VVS SCIENCE COUNCIL LC1/2025-2026

CURIOSITY

VASANT VALLEY SCHOOL SCIENCE NEWSLETTER

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Greetings from the Science Council!

The annual Curiosity Science Magazine has been a part of Vasant Valley School for years. This year, we intend to turn the Magazine into a shorter publication, coming to you multiple times a year. We hope it answers unspoken questions, sparks your curiosity, encourages you to explore scientific concepts you may find interesting - or at least, stop and wonder.

Have you ever wondered why optical illusions happen, or how fossils are formed? Did you know that ants practise slavery? Care to know what a 'living brick' is? Read on to explore each of these and more, try your own chromatography experiment using the instructions on our Experiments and Games page, and attempt the crossword puzzle.

We will be accepting articles, comics, posters, quizzes, and any other work for future issues year-round. Interested students should add their contribution to the following Google Folder: https://drive.google.com/drive/folders/1f3c1yHU0sqbOqxDcdBkrv_ZBBYMpz8lU?usp=drive_link, or email meeras@vasantvalley.edu.in or khushiseth@vasantvalley.edu.in with their contribution.

We'd like to thank every student who contributed to this issue - your scientific exploration and excellent writing made it possible.

Happy exploring!

Editors
Meera Shukla and Khushi Seth

THE LIVING WALL

NATURE MEETS ARCHITECTURE

Imagine walking into a house that breathes, heals itself when cracked, and even glows at night. It might sound like something out of a sci-fi movie, but thanks to bio-architecture, this futuristic vision is becoming real. Welcome to the world of living materials—building blocks made not from concrete and steel, but from living organisms like bacteria, fungi, and algae.

What are Living Materials?

Self-repairing, responsive, and adaptive biological organisms are combined to produce living materials. Archetypes include the living brick, a fascinating construction made from cyanobacteria. These microscopic organisms use water, air, and sunlight to "grow" solid bricks. They absorb carbon dioxide, and through a process of biomineralization, produce calcium carbonate, akin to what is found in seashells. Researchers from the Boulder branch of the University of Colorado took things a step further and designed regenerating bricks that have the potential to grow back into two full bricks if cut in half and placed under suitable conditions. Crazy, right?

Why This Matters

Buildings today are responsible for a big chunk of the world's carbon emissions. Concrete alone produces over 8% of global CO_2 emissions. But "living" bricks have the potential to absorb carbon instead of unleashing it. Not only do they lower energy consumption, but their production also minimises construction waste. Additionally, scientists are working with materials infused with algae that are capable of emitting both oxygen and biofuel. Other ongoing research includes fireproof fungal walls. Some designs even enable buildings to "sweat" to cool down or self-seal to automatically relieve internal stress cracks.

Challenges Ahead

There are concerns that keeping the organism alive in extreme environments, controlling moisture, and retention of strength over time presents. In saying that, thanks to the advances of synthetic biological and material science, researchers are closer to finding answers to these problems.

The Takeaway

As the climate crisis pushes us to rethink how we build and live, bio-architecture offers a wild but promising solution. The idea of homes made from living materials might sound far-fetched now—but it could be the norm in a few decades.

So, next time you look at a brick wall, imagine if it were alive. Because one day, it just might be.

- Amaira Goel, 11

THE SCIENCE BEHIND OPTICAL ILLUSIONS

CAN YOU TRUST YOUR EYES?

Have you ever stared at a picture and thought it was moving—even though it was completely still? Or struggled to decide whether you were seeing a duck or a rabbit? These strange experiences come from a fascinating phenomenon known as optical illusions, and they reveal just how easily our brain can be tricked.

What Are Optical Illusions?

Optical illusions are visual images that deceive the brain. They create a false perception of reality, causing us to see things that aren't actually there—or to misinterpret what *is* there. Sometimes the illusion is a clever use of contrast and shape, and other times, it's our brain filling in gaps or making assumptions based on experience.

There are several types of optical illusions:

- Ambiguous illusions show images that can be interpreted in more than one way, like the famous drawing that can look like either a young woman or an old lady.
- Distorting illusions change our perception of size, length, or curvature. The Müller-Lyer illusion, for example, shows two equal-length lines that appear different because of the arrows at their ends.
- Paradox illusions present images that are physically impossible, like Penrose stairs—stairs that appear to rise endlessly in a loop.

Why Do Illusions Happen?

