04/06/25

THE LAB REPORT

Today's joke

Did you hear oxygen went on a date with Potassium?

Toilet trained cows-how udderly civilised!

BIOLOGY

You can lead a cow to a water closet, but can you make it pee there? It turns out that yes, you can.
Researchers in Germany successfully trained cows to use a small fenced in area to do their number 1s, with turf flooring, just like how us humans tend to use toilets. This lets farmers easily collect and treat cow urine, which frequently pollutes air and soil. Cow urine is useful as it contains nitrogen and phosphorus elements which are used to make fertiliser.
The average cow releases ten litres of this valuable liquid every day which combines with the faeces it drops in barns to make a slurry which emits ammonia, a hazardous air pollutant. If cow urine leaches into waterways, it can release a harmful greenhouse gas, nitrous oxide (aka laughing gas), and despite its name this is no laughing matter!
Lindsay Matthews, a cow psychologist in New Zealand, is currently training 16 calves to urinate by themselves. She has named it 'MooLoo' training and has been quite successful with it.
So next time you're thinking about why cows are being trained to release their urea-concentrated yellow liquid in an agreeable manner without the help of humans, now you know.

By Hermione Redwood and Ron Zaki

- **Did you know... Fleas can jump 130 times their height. In human terms, that equates to a 6-foot-tall person leaping 780 feet into the air!**

Is there life on Mars? Or rather, K2 -18b

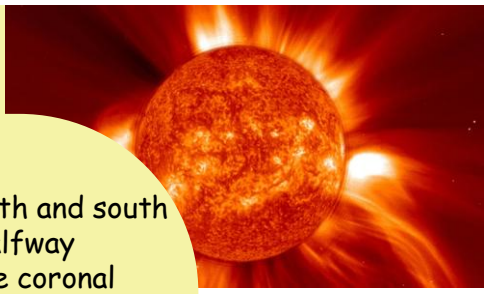
CHEMISTRY

Recent developments in the world of space exploration have unearthed (no pun intended) possible proof that we are not alone in the Universe. Using the James Webb Space Telescope - the largest and most powerful telescope ever launched to space - A Cambridge team, with lead researcher Prof. Nikku Madhusudhan may have detected a chemical called 'dimethyl sulphide' (DMS) in quantities thousands of times higher than on Earth. Transmission spectroscopy allowed them to deduce the contents of a planet's atmosphere by observing how light is absorbed by its gases on the way towards us. Only in the past two decades has the necessary precision been achieved to measure the data of exoplanets. In this instance, DMS was detected.
What's so special about this you ask? Well, DMS is almost uniquely associated with life on Earth.
Dimethyl sulphide and dimethyl disulfide are molecules from the same chemical family and could be biosignatures - this is a term which describes chemicals that, when detected around a distant planet, could indicate the presence of biological processes, eg. Life On earth. DMS is constantly being produced by tiny plankton in the oceans that then rises into the atmosphere; this provides a clean and unambiguous bio signature that can also be seen on the observed planet K2-18b, 124 light years away. This planet, like Earth, orbits its star in the habitable zone (Goldilocks Zone) giving it the potential to have conditions compatible with life ie. liquid water existing on its surface.
Whilst progress is still being made in terms of confirming the existence of extra-terrestrial life, this recent discovery is a milestone in space exploration.
By Freya Windle and Delaena Debre

Fun Fact

Water can exist in three states at the same time! This is known as the triple boil.

Is the sun making our trains delayed?



PHYSICS

The sun operates on a 'solar cycle' where every 11 years it's north and south pole flip. The last flip occurred in 2019, meaning we're about halfway through the cycle right now at a 'solar maximum'. This can cause coronal mass ejections, an event where large expulsions of highly magnetised plasma are sent into space by the sun. Lovely positive things like the Northern Lights (Aurora Borealis) can come out of this, but there is also a more annoying (and potentially dangerous) side effect.

Coronal mass ejections can interfere with radio communications and disturb the earth's magnetic field. This disturbance can make unwanted currents flow across power lines and pipelines, messing with our electric infrastructure. In 1989 in Quebec, Canada, a particularly strong solar storm caused a 9-hour blackout in the Hydro-Quebec electricity transmission system. The Carrington Event of 1859 saw Victorian telegraph systems go haywire, and the Northern lights were visible further south than ever before.

These are all extreme examples, but new research has shown that the UK railway system could actually face big consequences from this solar maximum. Signaling systems could be damaged, leaving trains travelling in the wrong direction or in fact not moving at all. In some scenarios, signals might show false readings, or communication between trains and control centres could be lost entirely which leads to the potential of trains going instead of stopping, which obviously poses a bit of a hazard. With the UK rail network becoming increasingly automated, a strong geomagnetic storm could make these hinderances and safety breaches more inconvenient than they have been ever before. At least Southeastern will finally have a valid excuse for all their delays...

