKS

I was inspired to write this article after being part of the Deadly Mission – Sharks live lesson at school.

Hammerhead sharks are a critically endangered species of shark. Opinion differs as to whether there are nine or ten species of hammerhead shark.

They eat, as well as sting rays: fish, crustations, octopuses and smaller species of shark, but bonnetheads eat seagrass so they are omnivorous.

They like to live in tropical and subtropical coastal waters all over the world, they can go up to 72 metres underwater, the zone they live in is called (scientific) epipelagic, photic or sun light zone.

Their predators are: dolphins, orcas and larger species of shark, but their biggest threat is us as a species (they like walm water but it makes them easy to hunt. Some cultures turn hammerheads and other sharks into things like shark fin soup), (dolphins probably go for the smaller hammerhead species and all the species pups).

Hammerheads can have from 6 – 42 pups in on litter.

They like to swim in groups (a group of hammerheads can be called a shiver, a frenzy or a school) in the day but hunt solitary at night.

The largest hammerhead is the Great Hammerhead (at six metres in length) and the smallest could be the Bonnethead (at 80 – 90 cm).

Warwick Preparatory School Student Article by Charlotte, 5KC

SHOULD THERE BE A HIPPOCRATIC OATH FOR SCIENTISTS IN THE FUTURE?

Physicists define time as the progression of events from the past to the present into the future. Therefore, if there is no progression in a system it could be classified as timeless. In this article, I will evaluate whether an oath "to do no harm" should be pledged by scientists in the future.

The foundations of scientific ethics in the West span back to the 5th Century BC and through the conception of the Hippocratic Oath which has been attributed to the ideas of the Greek physician, Hippocrates. This was a time when there were few restrictions and laws surrounding how they could conduct treatment, so it was only natural that a pledge like the Hippocratic Oath was created to prevent physicians taking full autonomy over lives to do as they pleased. It should be noted that this was a time when the act of healing had many connections to the divine, and the Hippocratic Oath itself directly swears on the ancient Greek gods to uphold specific medical ethics such as non-maleficence which is the obligation of not intentionally harming a patient. This oath still holds great significance today with adaptations made to fit the modern world and is used as a general guideline of ethical medical practices.

However, in an ever technologically advancing world, medical professionals aren't the only people to hold great power over people's lives. The first atomic bomb was dropped in Hiroshima, Japan by the United States of America and devastated over 11.4 square miles of the city, taking over 70,000 lives and permanently injuring thousands. In 1986, a nuclear power plant at Chernobyl, Ukraine exploded as a result of a flawed reactor design that was handled by untrained personal with fall-out radiation covering most of Europe. After researching deeper into both cases, I was inspired to write this article evaluating if scientists in the future should swear an oath too. I was specifically reminded of this passage: "I will use my power to help the sick to the best of my ability and judgement; I will abstain from harming or wronging any man by it."

Joseph Ratbolt was a scientist who was part of the AAAS (American Association for the Advancement of Science), in favor of scientists taking more ethical considerations and encouraging scientists to evaluate the consequences of their work. The AAAS proposed 16 different oaths that members of the scientific community could take. One oath that stood out was: "Scientists can no longer claim that their work has nothing to do with the welfare of the individual or with state polices."

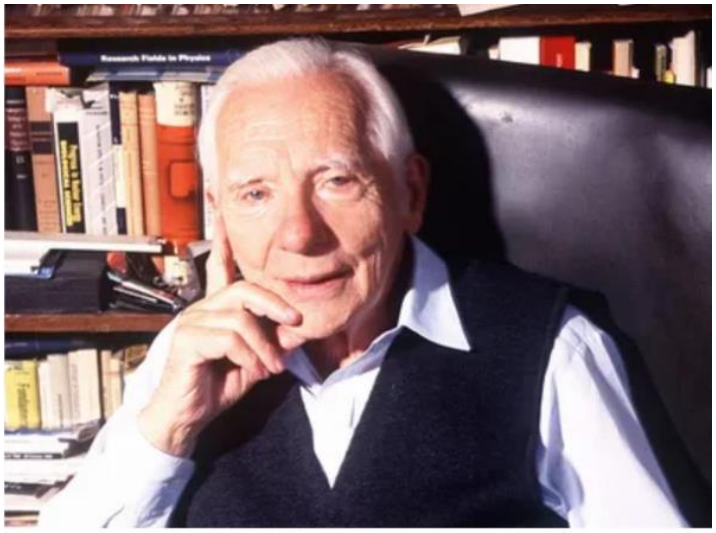
This is a very significant statement as Ratbolt himself was part of the Manhattan Project which had a large ethical implication on the world. Therefore, it would be expected that a scientist who worked on such a deadly project to hold such views on to do no harm to others.

