Get, Set, Know!

Issue 7, January 2019

MYSTERY TALK
The Antikythera Mechanism

WILDLIFE
Deep Sea Creatures

I WONDER HOW...
Guitars Work?

ADVANCED SCIENCE
What We are Made of
Bioinspired Responsive Materials

New puzzles at the end of articles!

Here we are again after yet another eventful year gone behind. Other than resolutions, getting to know about uncommon topics is yet another good way start a new year. As the following articles on the topics will indicate, often they discuss facts on topics which are rarely discussed but play a significant role in our surroundings (such as the article on glues), or usually defy the common conceptions and expectation (like having Archimedes in 'Great Scientists'). A new feature in the issue is the introduction of an interactive puzzle at the end of most articles, as in our belief knowledge is fully achieved only when one tends find out more himself or herself. We hope the readers enjoy reading and finding out (We have special prizes from GSK waiting to be awarded!) Before you go, take a good look at the back page and familiarize yourself with the personalities of the characters, since they will help you a lot in your journey through the issue.

The GSK Team

Editor	Cartoons and colors
Muhammed Muaaz	Muhammed Zaid

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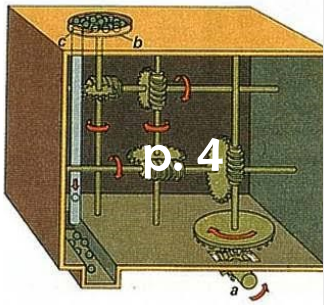
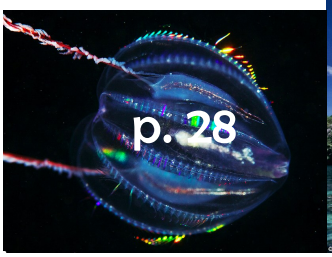
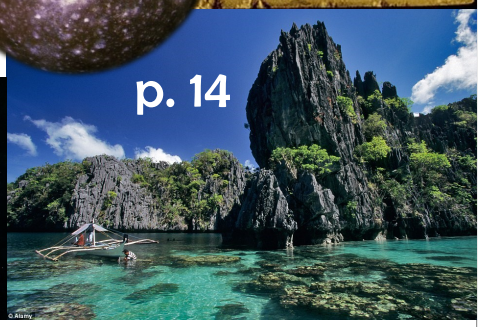
◊=win a special mention, ¤=win a prize!







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GREAT SCIENTISTS

ARCHIMEDES

Scientists don't need to be born in a technological era to become scientists. Lots of inventions of our everyday modern usage can be traced back to just this ancient Greek personality, yet there were many others such.

A 16th century painting of Archimedes' laser Death Ray

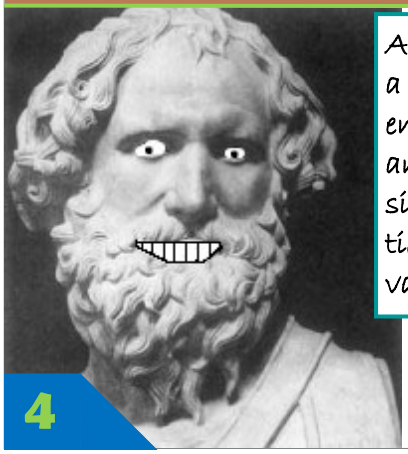
Erm.. Warren...my cousin seems to have a problem in choosing the right subject for further study. Can you bail him out of this mess?

...you know, he likes both architecture and physics...

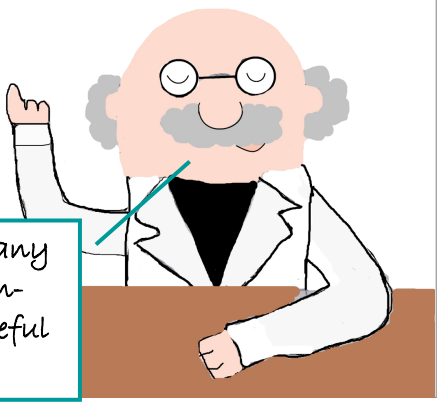
What has the world come to? Can't he study both?

I don't understand. How can someone simultaneously have two jobs and study two topics with equal importance?

Let me cite a wonderful example.



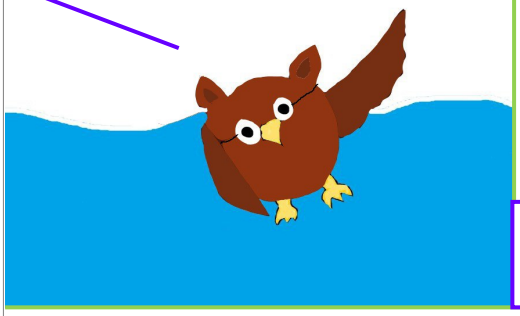
Archimedes (287-212BC) was a renowned mathematician, engineer, inventor, physicist and astronomer (five professions!) who has lots of inventions and revolutionary observations to his name.

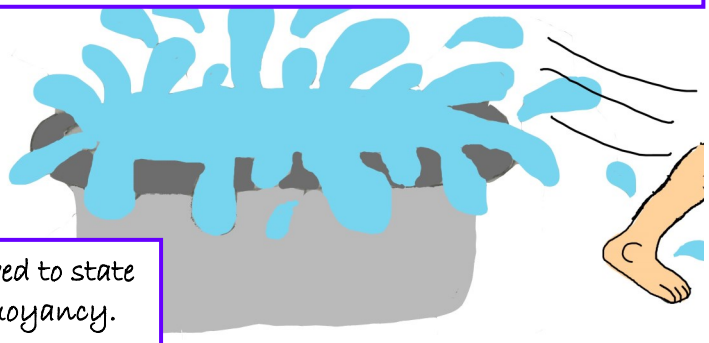


In fact, many of his inventions and useful even today!

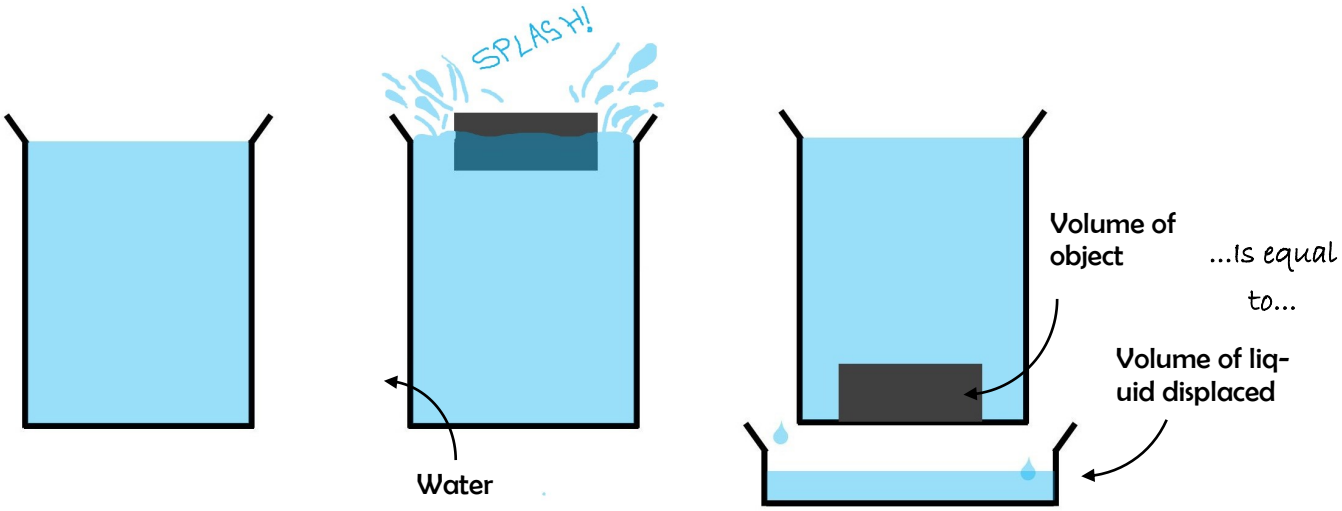
You might have heard of Archimedes' discovery and observation of the property of buoyancy...

...how he is said to have realised a method to determine purity of the king's crown while noticing how water spilled from the tub he was immersing himself in. What happened next is well known...

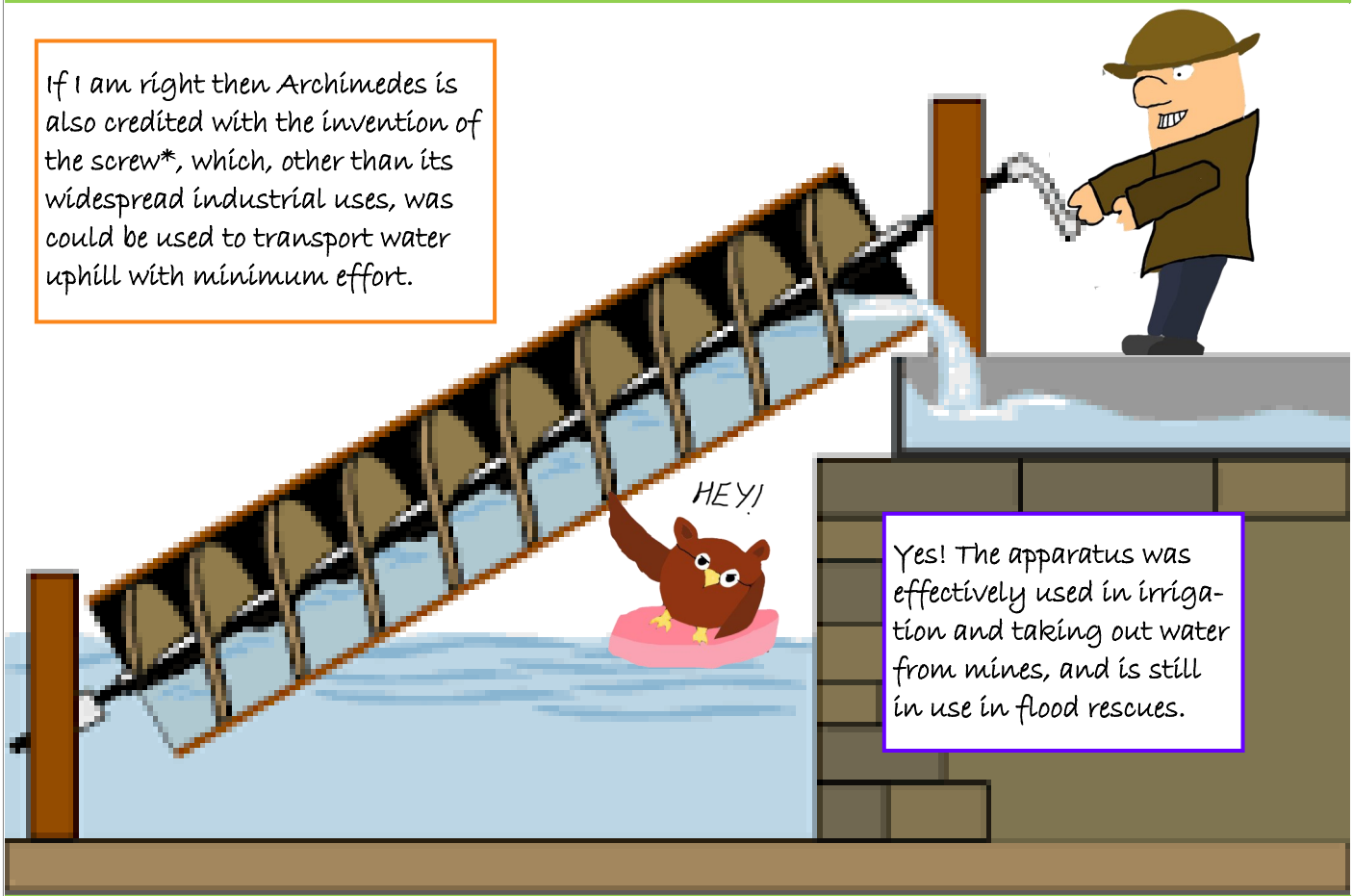




...which allowed to state the laws of buoyancy.