By Emily Ford

Myanmar Earthquake

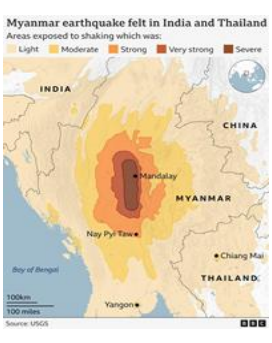
GEOLOGY

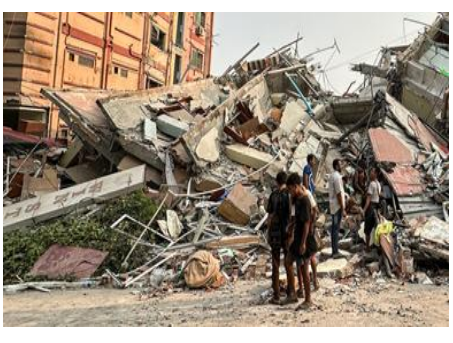
On the 28th March, a 7.7-magnitude earthquake hit Myanmar, stretching into areas of Thailand and China. A second 6.4-magnitude earthquake hit the same region just 12 minutes later, and aftershocks as strong as 5.9-magnitude were felt in the following days and weeks. Myanmar is considered one of the world's most seismically active areas, due to sitting on the Sagaing fault, which marks the boundary between the Indian plate and the Burma microplate. The boundary is a conservative one, where the two plates slide past each other, creating friction and stress which builds up over time. The cause of the Myanmar earthquake is thought to be strike slip faulting, with little to no vertical movement of the plates. Despite the region being so seismically active, Myanmar was not well-prepared.

Limited enforcement of building codes, limited funding, and lack of an early warning system contributed to the death toll of above 5000. Another reason for the huge impacts is related to the ongoing civil war. Since 2021, Myanmar has been ruled by a military junta, which has led to confiscated aid, disruption of seismic monitoring techniques, and prioritisation of political instability. As a result, when international aid arrived there was a lack of coordination from authorities, meaning aid did not reach some areas.

However, the junta announced a 20-day ceasefire on 2nd April, after resistance forces declared one to focus on supporting the humanitarian responses to the earthquake. Political analyst Kyaw Hsan Hlaing says the military is 'still grappling with the aftermath of the earthquake and that may create openings for the Arkan Army and others to seize more towns.' It is though the earthquake could shift the balance in the civil war due to the stress it has caused on the military junta.

By Clove Gater





FUN FACT

Bananas are radioactive- They contain potassium, which decays, so the yellow fruit becomes slightly radioactive.

CAREERS

This section of the magazine will be for students with a passion for science who want to pursue a career in STEM but aren't sure on the jobs available to them. In Each edition there will be an overview of a different career, including a description of what it entails, as well as the qualifications needed to get the job.

Neuroscientist

Job overview:
Neuroscientists conduct research on the nervous system, including the brain and the spinal cord, to understand its structure, function and development. This research supports advances in medicine, mental health, AI and cognitive science. The job may involve conducting lab-based experiments, studying brain function, behaviour, and diseases, using MRI's EEG's microscopes and genetics, analysing studies and working collaboratively with clinicians, phycologists and biotech professionals.
You may work in the NHS/private hospitals, universities, biotech companies, government health bodies or research councils
Entry requirements
A-levels:
Biology, chemistry and maths/physics are generally preferred
Typical grade requirements are:
AAA to AAB and top unis may ask for A*AA
University education
BSc (Hons) in Neuroscience or related subjects (e.g., Biomedical Science, Psychology with Neuroscience)
Followed by a **PhD** in Neuroscience or a specialised field for research/academic roles
Salary

Research assistant:	£23,000 - £30,000
PhD researcher:	£30,000 - £42,000
Lecturer/ industry scientist:	£43,000 - £60,000+
Senior Investigator:	£60,000 - £90,000+
Private sector lead role: (with experience)	£100,000+

By Samuel Johnson

REVISION TIPS

Teachers

Today we will be exploring one of the most underrated revision techniques, and in my humble opinion, the most valuable asset of all. Any guesses?... Your teachers! As corny as it may sound, they truly are the experts on whatever it is you need to learn, being passionate enough about their subject to not only choose it as a career, but to dedicate so much of their life to pass this invaluable knowledge onto students each year. Not only that, they also know and care about you on a personal level and are, perhaps some of the only people whose only goal is to guide you into flourishing academically. So next time you're struggling on a certain topic, being vocal with your teachers about which areas you need support in will open up so many learning opportunities to help you ace anything that those exams will throw at you. Whether they set up in school revision sessions, or guide you to higher quality materials elsewhere, rest assured that you are in the best hands.
By April McGowan

Today's joke
...It was OK. But then she dated Magnesium, OMG!

Find out about 👀
The Lab Report Competition on the next page

Want to get involved in The Lab Report? Now's your chance!

We're challenging you to write a science-based article in an area that interests you, and we'll pick the best two to publish next issue. The article must be around 200 words, complete with a picture, and sent to TheLabReport@ccgrammarschool.onmicrosoft.com by Friday 13th June. Please make sure you credit yourself with your name and form group. Good luck!

That's all from us , see you in our next issue !

April McGowan, Clove Gater, Emily Ford, Freya Windle, Samuel Johnson, Eloise Martin, Hermione Redwood, Ron Zaki , Delaena Debre

Edited by Eloise Martin