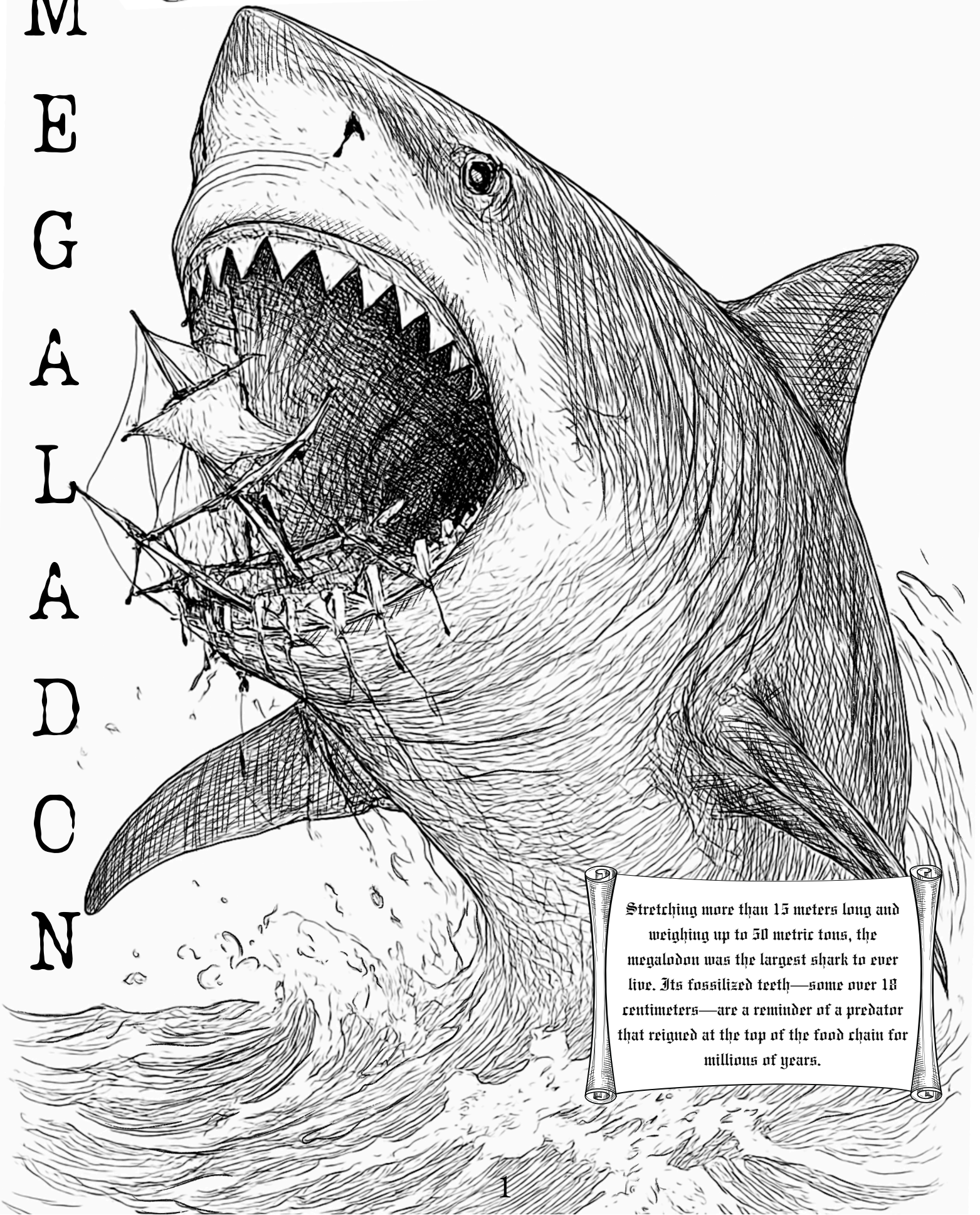
DELPHIC

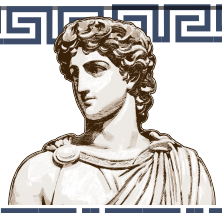
MEGALADON



Stretching more than 15 meters long and weighing up to 50 metric tons, the megalodon was the largest shark to ever live. Its fossilized teeth—some over 18 centimeters—are a reminder of a predator that reigned at the top of the food chain for millions of years.