To understand optical illusions, we need to understand the brain. When our eyes see something, they send signals to the brain to interpret the image. But the brain doesn't just take in raw data—it uses memory, experience, and assumptions to "fill in the blanks." This system usually works well, but sometimes it leads to funny or fascinating errors—optical illusions.

For example, in the Café Wall illusion, straight lines look like they're sloping because of the way the pattern is arranged. In the Spinning Dancer illusion, the figure may appear to spin clockwise or counterclockwise, depending on how your brain interprets the 2D image.

Optical illusions aren't just amusing—they're also useful. Psychologists and neuroscientists use them to study how the brain processes information, how attention works, and how visual disorders affect perception. Artists, too, use illusions to create depth and movement in flat images, blending science and creativity in extraordinary ways.

In Conclusion

Optical illusions remind us that seeing isn't always believing. Our brains are powerful, but even they can be fooled by a cleverly designed image. The next time you come across an illusion online or in a textbook, take a moment to appreciate the brain science behind the trick—and maybe try creating one of your own!

- Anvvi Singhi, 10

FOSSILS

Fossils are the remains of plants and animals that have escaped the rotting process and, many years later, through different methods, have become a part of Earth's crust. We would be unaware of our ancestors, ancient animals, birds and dinosaurs and important historic events from the past if it wasn't for the discovery of fossils. Believe it or not, fossils along with ancient artefacts are our only connections to the history of life on our planet. Fossils date back to about 4.1 billion years ago and cover the Jurassic, Triassic, Cretaceous, Cenozoic, Mesozoic, Ordovician, Precambrian and Cambrian eras. In Dorset, England, I saw belemnites - tiny squids who, according to me, look like tiny bullets. They are ancient squids whose inner skeletons fossilise. I also saw other sea creatures such as ammonites, similar to belemnites, except they have shells which we see as spiral fossils. Ammonites in particular remind me of a ram's horn (*see image to the left*).

There are many ways in which fossils form. The first way is by a volcanic eruption. If volcanic eruptions take place in an area where there are trees, fish, dinosaurs, animals etc., the molten lava will keep piling on top in layers, burying the skeletons deeper and deeper, while still completely preserving them. Millions or even billions of years later, palaeontologists excavate them and find them as fossils. The second method of fossilisation is if a dead fish lies on the seabed, it will normally decay or rot, but if it is buried very quickly, then it will be preserved. The mud will become a hard slate-like material called shale. It will then flatten the skeleton of the fish. Now that the skeleton is covered by sediment, to become a proper fossil, it will need to undergo harsh climate and pressure changes. More and more sediment keeps accumulating, constantly changing the structure of the fish and it has compressed the shale underneath a lot. Millions of years later, the rock bed has been exposed by retreating seas. Due to weathering, the rock around the fish also gets eroded, allowing fossil enthusiasts and palaeontologists to spot it more easily. This kind of fossilisation can also occur in other marine animals such as ammonites and nautiluses as well as marine dinosaurs. The third and final method by which something can fossilise is amber fossilisation. This method can only occur with small insects and arachnids. When trees release sap or residue, the orange, sticky sap covers any unlucky insect on that tree. This preserves the insect perfectly for many, many years. The problem with this method is that it is very difficult to tell how old they are.

From the cliffs of Charmouth, to the rocky terrain of Oman, to a fossil park in the middle of a hot desert in Jaisalmer, you can find fossils almost everywhere. All you need is to keep your eyes peeled at all times. There are many other places to go fossil hunting, especially around Europe and North America, but these are the places I have been fossil-hunting to.

Of course, It depends what kind of fossils you're looking for. If you're a great palaeontologist, you'll be focusing on finding dinosaurs and other huge ancient reptiles and mammals. If you are a nature or fossil enthusiast, you might not be that ambitious. I would recommend Charmouth in Dorset for both. Not only does it have fossils of different sizes for newbies, enthusiasts and pros alike, but it also has stunning panoramic views with rocky cliffs, sandy beaches, pristine coves and stunning seas. You are sure to spot at least one fossil in Dorset, whether you get a team to excavate a dinosaur, crack open a rock with a hammer and chisel and find an ammonite or simply spot sea urchin or belemnite fossils lying on the beach, you cannot go home without tightly clasping a million year old treasure in your hand. Oman is less well known for its fossils, but how amazing they are! Tons of beautiful fish, corals, plants and sponges are clumped together on cliffs, making them easy to spot and amazing to view. Unlike Dorset, they are such few fossils and they are so deeply embedded in the rock that, unfortunately, you cannot take them home. Now, for the final fossil hunting place I have been to is in India itself: the Akal Wood Fossil Park in Jaisalmer, Rajasthan. This happened due to the first method of fossilisation, volcanic eruption. Many millions of years ago, a volcano erupted near Akal Wood Fossil Park, which was a forest at that time. This caused all the trees to get buried in molten lava while they were still alive. Many years later, the trees got exposed due to shifts in tectonic plates and formed fossils.

