



January 2026

# Beths Science

*"Study hard what interests you the most  
in the most undisciplined, irreverent and  
original manner possible."*

- Richard Feynman -

# Contents

1	Upcoming events and talks	
2	Feature interview - Dr Tim Nott, Kings College London	
3	International Day - Clean Energy - Harvey Todd	Event
4	Smallpox: Tiny yet Deadly - Dammy Ogundalu	Biology
6	What to Watch - Extended learning	Learn
7	Why Huntington's is Difficult to Cure - Katie Herd	Biology
9	Treatment vs Enhancement : Playing God? - Harry Lin	Biology
12	What to Read - Extended learning	Learn
13	Intubation - Its Workings, Inside and Out - Kushi Pravinkumar	Biology
15	The Counterintuitive Nature of Probability - Carol Mbuse	Maths
17	What to Listen to - Extended learning	Learn
18	The Uniqueness of Vitamin D - Marwan Froukhi	Biology
20	What Astronomical Events to Expect for 2026 - Dev Parmer	Astronomy
21	Next Edition Preview	Preview
22	About Us and Picture Credit	

## Upcoming Events

Royal Society	Leeuwenhoek Prize Lecture : "Pathogen assassin" - "On the applications of treatment on neglected infectious diseases"	26/01/26 at 18:30
Royal Society	Clifford Patterson Prize Lecture : Mass photometry - Measuring the mass of molecules by using light	09/02/26 at 18:30



## Tim Nott



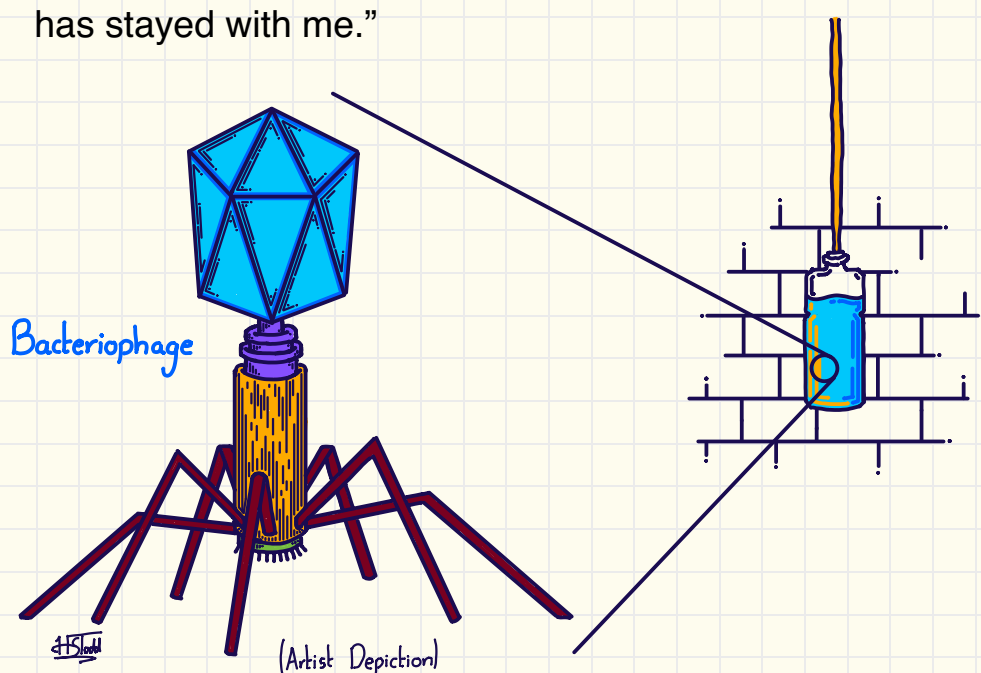
Tim Nott is a current reader of chemical biology at Kings College London, with his research mainly into interactions of proteins and sub-cellular features.

Receiving his PhD at the National Institute for Medical Research on Molecular Structure he then pursued a Postdoctoral in Toronto. He then received a Sir Henry Dale Fellowship from the Royal Society and the Wellcome Trust and started his own lab at the University of Oxford.

### Q. *What inspired you to want to pursue the sciences as a career?*

“One of the things that inspired me to pursue science was seeing a BBC Horizon program about bacteriophage lambda when I was at school. I was really amazed by its moon lander-like structure, and a short scene from the program stuck with me - someone leaning over a wall, lowering a plastic bottle on a piece of string to collect dirty water that might contain the phage.

This made me realise that amazing tiny molecular machines and life forms are everywhere around us, and that discovering them often just depends on being curious and knowing where to look. It opened my eyes and sparked a curiosity that has stayed with me.”



#### Explanation

A “lambda bacteriophage is a type of virus that infects bacterial species”(Wikipedia, Sep 2013), enacted by inserting its own genetic information into the cell. This is carried out by the proteins to oppose the lipid bilayer of the cell wall, which would otherwise protect it from external factors on the cellular level.

# International Day ~ Clean Energy ~

26th January

## What is “Clean Energy”

Clean energy typically refers to renewable sources that use naturally occurring and sustainable processes to generate energy rather than burning coal or other fossil fuels.

## UN Initiative

The UN’s target for clean energy focused on being able to provide everyone with greener sources, not just HICs (such as the US, UK or Canada etc.).

The goal set at the Paris Agreement was to reduce global warming to 1.5°C, however, some core governments have pulled out of the initiative, thus affecting global progress. Currently, it is predicted that the emissions will be reduced by 15% by 2035, when goal should be 55%.

Unfortunately, global change can only come from global participation, so the world needs everyone to contribute for the benefit of the future generations.

Source: <https://www.un.org/sustainabledevelopment/energy/>

## Why Can’t We Just Leave the Earth?

Currently, ideas around leaving Earth and developing humanity into a space-faring civilisation are only represented in science fiction. As far as we know, we live on the best planet for the development and survival of life, so we should do all that we can to protect it.

Evidence of the effects of natural climate disasters can be seen on our neighbouring planets of Mars and Venus, where their atmospheres were of a hostile composition and were too thin to maintain the perfect amount of heat on the planet. The sustained emittance of greenhouse gases thickens the atmosphere by increasing heat absorption thus leading to a warmer planet. Whilst small changes can be reversed over time, larger ones can have more significant outcomes due to the positive dynamic feedback that once the Earth starts getting hotter, it will only get worse, till all life either adapts or dies.

For now let us protect the planet that humans have called home for thousands of years, it is the best one that we have and it may be the only one that there is.



# Smallpox : Tiny, yet Deadly

Written by Dammy Ogundalu

Smallpox was a serious infectious disease caused by the Variola virus. It was highly contagious, feared, and caused fatalities across the globe, killing 300 million people worldwide before finally being eradicated on May 8, 1980.

