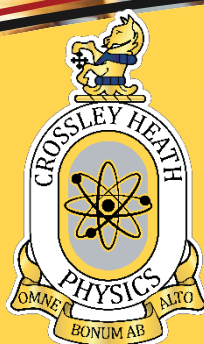
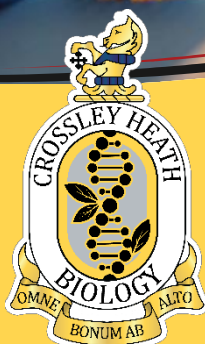


# The Crossley Heath Science Newsletter

March 2025



## **A warm introduction...**

### **What is the Crossley Heath Science Newsletter?**

It is a termly newsletter that is run by sixth formers: Lakshya, Chaarvik and Will to help encourage students - and teachers too - at Crossleys to write about anything science related that they're interested in. We want to provide a platform for year 12 and 11's to help publish any research that they've done so they can put it in their personal statement in year 13 but also to provide the younger years, a voice in the scientific community at school .

### **What to expect?**

This edition of The Newsletter contains 9 articles ranging from years 8 to 12 . We also have a special article from Biology teacher Miss Dollive...

### **Contents:**

- 1 – Water on Mars?**
- 2 – Is teleportation really possible?**
- 3 – What exactly is a neutron?**
- 4 – What is Déjà vu?**
- 5 – The discovery of Penicillin and Is Doomsday a lot closer than we think?**
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## Water on Mars? Viraat Walishetty - 9C

Water on Mars is one of the most exciting subjects in space exploration. For years, scientists have been studying the Red Planet to understand whether it could have supported life in the past or even now. Today, Mars is a cold, dry place with little to no liquid water on its surface, but there is strong evidence that water once existed in large amounts.

Thousands of years ago, Mars had a much warmer and wetter climate. Scientists believe it had rivers, lakes, and maybe even oceans, based on features like dried-up riverbeds and ancient shorelines found on the planet's surface. These signs suggest that Mars had a stable climate that allowed liquid water to flow for extended periods. In fact, certain minerals on Mars can only form in the presence of water, further supporting the idea that water was once abundant.

Currently, most of the water on Mars is frozen as ice, primarily at the poles. Mars's atmosphere is thin, and it doesn't trap enough heat to keep water in liquid form for long. However, there are still some intriguing signs that liquid water may exist underground, where it could be protected from the harsh conditions on the surface. Some studies even suggest that salty water could occasionally flow on the planet's surface in specific conditions, especially in certain seasons.

The search for water on Mars is crucial for future missions to the planet. If astronauts ever travel to Mars, they will need access to water to survive. Finding water underground or in ice could be key to sustaining future missions and even creating settlements on the planet. Additionally, the discovery of water may help scientists answer one of the biggest questions in space exploration: Could life have existed on Mars?

In conclusion, water on Mars plays an essential role in understanding the planet's past, its potential for life, and the future of space exploration. Researchers continue to study the evidence and search for more clues about this important resource.