Did you know? The process of trees turning into fossils is called petrification.

- Lila Kapur Gandhi, 6

THE SLAVER ANTS

You might know about the world war of the ants. But did you know that some ants practise the cruel trade of slavery?

Meet Polyergus, the most cruel and effective of the slaver ants. There are many different species, but they're usually black in colour, and are 3-5 millimeters long. Here is their story:

Act 1 - The Raid

Picture a massive colony in a sunny field, made up of thousands of Formica ants, who are genetic cousins of Polyergus. Nobody noticed the lone scout who briefly showed up today, before she scuttled away again.

The attack began in the early afternoon. The scout is back from her mission to find a nest. She dances and releases pheromones that attract and excite more Polyergus ants. Soon, a massive raiding party has formed. They rush to the nest and begin digging holes into the Formica Nest. Soon, hundreds of attackers scuttle inside. The Formica Ants are able warriors which shoot acid - but they scatter instead. Polyergus are resistant to the acid of the Formica, and use their mandibles to kill. They release propaganda pheromones that confuse the enemies.

Soon, the raiders find the larvae room. They grab hundreds in their mandibles, and carry them away. Wait a second, though. How are Polyergus actually turning ants into slaves?

Act 2 - The Brainwashing

After the larvae are abducted, they are bought into the slave room, which is filled with Polyergus enslavers. The pupae are covered in Polyergus pheromones, and are chemically imprinted with slave chemicals.

When the ants hatch, they act as Polyergus ants - they hunt, care, and clean for their masters without any mind of their own. They are not true slaves, as they show no interest in freedom. They will even attack other free Formica ants.

Act 3 - A New Colony

How are new Polyergus colonies created? After all, Polyergus workers are so incapable that a queen can't start a new colony without slaves. How does she get those slaves? There are two main strategies:

Scenario 1

A queen slips into a Formica Colony during a raid. She quickly uses the chaos to find the Formica Queen. She then kills her, becoming the queen of the Formica colony.

Scenario 2

A young queen finds a far-away Formica colony, and attacks. She bolts through an entrance, shoving aside workers with her powerful pheromones. She finds the Formica Queen and fights until she kills her. She then licks the queen pheromones of the dead queen and uses the scent to subdue the Formica ants into believing her the queen.

These are the horrors of the slaver ants. However, they can't hurt you.

I'll see you next time.

- Vir Khanna, 6

A BREAKDOWN OF TOXIC SUBSTANCES IN CERAMIC GLAZES (EXTRACT)

Ceramics are hard, corrosion-resistant materials made by subjecting non-metallic, inorganic substances (such as clay) to high temperatures. Not very visually appealing in their raw form, they are beautified by the use of glazes.

Most glazes, however, are toxic, especially those prior to the 1990s. Various colours (glazes) have their own toxic chemicals associated with them. The colour white, called 'lead white', contains lead carbonate as the main ingredient (found in nature as the mineral hydrocerussite). Lead is a heavy metal and neurotoxin which accumulates in the brain and causes insomnia, nausea and blindness, among other diseases.

Green glazes are made of copper(II) arsenate (which is found in nature as the mineral lammerite ($As_2Cu_3O_8$)), a variant of which (called Paris Green) was famously used by the impressionist Claude Monet. It has historically been used as an insecticide, rodenticide, and a murder weapon. Arsenic poisoning causes severe discomfort in the gastrointestinal tract, and other symptoms similar to those produced by other heavy metals.

Another toxic element used in ceramic glazes is uranium. Used to make red, orange, yellow, blue and black glazes, the most common compound used is uranium trioxide (UO_3), which is coloured an orange-yellow, and is produced during uranium enrichment. Blue and black glazes are made from uranium dioxide (UO_2, which occurs naturally in the mineral uraninite) and is used in nuclear reactors. Uranium is a radioactive element that releases alpha particles (helium nuclei) as it decays which can cause respiratory diseases (e.g. fibrosis and lung cancer), cause cell necrosis, initiate cancers, damage (mutate) DNA, and the usual symptoms of radiation poisoning: nausea, skin damage, hair loss, etc. Uranium was also added to crystal glass. The glass glows green under UV light.