## History of Smallpox

Smallpox was first documented in 1350 BCE in relation to a study conducted on Egyptian Mummies, notably with the absence of a theorised cure. The ancient practice of variolation (also known as variola or 'la variole') was widely used in Asia and some parts of Africa. This consisted of transferring small amounts of material to healthy people from smallpox sores, resulting in milder forms of illness and much lower mortality than natural infection. Some sources suggest practices of variolation were taking place as early as 200 BCE. Written accounts from the mid-1500s describe a form of variolation used in China known as insufflation, where smallpox scabs were dried, ground and blown into the nostril using a pipe.

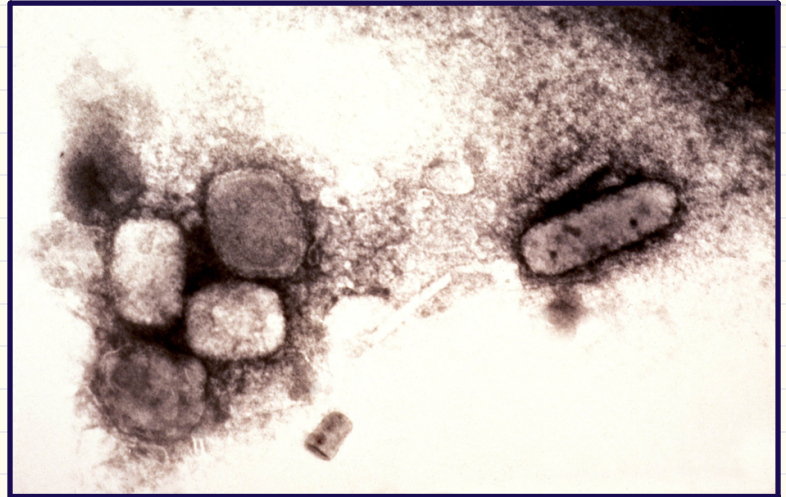
In India, similar practices were carried out through inoculation, using a lancet or needle to transfer material from smallpox pustules to the skin of healthy children. Accounts from the 18th century suggest this technique dates back hundreds of years.

## Symptoms and How it Spread

Smallpox is an acute contagious disease caused by the variola virus, a member of the orthopoxviral family. The incubation period typically lasts between 7 to 19 days (although the average length is 10 to 14 days), during this time the disease is not contagious, and the person usually has no symptoms. When initial symptoms start, smallpox can be contagious. However, when the early rash begins it is most contagious; it starts with small red spots on the tongue and in the mouth and lasts for about 4 days. Eventually it develops into pustular rashes and scabs and lasts for 10 days and is still very contagious, then finally the scabs fall off and once they all have, the person is no longer contagious (World Health Organisation, no date).

## First major step in vaccine history (1796)

Vaccinations derive their name from the Latin word *Vacca*, Latin for cow reflecting the origins of the smallpox vaccination (Wikipedia, no date). The first vaccine ever manufactured and used globally against infectious disease was the smallpox vaccination, having been developed in 1796 by British Physicist Edward Jenner. He demonstrated that an infection with the relatively mild cowpox virus conferred immunity against the deadly smallpox virus. Cowpox served as a natural vaccine until the modern smallpox vaccine emerged in the 20th century. "From 1958 to 1977, the World Health Organization (WHO) conducted a global vaccination campaign that eradicated smallpox, making it the only human disease to be eradicated" (Wikipedia, no date) on May 8, 1980, and hopefully with the way things are going, it won't be the last. Besides chemical developments, key components of the worldwide smallpox eradication effort included universal childhood immunization programs in some countries, mass vaccination in others, and targeted surveillance-containment strategies during the endgame.



Credit : <https://www.bbc.co.uk/news/uk-england-birmingham-45101091>

## Further Interest



A beautiful animated video on the functionality of the variola virus, and how deadly it really was.

Link : <https://www.youtube.com/watch?v=Kr57ax0OWMk>

Focus more on historical importance/impact and how the WHO initiated the campaign to eradicate smallpox.



Link : <https://www.youtube.com/watch?v=yqUFy-t4MIQ>

## Key Idea

Vaccinations act as a "test-run" for the immune system defences to "fight" against the actual virus. A vaccination often uses a weaker or damaged form of the actual virus, to allow for the immune system to be able to quickly generate antibodies used to reduce the effect of infection. In this way the immune system "remembers" how to fight the virus and so is better suited to dealing with it when the time comes, put into effect by the 'Memory T-cells', that store the information for the specific antibody production.

# TED What to Watch



This short TED talk by Ben Goldacre is on the common problems that we face with science and how important it is to analyse our sources of information.

It highlights the true passion of a scientist to be constantly curious and to question everything, not just to take the simplified (and often exaggerated) words of a journalist as scientific fact, but to identify their source of information to make a personal judgement.

This can be accessed via the free TED app or via : <https://www.ted.com/search?q=Battling%20Bad%20Science>



This series of podcast-type videos explores the connections of neuroscience to general societal problems. From how habits can change study habits, to how you can be incontestable in all actions through the sheer will power of the mind.

Through the links of science, Huberman links his knowledge of the anatomy of the brain to associate particular activities with neuro-development. Especially in this society, it is extremely important to understand how actions that we take in our lives can affect our mental cognition, especially in our perception of the world around us.



Especially important for students with public exams approaching, here Andrew discusses small habits that we can do to affect our productivity and inclinations to stop procrastination.

From the amount and quality of light that the eyes should receive in the morning, to how to harness your circadian rhythm



# Why Huntington's Is Difficult to Cure

Written by Katie Herd

Huntington's disease is an inherited genetic disorder (meaning it is passed down to you from either of your parents DNA) that progressively damages parts of the brain, causing involuntary decline in movement, thinking, and mental health – classifying it as a form of dementia. It is also rather famous, like many other forms of dementia, for having no current cure.

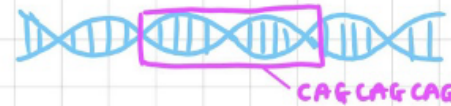
Ever since the disease was first comprehensively described by physician George Huntington in 1872, the world has played witness to a plethora of medical advancements: medical imaging devices, the iron lung, antibiotics, radiation therapy, pacemakers, robotic surgery and the Human Genome Project. However, in spite of this, 153 years on there is still no cure?

Perhaps looking at the biological blueprint of Huntington's Disease and comparing it with present day technological capabilities would explain why.

Normal HTT gene : <27 C-A-G repeats



Mutated HTT gene : >35 C-A-G repeats



A gene is a piece of inherited information which is present in every cell in the body. Genes have many roles in your body, but in summary, they tell cells what to do and when.

The gene that causes Huntington's is often called the 'huntingtin gene' (HTT), since it produces the protein, huntingtin, that is needed by nerve cells in the brain for DNA repair, cell protection and neurone transport, and for the body's development before birth.