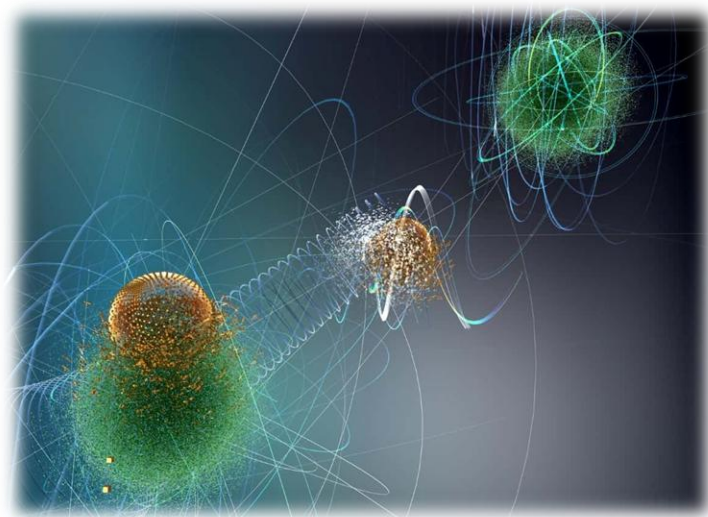
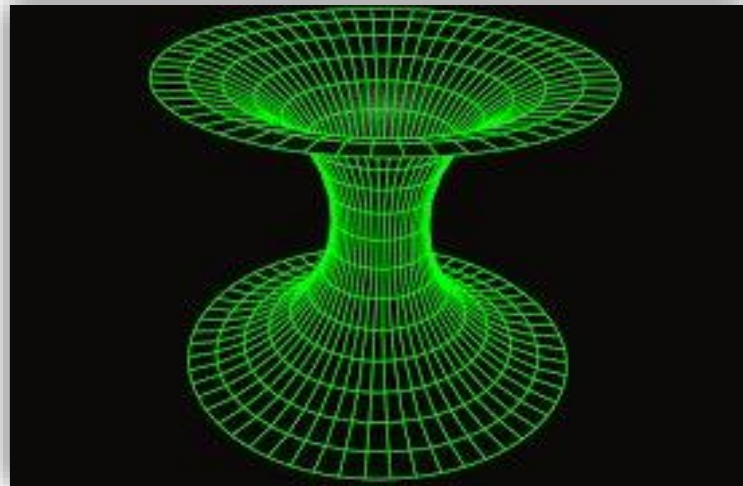


## Is teleportation really possible?

Elijah Hill - 8A

Quantum computing is a revolutionary field that leverages the principles of quantum mechanics to process information, providing exponential speedup for certain tasks. For example, Google has created a quantum chip (called Willow) that can solve a problem in five minutes that would take the world's fastest supercomputers ten quadrillion years to solve. This chip works with 105 qubits. Qubits are also known as Quantum Bits and unlike classical bits, which can either be 0 or 1, qubits can be a combination of both 1 and 0 states at the same time. This key concept allows quantum computers to perform multiple calculations at the same time and is the cause for the exponential speed compared to classic computers.

Recently, some researchers at the University of Oxford successfully demonstrated quantum teleportation using a powerful quantum supercomputer. They achieved quantum teleportation of data across a network link.



Even though teleportation has been achieved, this process is designed for moving data, not people or things. The team's breakthrough sent the information between separate quantum computers, effectively creating the first 'quantum network'. They have even said that this could lay the foundations for a future 'quantum internet'.

With this recent breakthrough and many other recent quantum chips, the vision of quantum computers is starting to seem as if it could come around in the not so distant future. However, progress is still sure to be needed before the human race achieves something of that unbelievable capability.

## What exactly is a Neutron?

Arjun Varshney - year 8

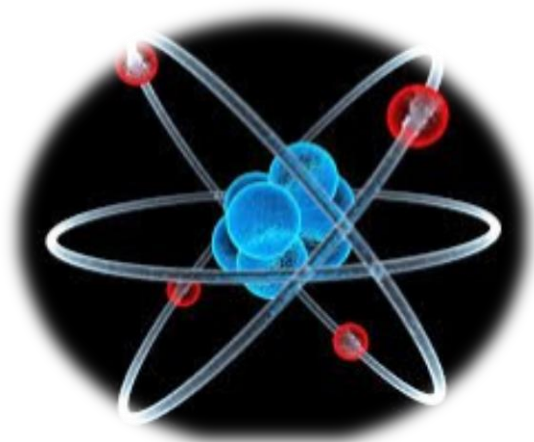
The neutron is a subatomic particle, symbol  $n$ , that has no electric charge, and a mass slightly greater than that of a proton. Protons and neutrons constitute the nuclei of atoms. Since protons and neutrons behave similarly within the nucleus, they are both referred to as nucleons. Nucleons have a mass of approximately one atomic mass unit, or dalton (symbol: Da). Their properties and interactions are described by nuclear physics. Protons and neutrons are not elementary particles; each is composed of three quarks.

Atoms of a chemical element that differ only in neutron number are called isotopes. For example, carbon, with atomic number 6, has an abundant isotope carbon-12 with 6 neutrons and a rare isotope carbon-13 with 7 neutrons. Some elements occur in nature with only one stable isotope, such as fluorine. Other elements occur with many stable isotopes, such as tin with ten stable isotopes, or with no stable isotope, such as technetium.