Potters and ceramic workers are exposed to the unfired, raw powder form of these glazes - being much more potent. Wearing respirators, gloves and eye protection are simple solutions. Users are exposed when acidic foods leach the toxins into food and drink. Not using pre-1990s ceramics is the easiest solution.

A simple way to test for toxic ceramics is to squeeze lemon juice into the ceramic and leave it overnight. If the ceramic contains toxins, the colour will fade. Thankfully, modern, non-toxic alternatives are on the rise, and with luck will soon replace toxic glazes.

Read the full article: A Breakdown of Toxic Substances in Ceramic Glazes

- Nirvan Garg, 11

THE DE-EXTINCTION DEBATE

Have you ever heard of Romulus and Remus? In Roman mythology, they were twin brothers raised by a she-wolf because their parents abandoned them. One of them, Romulus, went on to found the city of Rome.
Now fast forward to today.

A bioscience company called Colossal Biosciences has named three baby wolf pups Romulus, Remus, and Khaleesi. But these aren't just ordinary wolves—they're part of an experiment to bring dire wolves back from extinction. They went extinct over 10,000 years ago. Colossal found DNA from old fossils and compared it with today's gray wolves. They changed the gray wolf DNA by editing the genome. Then they put the embryo in a female gray wolf and the pups were born. They now want to do this for woolly mammoths and Tasmanian tigers.
In the past you might have heard of Dolly the sheep, the first animal ever cloned from a cell. She was born in 1996 and lived a fairly normal sheep life, but Dolly aged faster than normal and had health problems.

Bringing back an extinct animal might sound cool, but it raises some big questions:

- Will these new wolves be healthy and safe?
- How will they fit into the wild? Will it disturb food chains?
- Could they harm the environment or other animals if they get released?

Some scientists worry that changing animals this way could cause problems we don't expect. Others think it could help bring balance back to nature and even save endangered animals.

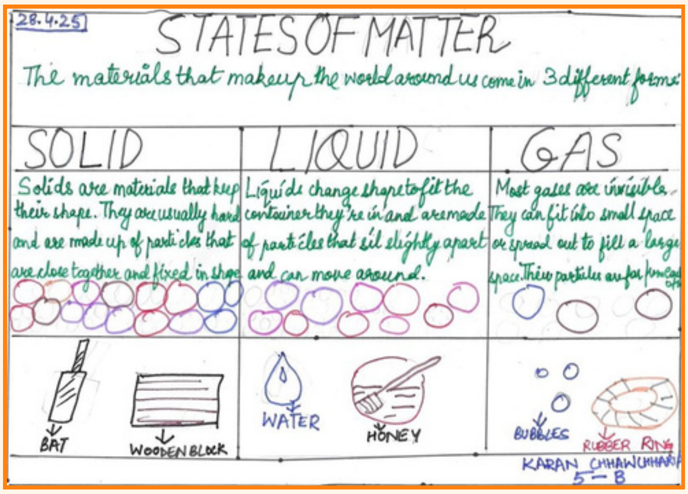
What do you think?

- Mira Sheth, 5

Marie Curie

Marie Curie was a brilliant scientist from Poland who had a passion for learning. Since women were not allowed to study at universities in Poland, she moved to France to continue her education. There, she discovered two new elements, radium and polonium, and became the first person ever to win Nobel Prizes in two different sciences — Physics and Chemistry. She also helped develop mobile X-ray machines during World War I, saving many lives. Marie Curie's work in radioactivity changed science forever, and she remains an inspiration to people around the world.

- Gurnoor Kaur Sandhar, 8



- Karan Chhawchharia, 5

DID YOU KNOW?

The sun is every possible colour. You can only see yellow because the earth's atmosphere scatters some of the light!

- Ahaana Jain, 5

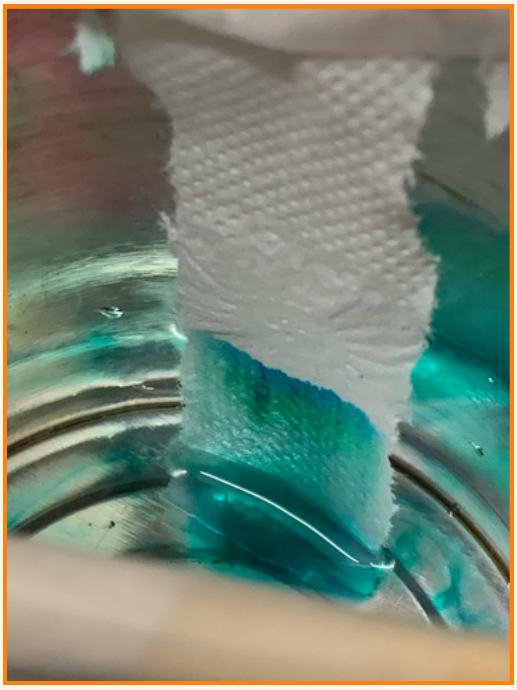
EXPERIMENT: CHROMATOGRAPHY

Apparatus:

