



THE LAB REPORT

Today's joke
A neutron walks into a bar and asks "How much for whiskey?"...

Logging, the data



It's no secret that industry is one of the biggest threats to rainforest conservation today. A recent Oxford University study unearthed some interesting findings about what exactly these different processes are doing to ecosystems. The study compared logging, the process of cutting down trees to produce timber/pulp (used in the production of paper), and the conversion of logged forestland into palm oil plantations, producing the magic ingredient found in many supermarket products; chocolate and peanut butter.

Impacts of logging:

There are different techniques used in logging; some involve the complete removal of all trees growing in an area of the forest, while others only remove certain trees according to their age, type of wood, demand etc. Nevertheless, even the less extreme forms of logging, common in tropical areas was shown to have a large impact on the ecosystem. The removal of taller, older trees in that area lead to gaps in the canopy of the forest allowing rapid-growing plants to flourish, but with very different characteristics- for example their wood is less dense, and their leaves are thinner, leaving them more vulnerable to herbivores.

Conversion to palm oil plantations:

In comparison, it was found that converting logged forest into palm oil plantations had a far wider impact on the ecosystem of those areas. It led to reduced numbers and diversity in species of birds, bats, dung beetles, trees, vines, and soil microorganisms compared to logged forest. It was concluded that the effects were caused by the massive change to the plants available as food sources, and hotter, drier microclimates of areas that have been converted.

This new study is particularly significant as it explores a far broader range of abiotic (non-living) and biotic (living) factors than ever previously studied, including soil nutrients, photosynthesis rates and different species populations, to really show us the cost of every delicious Hershey bar or peanut butter sandwich. These findings will affect future decisions on land use, showing that logged forest, which still leaves potential for recovery and adaptation of ecosystems, should not be written off for conversion to palm oil plantations without considering just how catastrophic this could be for the health of our rainforests.

By Eloise Martin



BIOLOGY

Read more....

E-waste into Gold: Alchemy or Simple Chemistry?

Technology is such a prevalent thing in society that one cannot ignore the subsequent waste that is piling up in our landfills and contributing to the ever-continuing problem that is pollution & climate change. But what if we could turn this electrical waste into something equally as valuable? As they say one man's trash is another man's treasure but what if this takes it to a new level making it so we could literally turn waste into gold?

This is exactly what the Royal Mint aims to do. Each year, more than 50 million tonnes of electronic waste is produced globally (weighing the same as 350 2600-capacity Giant Cruise ships!), with the statistic growing each year. The Royal Mint's partnership with Canadian company Excir produced a method which allows gold to be extracted from used circuit boards. The process occurs at room temperature - contributing to its energy efficacy - and consists of preparing circuit boards for metal extraction and then mixing them with a patented chemical formula that selectively extracts gold in seconds. Using precipitation, solid gold can be obtained from the liquid product, which can be melted into ingots for the Royal Mint's re-use. This chemical process lays the basis for a circular economy, producing gold with a purity of 999.9, and has the potential to preserve natural resources for longer, ensuring that the environmental impact of e-waste is reduced and controlled. Though it may seem like magic, this technology has the potential to change how our modern world approaches e-waste; that chemistry has achieved such feats is an impressive and important milestone in human scientific advancements. (And it's pretty cool that we can make gold appear out of seemingly nowhere!). As well as being a promising solution to the ever-growing landfill issues it could have huge economic benefits with four thousand tonnes of e-waste being able to generate up to 450kg of gold. This amount of gold is worth around £27million at current prices, boosting UK economy and opening up a whole new industry for much needed jobs.



Read more....

By Freya Windle and April McGowan

CHEMISTRY



Who owns the moon?

In 1967, the UN agreed that no nation should have ownership of the Moon, creating the Outer Space Treaty. This states that the moon belongs to everyone, and that any exploration must be carried out for the benefit of all humankind and in the interest of all nations. How cute!