The neutron is essential to the production of nuclear power. In the decade after the neutron was discovered by James Chadwick in 1932, neutrons were used to induce many different types of nuclear transmutations (the conversion of a chemical element or isotope into another chemical element). With the discovery of nuclear fission in 1938, it was quickly realized that, if a fission event produced neutrons, each of these neutrons might cause further fission events, in a cascade known as a nuclear chain reaction. These events and findings led to the first self-sustaining nuclear reactor (Chicago Pile-1, 1942) and the first nuclear weapon (Trinity, 1945).

### Discovery

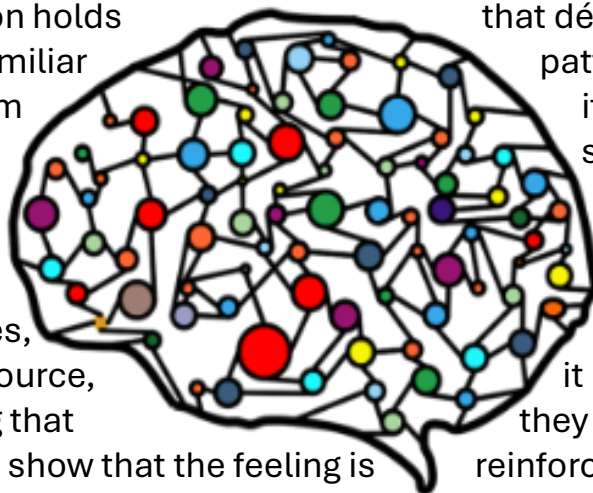
The story of the discovery of the neutron and its properties is central to the extraordinary developments in atomic physics that occurred in the first half of the 20th century, leading ultimately to the atomic bomb in 1945. In the 1911 Rutherford model, the atom consisted of a small positively charged massive nucleus surrounded by a much larger cloud of negatively charged electrons. In 1920, Ernest Rutherford suggested that the nucleus consisted of positive protons and neutrally charged particles, suggested to be a proton and an electron bound in some way. Electrons were assumed to reside within the nucleus because it was known that beta radiation consisted of electrons emitted from the nucleus. About the time Rutherford suggested the neutral proton-electron composite, several other publications appeared making similar suggestions, and in 1921 the American chemist W. D. Harkins first named the hypothetical particle a "neutron". The name derives from the Latin root for neutralis (neuter) and the Greek suffix -on (a suffix used in the names of subatomic particles, i.e. electron and proton). References to the word neutron in connection with the atom can be found in the literature as early as 1899, however.



## What is Déjà vu? Harshini Boya - 11F

Déjà vu is that strange feeling where you feel you have lived through a present situation before; in other words, it is an impression that this is not the first time that one has been in a place or carried out some activity. The field attempts to explain it in many ways. One speculative theory is that it is a memory intermix-up. Our memory involves taking in new experiences, storing them in temporary memory, and at some later stage transferring them into long-term memory. But sometimes this process goes awry; the new experience is not granted the status it should be, and at some point gets mistakenly attributed to the past, and you have that déjà vu sensation. Such processes are thought to involve interplays between regions of the temporal lobe, specifically those structures, including the hippocampus, that are responsible for creation and retrieval of memory.

Another interpretation holds when some highly familiar brain but fail to inform source. Think of face but having no name is. The brain comparing the some old experiences, trace out the exact source, person into believing that once before. Studies show that the feeling is increased activity in the areas of the brain involved in memory and recognition.



that déjà vu occurs patterns activate the it about their seeing someone's idea what his juggles situation with but if it fails to it instead tricks the they have been there reinforced when there is

Interestingly, some scientists think that déjà vu might be a sign of the healthy brain working well. It could be a double-checking mechanism that allows the brain to ascertain whether its memories are being encoded correctly. It is more likely to occur when we are tired or stressed, as both conditions lead to mixed-up memories. Déjà vu is most common in young adults aged 15 to 25, which may relate to the brain's development and ability to process new information.

So, the next time you feel a flash of déjà vu, remember that it's not some weird mix-up of the universe; it is your brain trying to make sense of everything it is crunching through. This is just another way of the many peculiarities of how our brains work, and, understanding this better might unveil further chapters on how we actually form and retrieve memories in general.

