



THE LAB REPORT

Today's joke
Why did the germ cross the microscope?...
...

Common food dye or revolutionary medicine?

Researchers at Stanford University have recently been successful in using the food dye known as FD & C yellow 5 to turn the skin of a live mouse transparent, allowing for internal organs such as the liver to be visible to the naked eye. The food dye (which can also be called Tartrazine) is found in many American products such as Doritos, however, is banned in the UK.

How it works:

When light waves strike the skin, the tissues scatter them which is what makes it seem opaque. This scattering is caused by the light having to pass through different materials in the tissue with different 'refractive indexes'. For example, in tissue there are water-based components and lipid-based components. Water and lipids have different refractive indexes so light scatters. However, by adding Tartrazine dye to the skin of these mice, the scientists increase the refractive index of the water-based components of tissue to match that of the lipids. This means that when the dye has been applied and placed under a red light, light can pass through, and the tissue effectively becomes invisible.

What impact could this have?

So far, the dye has only been tested on mice, which have notably thin skin, so it's difficult to say at this stage whether the dye could be used safely on humans. However, with more information and development over time, it is possible that this discovery could revolutionise diagnostic medicine by allowing an insight into the human body without harmful exposure to radiation such as X-rays and invasive procedures such as endoscopies.



Did you know that the average person sheds around 600,000 skin particles per hour?



BIOLOGY



The science of melting cheese

Believe it or not, there are actually scientific explanations behind the melt-factor of cheese, and they're more complex than you might imagine..

▪ Casein

Casein is the primary protein structure found in cheese that is seen as responsible for a cheese's melt. It can be thought of like a binding network held together by weak bonds, with fats and water studded to it. The Casein protein structure also contains the calcium phosphate (needed for baby animals and humans in milk). The fewer and weaker the interactions between these casein molecules, the easier for the cheese to melt. Furthermore, more moisture in the casein structure means an easier melt. The more the fat, the better the emulsifying effect (the mixing of ingredients) which allows it to be more gloopy like a camembert.

▪ Calcium Phosphate

By increasing or decreasing the amount of calcium phosphate bonds in the casein structure, the cheese becomes more or less 'melty'- the less calcium phosphate you have, the runnier the cheese will be.

▪ Acidity

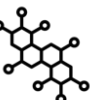
The main factor which affects how much calcium phosphate is retained in the casein structure is the pH of the cheese (in other words how acidic it is); too much acid will increase the Calcium bound to Casein too much and make the cheese stiff like the Halloumi in the 2nd picture, too little acidity will make it too runny.

• Age

Finally, as a cheese gets older it will lose some moisture and the protein structure will bind together stronger. Also enzymes will snip at some of the casein molecules. This makes the cheese less susceptible to melt and less stretchy. The rind on a cheese like a brie tends to help maintain optimal conditions however.



CHEMISTRY



Read more ↓

Fun Fact

1 Bucket full of water contains more atoms than there are buckets of water in the Atlantic ocean



Nobel Prize in Physics 2024: 'Godfather of AI'

Last week on October 8th, John Hopfield and Geoffrey Hinton were awarded the Nobel Prize in Physics for their 'foundational discoveries and inventions' in the field of artificial intelligence. Inspired by the human brain, they created artificial neural networks that could collect information and recall it like a memory.

Geoffrey Hinton, known widely as the 'Godfather of AI' helped to develop the technology behind things we use every day, like Google Translate or Face ID to get into your phone. He famously quit his job at Google last year so that he could speak freely and warn the world about the dangers of AI outsmarting humans one day.

John Hopfield contributed to networks in 1982 that could retrieve images when given similar patterns, which has developed over time to be the same software that can listen to music in a noisy room and tell you what song it is.

Professor Michael Wooldridge from the University of Oxford has said that this award shows how much of an impact AI is having - 'no part of the scientific world is left unchanged by AI. We find ourselves in a remarkable moment in scientific history.' Hinton himself has stated that these developments will someday be comparable to the Industrial Revolution.