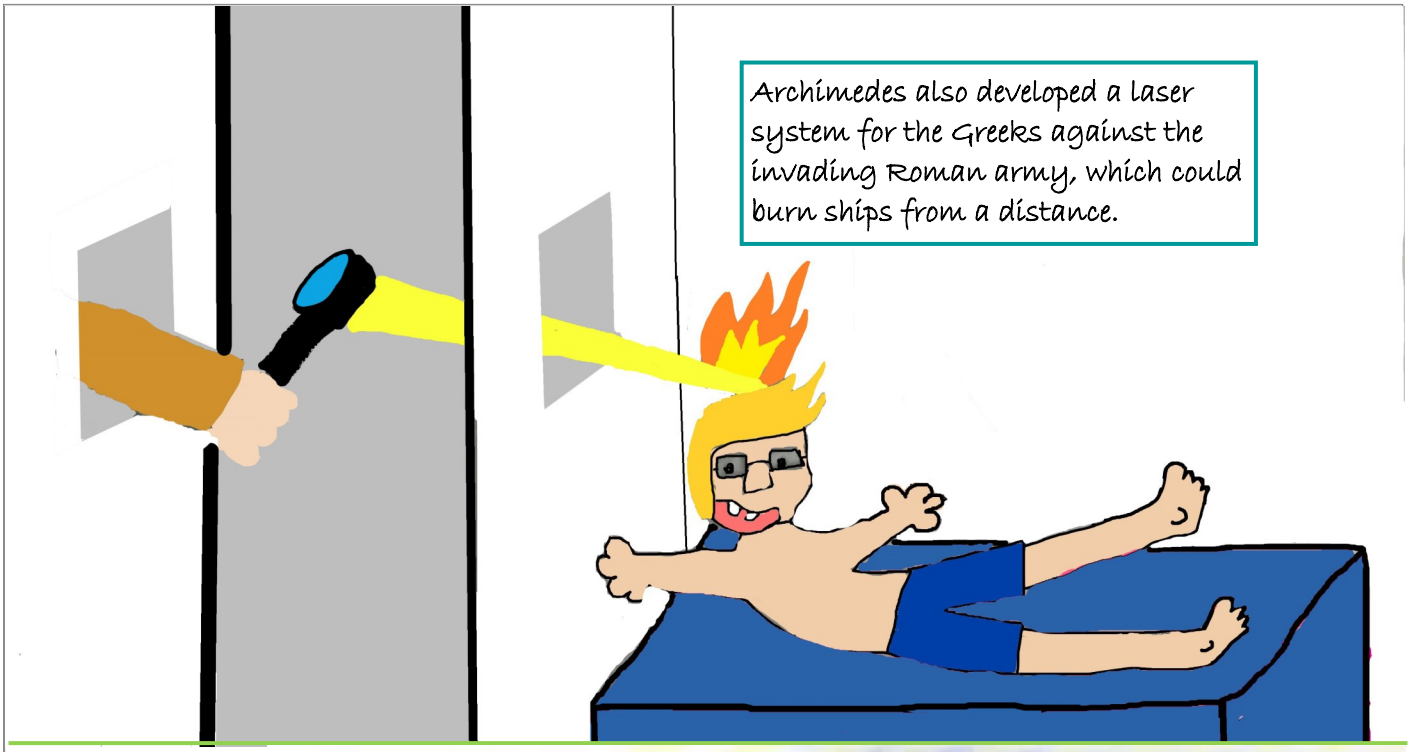


If I am right then Archimedes is also credited with the invention of the screw*, which, other than its widespread industrial uses, was could be used to transport water uphill with minimum effort.



Yes! The apparatus was effectively used in irrigation and taking out water from mines, and is still in use in flood rescues.

*Although there is certain evidence of earlier application of the screw (around four centuries before Archimedes) in maintaining the hanging gardens of Babylon.

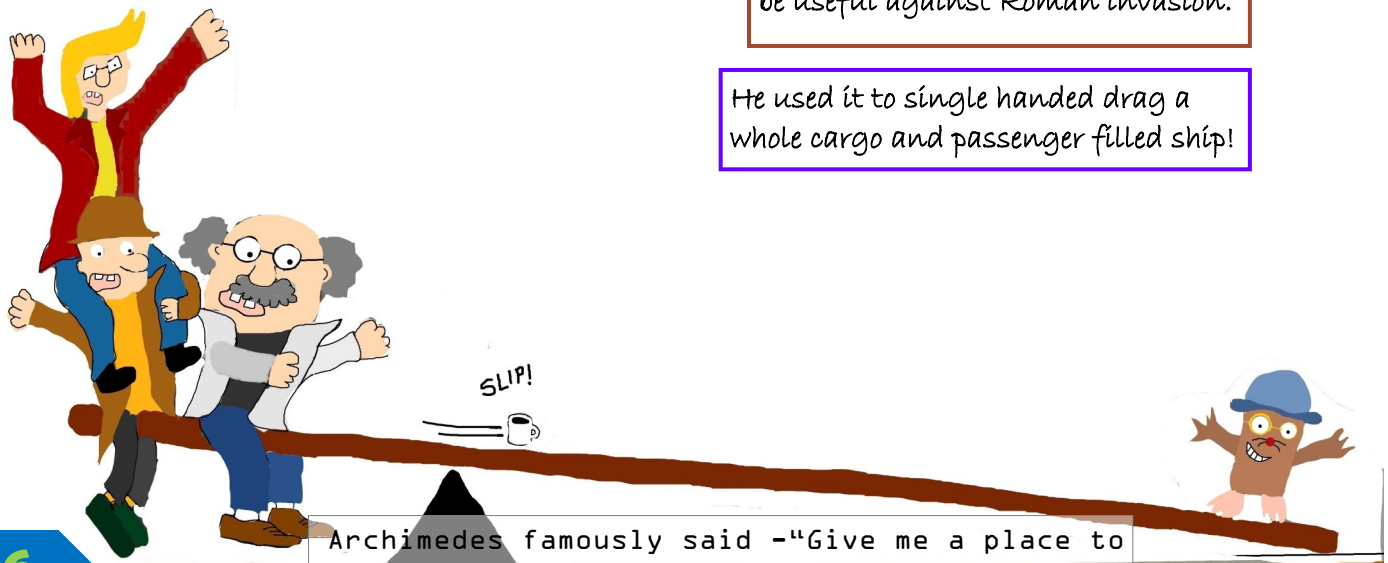


Archimedes also developed a laser system for the Greeks against the invading Roman army, which could burn ships from a distance.

He used an array of mirrors which focussed sunlight onto a small point on the enemy ship's sail, which would either burn the ship or blind the crew.

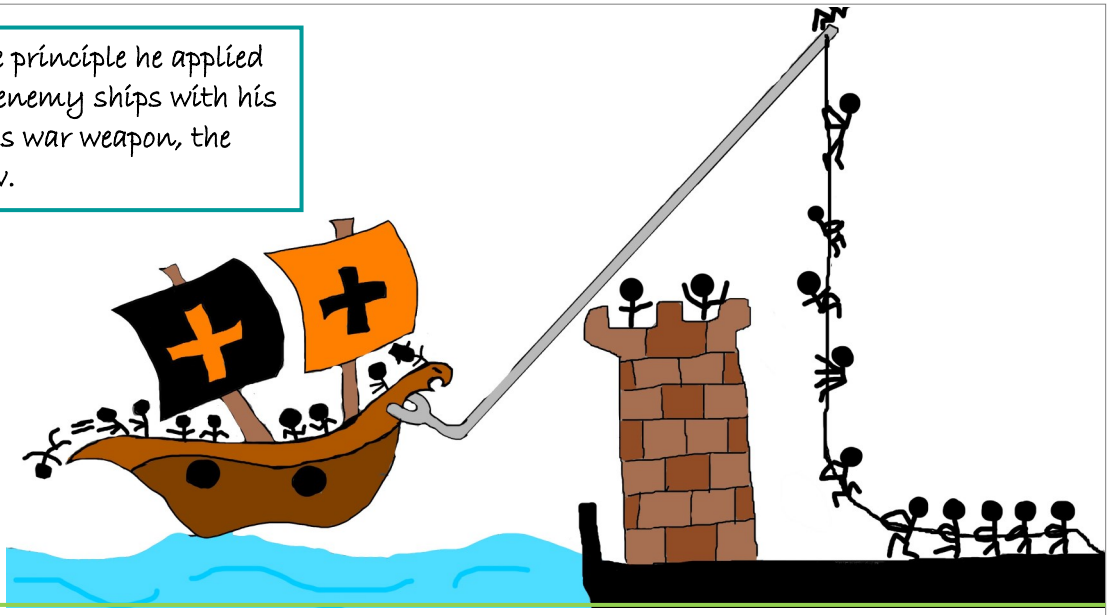
Archimedes is also noted for his significant work and research of pulleys and levers, which proved to be useful against Roman invasion.

He used it to single handed drag a whole cargo and passenger filled ship!



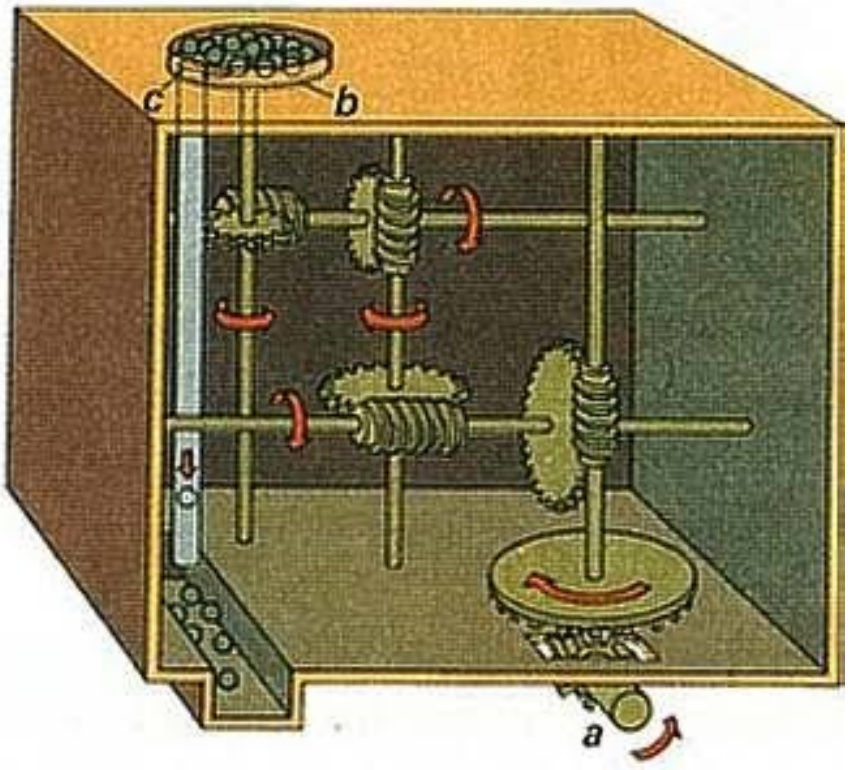
Archimedes famously said -"Give me a place to stand and I will move the earth.".

The same principle he applied to topple enemy ships with his ingenious war weapon, the Iron Claw.

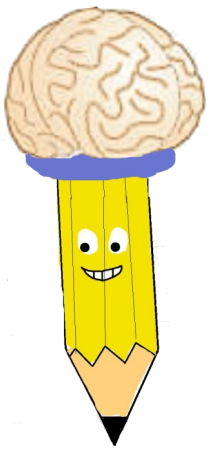


Most people might have seen the odometer in their vehicle, which keeps track of the total distance travelled..

But I didn't travel 25km without a number plate! Surely not!



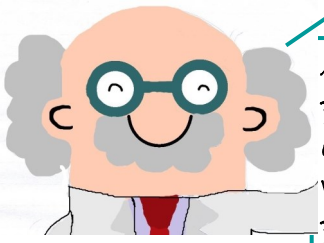
The earliest odometer was designed by Archimedes himself,. A complex set of gears turned by the axle of a wheel of known radius would drop a ball in a compartment after each turn. It was quite effective in measuring distances.