## The Discovery of Penicillin Eliza Hussain - 11F

Penicillin is one of the most prominent antibiotics we use today, but how was it discovered?

The discovery of Penicillin was an accident! It was discovered by Scottish physician and bacteriologist Alexander Fleming in 1928. While sorting through petri dishes containing colonies of Staphylococcus bacteria, he found that a specific mold had killed many of the bacteria. This led to penicillin being the first antibiotic to treat bacterial infections.



Before penicillin was discovered there were little ways to fight against bacterial infections, this meant that traditional tactics such as bloodletting and the use of leeches were quite common. These treatments were dangerous, outdated and often ineffective leading to an increased mortality rate from simple bacterial infections; this also includes women in childbirth who often died from infections given to them during delivery.

The discovery of penicillin revolutionised medicine, after Fleming's discovery it was developed into a consumable drug by scientists Florey and Chain and put on the market. It was widely regarded as a wonder drug due to its high efficacy and lack of harmful side effects when used in large doses.

Today, penicillin is used to save millions of lives around the globe, it can treat a wide spectrum of bacterial diseases from pneumonia to syphilis. Its discovery also helped pave the way for new antibiotics to treat specific bacteria, transforming medical practices and public health for the better.

## Is doomsday a lot closer than we think? Callum Lomas – Year 12

You may think our little, blue planet will be fine for at least 7 billion years, at least until the sun runs out of fuel and enters the red giant phase, right... What if I tell you 7 billion years is way too optimistic for us, and in a mere 8 years this could be all over. The recently discovered asteroid 2024 YR4 is currently predicted to swing close to Earth near 2032. Few, all good! No. On Jan 31st the probability of impact was set at 1.4%, only for a week later (Feb 7th) for it to be upgraded to 2.3% and most in the scientific community agree that as more data becomes available this is bound to get higher. You've got to remember because it has a 2.3% chance of hitting, it has 97.7% chance of missing, so you can sleep easily tonight. But it does beg the question, what do we do if this gets any higher: 10,20,30%?

NASA has sent spacecraft and orbits to study and collide with completely safe asteroids in recent years to study how the impact changes their paths. Yes, humans can make quantum computers, genetically engineer new species, but their solution to a big rock in the sky is to either ram it with a spaceship or blow it up with a nuclear bomb into less dangerous pieces. World-leading scientists (inc. Brian Cox) have suggested that we plan for the worst and hope for the best. No matter whether YR4 will hit, we should practice properly deflecting an asteroid in a completely different path, so that one day when that dreaded day does arrive, we are ready.



## The Science Behind the 'the Deep Stretch' Zain G. Hamid - Year 12

Weightlifters and fitness enthusiasts are always looking for next most optimal ways to increase hypertrophy and strength in their muscles. While many believe lifting heavier weights or increasing repetitions will increase gains (which is not wrong...), one often overlooked aspect of training is the 'deep stretch' at the bottom of a lift that all the 'know it alls' in the lifting industry keep talking about. This technique, known technically as stretch-mediated hypertrophy

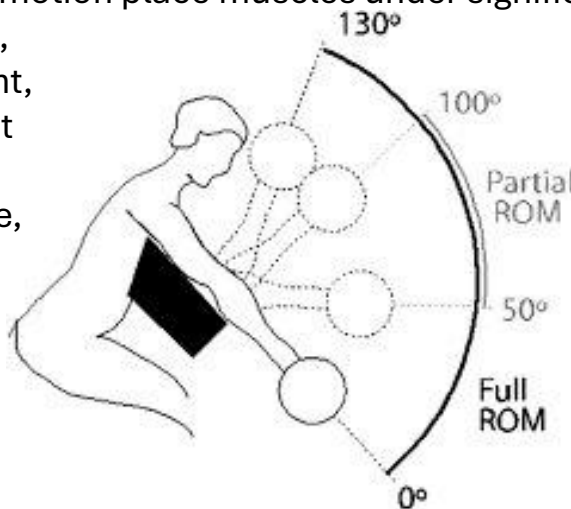
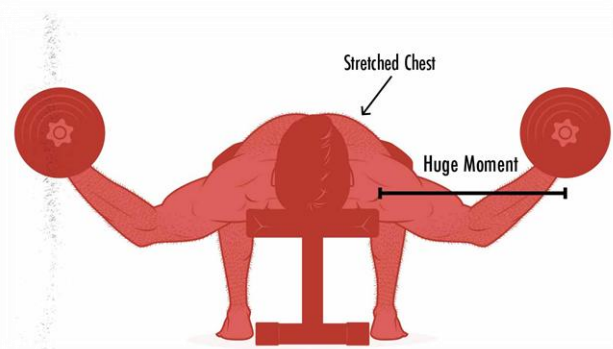
(SMH), plays a significant role in building muscle mass and strength. But what exactly is SMH, and what is the science behind it?