PHYSICS

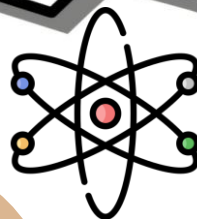
Read more at....

<https://www.nobelprize.org/prizes/physics/2024/summary/>

<https://amp.theguardian.com/science/2024/oct/08/nobel-prize-physics-john-hopfield-geoffrey-hinton-machine-learning>

Did you know?

All the matter that makes up the human race could fit inside a sugar cube!



AN EXPENSIVE VOLCANO

The southernmost volcano in the world, Mount Erebus, is located in Antarctica. Erebus towers 12,448 feet high and is named after the Greek deity and God of darkness. It was discovered in 1841 by British explorer Sir James Clark Ross.

Erebus erupts almost continuously, but not with magma. In the 1990s, it was discovered that the volcano emits gas, steam, and miniature gold crystals. The NASA Earth Observatory released in April 2024 that the gold particles are not more than 20 micrometres each and are carried into the air by volcanic gas, where they can be distributed up to 600 miles away from Erebus, at a value of around £5000. It is the only known volcano to release gold in its solid form, because the gold crystallises so quickly in the freezing temperatures. Scientists have recently realised Erebus has very little water in its magma, instead rich in carbon dioxide. This allows the magma to travel closer to the surface, which in turn causes metals such as gold to solidify.

Erebus is unique in the fact it also releases gas very slowly, which scientists are baffled over why, but this gives extra time for the gold to crystallise in the air. Unfortunately, much of the gold emitted cannot be mined due to Erebus' unstable, dangerous nature, with constant eruptions, a lava lake, ice caves, and finally because of its remote location on Ross Island, where temperatures are around -40 degrees Celsius. (Top: Mount Erebus)

GEOLOGY



Read more at...

<https://www.ladbible.com/news/science/mount-erebus-antarctica-volcano-gold-dust-767268-20240923>

FUNFACT

The Earth's interior is squishy, owing to the high temperatures and pressure that allow the mantle to flow



MEVO - <http://erebus.nimf.edu/>

CHEMICAL ENGINEERING



CAREERS

What they do?

Chemical engineering about turning raw materials into useful, everyday products. From the clothes we wear to the energy we all depend on so heavily is down to chemical engineering. It's chemical engineer's jobs to work out the processes to make all these products, while also helping to keep the balance of the world's natural resources, protect the environment and ensure health and safety standards are kept up to standards. There are two main sections in the industry: the design, manufacture, and operation of plants and machinery, or the development of new or adapted substances and materials.

Education path:

- 3 A levels in Chemistry, maths and another stem subject
- Degree program: Apply for a BEng (Bachelor of Engineering) or MEng (masters of engineering). Top universities include Imperial, Cambridge, Birmingham, Manchester etc. The bachelor's degree on average takes 3 years and the masters takes 5.
- Gain work experience and work your way up the career ladder in things like internships and industrial placements.

Salary:

The starting salary starts from £28000 and increases to an average of £56000 but can be upwards of £80000 depending on the job, company and years of experience.

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.

BLURTING

When it comes to revising content heavy subjects , it's very easy to become overwhelmed. Blurting is a good way to see what you do know, so that you can then focus on what you don't.

You can keep repeating the process till you are able to write down everything accurately; 2 different colours helps keep track of progress.

Blurting involves writing everything you can remember about a topic down on paper/whiteboard , or even typing into a notes app. Then going back over your notes, analysing what you forgot/got wrong and adding it in a different colour.


Blurting

When you need to memorise key facts, information like required practicals, ionic charges, reactivity series; it is especially helpful in that regard.

REVISION TIPS

Find out about 
The Lab Report Competition on the next page



Today's joke
... To get to the other slide


**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 Monday the 4th November. 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