As for his mathematical contributions, he introduced the concept of exponents...

10^3

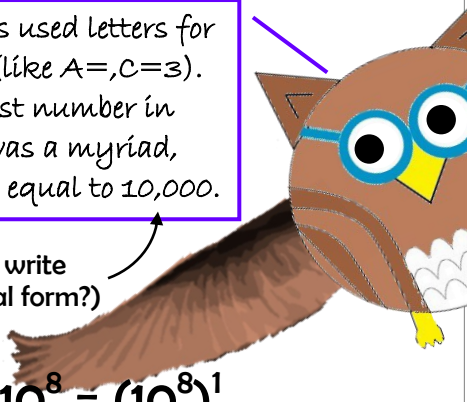
For example, you can write **28450000000** as **2.845*10^10**, the superscript indicating that '10 is multiplied with itself 10 times.



Archimedes was tired of people saying that the number of sand particles on a beach were uncountable, so he applied his study of exponents to create a 'beast number', so big that it does not have proper uses.

The Greeks used letters for numbers (like A=,C=3). The greatest number in their use was a myriad, which was equal to 10,000.

(How would you write this in exponential form?)



He started by multiplying a myriad by another...

$$10^4 \times 10^4 = 10^{4+4} = 10^8 = (10^8)^1$$

Numbers upto a myriad-myriad would be of the first order. Numbers of the second order will be upto 10^{16}, and so on.

$$10^8 \times 10^8 = (10^8)^2$$

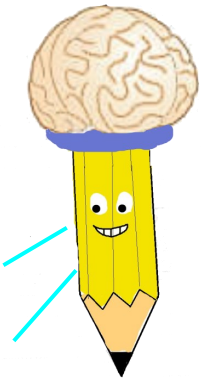
$$10^8 \times 10^8 \times 10^8 = (10^8)^3$$

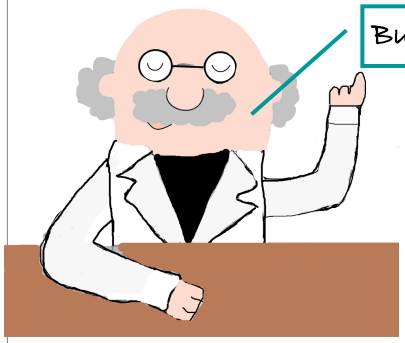
He declared that the upper limit of the eighth order of numbers would be the number of grains of sand required to fill the entire known universe!

$(10^8)^8$

That's 1 followed by 64 zeroes!

There are 10^{57} atoms present in our sun!





But he didn't stop here.

Just to show that bigger numbers could exist, he introduced periods.

Numbers upto the first period were less than a myriad multiplied by itself a myriad of times or till the 10^{8th} order...

$(10^8)^{(10^8)}$

Upper limit of second period

$(10^8)^{(10^8)^2}$

That's 1 followed by 8×10^{16} zeroes!!

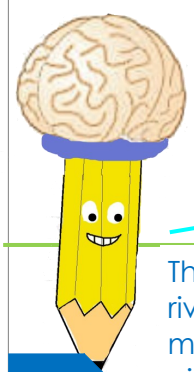
He continued till he reached the 10^{8th} period, the last number of which is popularly known as 'Archimedes Beast number'.

$(10^8)^{(10^8)^{(10^8)}}$

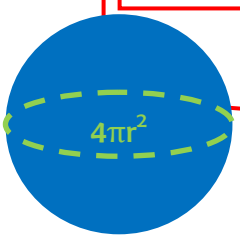
How would you explain it in terms of myriads?

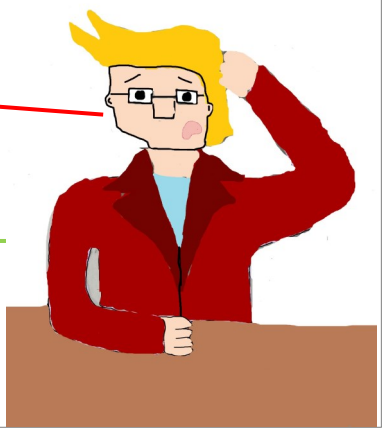
The well known expressions used for finding the surface area and volume of the sphere were also found and proved by Archimedes.

What is the 'π' in the expression?



An irrational factor. Decimal forms of irrational numbers are endless and non-repeating, so only approximations can be taken.





The approximation for π that is so popular today was derived by Archimedes. What was his procedure and approximation? Research and mail us the procedure to win a special mention in the next issue.

FOOTBALL WORLD CUP EVENTS

The Football World Cup, started back in 1930, is the most popular sports event. And things that makes it exceptionally special are the unpredictable events that are so common.

Some of such unforgettable World Cup moments follow...

Dr. Aminul Islam, Associate Professor, Department of Chemistry, AMU, Aligarh

Did the ball cross the line? The 'Wembley goal' of the 1966 world cup final was one of the most controversial.

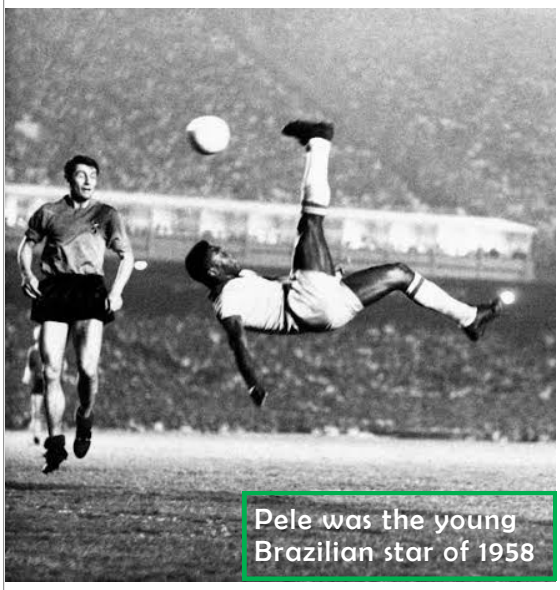
- Although football was officially born in 1904 with the founding of FIFA, it was not until 1924 and the Olympic tournament in Paris that the international game really came to its great glory. In 1928 however, when many nations abstained from the Olympic tournament in Amsterdam, the FIFA congress decided to organise a new tournament - the FIFA World Cup in 1930 in Uruguay without any qualifying rounds.
- The whole of this world cup took place in a single city, Montevideo, with its three stadiums. In the final, Uruguay were down 2-1 at half time, but fought back bravely to stun the Argentineans with a 4-2 victory.

The Italians celebrate their second world cup victory

- Italy won the 2nd and 3rd. "I may have let in four goals, but at least I saved the lives of 11 men", Hungary goalkeeper referred to the telegram Mussolini sent to the Italy team before the 1938 Final, which contained the words "Win or die". Throughout the second world war, the Italian Vice-President of FIFA hid the world cup trophy in a shoe-box under his bed.
- 1950 saw the first post-war world cup in Brazil. They just needed a draw against Uruguay in Maracanã- the planet's biggest stadium to become World Champions but were defeated. A whole nation was plunged instantly into mourning. The Brazilian officials even forgot to present the Uruguayans with the trophy. FIFA President Jules Rimet himself went onto the pitch in search of the Uruguayan captain to perform the ceremony.
- The fifth one in Switzerland (1954) was unforgettable for its sensational high-scoring games, introduction of television coverage and a surprise win for an admittedly under-strength German side against Hungary. It was also the first time in history that all players wore a number on their shirt. Hungary, the "magical Magyars" were the favourites with a team including Puskas, Bozsik, Kocsis and Hidegkuti, unbeaten in 28 internationals (since May 1950) and Olympic champions. But after the infamous "Battle of Berne" with Brazil, three players were sent off and the teams fought afterwards in the dress-

ing rooms. In the final, after leading 2-0 against West Germany, whom they had beaten 8-3 in the opening round, they went down 3-2. In ten memorable minutes the West Germans had fought back to equalise. After the Hungarians hit the post, Helmut Rahn scored the winner for West Germany with only six minutes remaining, when the Hungarian goal-keeper slid on the wet grass as he was about to go for the ball.


Helmut Rahn scored Germany's third winning goal against Hungary


Pele was the young Brazilian star of 1958

• Brazil, inspired by a 17-year-old youngster called Pelé, won the trophy for the first time. Pelé scored against Wales, hit a hat-trick in a 5-2 win over France in the semi-finals and struck two more in the final, a 5-2 triumph over the hosts Sweden. The real magician was Mario Zagallo, who was there again in the 1962 winning team and then in 1970 as coach, when Brazil took home the Jules Rimet Cup forever after their third win. Best goal-scorer Just Fontaine's (France, 13 goals) record stands to this day and is unlikely ever to be suppressed.

• 1962 saw another Brazilian triumph. The tournament also staged one of the most notorious matches in the history - the Battle of Santiago between Italy and Chile, in which two Italians were sent off and one had his nose broken by a solid left-hook from a Chilean player.

• The 1966 world cup was won by host England. After the Jules Rimet Trophy was stolen while on display in London, the hosts triumphed again when it was recovered by a dog called Pickles under a bush in a suburban front garden in south London a few days later. Defending champion Brazil was eliminated in the first round. Probably no event in the history of the World Cup has caused so much discussion as the so-called Wembley goal', a controversial one (goal-line controversy) that set England on the way to victory when Geoff Hurst (hat-trick) made it 3:2 in the final against Germany. North Korea became the first Asian country to reach quarter final stage but lost to Portugal in one of the most astounding and entertaining matches in the history of the competition. Amazingly trailing 0-3 to North Korea, Portugal staged a rousing comeback courtesy of four goals from the trailblazing star Eusebio (popular as the Black Pearl) and eventually triumphing by 5-3.


Eusebio scored 4 goals against North Korea in the quarterfinals

• The Jules Rimet Cup, named after the founder of the FIFA World Cup competi-

1970: Franz Beckenbauer remained playing on the field with a dislocated shoulder.

tion, became Brazilian property outright when the team's victory in 1970 saw the cup pass into their hands for the third time. The trophy was stolen in Brazil and, unlike in England in 1966, was never seen again. A fiercer and nerve-racking struggle was seen in the semi-final between Germany and Italy. After 90 minutes the two teams were locked at 1-1. What followed in extra-time has entered football folklore, with both teams leading at different times in a heart-stopping battle. Franz Beckenbauer remained on the field even with a dislocated shoulder. His courage, however, was not to be rewarded, as it was finally the Italians who had their way (4-3) to reach the final. It was the the only match in FIFA World Cup history to have produced five goals in extra time. For the first time substitutes were allowed, as well as yellow and red cards being introduced.

.....To be Continued.....

NUTRITION BITES

Dr. Kamil Ashraf, Assistant Professor, Department of Medicine, JNMC, AMU

A, B, C ... G - GARLIC

Garlic is used worldwide as a condiment for the strong flavour it adds to food. Native to Central Asia and popular with ancient cultures, garlic has long been used for its pungent, spicy taste and exhilarating health benefits. Garlic bulbs usually have numerous fleshy cloves, which are the edible parts of the plant. The green leaves and flowers, often termed as green garlic are also used in cooking. By heating the heads of a garlic for several weeks, black garlic is obtained, a sweet syrupy sauce, originally Korean and now popular worldwide. Garlic is popular in flavouring oils, used with meats, vegetables and breads. Garlic is popular in Indochinese sauces, Central Asian meat gravies, and European smoked stews.