### What is Stretch-Mediated Hypertrophy?

Stretch-mediated hypertrophy is the process of which muscles grow and build in response to being stretched under load. When lifting weights, movements involving a deep range of motion place muscles under significant tension as they stretch. This tension, particularly at the bottom of a movement, muscle fibres in ways that stimulates promote growth. The deeper the stretch and the greater the Exercises such as weighted squats, dumbbell press and pull ups all utilise this. In order to achieve it the range of motion you used should be maximised to what your joints allows. In support of this there are a plethora of studies showing a

causal relation. For example, Maeo and colleagues' study contrasted seated and lying hamstring curls whilst controlling as many factors as possible. Both workouts had the same range of motion at the knee joint, but when we bend at the hips, certain hamstring muscles cross the hip joint and stretch out further. Muscle growth was more than doubled by the additional depth at the hip joint.

**Continued overleaf ...**

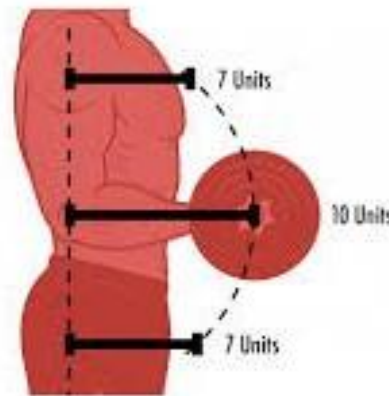


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## The Science Behind the 'the Deep Stretch' continued...

### How Does It Work?

Muscular hypertrophy occurs when muscle fibres experience stress that causes microscopic damage to muscle tissues. When lifting weights at a high intensity small tears called micro-tears occur in the muscle fibres. The body then repairs these micro-tears by satellite cells, these are located on the outside of muscle fibres, which are activated and fuse with the damaged fibres, donating additional nuclei. These new nuclei help to increase the muscle fibre's capacity for protein synthesis. During this process, amino acids from protein intake are used to create new proteins, such as actin and myosin, which are the structural components of muscle fibres. These proteins fill in the gaps created by the micro-tears, repairing the muscle and making it thicker and stronger in response to the stress, thickening and strengthening the muscle. This is why we are taught protein is for growth and repair very early on. Stretch-mediated hypertrophy differs in that muscles are not just contracting but are also stretched under load. Further, the 'deep stretch' activates muscle spindles, a specialised receptor that detects changes in muscle length. When the muscle is stretched using weight, these spindles send signals to the brain, triggering muscle-building pathways like mechanical tension and muscle protein synthesis (explained above).



In conclusion, stretch-mediated hypertrophy plays a critical role in muscle growth by utilising the 'deep stretch'. This stretch creates significant tension on muscle fibres, triggering both the activation of muscle spindles and satellite cells, which are essential for muscle repair and growth. The resulting micro-tears in the muscle fibres are repaired through protein synthesis, where the body uses amino acids to rebuild the muscle, making it thicker and stronger. Therefore, incorporating exercises that maximise the deep stretch under load enhances hypertrophy, contributing to increased hypertrophy and strength.

## How Does AI Think?

William Whatley – Year 12

Machine Learning is a small part of Artificial intelligence. It is the process of developing algorithms that can learn from presented data and generalise inputs into categories. It is the foundation of artificial intelligence allowing it to be able to complete tasks without an instruction set.