- A strip of porous paper (such as kitchen towel)
- A pencil and ruler
- A brush pen or marker
- Water
- A cylindrical container to hold the water

Procedure:

1. Fill the bottom of the container with a small amount of water. It should be quite shallow and not very deep.
2. Take the paper, and draw a line through the centre lengthwise using the ruler. After this, draw another line, perpendicular to the first, parallel to the width, but make sure that this line is towards the bottom of the paper. However, it should not be very close to the edge.
3. Take the brush pen or marker and draw a singular dot at the place where both lines intersect.
4. Tape the other end of the paper, away from the dot, to a pencil.
5. Lower the paper strip into the container, ensuring that the paper touches the water, BUT THE INK DOT DOES NOT. The pencil acts as a stopper, ensuring that the paper does not fall into the water.
6. Leave for at least two hours. When you return, you should see different colours, at different heights along the paper.

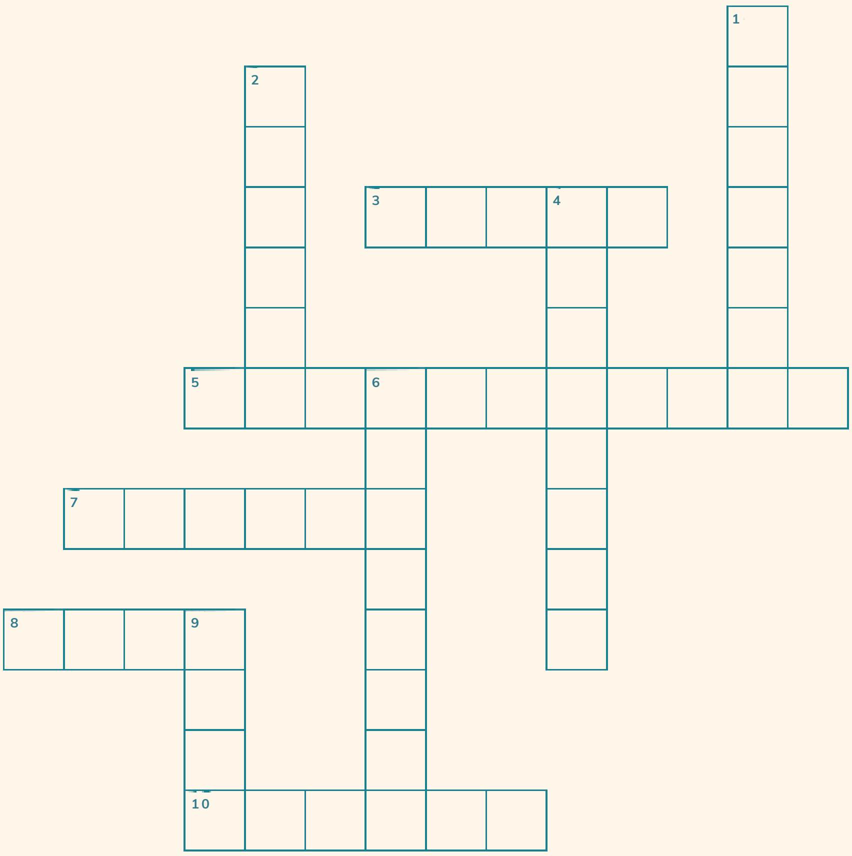


In the above picture, you can see the separation of the constituents of blue ink.

Explanation:

Chromatography is a method to separate mixtures. The idea is that in a mixture, each constituent has a different solubility in the solvent (in this case water). The ink of the brush pen/marker is a mixture of multiple dyes. As each dye has a different solubility, it dissolves in the water and travels up the paper at a different rate, and we can see the constituents separated.

THE CROSSWORD



Across

3. E.g., mushroom
5. First layer of the atmosphere
7. Atomic number
8. Resistive force
10. Largest taxon

Down

1. Measuring device
2. Magnitude and direction
4. Carbon allotrope
6. Lion genus
9. Aurum

Answers will be published in the next edition.