The HTT gene is composed of DNA, acting like a coded message, different DNA sequences are characterized by four different chemicals: Adenine (A), Cytosine (C), Guanine (G) and Thymine (T) in unique orders. When the HTT gene is faulty, the triplet chain of chemicals (a codon) C-A-G is repeated too many times in the gene's DNA sequence. This code then produces a protein, and appears to damage nerves in the brain causing the progressive development of Huntington's disease that would be seen later in an individual's life – although how and why this happens is still unclear to researchers and scientists.



Could this lack of biological understanding be the most damning reason there is no definite cure to Huntington's?

In truth, advancements in finding a cure have increased exponentially in the past 35 years. As the discovery of HTT in 1993, and more recently (in 2025), ground-breaking gene therapy trials shows success in slowing the disease's progression by 75%.

Hence, perhaps an answer also lies in the present-day technology available to the scientists and researchers combating the disease. Over the past 5 years, artificial intelligence has become increasingly more embedded in our lives, and especially so in medicine and biomedicine. A rise in the application of gene therapy has accelerated treatments that can build up to a cure for Huntington's disease ; greater use of AI has promising potential in getting there faster. However there can only be as much done now as what technology and engineering allows, limiting access and discovery to a cure.

To conclude, yes, Huntington's disease is a highly frustrating disease to conquer, its complicated and specified biological composition alongside a lack of universal access to the machines that could help us to find a cure all make the the aim difficult to reach.

## Further Interest



This short TED video summarises the effect of neurodegenerative diseases and how discoveries in science have both developed our ideas and stagnated fields. The use of a metaphorical drumming to represent neurone stimulation clearly demonstrates the danger of these diseases.

[https://www.ted.com/talks/james\\_kozloski\\_can\\_a\\_new\\_brain\\_circuit\\_model\\_change\\_our\\_thinking\\_about\\_neurodegenerative\\_disease](https://www.ted.com/talks/james_kozloski_can_a_new_brain_circuit_model_change_our_thinking_about_neurodegenerative_disease)



With a stronger focus on the physical structure of the brain, this talk looks at how we could try and “expand” the workspace of the brain to discover more about how it works to hopefully create better treatments and more cures for neurodegenerative diseases.

[https://www.ted.com/talks/ed\\_boyden\\_a\\_new\\_way\\_to\\_study\\_the\\_brain\\_s\\_invisible\\_secrets](https://www.ted.com/talks/ed_boyden_a_new_way_to_study_the_brain_s_invisible_secrets)

# Treatment vs Enhancement : Playing God?

Written by Harry Lin

Gene therapy is a technique that uses genes (small sections of coding DNA that corresponds to a protein) to treat, prevent, or cure a disease. Often, gene therapy works by adding new copies of a gene that is broken, or by replacing a defective or missing gene in a patient's cells with a healthy version of that gene. Both inherited genetic diseases and acquired diseases have been treated with gene therapy.

## What is Somatic Gene Therapy?

Somatic gene therapy treats diseases or genetic conditions by acting on the DNA contained in a person's body or 'somatic' cells. This means that any changes produced by the therapy will be limited to that patient and that any modifications will not be inherited by the patient's children.

This method of gene therapy works by excluding some of the dysfunctional cells in the patient and introducing them with a cloned version of the normal gene. These transgenic cells (cells with foreign DNA) are then implanted into the patient's body where they perform the rectified and healthy gene function. Current medical implementations of somatic gene therapy are primarily limited to monogenic (single gene) disorders and cancer treatments. For example, CAR T-Cell therapy consists of genetically modifying a patient's T-cells to express artificial receptors (CARs) that specifically recognise and attack cancer cells.

## What is Germline Gene Therapy?

Germline gene therapy aims to prevent genetic disease from being inherited by a patient's descendants, effectively removing harmful mutations from the human gene pool. This approach involves editing genes in gametes (sperm or eggs) or in early-stage embryos, meaning the genetic changes are heritable and present in every cell of the resulting individual.



In theory, germline editing could prevent severe inherited disorders, such as cystic fibrosis or Huntington's disease, from being transmitted within families. Techniques such as CRISPR-Cas9, which uses a guide RNA and the Cas9 enzyme to precisely cut DNA, could be used to correct disease-causing mutations in nuclear or mitochondrial DNA.

However, germline gene therapy remains highly controversial. Concerns include unintended mutations, unknown long-term health effects, and the inability of future generations to consent to genetic modification. Despite this, in 2018, He Jiankui illegally edited the genome of human embryos in an attempt to confer genetic resistance to HIV, an event that was met with global condemnation and led to stricter regulations on human germline editing in China. As a result, germline gene therapy is currently prohibited or tightly regulated in most countries.

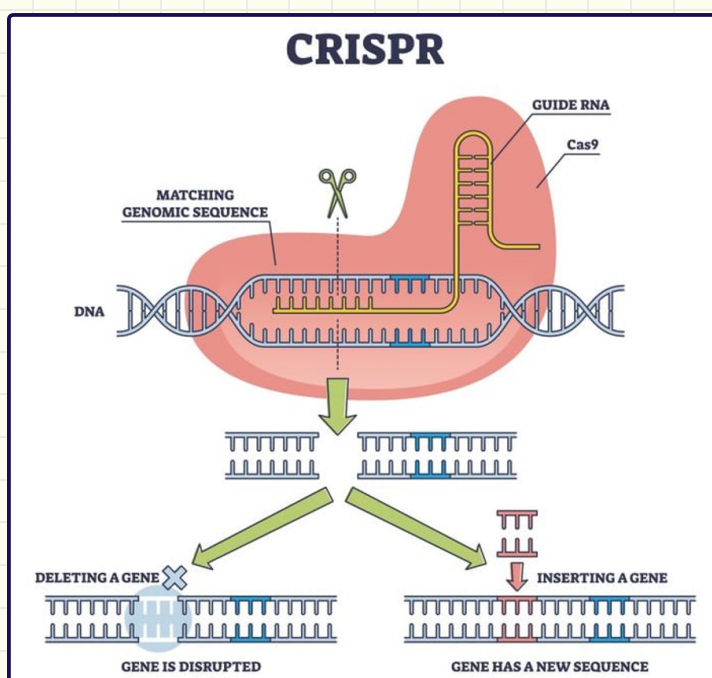
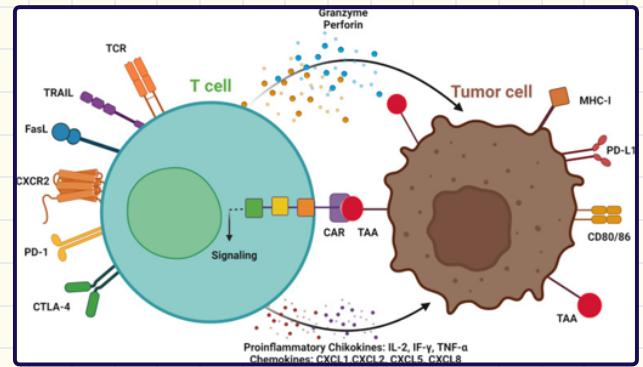


Photo credit: <https://www.camenabio.com/resources/helping-crispr-cas-technology-unleash-its-potential>



Visual of CAR T-Cell therapy allowing for recognition, of the Tumor cells to prevent a potentially dangerous development.