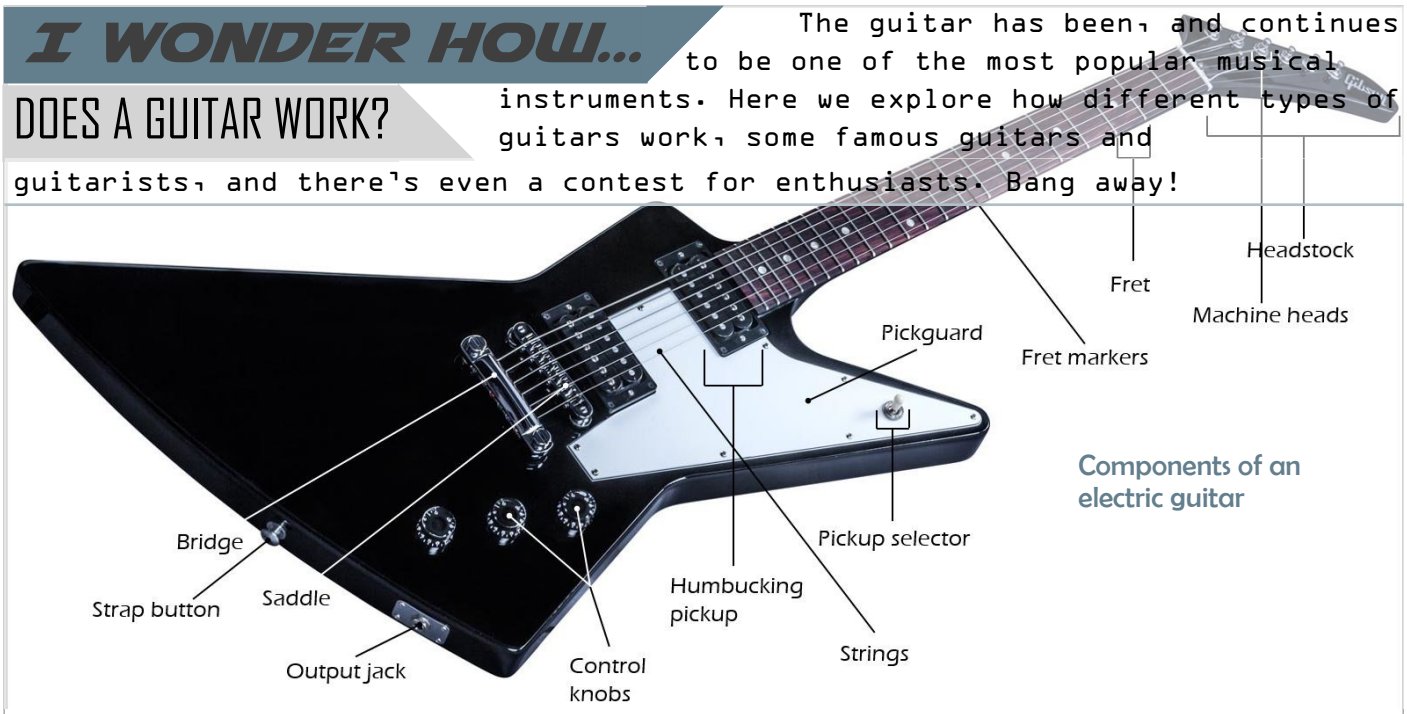
Garlic enhances taste of breads, meats, oils and sauces.

- Sulphur compounds, vitamin C and vitamin B6 in garlic boost functions of the immune system in its battle against common illnesses, which is a detrimental factor in increasing longevity.
- Antioxidants in garlic prevent Alzheimer's, dementia and other brain related diseases.
- Compounds in garlic also detoxify the body, and increase bone health.
- Garlic was prescribed to Olympic athletes in ancient Greece and has proven to boost performance.
- Other than that, garlic also reduces blood pressure and cholesterol.
- A disadvantage of garlic? Bad breath.

I WONDER HOW...

DOES A GUITAR WORK?

The guitar has been, and continues to be one of the most popular musical instruments. Here we explore how different types of guitars work, some famous guitars and guitarists, and there's even a contest for enthusiasts. Bang away!



Components of an electric guitar

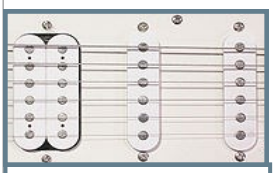
A guitar, as most of us know, is a six stringed instrument with a fretted neck which players press down at specific points (thus shortening the length of the string, increasing its frequency) to produce various notes of different pitches. The other hand plucks the strings with either a flat triangular plastic plectrum or with the fingers.

Structure and Functioning

There are chiefly two types of guitars - electric and acoustic (bass guitars are often grouped under the former). The guitar neck has segments called frets separated by thin metal strips (bars) that firm the pressed strings to the neck. There are machine heads at the headstock that help tune individual strings by adjusting tension. Strap buttons at either ends of the body are present to fix a leather strap for playing in standing position. speaker like metal boxes present at rock concerts), which is a combination of a guitar

An acoustic simply amplifies the string vibrations by its hollow body. A sound hole allows the sound to enter, resonate, and exit the body.

An electric guitar is mainly thin, and has solid body along with various other components. An electric guitar has one or more pickups which are basically electromagnets with thousands of coils of thin wire. The pickups partially magnetize the strings, strumming which disrupts the magnetic field, inducing electric currents into the wires (the principle of electromagnetism, as observed in the case of dynamos). The electric currents, too weak to power a loudspeaker, go through an amp (the large amplifier and a loudspeaker. An amplifier increases the current, while the loudspeaker converts the electric signals to sound. Sometimes, the pickups may catch stray and unwanted electric signals. A humbucking pickup (which has two attached coils of opposite polarity) helps minimize this. Electromagnetic noise is directed from one pickup towards the other and vice-versa, thus cancelling out the noise.



Humbucking (left) and single coil pickups.

Acoustic guitar

Also, the combined inductance of both coils results in a

more powerful and heavier tone. Fender guitars are iconic for their notable single coils and Gibson for their humbucker guitars. Pickup selecting switches are present in guitars with multiple pickups, for example a double pickup guitar (as in the cover picture) has three way switches three pickup guitars have five way switches.

Proposed by George Beauchamp and improved by Leo Fender, the electric guitar revolutionized the music world and now form an important part of almost any concert.

Some guitars also have a vibrato arm, a metal handle that guitarists use to purposely distort sound by moving the bridge of the guitar. Other external effects can be achieved by means of stomp boxes featuring distortion, reverb, delay, chorus, fuzz and so on.

A guitar is much more than just pressing plucking and plucking with fingers. Guitar playing involves various articulations, present to make sounds more appalling and connected. String bends, hammer-ons, pull-offs, legato, slides, vibratos, palm mutes, harmonics, taps, volume swells, dive bombs; alternate, tremolo or sweep picking in the picking hand and alternate tunings are some of the commonly used techniques. Over these years, guitars have developed all sorts of amazing and crazy modifications and customizations, like left hand guitars, twelve string guitars, double neck guitars, flaming guitars, screaming guitars just to name a few. (A very famous fuzz guitarist is missing below, find out who it is.)

Find out who these famous guitarists are and what popular guitar are they playing. A surprise prize from us awaits you!

PALWAN ISLAND

Declared a UNESCO biosphere reserve, the Palawan island is one of the most enigmatic and biologically diverse regions on earth. Scientists have only recently started to realise how the island teems with all sorts of flora and fauna

Dr. Asaduddin Laskar, Assistant Professor, Department of Chemistry, Jazan University, KSA

In the Philippines lies a tropical paradise, namely the Palawan Island, with bountiful scenic nature. The Palawan Island may be reached both by sea and air. It has a culturally diverse population, consisting of 87 sects speaking 52 languages. Climatically, it's a true tropical island with an annual average temperature of 31 °C and rainfall varying with seasons. Interestingly, the weather is often different in different parts of the island. The coast on the eastern side, which faces the Sulu Sea, often experiences intermittent rainfall with 1 to 3 months of dry seasons, while the other parts, however, go through extreme climate with six months of dry weather and six months of rainfall. Some of the attractions include white sandy beaches, steep-sided mountains, jungles, coves, caves, underground river, rare aquatic species and the native animal and plant species. The unique species which are its native inhabitants include the blue mushroom, purple crabs, the carnivorous

A Palawan beach

Palawan peacock -pheasant

© Stewart McPherson - used with permission

Shrew-eating pitcher plant

Palawan's underground river

shrew-eating pitcher plant Nepenthes attenboroughii, the Palawan peacock-pheasant, the Palawan bearded pig, the Palawan pangolin, the Palawan mouse-deer and the Palawan birdwing. In the past, the Palawan Island had the world's largest pearl with a diameter of 9.4 inches. In the 1990s, the UNESCO declared it a Biosphere Reserve, whereby the place is considered as conserved and fit for a living laboratory for productive long-term studies. A visit to the El Nido Marine Reserve Park and Tubbataha Reef Marine Park would allow you to catch sight of some endangered aquatic species, among both the flora and fauna. The Palawan Island offers many other sightly coral islands and lagoons. At Puerto Princesa, you will come across the world's second largest underground river, that is five mile long, and ultimately meets the sea. Being an ecologically important part of the world, the local and international authorities are cautious about any development, within the Palawan Island, that may cause detrimental changes.

A Purple crab

A Blue mushroom

SNIPPETS

THE WEALTHIEST MAN IN HISTORY - Mansa Musa

Syed Ali Atiq, IX, The Blossoms School, Aligarh

Mansa Musa, also known as Musa I, was born in Mali in the year 280 CE. was the tenth sultan of the Mali Empire and belonged to the Keiti dynasty. Musa is said to be the richest individual to have ever lived on this earth with an estimated worth in today's value of INR 26 trillion (USD 400 billion).

In 1312, the emperor Abubakra Keiti II left on an expenditure to explore the Atlantic Ocean, leaving Musa as his deputy. Abubakra never returned. So Musa become the king and was given the title of 'Mansa' which means 'Emperor'. Musa I conquered many cities and his empire stretched over 2000 miles covering parts of present day Mali, Ghana, Nigeria, Mauritania, Ethiopian, Chad and Gambia. His wealth was due to the resources found in Mali and other parts of Africa, especially gold. Musa was a pious man and in 1324, he set out for a holy pilgrimage for Mecca. It was after this pilgrimage that his wealth was known to the world. He moved with a large caravan of 60,000 men and women including 12,000 slaves who were laden with gold and other precious items. The wealth was distributed to the poor in the Arabian cities as he passed through on his way to the holy city. It is said that he build mosques in every city that he stopped on a Friday. On his way back, he brought scholars and architects to his country. He also build many beautiful mosques which still stand today.

Mansa Musa died in 1337 at the age of 57 years, after ruling for 25 years. His elder son, Maghan Musa ascended the throne after him.

WHAT WE ARE MADE OF

You are what you eat. But do you recall munching some molybdenum or snacking on selenium? Some 60 chemical elements are found in the body, but what most of them are doing there is still unknown.

Khairul Laskar, National Post Doctoral Fellow (SERB), Department of Chemical Sciences, Tezpur University, Assam

Roughly 96 percent of the mass of the human body is made up of just **four** elements: oxygen, carbon, hydrogen and nitrogen, with a lot of that in the form of water. The remaining 4 percent is a sparse sampling of the periodic table of elements.

Some of the more prominent representatives are called macro nutrients, whereas those appearing only at the level of parts per million (ppm) or less are referred to as micronutrients.

These nutrients perform various functions, including the building of bones and cell structures, regulating the body's pH, carrying charge, and driving chemical reactions.

The FDA has set a reference daily intake for 12 minerals (calcium, iron, phosphorous, iodine, magnesium, zinc, selenium, copper, manganese, chromium, molybdenum and chloride). Sodium and potassium also have recommended levels, but they are treated separately.

However, this does not exhaust the list of elements that you need. Sulfur is not usually mentioned as a dietary supplement because the body gets plenty of it in proteins.

And there are several other elements - such as silicon, boron, nickel, vanadium and lead- (yes, the infamous lead that is said to have wiped out the Romans) that may play a biological role, but are not classified as essential.

A normal diet consists of thousands of compounds (some containing trace elements) whose effects are the study of ongoing research. For now, we can only say for certain what 20 or so elements are doing. Here is a quick rundown, with the percentage of body weight in parentheses.

Oxygen (65%) and Hydrogen (10%) are predominantly found in water, which makes up about 60 percent of the body by weight. It's practically impossible to imagine life without water.

Carbon (18%) is synonymous with life. Its central role is due to the fact that it has four bonding sites that allow for the building of long, complex chains of molecules. Moreover, carbon bonds can be formed and broken with a modest amount of energy, allowing for the dynamic organic chemistry that goes on in our cells.