Delphic Defined

Tracing the oracle's origin



The term "Delphic" originates from the ancient Greek city of Delphi, which is known to have housed the mythical and legendary source of wisdom, the Oracle of Delphi. Delphi was no ordinary place, it was thought of as the navel of the world where individuals from all over Greece and beyond came in search for answers. Situated on the slopes of Mt.Parnassus above the Corinthian Gulf, was a sanctuary which delivered prophecies which were known for their obscure nature. At the heart of this sanctuary, sat Pythia, the priestess of Apollo. Although cryptic, her answers shaped and influenced ancient history, holding significance in everything from the most trivial concerns to the most vital matters. To illustrate, battles of the empire were declared after consulting her, farmers planted their seedlings, and explorers set off after consulting her. Her comments encouraged individuals to delve deeper into comprehending and analyzing her messages as they were open to multiple interpretations. Like the Delphic Oracle, science offers revelations—not through mysticism, but through exploration. Discovering, questioning and understanding truths that shape the complex nature of our world. It is this relentless pursuit of knowledge that the Delphic embodies, finding its roots in this conduit for God Apollo.

Science is more than just a collection of facts, it aims to push boundaries, while challenging assumptions and understanding topics with logical lenses rather than just looking at them as plain figures to memorise.

With this issue of the Delphic, we urge you to delve deeper into the ever-evolving world of Science. We have included intriguing topics such as the familiar phenomenon of déjà vu, the aerodynamic principles in building *Formula One* cars and the feasibility of immortality.

Happy Reading!
Naisargi Patel
Editor-in-chief

THE YEAR OF QUANTUM

We live in a world where the limit extends even beyond the sky. In this fast-paced and ever-evolving world, we observe the intervention of all spheres of life and their intricate blending into something spectacular that is innovation. Science and technology form the core of this innovation that we so proudly talk about. Quantum stands at the centre of the 21st century's most expeditious developments. The year 2025 has been declared the Year of Quantum. What was first discovered 100 years ago has significantly altered our understanding of the universe- from tiny building blocks of matter to the vast cosmos. Quantum is making our lives easier with its applications in physics, chemistry, biology and technology. With its vast integration in different matters, Quantum is said to be able to revolutionise computers through the process of Quantum Computing, driving massive change in the field of calculation. These quantum computers, with a broad array of potential uses, were able to perform a specific calculation in a sliver of the time. A classical supercomputer would have needed to solve the same problem in a milestone research study in 2019. While such applications of Quantum still have a long way to go, quantum principles are already at work in many devices used today. Applications of Quantum mechanics are found in devices such as MRI, lasers, toasters and even fluorescent lights. The Year of Quantum not only informs us about the multiplicity of uses and the change that Quantum Mechanics drive, but also ushers in an age of elevating innovation. This year stands as a testament to the heights attained in the past century.

-Gauri Nanda
Class 12

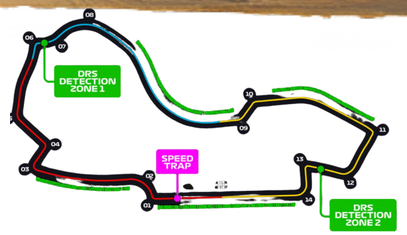
THE CHEESE TRAP

"Cheese can't possibly be a drug; it's just food!" So then what is it exactly that people like in this gooey, amorphous, sticky white substance? Since its all the things people usually don't seek out in food. To break the news to you, there has been evidence that cheese does activate some of the same regions of the brain as addictive substances. Studies show that cheese contains unusual amounts of casomorphins, which can act like super-mild opioid painkillers. Let's dive deeper into that, shall we?