It could be argued that scientists (more specifically chemists and physicists) do not directly work with the intention of serving the general public directly, so they do not hold the same amount of responsibility if their development is used for harm, unlike medical professionals who have direct contact with patients. In more general terms, a typical example of this would be a social media app which has several reports of the app being used as a medium for online bullying. One group of people might take action against the development company itself, protesting that more strict restrictions should be enforced on the app to prevent such cases. Whereas another group of people may argue that the developers did not create the app with the intention that people are going to be personally affected. Therefore, they could not have expected the app to be misused in this way. This also means that the developers are not held to the same responsibility for their actions as the situation was beyond their control.

Therefore, I conclude that scientists should not perform a version of the Hippocratic Oath as it may pose limitations to scientific research and block avenues such as stem cell research.

(See picture pf Joseph Rotbalt below)

Student Article by Jashany



WHY IT IS TIME TO STOP THE ILLEGAL WILDLIFE TRADE.

I'm going to talk about the illegal wildlife trade; after exploring this topic in Model UN, I was keen to dive deeper and learn a little more about it, which I would like to share with you. The illegal wildlife trade is the selling or exchange of wild plants and animals that are at risk and protected by law. It involves live plants and animals, or products derived from them and is the 4th largest illegal trade in the world. Trade hotspots are found in Southeast Asia, with China having the largest market. These are pangolins, which if you don't know, looks like this:

They are the most trafficked mammal in the world is the and are the only mammal with scales. Shockingly, the trade of pangolins contributes $19 billion to the trade, making them one of the most lucrative targets for poachers and traffickers. Their meat is considered a delicacy in areas of Asia with their scales being used for traditional medicine. In the US, their scales are used for belts, wallets and boots. There are 8 species of pangolin, all of which are on the endangered list. These beautiful animals are very gentle and rather shy creatures who are very intelligent and incredibly special, being referred to as the 'guardian of the forest'

They have a huge appetite- one pangolin can consume around 70 million ants and termites each year, saving 41 acres from termite destruction. In 2016, the pangolin trade was banned (which 182 countries signed) but, due to a huge loophole in the market, this meant that the trade did not stop, but continued to grow. So, in 2020, China increased protection for the Chinese pangolin – a critically endangered species. Companies such as Flora and Fauna are trying to help save the pangolin from extinction, but the trading of these animals is on an immense global scale and many other organisations are doing their best to help.

Another animal that has been prolifically hunted in the past is the whale. Whales, the largest mammal in the world, have a story of admiration and exploitation, which luckily has a happy ending. Whaling is centuries of years old, as they are prized for their valuable resources such as oil, being used in the industrial revolution, in machinery and engines and were also used for their meat and blubber. Whaling was a key industry in the 19th century, particularly in the US using oil for lighting. New technologies created in the late 1800s such as steam powered boats and harpoons made whaling far more efficient than ever before and 1890 began the age of 'modern whaling'.

The 20th Century brought huge demands for whale oil and as more technological advancements were made, there became more uses for it. Whale hunting extended beyond fuel, being used in cosmetics and fashion – whale teeth are large sheets of keratin, which were used in things such as corsets, skirts, & parasols. Whale hunting soared, and peaked in the 1960's, with 80,000 whales being hunted each year. The blue whale population plundered to the brink of extinction, reducing the population by a staggering 98.5%.