Nitrogen (3%) is found in many organic molecules, including the amino acids that make up proteins, and the nucleic acids that make up DNA.

Calcium (1.5%) is the most common mineral in the human body. Nearly all of it found in bones and teeth. Ironically, calcium's most important role is in bodily functions, such as muscle contraction and protein regulation. In fact, the body will actually pull calcium from bones (causing problems like osteoporosis) if there's not enough of the element in a person's diet.

Phosphorus (1%) is found predominantly in bone but also in the molecule ATP, which provides energy in cells (mitochondria) for driving chemical reactions.

Potassium (0.25%) is an important electrolyte (carries a charge in solution). It helps regulate the heartbeat and is vital for electrical signaling in nerves.

Sulfur (0.25%) is found in two amino acids that are important for giving proteins their shape.

Sodium (0.15%) is another electrolyte that is vital for electrical signaling in nerves. It also regulates the amount of water in the body.

Chlorine (0.15%) is usually found in the body as a negative ion, called chloride. This electrolyte is important for maintaining a normal balance of fluids.

Magnesium (0.05%) plays an important role in the structure of the skeleton and muscles. It also is necessary in more than 300 essential metabolic reactions.

Iron (0.006%) is a key element in the metabolism of almost all living organisms. It is also found in hemoglobin, which is the oxygen carrier in red blood cells. Half of women don't get enough iron in their diet.

Fluorine (0.0037%) is found in teeth and bones. Outside of preventing tooth decay, it does not appear to have any importance to bodily health.

Zinc (0.0032%) is an essential trace element for all forms of life. Several proteins contain structures called "zinc fingers" help to regulate genes. Zinc deficiency has been known to lead to dwarfism in developing countries.

Copper (0.0001%) is important as an electron donor in various biological reactions. Without enough copper, iron won't work properly in the body.

Iodine (0.000016%) is required for making of thyroid hormones, which regulate metabolic rate and other cellular functions. Iodine deficiency, which can lead to goiter and brain damage, is an important health problem throughout much of the world.

Selenium (0.000019%) is essential for certain enzymes, including several anti-oxidants. Unlike animals, plants do not appear to require selenium for survival, but they do absorb it, so there are several cases of selenium poisoning from eating plants grown in selenium-rich soils.

Chromium (0.0000024%) helps regulate sugar levels by interacting with insulin, but the exact mechanism is still not completely understood.

Manganese (0.000017%) is essential for certain enzymes, in particular those that protect mitochondria from dangerous oxidants.

Molybdenum (0.000013%) is essential to virtually all life forms. In humans, it is important for transforming sulfur into a usable form. In nitrogen-fixing bacteria, it is important for transforming nitrogen into a usable form.

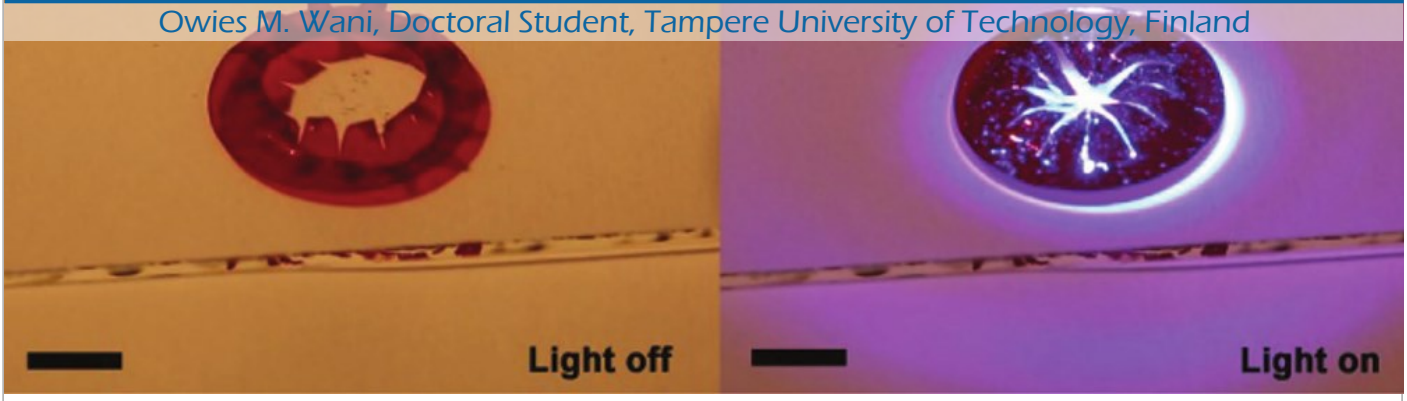
Cobalt (0.0000021%) is present in vitamin B12, important in protein and DNA formation .

What are the four main types of compounds in our body and what compounds come under them? Research and mail us to win a special mention in the next issue.

BIOINSPIRED RESPONSIVE MATERIALS

We all have seen how dynamic parts of our and other living organisms bodies are in function, strength and efficiency in the tasks they are specialised in. Materials involved in such biological processes are new inspirations for scientists, as they provide endless varieties of applications..

Owies M. Wani, Doctoral Student, Tampere University of Technology, Finland



Material scientists have always been intrigued by the complexity of biological materials and often times this has led to the development of revolutionary functional materials. Biological materials mainly possess three important qualities that make them inspirational for researchers around the globe. Firstly, they possess superior mechanical properties due to hierarchical arrangement of alternative soft and hard structural components across a variety of length scales. For example, this feature gives bones improved strength and fracture resistance. Secondly, such materials are functional and often can perform multiple functions e.g. self-cleaning ability of lotus leaves. Finally, one of the most striking feature of biological materials is their ability to respond or adapt to their environment, which is very challenging to mimic in artificial materials. Examples of natural adaptive systems include self-healing of bones and vascular tissue, colour change in some animals like chameleons, switching of adhesion in Gecko feet, light-responsive movement of iris, flowers etc.

Recently, bioinspired artificial materials, which are capable of stimuli responsive movements are getting lot of attention from the scientific research community. These materials are referred as stimuli-responsive actuators. Their movement can be triggered by different stimuli such as heat, humidity, pH, light, electricity, magnetic field, etc. Light being so ubiquitous, with high degree of spatial and temporal control, makes an interesting choice as a stimulus. Light triggered actuators are the materials which can deform (change their shape) reversibly under light irradiation. The Iris in our eyes opens widely under dark light and constricts in presence of bright light, to control the amount of light passing inside the eye. The figure depicts an artificial iris, made from liquid crystal material, which regulates its aperture size according to intensity of irradiated light. Similar to iris in our eyes, the artificial iris possesses large aperture size under low intensity light and the aperture size decrease under irradiation with higher light intensity. Other bioinspired light responsive actuators mimicking the motion of caterpillar, opening and closing of flowers etc. have also been synthesized and demonstrated in laboratories. Although, study of these light-based actuators is driven mostly by scientific curiosity, yet many future applications in tuneable optics and specialised and versatile robotics can be envisioned.

Whenever we discover something new or encounter a problem, we find nature already has found a solution and mastered it in its applications.

THE INDIAN CIVILLISATION

In a nation of cultural richness, where disputed history is being credited by various political organisations, it is essential to have a knowledge of the facts and myths…

Dr. Ghulam Nadri, Associate Professor, History Department, Georgia State University, Atlanta, GA

A civilisation is defined as a society with a set of beliefs, values, rules of behaviour, and a social system based on hierarchy and division. The Indian civilisation is a rich and composite civilisation whose roots go back to the prehistoric times. The history of the Indian civilisation begins with the Indus Valley Civilisation, a sophisticated city-based culture, which flourished during 2500-1900 BCE (Before Common Era). The people of this culture cultivated grains, such as wheat, barley, millet, and produced textiles. They spoke a language and used a script, which has not been deciphered yet. Harappa and Mohenjo-Daro were the two most important cities of this period. A few centuries after the decline of the Indus Civilisation, the Aryans arrived in the Indus region. With them came the Vedas and its language, Sanskrit. Vedas are the collection of hymns composed in praise of Aryan gods, which were transmitted orally from one generation to another for several centuries before they were written down. The four Vedas (Rig Veda, Sam Veda, Yajur Veda, and Atharva Veda) and the commentaries on them represent one of the finest examples of philosophical, literary, and technical or scientific creativity in Indian history. Present-day Hinduism has its origins in the Vedas. The Aryans also introduced the caste (Varna) system in the Indian society. Originally, there were four castes (Brahman, Kshatriya, Vaishya, and Shudra), but, later, the society evolved and several new castes or sub-castes (jatis) were added to the caste system.

A tablet depicting script used by the Indus

In the Vedic culture, scholars and philosophers had the freedom to debate and question the ideas and conceptions of god and the rites and rituals associated with the religion. Many of them were critical of animal sacrifice and rituals, which were main aspects of religion in the early Vedic period. It was out of this tradition that Buddhism and Jainism emerged as the new religions in the 6th century BCE. The followers of Buddhism and Jainism did not believe in the Vedic sacrifice or rituals, rejected the caste system and practiced non-violence. In response to the growing popularity of Buddhism and Jainism, the Vedic religion (Brahmanism) itself underwent a major transformation. The essence of the Vedic religion changed from sacrifice to devotion to a supreme deity. Vishnu and Shiva became the most important deities and Vedic Brahmanism transformed into devotional Hinduism. These and many other transformations in the religions and societies in the classical period (2nd century BCE to 10th century CE) made the Indian Civilisation one of the richest and most dynamic civilisations in the world.

NATURAL SATELLITES

A planet orbits around a star. A moon orbits around a planet. This unique cosmic system leads to innumerous phenomenon perceptible on all worlds. Since 19--, total --- satellites have been found in our solar system and many beyond...

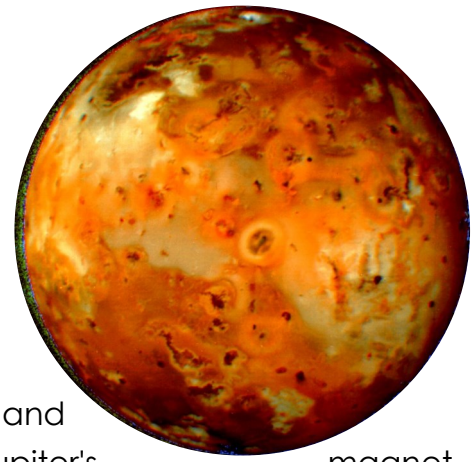
Munaf Nadim Qazi, IX, The Blossoms School, Aligarh

A planet orbits a star. A satellite orbits a planet or a dwarf planet. In our solar system, all planets except the two innermost have moons, a total of 185, plus 384 minor planets having moons. The moon has been a natural companion to our planet since ages immemorial, but it was first looked upon as a satellite only by Copernicus in the 16th century. Until the discovery of the four Galilean moons of Jupiter, the moon couldn't be classified as a separate class (they didn't knew then if others moons existed). The term satellite was coined by the German astronomer Johannes Kepler, who used to refer to the objects which followed planets in their journey across the sun. Moons play an important role in regulating the natural processes of their planets.

Although none have been discovered yet, scientists have recently found evidence of existence of 'satellites of satellites' around the ring systems of Saturn's moon Rhea.