All dairy products contain casein, a protein that is broken down by our body into smaller compounds called casomorphins. These clever little ones are able to cross the blood-brain barrier and hence proceed to attach to the dopamine receptors located in the brain, which, on signal transduction, produce dopamine, a hormone associated with pleasure and a sense of fulfillment. So on ingesting cheese, this is what invigorates us to have more and more. Casomorphins were initially found in cow's milk to keep calves coming back for more, as it was their only form of nutrition in their toddler days. And this would accelerate the formation of a strong, affectionate bond between mother and child. However, in the present scenario, it has become something much more; it has turned into.....THE CHEESE TRAP!

Cheese is not only loaded with calories but is also high in sodium, packed with cholesterol, and sprinkled with hormones—it's both fattening and addictive. And researchers have literally labelled it the 'dairy crack.' The effects of pure morphine can be up to 5% of those of casomorphine. Casomorphine, however, is less deadly. We are discussing a family of drugs that are extremely addictive, so be cautioned!

-Vaanya Goel
Class 12

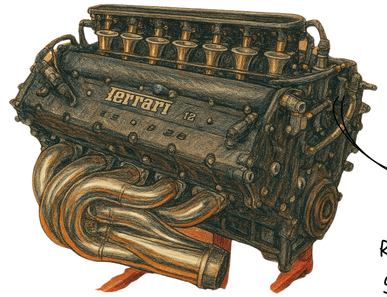


Drag is the resistance from the air that slows the car down on straights. If there is too much downforce, you lose the top speed. If it is too little, you cannot corner fast enough. Teams have to find the perfect balance, tweaking the wings and the floor for each track

DRS: Drag Reduction System

On some parts of the track, drivers can open a flap on the rear wing. It cuts the drag so that they can go faster and overtake. As it is only allowed in certain zones it is a tactical move.

F1 drivers can lose 4-5 kg during a race due to extreme heat and intense effort. Cockpit temperatures exceed 50°C (122°F). After races, they use ice baths to cool down, reduce muscle strain, and recover quickly.

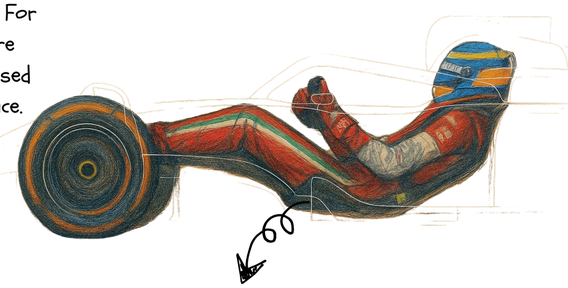


F1 cars use a hybrid engine with the Energy Recovery System (ERS). This is a clever way to grab energy that is normally wasted, as it is turned into extra power. There are two parts: one catches energy when the driver brakes (called MGU-K), and the other grabs heat from the exhaust (MGU-H). This stored energy gets sent to a battery and gives the car a speed boost.

The rear wing is huge and angled to force the air up, which pushes down the back of the car even more.

The Halo is a strong, curved bar that sits above the driver's head in an F1 car. It is like a shield made of titanium, designed to protect the driver from flying debris or crashes.

F1 cars use Pirelli tyres, which are suited to soft (red), medium (yellow), and hard (white) conditions. For dry tracks, soft grips are the best but wear down quickly. For the rain, intermediates (green) and full wets (blue) are preferred to prevent sliding. Teams pick their tyres based on the weather. They must use two dry tyres in a race.



The driver's position is engineered for maximum performance, safety, and comfort. Sitting low and centred optimises the car's centre of gravity, improving handling and stability at high speeds. The seat is custom-moulded, securing them during high g-forces. The steering wheel is positioned for precise control, while the pedal setup ensures responsive throttle and braking.