Despite this, the world was able to turn this around and there was a decline in whale hunting. Why? Due to the newer and cheaper substitutes being brought in, there was a declining profitability of whales, and of course they became harder to hunt as the numbers became smaller and smaller. Policies were introduced in the 1980's, such as the International Whaling commission, and a Whale Moratorium was introduced in 1987 which banned commercial whaling with few exceptions.

This turnaround has been a huge success! Today the whale populations are gradually increasing, and whales have been saved from extinction. A particular example is the South Atlantic Humpback whale which had a population of 1000 for 40 years, now has increased to 25,000. While some populations will take decades more to recover, there has been a continuous incline in numbers. The whales give us hope that illegal trading and hunting can be stopped, but lots more still needs to be done for the future, in order to stop this immense illegal trade.

Student Article by Bella

WHY IS IT IMPORTANT TO SPEND TIME EACH DAY BRUSHING YOUR TEETH?

Oral hygiene is connected to our overall health. Poor oral hygiene can have effects on organs that are not even connected to our mouth.

The symptoms of poor oral hygiene include:

- Tooth pain
- Altercations to the tongue (discolouration)
- Deteriorating gums (bleeding or swelling)

Poor oral hygiene can lead to gum disease (periodontal disease).

Periodontal disease is an infection of the gum tissues often caused by poor brushing or flossing habits which allow plaque to build up and harden. Symptoms include redness, bleeding of gums, ulcers in the mouth, and loose teeth. Gum disease is linked to a host of illnesses including heart disease, diabetes and respiratory diseases.

Heart disease

Bacteria present in the mouth due to gum disease can travel through the body when ingested or when they enter the bloodstream, triggering inflammation in the heart's vessels and infection in heart valves. This is why people with gum disease were twice as likely to die from a heart attack and three times more likely to have a stroke. Additionally, inflammation can encourage cholesterol depots to build up along blood vessel walls which can cause the hardening of the arteries. This can cause high blood pressure, therefore increasing the likelihood of things like a heart attack.

Respiratory diseases

Bacteria can spread to the lungs which is what causes respiratory problems. This can lead to the development of bronchitis, emphysema or pneumonia.

Diabetes

Inflammation caused by gum disease can weaken the body's ability to use and produce insulin, which can increase blood glucose levels, therefore leading to diabetes.

Tooth decay

Another sign of poor oral hygiene is tooth decay, which can lead to inflammatory bowel disease and digestive irregularities. These are the two main stomach issues that arise as result of tooth decay. In severe cases, this may result in sepsis, which can present with gastrointestinal symptoms such as vomiting and diarrhea.

Gum disease is the most common chronic inflammatory condition in the world, yet it's often a silent disease. This is because as the disease progresses, gum tissue and bone are destroyed but this process has little symptoms and most people will brush it off. This is especially because plaque build-up is often in the back of the teeth so is hard to see. By then, it is too late to get fully successful treatments.

Luckily, there are plenty of things we can do to prevent gum disease and tooth decay:

- Brushing your teeth twice a day with a fluoride toothpaste.

This is very effective in preventing tooth decay and reduces the demineralisation of enamel (breakdown of enamel). It also promotes the remineralisation of enamel, whilst inhibiting the metabolism of bacteria.

How to avoid gum disease

Fluoride toothpaste

- Prevents tooth decay
- Reduces demineralisation of enamel (breakdown of enamel) , promotes the re-mineralisation of enamel, inhibits the metabolism of bacteria
- Dental fluorosis is caused by taking in too much fluoride over a long period when the teeth are forming under the gums

Brushing your teeth twice a day with a fluoride toothpaste.

Flossing regularly to remove plaque from between teeth.

Visiting the dentist routinely for a check-up and professional cleaning.

Quit smoking (immune system)

Quit smoking (immune system)

Too much fluoride in the toothpaste can lead to dental fluorosis which is where too much fluoride is taken in over a long period of time when the tooth is forming under the gums. This usually only affects children aged 8 and under.