## Ethical Considerations

The ethical implications of gene therapy differ between somatic and germline approaches. Somatic gene therapy is generally considered ethically acceptable, as its effects are confined to a consenting individual and aim to alleviate diseases. This also means that long-term health effects can be monitored which can improve the effectiveness as well as safety of the treatments over time. In contrast, germline gene therapy introduces heritable changes that affect future generations who cannot give consent and may result in unknown long-term consequences that could negatively impact their quality of life.

Additional ethical concerns include the potential rise of 'neo-eugenics' and the use of medical technologies to enhance human traits beyond therapeutic needs. Such practices could exacerbate social inequality, discrimination, and moral conflict. Furthermore, concepts of 'enhancement' such as intelligence, appearance, or height are subjective and risk removing an individual's right to an open future. Historical examples, including Nazi eugenics policies, serve as cautionary reminders of how genetic ideologies can lead to severe human rights abuses.

### Key Takeaway

Genetic engineering and editing has limitless possibilities. From improving the nutrient concentration in GMOs such as with "Golden Rice", to changing the characteristics of humanity to become stronger, faster and smarter.

The future appears to be one of rapid designed "evolution" for the better of all, or for the removal of "imperfections" from society.

The only way to use this technology is if we all work together to provide a better future for all and for future generations.

### Further Interest



<https://www.youtube.com/watch?v=jAhjPd4uNFY>

Kurzgesagt describes the history of genetics and the impact that CRISPR now has on the future of genetic research. The beautiful illustrations make the ideas clear and impactful, whilst still maintaining scientific fact.



[https://www.ted.com/talks/jennifer\\_doudna\\_how\\_crispr\\_lets\\_us\\_edit\\_our\\_dna](https://www.ted.com/talks/jennifer_doudna_how_crispr_lets_us_edit_our_dna)

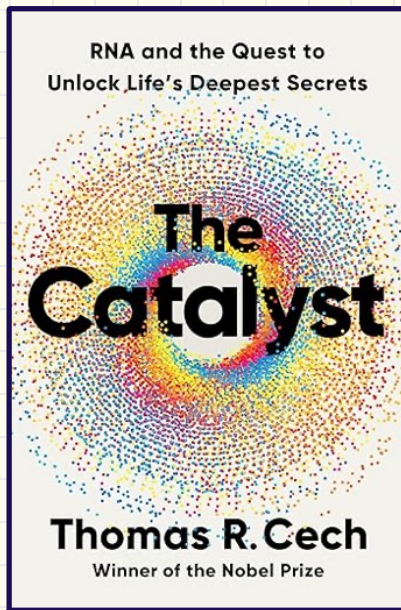
Explained from the co-founder of CRISPR-Cas9 as a genetic technology, the potentials of this mechanism appear limitless yet defined by ethical concerns as to the future of humanity as a species or if genetics will merely be another characteristic that we can change, such as our hair colour or weight.

'Science Direct' sources: <https://www.sciencedirect.com/science/chapter/referencework/abs/pii/B0080430767033647>  
<https://www.sciencedirect.com/topics/medicine-and-dentistry/germ-line-gene-therapy>





## What to Read



In “The Catalyst”, Tom explores the properties of RNA and how the short-stranded replica contains key characteristic for the future of biological exploration.

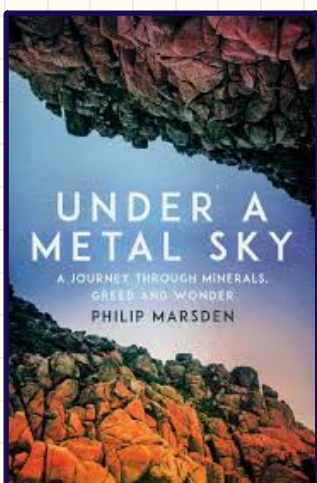
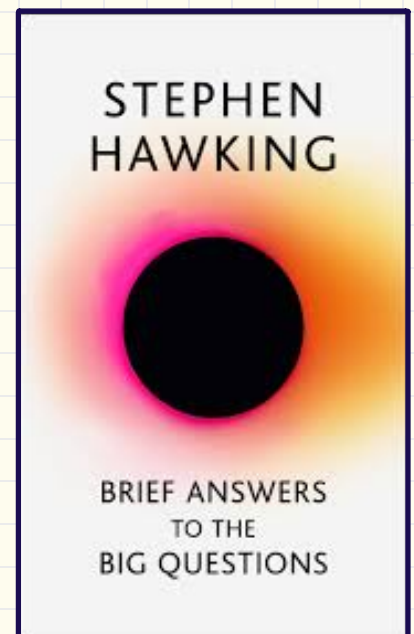
From describing its catalytic properties to the functioning of telomeres to change the life span of humans, possibly even allowing for increased life spans in the future through gene-editing technologies.

Written by the Nobel Prize Winner Tom Cech, insight into the capabilities of RNA-medicines has already taken effect, most notably through the Covid-19 vaccination.

One of the most famous books on the physical sciences to read, Stephen Hawking addresses broader societal questions with a scientific perspective, obtaining a solely factual viewpoint in answering some of life’s big questions.

Addressed on the front cover with the diagram, is one of Stephen’s many contributions to science, the ‘Hawking Radiation’ emitted by Black Holes - notable points in our universe under which classical ideas of physics “break down”.

How Hawking answers these questions offers insight into the curiosity of scientists in helping to explain the natural world all around us.