Some extraordinary moons of our solar system,

Io

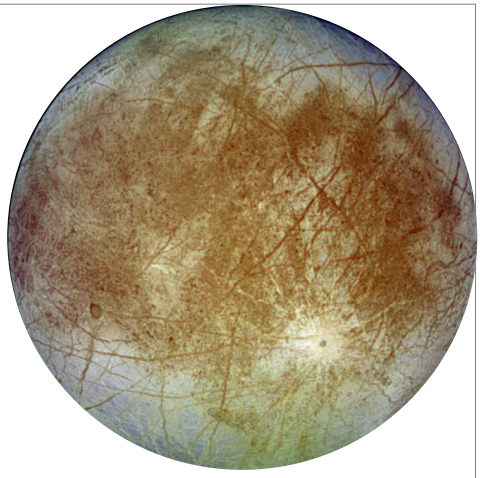


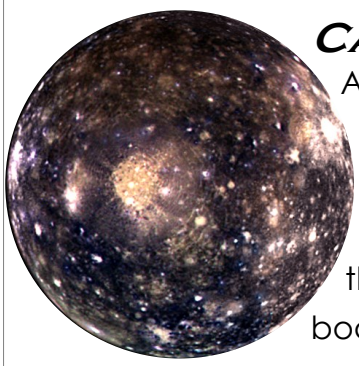
Often considered to be the topmost contestant for hellish places in our solar system, the volcano blasted surface of this moon at first sight demonstrates its characteristics. Io is the most geologically active body in our solar system, its dynamic nature caused by the immense gravitational force acting on it by the planet it orbits, Jupiter. The volcanoes constantly reshaping the surface and spitting sulphur and magma. Io's volcanoes play a significant role in shaping Jupiter's magnetic field, acting as a electric generator that can develop 400,000 volts and create an electric current of 3 million amperes. Jupiter's magnetic field lines, which Io crosses, couple of Io's atmosphere and neutral cloud to Jupiter's polar upper atmosphere by generating and electric current known as the Io flux tube. This current produces an auroral glow in Jupiter's polar regions known as the Io footprint, as well as auroras in Io's atmosphere.

Europa

Although at roughly the same the distance from its previous cousin and sharing

the same parent, Europa is a frozen ice world. The red-brown streaks seen crisscrossing the surface of this moon are dry ice channels. However that doesn't imply that Europa is a dead world. Geological activities are going on beneath the kilometres long icy surface. Scientists believe a liquid water ocean exists under the surface, which may host life similar to that of that of Earth's oceans since Europa's rocky core is predicted to be in contact with the oceans and rich in nutrients.

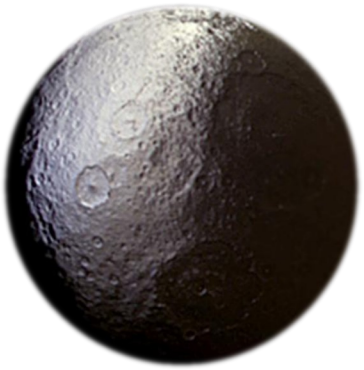




Calisto

Another one of Jupiter's iconic moons, Calisto's pockmarked surface is definitely its most distinctive feature. The bright spots are the thousands of impact craters that show the symbols of a much more chaotic period, when the solar system was forming and there were high number of collisions with every major astronomical body, including our own moon.

Iapetus

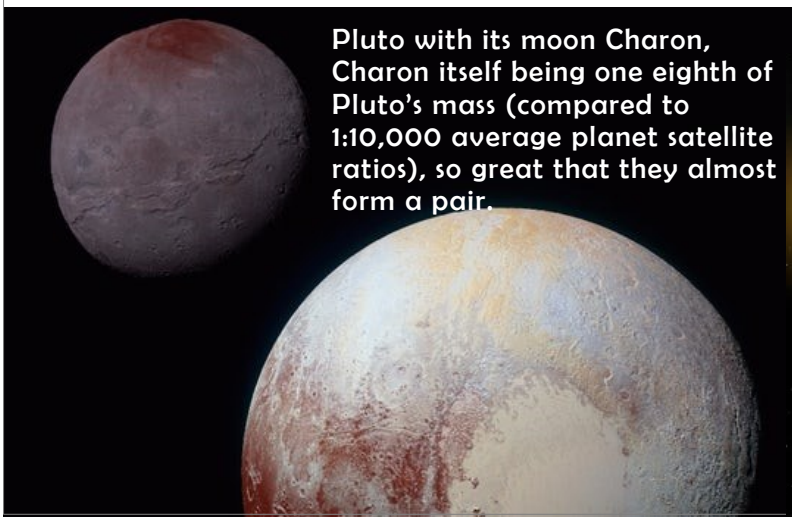


An observer would quite understand that this Saturnian moon's two distinct tonal surface is odd n itself, and not merely a dark shadow. Iapetus' distinct surface colours and its tidally locked properties don't match up and have baffled astronomers ever since it was discovered. The trace of an odd monolithic protuberance on the bright side of the moon became one of the platforms for Arthur C. Clarke's science fiction 'Space Odyssey' series, which involved expeditions to various other satellites.

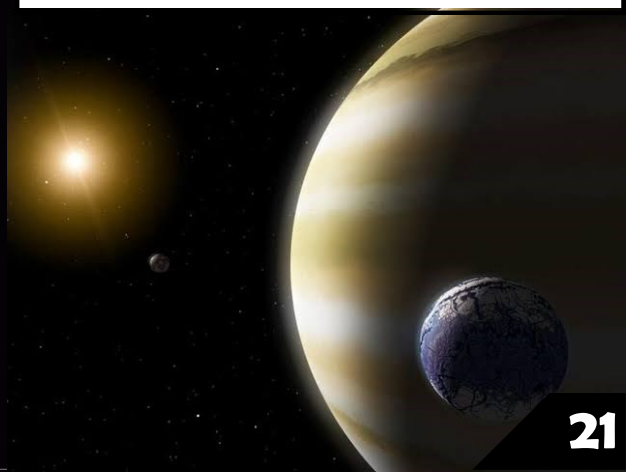
Titan

Yet another odd satellite, Titan is the only satellite known to have an atmosphere, and characteristics that may seem favourable to life, yet, its atmosphere isn't at all like that of earth. Titan has a stable atmosphere, lakes, and rivers of *methane*… Titan's surface is mostly rocky and icy and recent observations showed dust storms.

A planet around a star is detected by studying a permanent slight dip in its light when the planet is in transit in front of it. In a similar way, exomoons, or moons of stars outside our solar system are detected, although the process is a very tedious one.



Pluto with its moon Charon, Charon itself being one eighth of Pluto's mass (compared to 1:10,000 average planet satellite ratios), so great that they almost form a pair.



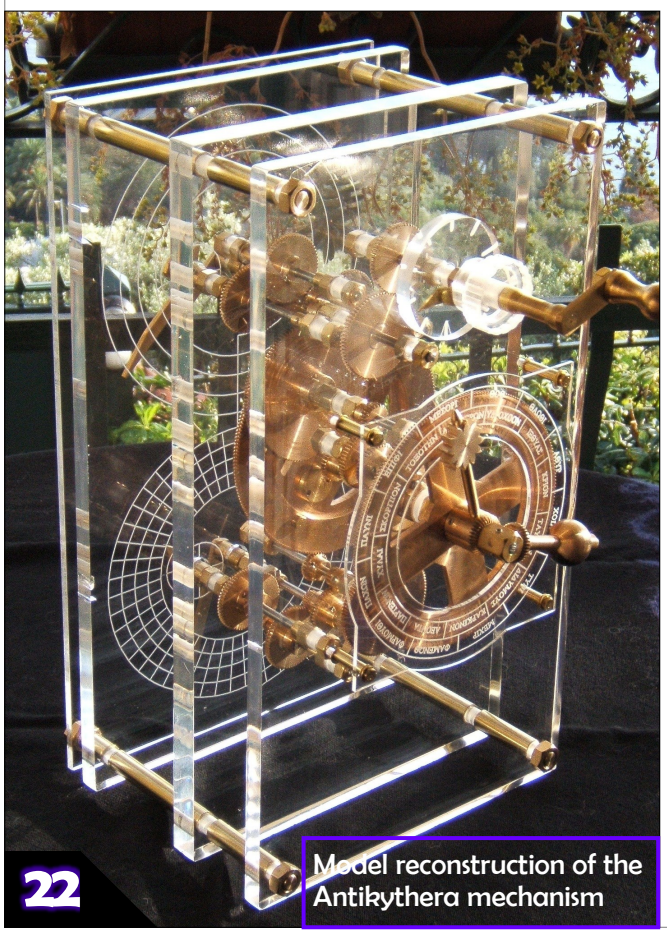
MYSTERY TALK
THE ANTIKYTHERA MECHANISM

The dominant worldwide conception today is that technology is modern. Obviously technological advancements are more rapid today, but that doesn't imply that our ancestors were fools...

Mohammed Misbah Tamanna, IX, The Blossoms School, Aligarh

Between the years of 76 and 67 BC, a ship containing various items such as statues, coins, pottery, unique glassware, jewellery etc. capsized near the Greek island of Antikythera. And there it lay under the sea not to be discovered until thousands of years later.

The ancient shipwreck was finally found in April, 1900 by a group of sponge divers (as the name suggests, their purpose is to retrieve natural sponges for human use). Then, in July 1901, an unusual artefact believed to be a part of the ships cargo was retrieved. An year later, an archaeologist Valerios Stais, while going through the artefacts, identified an artefact as a gear wheel. Since all the artefacts were apparently worthy of conservation, the mechanism was ignored until 1951. After almost two decades, the first publication on the Antikythera mechanism was made in 1974 by physicist and historian Derek de Solla Price. It was discovered to be the earliest true computer in the world, a complex clockwork of 30 meshing bronze gears. Detailed images of the mechanism show that it originally had 37 gear wheels which enabled it to follow the movements of the moon and the sun though the zodiac, to predict the eclipses and even to model the irregular orbit of the moon. It was concluded by 1974, that it was made during 87 BC and was lost in the shipwreck later a few years later. The original mechanism came out of the Mediterranean as a single encrusted piece. Soon after, it fractured into three major pieces. Xenophon Moussas, an astrophysicist at Athens University, theorized in 2006 that the



Model reconstruction of the Antikythera mechanism

boat on which the mechanism was found, may have been headed to Rome as part of a triumphal parade for emperor Julius Caesar in the 1st century BCE. The marine explorer Jacques Cousteau and his team dived to the Antikythera shipwreck, shortly after Price's publication in 1976. They found coins
from the 1st century BCE and a few smaller pieces of the mechanism. A few years after that, the famous scientist, Richard Feynman visited the museum in Athens, where the mechanism was kept. Before the invention of digital computers, there had been many analogue computers which ranged from a simple abacus to devices which could predict tides. The Antikythera mechanism, which was designed to calculate the dates and predict astronomical phenomena, has been called the earliest analogue computer.

The major retrieved fragments ▶

The mechanism was present in a wooden container (which was approximately the size of a shoebox), the clockwork being advanced for its time. It had a hand crank, which the user could use to turn the time forward and backward. This also leads to the question that if such complicated mechanism did exist as early as 2000 years ago, then why didn't we see more like them? It seems that the information needed
to make such a device was lost through time, perhaps because it was kept a secret back then, or it was too expensive to create. Such astronomical clocks didn't reappear in Europe until the 14th century.

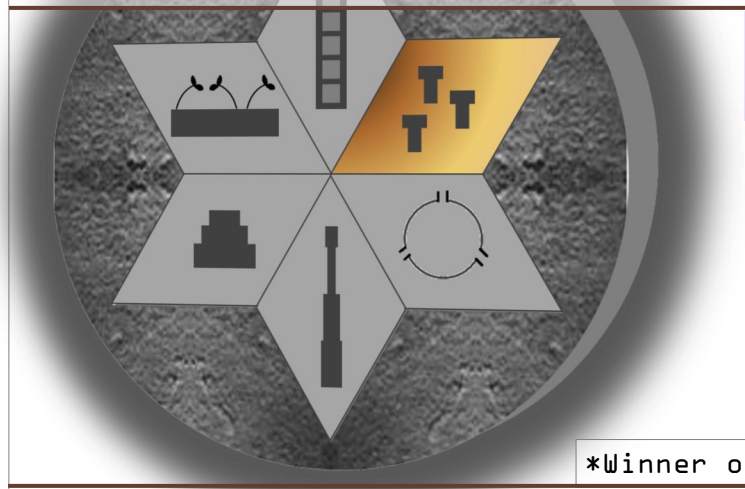
The mechanism tracked the lunar calendar, predicted eclipses, track the phases and position of the moon and also tracked the seasons and ancient festivals like the Olympics. The calendar was based on the time from one moon to the next and it also allowed the user to envision the season, which could have been useful for agriculture. The mechanism had two dials that rotated to show both lunar and solar eclipses. The most sophisticated thing the mechanism did was to model out the moon's elliptical orbit. The mechanism also included the pointers for Mercury, Venus, Mars, Jupiter and Saturn , all of which are easily visible in the sky. The parts that worked these planetary pointers are gone but the inscriptions confirms that the planetary motion was modelled mathematically using numerous complex gears and that it was highly accurate.