Funnily enough, the driving force behind this treaty was not cooperation - but rather the tensions of the Cold War. The Soviets wanted to steal the moon. Interestingly, a key part of the treaty was that no nuclear weapons can be sent into space to avoid interplanetary battlegrounds. It is a good day to be an alien.

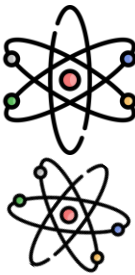
In 1979, yet another international treaty declared that no state or organisation can claim to own the resources there. However, only 17 countries agreed to this, not including any countries which have ever actually been to the moon - how ironic. The US even passed a law stating that citizens and industries can extract, use, and sell any space material they please.

This begs the question: why does everyone want the moon? The real moon treasure is the humble H_2O . Water. L'eau. El agua. Das wasser. At the moon's poles there is ice frozen inside permanently shadowed craters, which in the future could be used for drinking water; or to create oxygen or rocket fuel by splitting it into hydrogen and oxygen.

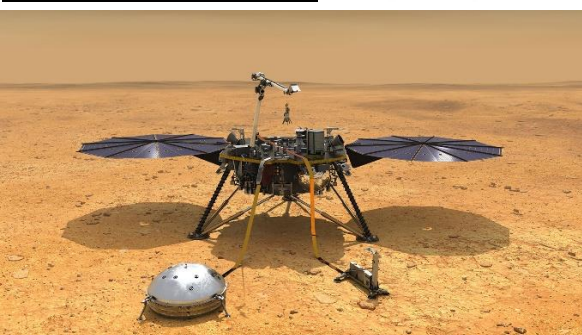
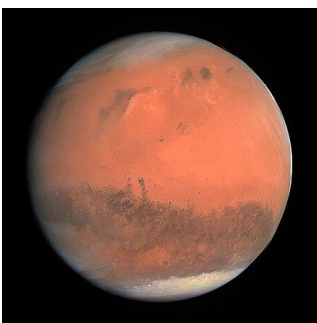
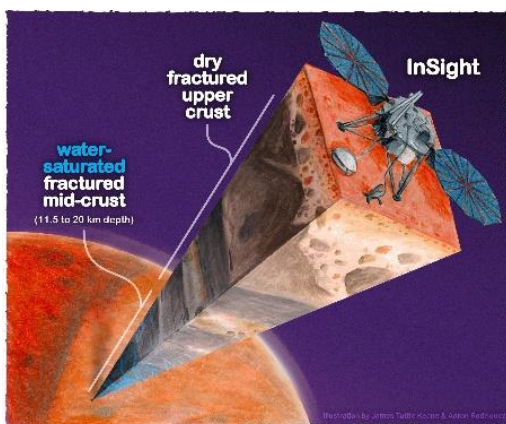
The USA is now attempting to establish a new set of principles surrounding lunar exploration and exploitation. However, countries such as China do not seem to agree. Some argue that the new rules should not be led by a specific country but rather through the United Nations. The real estate race on the Moon is similar to that of Antarctica, which is also not owned by any one nation and has similar controversies.

By Henry Cleverdon and Emily Ford

PHYSICS



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Mars' Aquatic Aliens



Scientists analysing NASA's InSight Lander have discovered a reservoir of liquid water deep in the outer crust of Mars. The Lander used a seismometer to measure how the planet moves and how vibrations occur within the lithosphere. The monitoring revealed 'seismic signals' of there being water present, focusing on the speed at which the waves travelled through. The results showed that the waves between 10 and 20 kilometers deep were most likely moving through water.

The rocky planet has been a desert on its surface for 3 billion years, as water evaporated when it lost its atmosphere - whilst there is ice at Mars' poles and evidence of vapour in the atmosphere, this is the first time liquid water has been found anywhere on Mars. Professor Manga states that, "much of our [Earth's] water is underground and there's no reason for that not to be the case on Mars too."