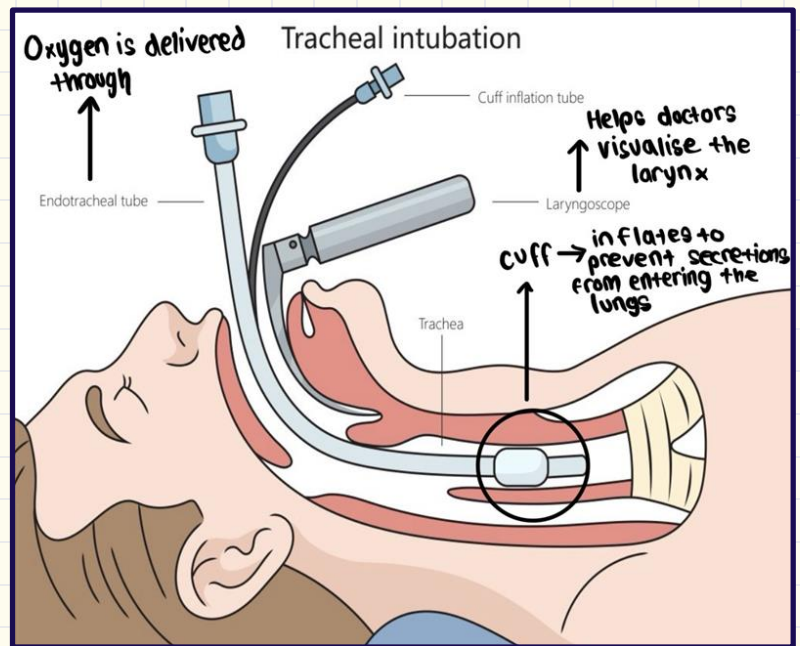
For any prospective geologist, “Under A Metal Sky” discusses the history of the world in relation to notable minerals and materials that have influenced how society works. Exploring economical aspects as well as the scientific marvels that faced our earlier civilisations in discovery. Despite all of these changes, only one thing has remained the same, the fascination of the natural order of the world we live on, the Earth.

# Intubation - Its Workings, Inside and Out

Written by Kushi Pravinkumar

Medical television dramas like Grey's Anatomy and ER often depict intubation as a quick and easy life-saving procedure. In these shows, doctors insert the tube in seconds, usually without visible preparation or monitoring, and the patient stabilizes quickly. Complications are rarely shown, and the procedure almost always succeeds on the first try. While this portrayal is effective for storytelling, it creates an unrealistic view of how simple and safe intubation is. It may lead viewers to underestimate how critically ill a patient must be to need it.

Endotracheal intubation is a serious medical procedure used when a person can't breathe well enough on their own. It involves placing a special tube through the mouth, past the vocal cords, and into the trachea to support or fully control breathing.



This is necessary because normal breathing relies on the diaphragm and intercostal muscles creating negative pressure in the chest to draw air into the lungs. When this system fails because of illness, injury, or unconsciousness, oxygen delivery to vital organs becomes insufficient, making medical help essential.

Once the tube is in the right position, it connects to a mechanical ventilator that helps or completely takes over breathing. Unlike normal breathing, which relies on muscle movement, mechanical ventilation uses positive pressure to push air into the lungs. This allows medical staff to carefully control breathing rate, tidal volume (the amount of air moved in each breath), oxygen levels, and airway pressure. This level of control matters greatly in patients with severe lung conditions, such as acute respiratory distress syndrome or pneumonia, where improper ventilation can worsen lung damage or decrease oxygen exchange.



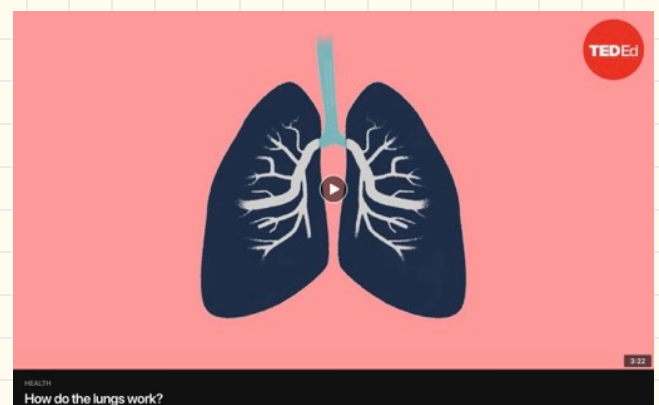
Continuous monitoring is critical during intubation and ventilation. Staff measure oxygen levels in the blood, carbon dioxide levels, heart rate, and blood pressure constantly to ensure the body's tissues receive enough oxygen. These checks help clinicians spot problems quickly and adjust treatment as necessary.

Although intubation can be life-saving, it comes with significant risks. Possible complications include airway injury, low oxygen levels during the procedure, and a higher risk of infection, especially with long-term ventilation. Prolonged mechanical ventilation can also cause additional lung problems. Because of these risks, intubation is reserved for critically ill patients and is performed by skilled professionals, like anesthesiologists or critical care doctors.

Correct placement of the endotracheal tube is vital. The tube must go through the vocal cords and into the trachea, directly in front of the esophagus. If the tube mistakenly enters the esophagus, oxygen won't reach the lungs, and the situation can become dangerous. To lessen discomfort and avoid reflex responses like coughing or gagging, patients are often deeply sedated or already unconscious. After placing the tube, a small cuff near its end is inflated to seal the inside of the trachea, improving ventilation and lowering the risk of aspiration.

Unlike the effortless scenes often shown on television, real-world intubation is a high-stakes procedure. Precision, training, and constant monitoring can mean the difference between life and death. What appears on screen as a moment of drama is actually a carefully controlled scientific process that emphasizes the complexity of the human body and the skills needed to keep it alive.

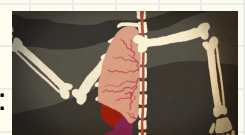
### Further Interest



[https://www.ted.com/talks/emma\\_bryce\\_how\\_do\\_the\\_lungs\\_work](https://www.ted.com/talks/emma_bryce_how_do_the_lungs_work)

This short video briefly describes the structure and mechanisms involved with the respiratory system. The failing of the diaphragm is where intubation is needed, as there is no longer any pressure to take in the necessary oxygen.

The “journey of oxygen” is further described in this video:



[https://www.ted.com/talks/enda\\_butler\\_oxygen\\_s\\_surprisingly\\_complex\\_journey\\_through\\_your\\_body](https://www.ted.com/talks/enda_butler_oxygen_s_surprisingly_complex_journey_through_your_body)

# The Counterintuitive Nature of Probability

Written by Tatenda Carol Mbusa

The human brain is wired to search for patterns, even where there are none. Probability, ironically, counters that.

Probability is described as “the mathematical measure of how likely an event is to occur, expressed as a value between 0 (impossible) and 1 (certain), or as a percentage from 0% to 100%.

Despite having a clear definition; full understanding of how it works; and an understanding of how to carry out calculations - probability still clashes with intuition because randomness has no memory. A string of heads in coin tosses does not make tails due. This common misunderstanding is known as the gambler's fallacy (aka Monte Carlo Fallacy).

A striking example of probability defying intuition is The Birthday Paradox. Intuitively, many assume that a shared birthday in a room would be rare unless there are close to 365 people present. However, The Birthday Paradox is a counterintuitive idea suggesting that in a group of just 23 people, the probability that at least two people share the same birthday exceeds 50%. This result feels paradoxical because people tend to compare one birthday to all 365 possible dates, rather than considering the rapidly increasing number of pairings within the group, thus highlighting how quickly probability can accumulate.