In its most raw form a machine learning algorithm would be able to take an input of labelled data, in our case we can use pictures of cats labelled same with “dogs”, and an algorithm to predict. The labelled data is the ‘teach’ the algorithm. then take all the and use them to build up which the average cat does the same for dogs.



case we can use “cats” and the produce an input images. set we require to The algorithm will pictures of cats a set of values to possesses, and

At this stage our machine learning is complete, and we have a complete algorithm which can determine how likely the inputted image is to be a cat or a dog. It will use the values for which it predicts a cat or a dog possesses and compare them to the values in the input image. This process is called supervised learning and is the basic form of machine learning.

In fact this is so simple it is accessible online to everyone through a website called teachable machine. Here you can input your labelled data such as pictures of animals and create a labelling algorithm through machine learning. Have a try for yourself at <https://teachablemachine.withgoogle.com/>  
I hope you managed to understand how a basic machine learning model works and maybe even had a go at creating one yourself.

## Fantastic beasts: The curious case of the wood frog

Miss C A Dollive - Teacher of Biology

Have you ever thought about the possibility of being cryogenically frozen, and then being woken up years into the future?

Here is how one frog's

this science fiction

science fact. The

*sylvaticus*) is

America, an

creature most

an unusual

survive over winter in

Frogs are exotherms (cold-blooded) which means that they rely on the air temperature to warm up. In cold winter months, most frogs will hibernate

either deep underground or in ponds where it is cold, but their body

temperature does not drop below freezing. The wood frog, however, has an

entirely different (and much cooler!) strategy. They hide under leaf litter on

the forest floor and spend the winter entirely frozen. Freezing is dangerous

for most animals because if ice crystals form inside the animal damage

can occur such as damaged cells, punctured blood vessels, and frozen

blood can not travel to deliver oxygen to vital organs. But the wood frog can

remain frozen for up to eight months of the year and still wake up in spring

with no issues at all.

So what is the wood frogs superpower?

As the frog begins to freeze and ice crystals form outside of it's organs, its

liver starts to produce large amounts of glucose which enters every cell in

the frog's body. The sugary cytoplasm in the cells prevents ice crystals from

forming and so stops the cells from freezing.

So although ice crystals can form on the

outside of the frog and its organs, no ice

crystals can form inside cells so no

damage can occur. The frog remains in

this frozen state of suspended animation

all winter with no muscle movement, or heartbeat.

Once spring arrives the wood frog begins to thaw from the inside out. First

the heart starts to beat, until finally the leg muscles begin to move, and off

this truly astonishing little creature hops.

To learn more, search for the science of cryobiology.



survival strategy may suggest that

might someday become

wood frog (*Lithobates*

found across North

unassuming and small

would overlook, but it has

superpower that enables it to

freezing cold temperatures.



## **A Quick thank you from us...**

Thank you for reading this edition of the Crossley Heath Science Newsletter! We hope you found the articles insightful, thought-provoking, and inspiring, whether you're passionate about biology, maths, chemistry, physics, or the latest groundbreaking scientific discoveries. Science is all about curiosity, exploration, and pushing the boundaries of what we know, and we're thrilled to share this journey of discovery with you.

If you have any ideas, questions, or topics you'd love to see covered in future editions, we'd love to hear from you! Your input helps us make this newsletter more engaging and relevant to our readers. Additionally, if you're interested in contributing your own article—whether it's a deep dive into an exciting scientific concept, an analysis of a recent discovery, or even a personal perspective on a science-related issue—we encourage you to share your work with us.

Writing for the newsletter is a fantastic way to develop your research and writing skills while sharing your enthusiasm for science with others. Whether you're an aspiring scientist, an avid science enthusiast, or just someone with an interesting idea to explore, we welcome contributions from all students. If you'd like to submit an article or discuss a potential topic, please don't hesitate to reach out. You can email your submissions, suggestions, or inquiries [wisaacbarker19@crossleyheath.org.uk](mailto:wisaacbarker19@crossleyheath.org.uk), and we'll be happy to use your work in future editions.

Thank you for being a part of our science-loving community! Keep exploring, stay curious, and never stop asking questions. We look forward to bringing you more exciting science updates next time! A special thanks to Mrs Ryan for supporting us in getting the project up and running and also Mrs Tomlinson for the help with the design of the newsletter!