- Flossing regularly to remove plaque from between teeth.
- Visiting a dentist routinely for a checkup and professional cleaning.

Also, quitting smoking (which weakens the immune system making it harder to fight off infections) can help to reduce the risk of gum disease.

Student Article by Tamika

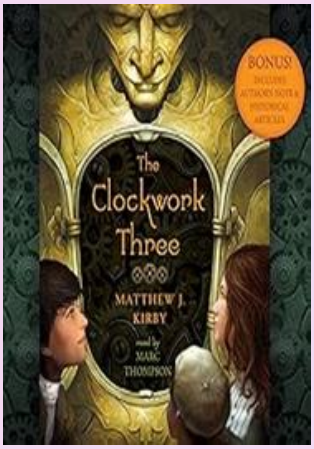
Edited by Lucy

Recommendations

Reading can help enhance your scientific understanding further therefore this section of the newsletter features many fiction and non-fiction book recommendations that relate to science or the theme of time.

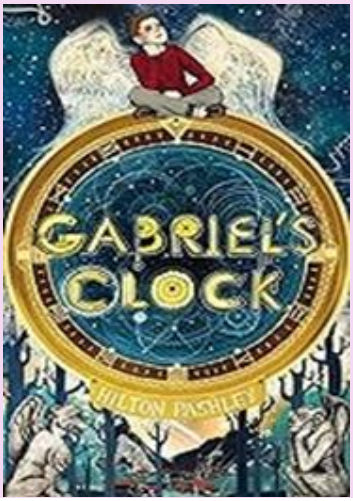
BOOK RECOMMENDATIONS FROM THE LIBRARIAN RELATING TO THE THEME OF TIME BY MRS BURMAN

"I wish it need not have happened in my time," said Frodo.
"So do I," said Gandalf, "and so do all who live to see such times. But that is not for them to decide. All we have to decide is what to do with the time that is given us."
— J.R.R. Tolkien, The Fellowship of the Ring

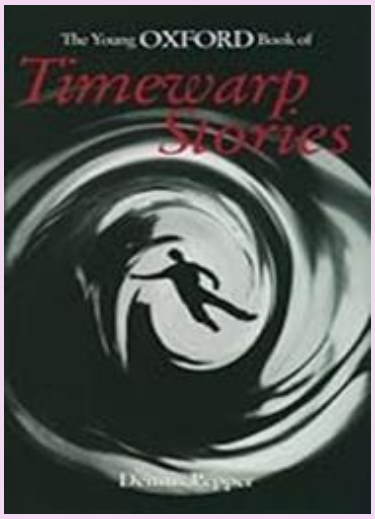


Jonathan is in terrible danger. After his home is attacked by faceless monsters in bowler hats, he wakes up in the strange village of Hobbes End that protects those who need to be safe – and nobody is more in need of protection than Jonathan.
Jonathan is the only half-angel, half-demon in the universe, and now the forces of Hell want him for their own

A team of unlikely friends - an orphaned street musician, a hard-working girl from the tenements, and a talented clockmaker's apprentice - discover that together they can overcome even the darkest of fears.

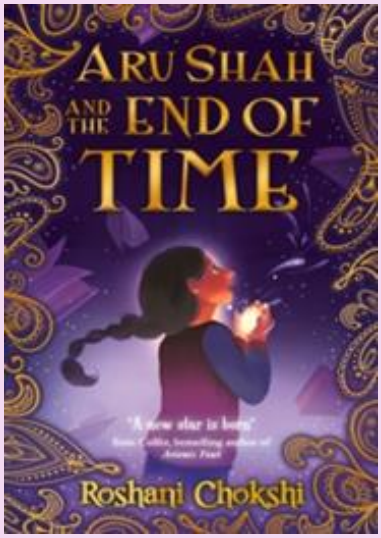


purpose. Aided by a vicar with a broken heart, a big man with a cricket bat and a very rude cat, Jonathan races to find the mysterious Gabriel's Clock. If he doesn't find it then his family and friends will die, but, if he does, then he risks starting a war between Heaven and Hell that could engulf them all.