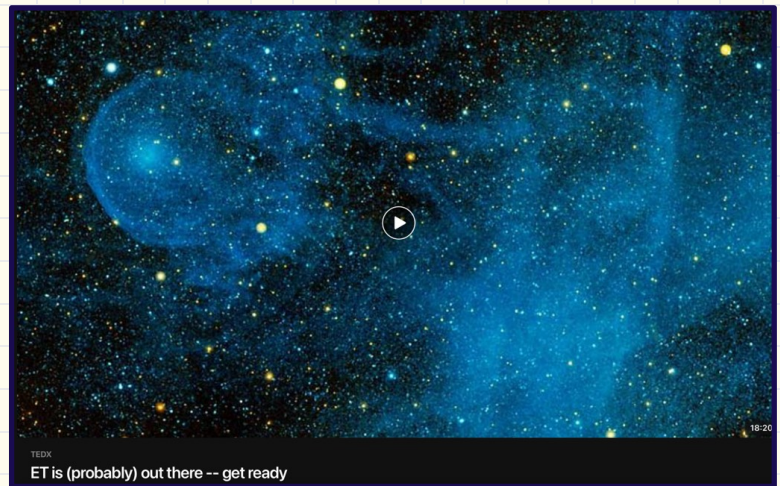
Mathematical Probability, on the other hand, can be described as mathematicians' “bane of existence”, because it not only conflicts with intuitive thinking, but also requires a shift in mindset: It is not about predicting what will happen next, but instead calculating the likelihood of possible outcomes. Even then, a high probability never guarantees an event will occur, just as a low probability does not make an event impossible.



The counterintuitive nature of probability is also evident in modern physics. In Quantum Mechanics, events cannot be predicted with certainty, only described probabilistically. The position or momentum of particles is represented using probability distributions rather than exact values. Outcomes that seem unlikely from a human perspective can still occur, reinforcing the idea that probability does not predict outcomes, instead it describes likelihood/chance.

In some cases, probability calculations work backwards. Instead of calculating the chance that an event will occur, it is often easier to calculate the probability that it will not occur and subtract this value from 1. This method is used in classic problems like the birthday paradox and remains an essential method in more complex probabilistic models, further demonstrating how probability often rewards indirect thinking over intuition.

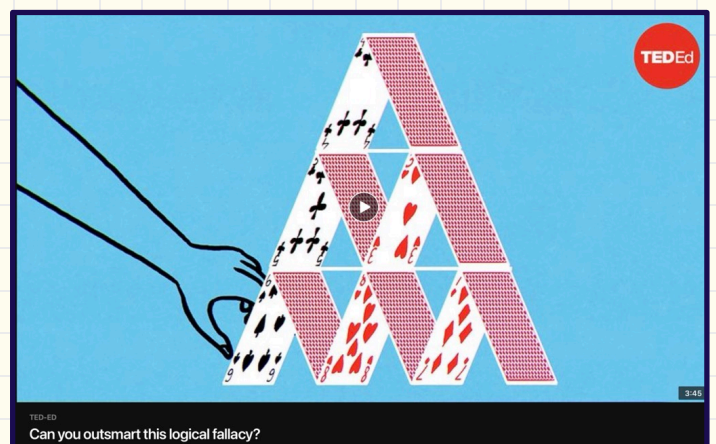
## Further Interest



[https://www.ted.com/talks/seth\\_shostak\\_et\\_is\\_probably\\_out\\_there\\_get\\_ready](https://www.ted.com/talks/seth_shostak_et_is_probably_out_there_get_ready)

Exploring the idea of probability, this video looks into one of the largest questions in our society, whether there is life in the universe other than us.

Determined by theories such as the Goldilocks Zone and the “Rare Earth Theory”, this is but one of the applications for probability in the real world.



[https://www.ted.com/talks/alex\\_gendler\\_can\\_you\\_outsmart\\_this\\_logical\\_fallacy](https://www.ted.com/talks/alex_gendler_can_you_outsmart_this_logical_fallacy)

Exploring the “conjunction fallacy”, this short animated story clearly explains the assumptions that we make despite a definite mathematical explanation of the opposite. Assuming more details about a scenario will always make it statistically more unlikely although specific characteristics may make it seem more probable to us, despite what the “maths says”.

# What to Listen to



“The Rest is Science” podcast from Hanna Fry and Michael Stevens explores interesting and often quite extreme ideas. From how sound can cause us to levitate and what the day actually is to how we are all (gravitationally) attracted to each other and how to ‘drink lava’.

In a school experience often dominated by the focus of grades, this is a fun refresher to the wonders of life and the beauty of curiosity.

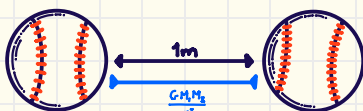
<https://www.youtube.com/@TheRestIsScience>

## Recommended Episode

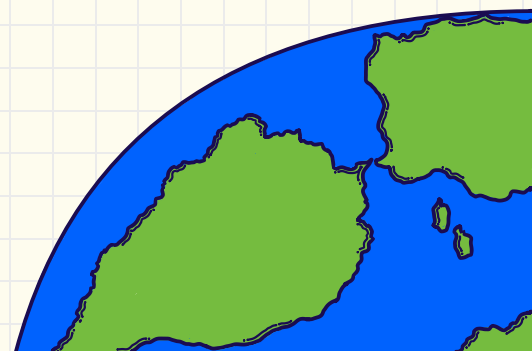
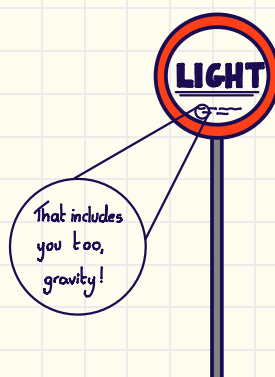
### We’re All Being Pulled Together



This episode explores the idea of gravity, and the works of Newton and Einstein in establishing a cohesive theory of this universal force. Starting with how to explain gravity to an alien, to what actually is mass? Gravity is such that each object attracts each other, although on a scale with a lower mass, other forces such as pressure and friction fully oppose the actions of gravity.



(These diagrams are all references to ideas mentioned in the episode)



# The Unique Nature of Vitamin D

Written by Marwan Froukhi

You may have already heard that you “get” Vitamin D from the sun before, but have you thought about how this actually happens?

Among the thousands of different chemical reactions in the body the production of Vitamin D involves a very unique chemical reaction not found anywhere else.

But before exploring the unique chemical reaction, let's understand the importance of Vitamin D in the body.