However, the reservoir won't be of any use, as it is located too deep to tap into. The water is distributed in tiny cracks and pores in the rock of the crust. At this time, scientists hope to use it to better understand Mars' water cycle. It is estimated to be enough groundwater to cover the entire planet between 1 and 2 km deep - far more in volume than was previously expected to be in Mars' oceans. Professor Manga claims, "we have identified a place that should, in principle, be able to sustain life."

[Read more ...](#)

By Clove Gater

GEOLOGY



PHARMACOLOGY



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.

What do they do?

Pharmacology is the study of drugs and how they affect the body. It includes the study of a drug's composition, origin, and how it is used to treat disease. They work in labs, design clinical trials, and analyse data to develop new products and treatments.

- Pharmacologists research how new drugs work and develop new drugs
- Ensure drugs are used safely and effectively
- Study how drugs affect the nervous system/cognition/mood/behaviour
- Study how genetic variations affect a person's response to drugs

Pharmacologists can further specialise in fields such as toxicology which investigates the effects of chemicals on our bodies or in neuropharmacology which studies the effects of drugs on our nervous system. Pharmacologists can even become patent attorneys and policy and regulatory officers. The field is diverse and has exciting prospects.

Education path

Strong academic foundation:

Aim for strong GCSE grades especially in your sciences and maths For A-levels most universities require A's and B's upwards and most require you to take chemistry and biology. Maths can be helpful too

A suitable degree:

Taking a pharmacology degree is the most direct route however you can also do a degree in a different scientific degree and later specialise in pharmacology.

Post graduate study:

Master's Degree: A master's degree in pharmacology can specialize your knowledge and enhance your career prospects.

Doctoral Degree (PhD): A PhD is essential for research-focused careers in academia or industry

Salary

Early career pharmacologists with one to four years' experience can expect to earn from **£30,000**, rising to **£100,000** or more for senior leaders in industry, with significant experience.

The range of different specialities and the scope for entrepreneurial roles available in this field mean that earnings can easily expand.

By Samuel Johnson

Mind maps

Mind maps are supposed to follow a hierarchal structure, with the key ideas closest to the centre and additional information forming branches outwards..

You can effectively organise information and visually represent the connections between different concepts or topics,

This method of revision can be particularly useful for essay-based subjects such as English where a question may require you to link multiple aspects of a character or theme, for example, but can be used for any subject.

Mind-maps can also be used as a part of active recall to really improve retention of information.

After the mind map has been created, read over it and try to recreate it completely from memory. Compare it with the original mind map and fill in any key information you missed in a different coloured pen.

You'll not only be able to recall all of the information, but also all the ways that different ideas link together, ready to answer any question!


Mind maps

REVISION TIPS

By Hermione Redwood

Find out about 
The Lab Report Competition on the next page



Today's joke
The bartender smiles and says,
"for you, no charge" 

The Purr-fect Predator: The science behind cats

Cats are known to be flexible, agile, observant, and cute. Years of evolution, Cats have developed unique traits that make them the purr-fect predator.

Did you know, Cats have an astounding reaction time of 20-70ms. This is because they have extra thick insulation (myelin) on their nerves, and a small body, which allows them to respond to a stimulus more rapidly. Cats are also well-known for their ability to pounce stealthily; this is because they coil their body like a spring and then use their hind legs to release an explosive push. Their muscles are also a powerful fast twitch muscle fibres, which allows them to contract the muscles quickly and produce quick bursts of speed. Their Highly elastic tendons also contribute to their explosive bursts and shock absorption when landing on ground. Another Paw-some fact about cats is that they have claws that are retractable, which helps them keep the claws in prime condition for marking, grooming, and climbing. If you ask me, Cats are truly claw-some predators but also the purr-fect house pet, as they are paw-sitively purr-fect for cuddles and companionship.



By Vincent Huang

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 Wednesday 5th February. 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 !

Edited by Delaena Debre