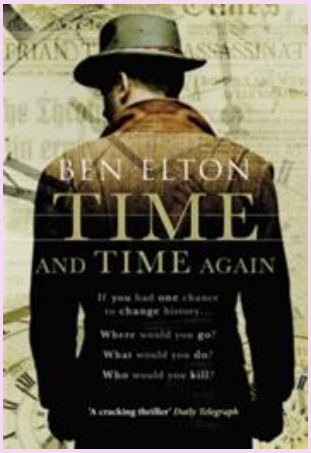


This is a collection of stories about time, exploring all the different ways that we can twist and play with time. The stories take in trips to the future, package holidays to the past, visitors from other times with unwelcome messages, a thief with the power to stop time altogether, a man in love with someone who died years before he was born, a star fleet that paradoxically caused its own destruction, and many more.

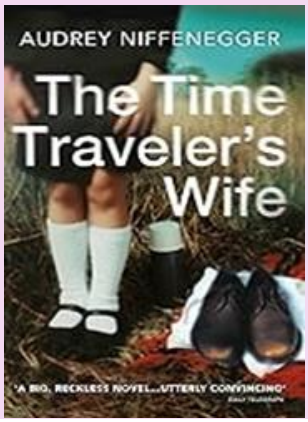
Aru Shah tends to stretch the truth in order to fit in at school. Whilst her classmates are jetting off to exotic locales, she'll be at home, in the Museum of Ancient Indian Art and Culture where her mother works. Is it any wonder that Aru makes up stories about being royalty, traveling to Paris, and having a chauffeur? When Aru's schoolmates dare her to prove that the museum's Lamp of Bharata is cursed, she doesn't think there's any harm in lighting it. Little does Aru know that



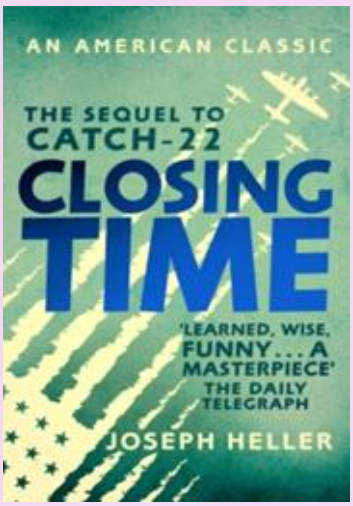
lighting the lamp has dire consequences.



Joseph Heller returns to the characters of Catch-22, now coming to the end of their lives and the century, as is the entire generation that fought in World War II. But this time they are fighting not the Germans, but The End. Closing Time deftly satirizes the realities and the myths of America post WWII: the absurdity of their politics, the decline of their society and their great cities, the greed and hypocrisy of their business and culture – with the same ferocious humour as Catch-22.



It's the 1st of June 1914 and Hugh Stanton, ex-soldier and celebrated adventurer is quite literally the loneliest man on earth. No one he has ever known or loved has been born yet. Perhaps now they never will be.
Stanton knows that a great and terrible war is coming. A collective suicidal madness that will destroy European civilization and bring misery to millions in the century to come.
He knows this because, for him, that century is already history. Somehow, he must change that history