Vitamin D plays many different roles such as:

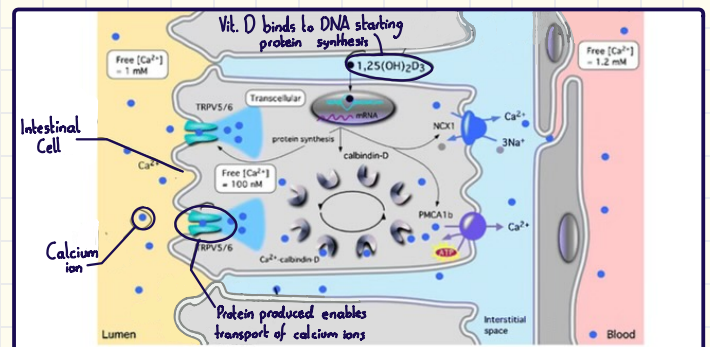
- Absorption of calcium into the body
- Maintenance of bone mass
- Supports the immune system
- Muscle Function
- Helps maintain normal blood pressure

...with the most significant roles being the first three.

## Absorption of calcium + maintenance of bone mass

Vitamin D binds to genes in intestinal cells allowing your body to produce special proteins that allow calcium to enter your cells.

Calcium is an essential mineral needed in the body that helps with many things such as muscle contraction, heart rhythm regulation, blood clotting, bone structure (and much more). Therefore, Vitamin D helping absorption of calcium also helps to maintain bone mass.



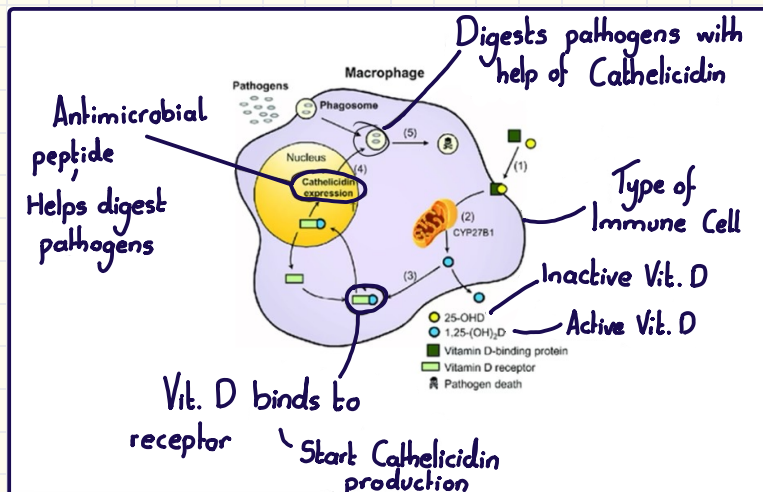
## Support of the Immune System

If you imagine the body as a fortress constantly under attack, Vitamin D would be the general that helps to coordinate all the soldiers.

Vitamin D activates your immune cells (so they can start attacking pathogens), helps produce antimicrobial proteins (that kill pathogens), helps to regulate inflammation and supports barrier defenses like the skin, lining of the gut and lungs.

Vitamin D plays all these different roles by binding to Vitamin D receptors on cells, allowing the body to produce proteins that help the body fight pathogens and maintain strong barriers.

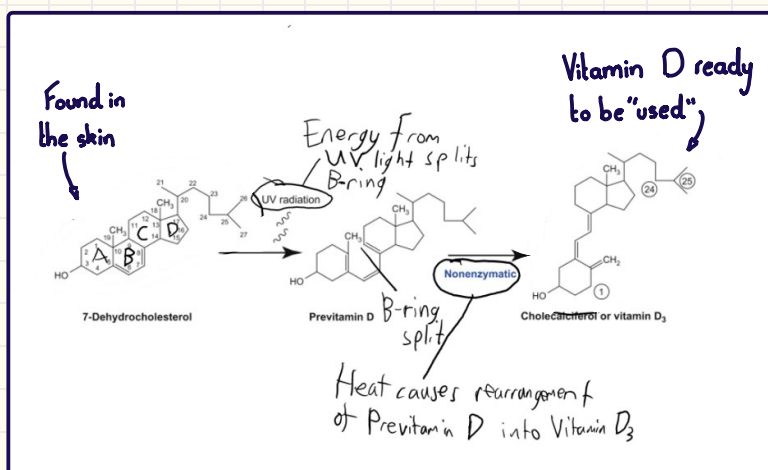




## Synthesis of Vitamin D

The unique chemical reaction that helps produce Vitamin D is the use of UV light from the sun to break the steroid structure of a molecule allowing the body to further modify it using thermal isomerization (another rare process in the body).

The production of Vitamin D is unique in this way as it is the only molecule in the body that uses UV light from the sun to produce a completely new molecule.



## Further Interest



[https://www.ted.com/talks/](https://www.ted.com/talks/richard_weller_could_the_sun_be_good_for_your_heart)

[richard\\_weller\\_could\\_the\\_sun\\_be\\_good\\_for\\_your\\_heart](https://www.ted.com/talks/richard_weller_could_the_sun_be_good_for_your_heart)

This TED video explores the additional benefits that sunlight can have by the effects of UV light on the skin, not just the exposure to Vitamin D.

As an accompaniment to the topics discussed earlier in the article, this furthers the ideas of the benefits of sunlight.



[https://www.ted.com/talks/ginnie\\_nguyen\\_how\\_do\\_vitamins\\_work](https://www.ted.com/talks/ginnie_nguyen_how_do_vitamins_work)

As a more general explainer of the importance of vitamins, this TED talk goes into how they function and how the range of vitamins enters our bodies for their beneficial functions, whether that is by sunlight or through the food that we eat. Their range of functions spans the ability for the body to heal to how the immune system effectively works.

# Astronomical Events of 2026

Written by Dev Parmar

Down below is just a short collection of out-of-this-world sights that you can enjoy over the course of this year. Gather your family and friends and rather than looking down at those flashing screens we all stare at constantly, take a second to look up at what the cosmos has to offer for you.

- **April 22** – Lyrids Meteor Shower Peak: Fast bright meteors (some with trails). Associated with Comet Thatcher
- **May 6** – Eta Aquariids Meteor Shower Peak: Meteors will be quite low in the sky. Associated with Comet Halley
- **May 31** – ‘Blue Moon’: Contrary to belief, blue moons are common and don’t actually appear blue! (in very rare cases they may be due to dust particles in the atmosphere)
- **June 9** – Venus-Jupiter Planetary Conjunction: These two planets will appear to be close to each other in the sky.
- **August 12** – Partial Solar Eclipse: Will almost be total with 90% of the Sun covered by the Moon’s shadow. Begin around 6pm.
- **August 13** – Perseids Meteor Shower Peak: Many bright and fast meteors with trails. Associated with Comet Swift-Tuttle
- **August 28** – Partial Lunar Eclipse: At its peak (around 5am) 90% of the Moon will be in Earth’s shadow.
- **October 4** – Saturn ‘in opposition’: The Earth will be directly in between the Sun and Saturn, making Saturn appear larger and brighter than usual.
- **November 18** – Leonid Meteor Shower Peak: Fast, bright meteors with fine trains. Associated with Comet Tempel-Tuttle
- **December 14** – Geminid Meteor Shower Peak: Plenty of bright meteors but with few trails
- **December 24** – Supermoon: Appear to be 14% bigger and 30% brighter.