Downforce is like an invisible force that pushes the car down onto the track. The more downforce, the more grip the tires have, which lets the car corner at insane speeds without sliding off.

This is how a diffuser looks like!

The air under the car moves faster than the air above it, and this speed difference creates a low-pressure zone. This sucks the car down to the track—like a vacuum cleaner pulling it in! This is why F1 cars can stick to corners so well.

The front wing is the first part of the car that hits the air. It is shaped to push the air up and over the car, but also down under it. This initiates the creation of downward pressure.

The Resurrection Lab

Resurrected and rebranded—the dire wolf enters its lab-grown era.

Over 99.9% of all the species to have ever existed on this planet are now extinct. Animal extinction is rapidly accelerating due to heightened human activity. It is distressing that creatures are constantly endangered and are rapidly ceasing to exist, with humans having destroyed strong, nearly mystical creatures such as the mammoth and the megalodon.

Across the globe and in India, significant initiatives have been made to save and preserve extinct and endangered species. International initiatives such as the Convention on International Trade in Endangered Species and the establishment of wildlife sanctuaries and national parks try to salvage these dwindling ecosystems and species. In India, initiatives such as Project Tiger try to revive the declining predator base. Even though there have been many collective endeavours, there are numerous obstacles.

Another scientific method that might recover our lost biodiversity is de-extinction. De-extinction is the process of reviving extinct species by techniques such as cloning or genetic engineering, which use preserved DNA or closely similar species.

Using the same technology, every Game of Thrones fan's fantasy has come true with Colossal Biosciences, the world's first de-extinction company's unprecedented success of generating three dire wolf pups utilizing ancient DNA, cloning, and gene-editing technologies.

Scientists have brought back a creature that went extinct over 12,500 years ago by genetically modifying modern animals. Researchers at Colossal mapped the genomes of two extinct dire wolves and identified key genetic traits, such as white coats and thick fur. They made 20 genetic changes to grey wolf cells, altering 14 genes, and then replicated the most promising cells. These were implanted into donor eggs, which were carried by mixed-bred dogs. This gave birth to three dire wolf pups: Romulus, Remus, and Khaleesi. These puppies mark a significant advancement in genetic science, combining ancient DNA with current cloning technologies to resurrect a creature that was once lost to history. Colossal aims to use de-extinction methods to rescue threatened species, having just cloned critically endangered red wolves using a new, less invasive technology based on their work with dire wolves. Critics say that although the cloned pups appear visually similar to dire wolves, they remain genetically grey wolves, and questions arise as to whether they can really be called the ancient species. Could they just be grey wolves disguised in a dire wolf's clothing? Critics are skeptical about whether de-extinction funding could be used more wisely to save endangered animals or ecosystems than to bring back the extinct. There are relevant concerns regarding the ecological niche of the dire wolf, particularly during difficulties in controlling grey wolf populations. Colossal's task is thrilling but also questions how one can resurrect a species and the ethical repercussions.

Even though bringing back animals like the dire wolf would be considered to be a scientific breakthrough, the question arises about humans' role in modifying nature and de-extinction and whether it is the best conservation tool to utilize. After all, it's not mankind's place to decide when a creature should be born or when it's time for it to die. As Colossal tests the limits of genetic science, the larger question is: can these genetically altered animals really improve ecosystems, or are they merely an elaborate scientific experiment?

-Rudrani Rajyalakshmi
Class 11

Immortality

Eternal Youth? It's All in the Ends (of Your Chromosomes)

From lush skin and flourishing immunity to wrinkled skin and greying hair, the ageing journey is ever-changing Over recent years, however, researchers have discovered the secret behind immortality and ageing. Deep within us, in the nucleus of the cells of our bodies lies the reason for our ageing. DNA or deoxyribonucleic acid is one of the most important molecules in life. Apart from acting as a blueprint for all living organisms, it plays a key role in heredity: passing traits from one generation to the next. During cell division, DNA coils together to form chromosomes, which help organise and distribute genetic information.