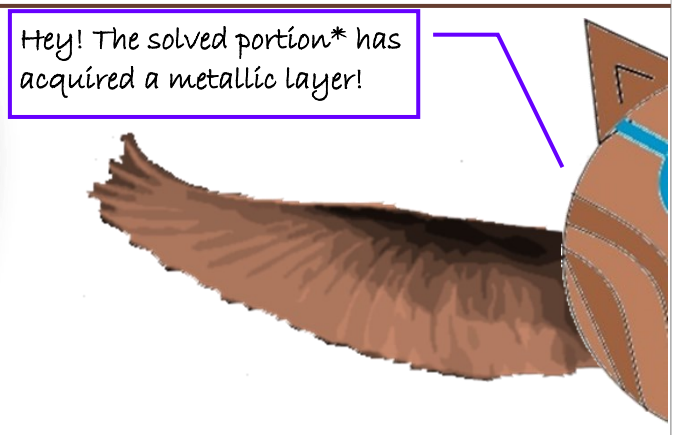
To conclude, I would like to say that the Antikythera mechanism was a highly complex and useful device (which may have been used by rich families or used in schools) that was technologically too far ahead for its time. Scientists and researchers have learned a lot about our past through it and it is also possible that more advanced devices may have existed earlier and in other pats of the globe. The mechanism also appeared in Google Doodles on 17 May, 2017, marking the 115th anniversary of its discovery.

Find out about any three other iconic ancient astronomical observatory or observing device along with descriptions of their functioning and mail it to us to win a special mention the next issue.

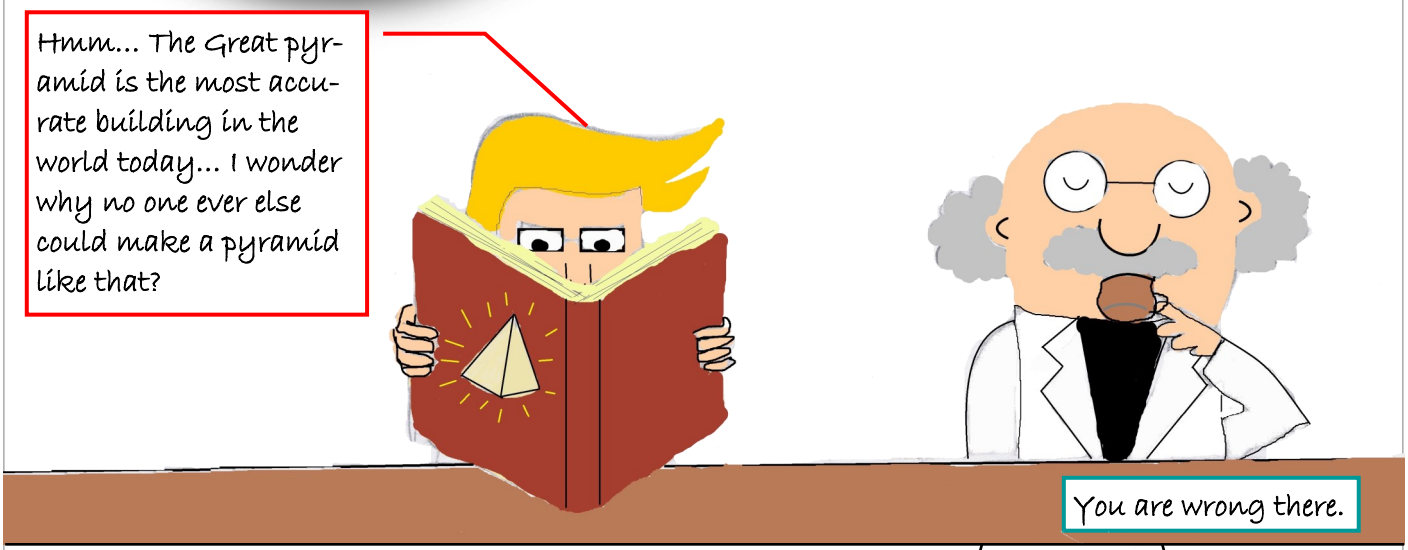
MONUMENTAL PUZZLES

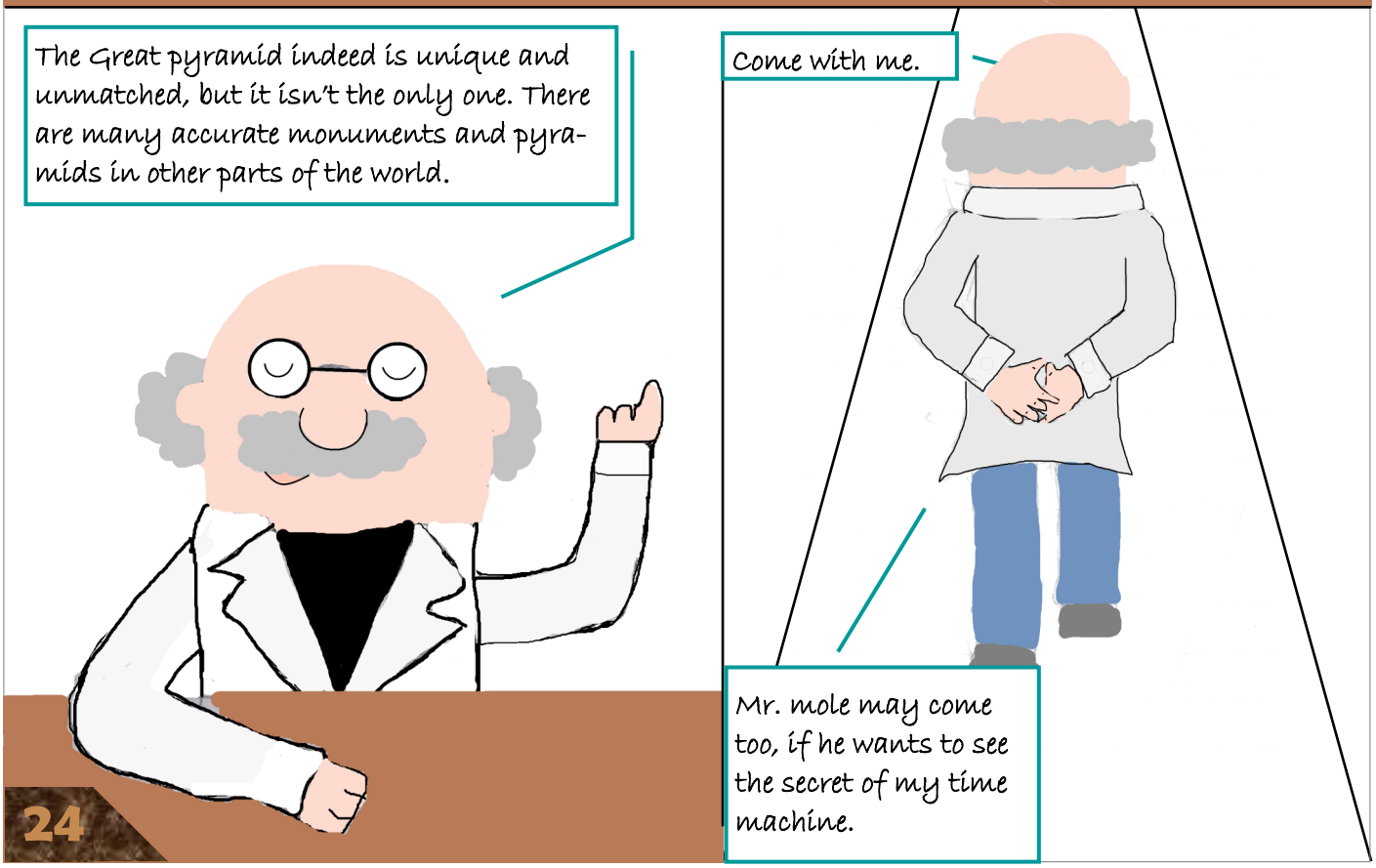
Previously...
The GSK toons were introduced to the archaeologist Mr. Mole, who had brought with him details of an unusual underground anomaly he had found. On Warren's insistence that he wanted to personally inspect the round stone slab, it had to be brought to the GSK headquarters.





*Winner of previous puzzle- Syed Ali Atiq, IX





Warren takes them to GSK's vast library-

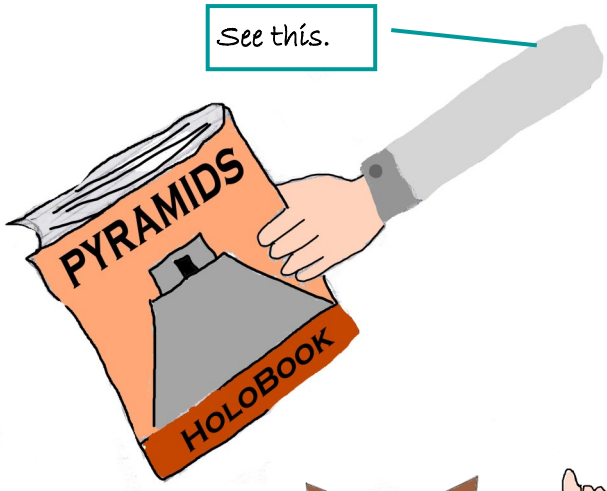
From here I gather information of the personalities you interview, for the stimulator.

Stimulator?

Ha! The box which you call the time machine actually generates only pictorial representations of places and people.

Prof, you've got an immense treasure of books in here...

See this.



This is a holographic model of the pyramid of _____ or __ _____, of the archaeological site of _____ _____. It is one of the greatest architectural wonders in the world today.

Many archaeological sites of this area feature stepped pyramids, and since this is the most iconic pyramid in all of the continent...

The _____ civilization flourished here in the _____ peninsula and this was a focal point for their activities right from 600AD till the Spanish conquest.

Which is similar to the engraving on the stone! Bravo!

Why don't we explore a stimulation of the site?

And so...

Take a seat and make yourself comfortable. The projection will load in a few moments.

It's pretty hot in here, anyway.

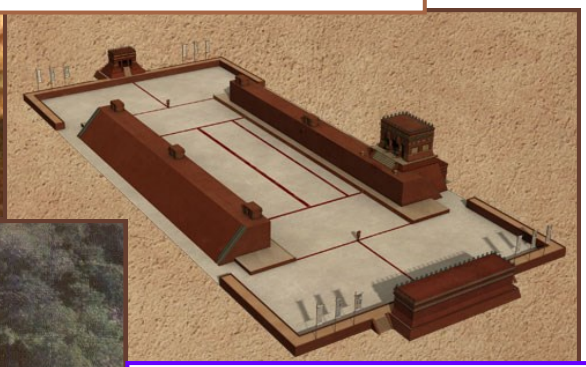
Let's see. That's the pyramid dominating other structures....

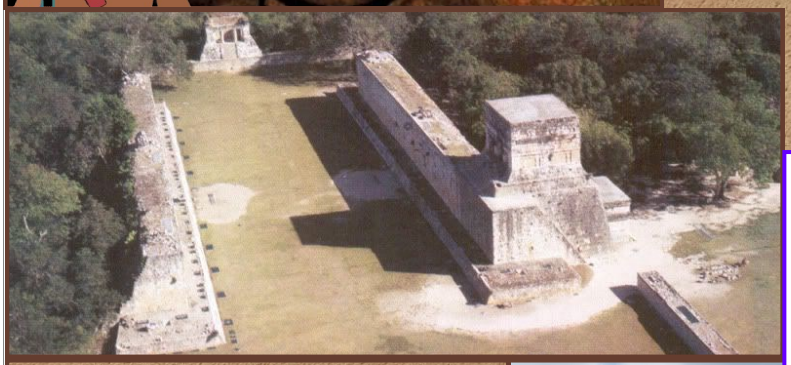
Psst... you have to find out the names of the structures!