# Coming Soon...



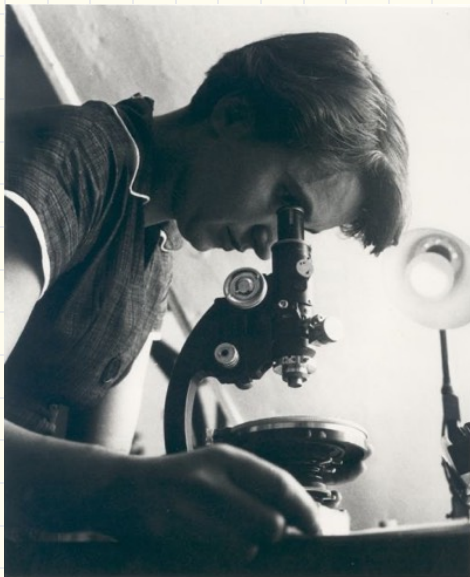
'Piggy-Bank' being struck by lightning

Photo Credit: Lightning University, Cardiff University

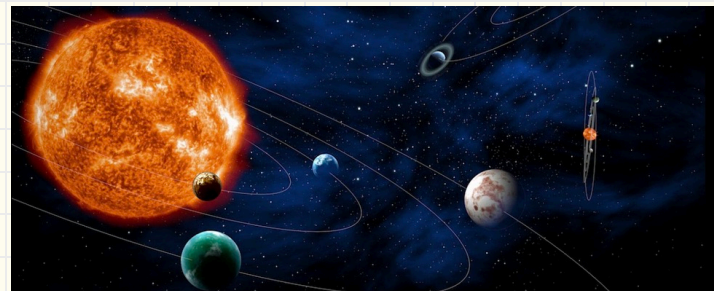
What it is like to work with lightning and a view on science as a career with **Daniel Mitchard**, from the Lightning Laboratory at Cardiff University.

Event : Royal Institution

How improvements to spectroscopy can help us identify the composition of **exoplanets**

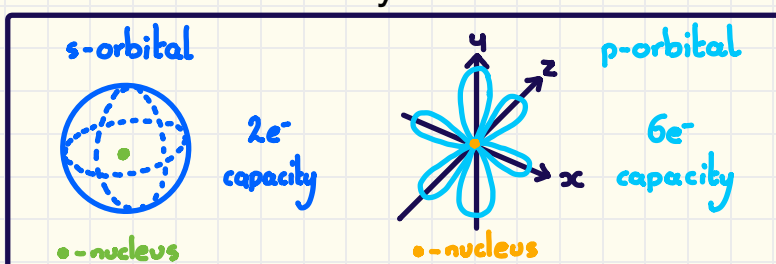


A look at the History of **Women in STEM** to celebrate the international day on the 11th of February



Picture Credit: Royal Institution

What Actually are **Electrons**?



# And Lots More...



# Special Mentions

~ Edwin De-Ben Rockson ~

~ Mr Martin ~

~ Ms West ~

~ Tim Nott ~

~Ms Brobbey~

## Picture Credit

Vaccination photo - <https://www.communitypharmacyni.co.uk/community-pharmacists-hail-success-of-winter-vaccination-programme-as-residents-in-440-care-homes-are-vaccinated/>

Molecular Orbital - [https://saylordotorg.github.io/text\\_general-chemistry-principles-patterns-and-applications-v1.0/s13-03-delocalized-bonding-and-molecu.html](https://saylordotorg.github.io/text_general-chemistry-principles-patterns-and-applications-v1.0/s13-03-delocalized-bonding-and-molecu.html)

Feynman quote - [https://www.goodreads.com/author/quotes/1429989.Richard\\_P\\_Feynman](https://www.goodreads.com/author/quotes/1429989.Richard_P_Feynman)

Energy - <https://www.shipleenergy.com/resources/energy-guides/green-sustainable-clean-and-renewable-energy-what-does-it-all-mean/>

Probability visual - <https://brilliant.org/courses/winning-with-probability/>  
Space: <https://www.nhm.ac.uk/discover/what-is-space.html>

Vitamin D Food Photo - <https://www.everydayhealth.com/vitamin-d/>

Astronaut visual - <https://www.polytechnique-insights.com/en/columns/space/what-are-the-risks-of-space-for-humans/>

Royal Society Photo : <https://programme.openhouse.org.uk/listings/2135>

Tim Nott Photo : <https://www.kcl.ac.uk/people/tim-nott>

TED photo : <https://www.ted.com/search?q=Battling%20Bad%20Science>

Biological Enhancement photo : <https://www.pewresearch.org/religion/2016/07/26/human-enhancement-the-scientific-and-ethical-dimensions-of-striving-for-perfection/>

Intubation visual : <https://hayekmedical.com/2025/01/06/endotracheal-intubation-complications-and-risks/>

The Rest is Science : <https://deadline.com/2025/11/rest-is-science-hannah-fry-michael-stevens-podcast-1236620145/>

The Catalyst : <https://www.amazon.co.uk/Catalyst-Quest-Unlock-Deepest-Secrets/dp/1324050683>

Huberman Lab : <https://www.hubermanlab.com/premium>

Hawking Book : <https://www.amazon.co.uk/Brief-Answers-Questions-Illustrated-illustrations/dp/1399829254>

And : <https://www.amazon.co.uk/Brief-Answers-Big-Questions-Stephen/dp/1473695988>

Under A Metal Sky : <https://www.amazon.co.uk/Under-Metal-Sky-Journey-Minerals/dp/178378962X>

## About Us

As you can imagine, as this is the first newsletter, the Team is very small in producing these meticulous arrangements of articles.

The main idea behind Beths Science is to be able to explore the sciences, free from the constraints of trying to simplify language to be able to fully explore passions. The beauty of science cannot be expressed if I one has to use simple words, if there is a much more efficient specialist term.

If you would be interested in contributing to future newsletters, contact our founder/editor Harvey Todd at:

[20B-Todd@beths.bexley.sch.uk](mailto:20B-Todd@beths.bexley.sch.uk)

This can be used for both my email and for my teams account, if you drop a message I will take a look and then organise something for you, whether that is a short feature article or experience etc. or whether you would like to participate by writing as part of the Team.