Chromosomes are capped with structures called telomeres (pronounced as tee-lo-meres) that prevent the degradation and damage of chromosomes like how aglets on shoelaces prevent fraying of ends. They are segments of repeating non-coding DNA and proteins (with nitrogenous bases in TTAGGG order) that play a major role in ageing by limiting the number of times a cell can divide. Every time a chromosome divides, some of the DNA which makes up telomere sequences is lost and hence the telomeres shorten. You age depending on how quickly the protective caps wear down. Telomeres that are too short signal to the cell that it is time to retire. And the reason for our ageing is our cells dying. Skin cells start to die and we see wrinkles, hair pigments getting bleached and immunity cells being rendered useless.

Cells die constantly and hence we age every day. An extraordinary discovery from research labs worldwide is that telomeres can be lengthened. As a result, ageing can be slowed and in some cases reversed. Elizabeth Backburn, an Australian-American Nobel laureate, researched protozoan, *Tetrahymena thermophila* and noticed that they neither died nor got old, which perplexed her; their telomeres didn't shorten and sometimes they even got longer.

She came across an enzyme-telomerase that could replenish telomere length. So she concluded that their long lifespan could be indirectly attributed to the high number of telomerase in them. In humans, germ cells have an active gene for the production of telomerase (while somatic cells have the same gene, they are inactive). In short, the key to a long healthy lifespan depends on supporting healthy cell renewal, which can be done by learning how to lengthen telomeres.

A study shows that telomere length isn't just a matter of age counted in hours but other factors such as stress contribute to it too. We have control over the way we age. Our attitude matters. If you are a negative thinker you would see a stressful situation with a 'threat-stress response'. Persistently high levels of cortisol in the blood damp down telomerase. Some other epigenetic factors can also hurt our telomere length and can cause a decrease in lifespan like a poor diet, smoking, alcohol consumption, lack of sleep, pollution and negative emotions like pessimism, shame, fear etc... Other practices like focusing on your breath, reducing the intake of fatty acidic foods, getting good sleep, exercising or even having good relationships can reduce the rate at which telomeres shorten. From this, we can conclude that the more telomerase there is in our body, the longer our telomeres become, causing us to live longer. One could continue this lifestyle to remain young for years, maybe decades even, but it is imperative to note that excess amounts of telomerase can cause harm as well.

The self-depleting mechanism of telomeres is beneficial in the maintainability of the number of times a cell divides. If cells have no such barrier to permit their growth rate, it could lead to cancer or tumours. Hence, the production of telomerase should not be considered the fountain of youth.

-Drishti Mahajan
Class 12

How to build an invisible cloak?

Ever wished you could sleep in class without your teacher seeing or go invisible like Harry potter? Thanks to metamaterials, that fantasy is edging closer to reality. These engineered wonders can bend light in ways nature never intended, bypassing all physics laws.

Metamaterials aren't just ordinary stuff. Their power lies in tiny, repeating structures that twist light or sound waves. Picture light flowing around an object the way water flows around a rock—poof, it's "invisible"! In 2006, Duke University researchers hid a small object from microwaves using this trick. Visible light's tougher to hide from, but science is sprinting toward the finish line.

So, how does this exactly work? It's due to the magic of negative refraction where specially designed metamaterials (think tiny, precisely arranged gold and insulator patterns) force light to bend backward instead of the usual way. The result? Light skirts around the objects, leaving them unseen. Cool, right?

While full optical cloaking is still a challenge, scientists are making crazy progress. One day, Harry Potter's cloak might not just be a fantasy, but a high-tech gadget in your wardrobe. Until then, we'll have to settle for sneaky science, mind-bending physics, and a world where light itself plays tricks on reality.

-Yashvi Agarwal
Class 12

CREDITS