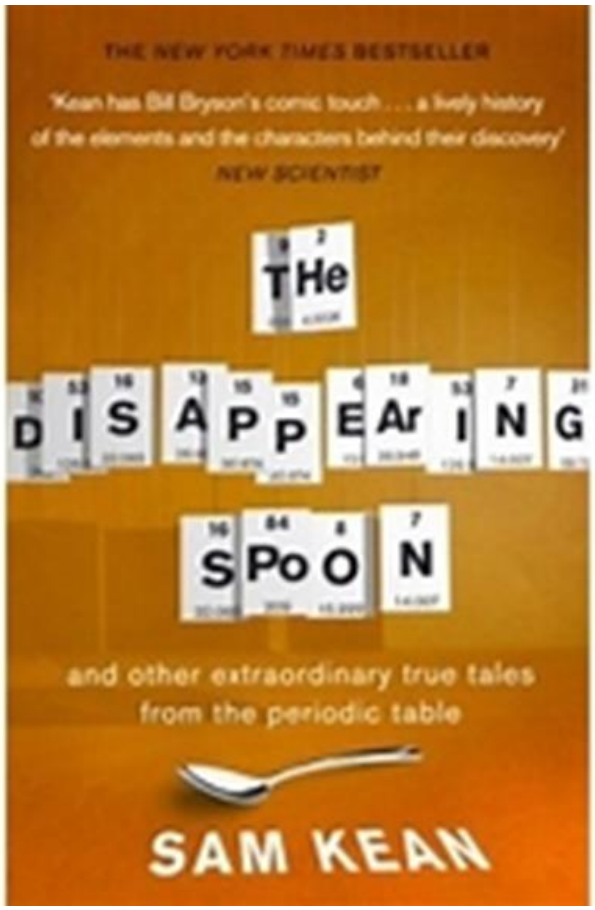


Clare and Henry met when Clare was just six and Henry thirty-six, and were married when Clare was twenty-two and Henry thirty.
Impossible but true.
Henry is a librarian who suffers from a rare condition where his genetic clock periodically resets, finding himself pulled suddenly into his past or future.

Meanwhile, Clare is an artist waiting all her life for her great love Henry to appear. In the face of this force neither can prevent nor control, Henry and Clare's struggle to lead normal lives is both intensely moving and entirely unforgettable.

BOOK REVIEW: THE DISAPPEARING SPOON BY SAM KEAN

The Disappearing Spoon is a comprehensive guide to all things Periodic Table related. Over 20 chapters, the book explores how Chemistry is linked to Physics and Biology, the uses of Chemistry at its best (and worse), and medicinal Chemistry.



The book begins by exploring the unique properties of Mercury, as one of the only elements which is a liquid at room temperature. Instead of water, which spreads out when spilt, mercury does the opposite due to its bonding and the molecules form one droplet. It then ends with the idea of the island of stability at element 114 surrounded by unstable, radioactive elements and the limitless possibilities for the future of the table.

My favourite chapters included the coverage of the Nobel Prize winners, including Fritz Haber, who one year was a Nobel Prize winner for his Haber Process(a process which takes nitrogen and hydrogen and reacts them under certain conductions to form ammonia, an important component of fertilisers), and the next year was deemed a war criminal for his work in building nitrogen based explosives and developing mustard gas during the First World War. The book also covers the Science of the Cold War (the race for discovery of elements between both Russia and the USA), the chemistry of DNA, including Pauling's triple helix theory(three strands of DNA with inverted phosphate groups- this was later disproven by Watson and Crick) and the antimicrobial properties of silver, which led one man to consume it frequently. Stan Jones developed argyria which turned his skin blue by consuming home-made colloidal silver for 4 and ½ years (DO NOT TRY THIS AT HOME!).

The book also addressed the theme of time through reference to the periodic table's history and atomic clocks. The definition of the second has changed throughout history, but can now be measured as 9,192,631,770 times the outer electron moves backwards and forwards in a cesium atomic clock. Currently the most precise atomic clock will only miss one second every 300 billion years.

I thoroughly enjoyed this book and would definitely recommend.

Below is Stan Jones who turned blue through silver poisoning.

Student Article by Lucy

Activity

Time

F H S O D T M U T A T I O N D
Q M L B T E N G D P E P Q E N
H U I S R H L E P T Y S H O V
Y I Z E E T E A S H Y Y S A N
R V D R A W H O Y E P X R R O
A Y T V C R F V R O R I E S I
D U R A T I O N T Y A P R T T
G V U T I C P H Y B O H U O U
U G A I O I E Q L B H C T P L
S R X O N S U E H M L R U W O
E K Q N I E D A C E D A F A V
T D I S C O V E R Y W E P T E
C O N C L U S I O N C S U C P
T N E M I R E P X E V E Y H F
O T Y R R B T S A P W R F C Z

conclusion
discovery
evolution
hypothesis
past
research
variable

decade
duration
experiment
mutation
present
stopwatch

delay
era
future
observation
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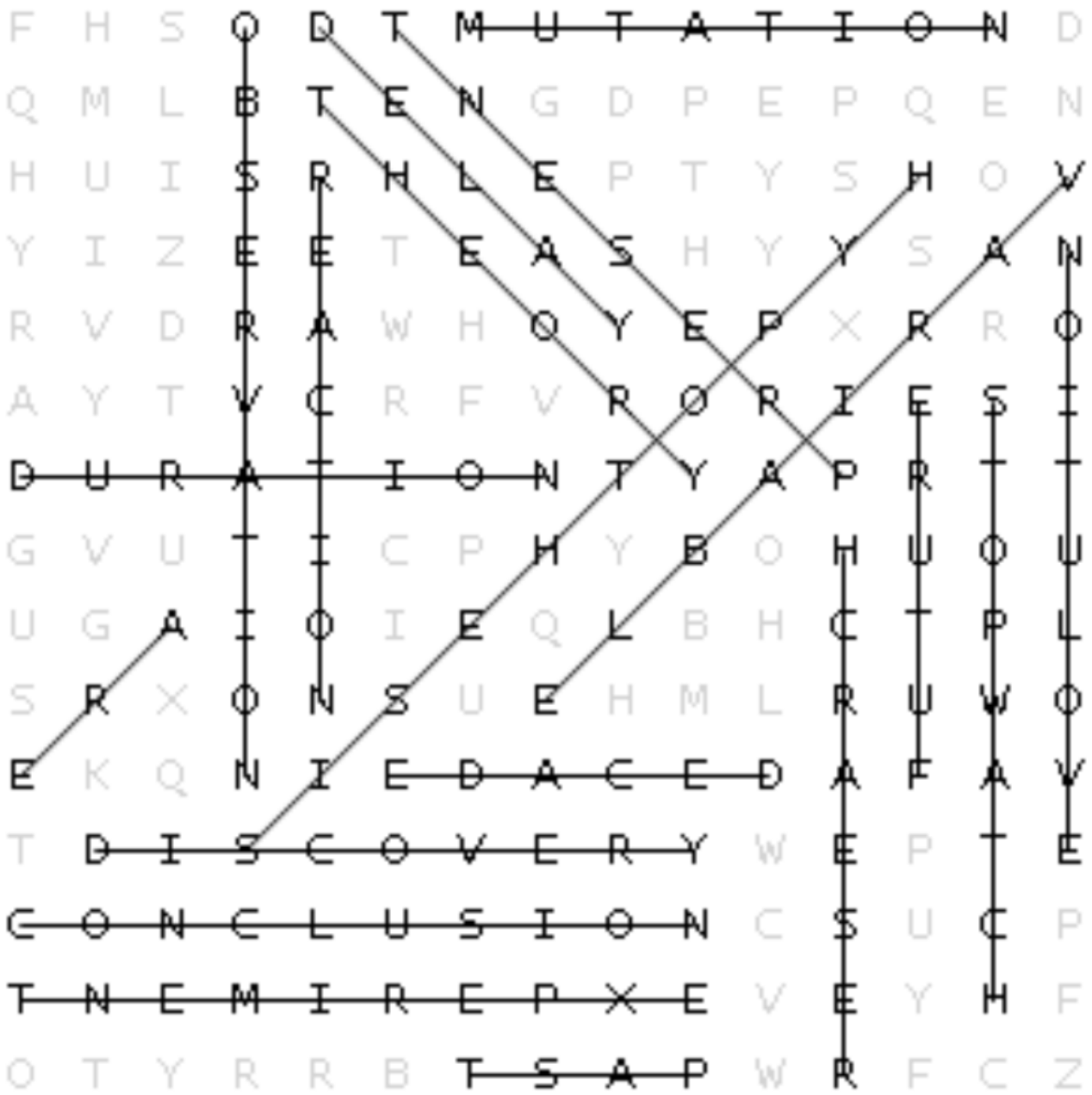
theory



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