The total steps (including the temple at the top) add up to 365, the number of days in an year.

The structure is constructed in such a manner that at every equinox (the two days of the year when day and night are equal in duration), the sun casts a shadow upon the staircase in such a manner that it resembles a snake descending from the top, which the people worshipped.

Expeditions in the 1930's led to the discovery of a tunnel under the pyramid, which led to another smaller pyramid evidently built before it. The temple at the top had a jaguar statue and a lying human figure in the 'throne room' chamber.





A part of the complex is a _____ _____, where the players had to pass a small rubber ball through stone rings (which was 9m from the ground) with certain parts of their body. Often, matches lasted for days and the players of the losing tea were sacrificed!

A skull _____ was also found, which bore carvings of similar structures seen other nearby sites, where skulls of scarified people were impaled by the thousands.

There is also an _____ (pictured above) and many other religious buildings around, their exact purposes still in debate...

Your job is fairly obvious. Find out which place we explored, name the structures in the map and mail us. The earliest correct answer wins a special prize form GSK!

WILDLIFE

DEEP SEA CREATURES

We know more about the moon than our own oceans. Only 5% of it has been yet explored. It is even tougher to reach the lower depths of the oceans, even then, scientists find all sorts of unusual, rare lifeforms thriving in this habitat of high pressure and darkness.

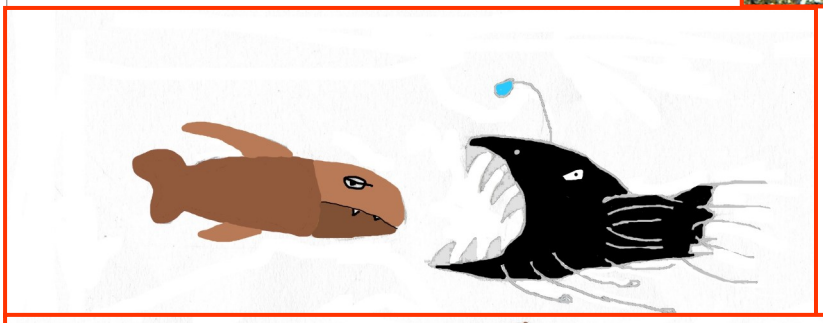
Muhammed Zaid, IV, The Blossoms School

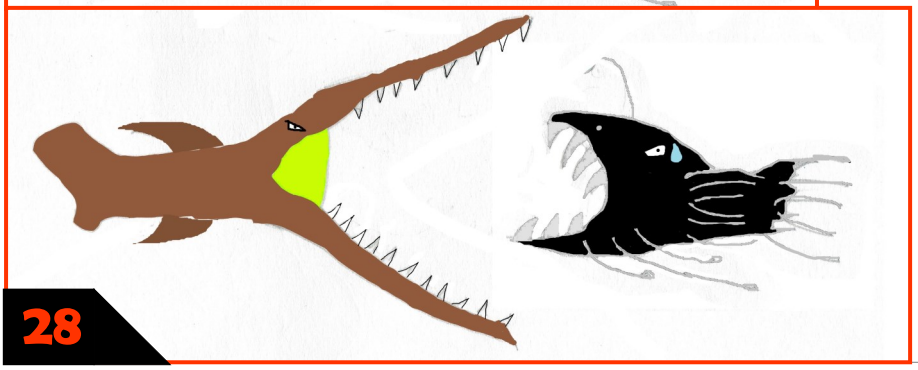
GOBLIN SHARK (pictured above)

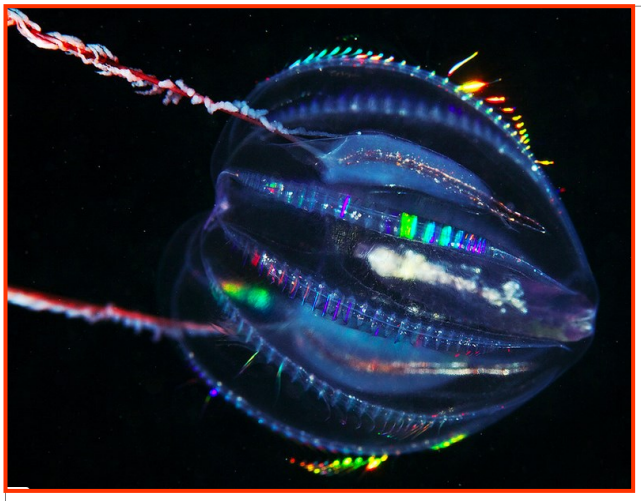
Spooky as it looks, the goblin shark has electro-sensitive organs (to sense the presence of their prey) in their elongated, flattened, blade like snouts. They developed these snouts because of the absence of light in their hunting grounds. These creatures have protruding and extremely delicate jaws that are equipped with long, slender, sharp fang-like teeth. Also called as 'living fossils' as they are unchanged for 125 million years. The fish appears whitish-pink or greyish-purple with pigment lacking skin.

SARCASTIC FRINGEHEAD

Famous for its gaping mouth it displays to keep invaders off from its territory, the fringehead is a small fish known best for being aggressively temperamental and for the unusual way it defends itself. Fringehead can grow up to 12 inches long, but most are between 3 and 8 inches, having large pectoral fins and a brownish tinge with green lips. These creatures have poor eyesight and in case of threat, the mouth wrestling unfolds! The wrestle by pressing their highly distended mouths equipped with needle like teeth against each other, and the stronger fish becomes dominant.







Comb Jelly

Comb jellies are gelatinous animals and, as their name suggests, their special feature is their padding combs generating a combination of colours glowing in colourful patterns. They are 95% water and have roamed the sea for nearly 700 million years. They swim by beating their combs rhythmically to push themselves forward. Their colour bands divide the body into eight symmetrical parts. They can prey on their own species if they do not find enough food. If starving, they shrink in size and stop reproducing. They use their bioluminescence, that is, in case of predatory threats, they flash brightly to blind the potential predator allowing comb jellies to escape. They can also camouflage in dark waters producing red pigment that makes them invisible.

Japanese Spider crab

Contrary to the spider crab's terrifying looks, the largest arthropod on earth is more gentle than it seems, scavenging on carcasses rather than hunting. This ten-legged animal measures 5.5 meters from one claw to the other (although average length is and height in its natural position is 3m). The 40 cm wide body is covered with a spiny and tough calcareous carapace. The Spider crab is second in weight only to the American lobster, weighing around 20kg. The bumpy orange-white shell also helps in camouflage. Young spider crabs are also known to decorate their shells with crustacean and sponges to further this cause.

Giant Isopod

This monster, an oversized version of the terrestrial pill-bug, cannot be seen easily, unless poachers (scientists, rather) raid the deep sea and bring them on land to raise them as their pets. They are carnivores and can stay without food for a long time. Giant isopods have widely spaced, fixed compound eyes with more than 4000 individual facets and, maybe they might not see well, they have a pair of antennae to compensate for that. To grow, they shed their exoskeletons and have the largest eggs of all marine invertebrates from which baby isopods come out.

Frilled Shark

Consider this one a living fossil as they are unchanged for 300 million years, since the dawn of the dinosaurs. This snakelike deep-water dwelling creature has a ruffled throat and lizard-like rounded head. It got its name from its frilly appearance of its six pairs of gills, with the first pair meeting across the throat. Another feature of this shark is its teeth numbering over 300 in all; each tooth is small, with three slender, needle-like cusps alternating with two cusplets, which indicates its primary prey is slippery squid. The frilled shark captures prey by bending its body and lunging forward like a snake. They live in the depths and are rarely caught.

Frilled Shark teeth

Pacific Blackdragon

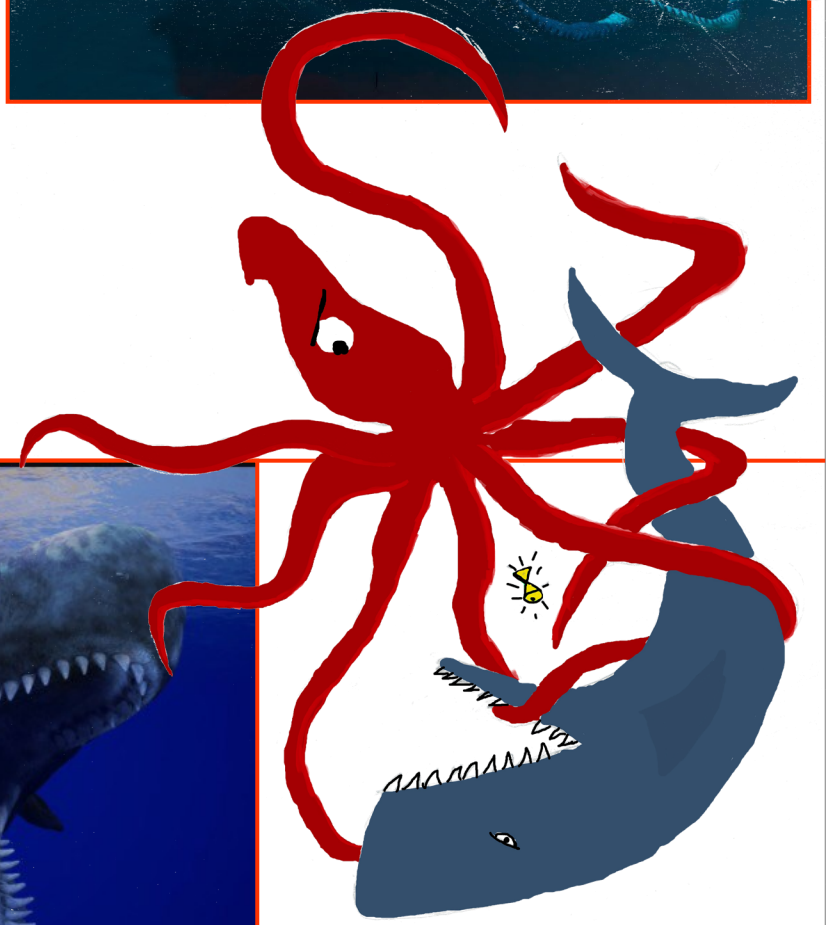
This horrifying fish can be said as the frightening hybrid between an angler and a viper fish, an ambush predator in all black. Even its stomach is covered with black tissue to block out any light that might be produced by bioluminescent animals that they eat. They have a separate light organ at the end of the long barrel that hangs down from the chin, which is used as a lure to attract prey. Even though it lives in deep waters, the Pacific Blackdragon receives some sunlight during the day, so the eyes are large and well developed. Females reach approximately 60 cm, the males being much smaller; having no teeth, stomach, or chin barrel, and are unable to feed. They never really leave the larval stage of development, and all of their energy comes from the egg yolk. Scientists believe that this extraordinary difference between the sexes is to reduce competition for life-supporting resources that are limited in availability.

Barreleye

Absolutely alien on first sight, a person has to see himself to believe that a creature can have a transparent head and green cylindrical eyes (Yes, the two structures near its mouth are not eyes, they are fish equivalents of nostrils). The barrel like eyes mostly look directly upwards, except when its feeding. Even its brain is visible through its fluid filled head. The green substance filled eyes are ultra sensitive and highly capable of differentiating meagre sunlight from bioluminescence.

Colossal Squid

This massive squid, although shorter, is three times the giant squid's weight and holds the record for the largest living invertebrate, upto 65 feet. The colossal squid's tentacles reach up to 46 feet and have sharp hooks, usually tri-pointed. They weigh at least 550kg and have a reddish tint and a large fin. Surprisingly, most of the colossal squid's anatomy has been found already digested - in whales' stomachs ready for marine biologists to examine, although occasionally smaller specimens have been caught.



Sperm Whale

This enormous blue whale which feasts on the deadly colossal squid consumes over 2000 pounds of food everyday and hunts its prey with echolocation. It makes the loudest animal-made clicks, the loudest heard off the coast of northern Norway which reached 235 (dB re 1 µ Pa), which is equal to the sound pressure of the Saturn V rocket heard at about one meter distance. This showed that Sperm whales can stun or even kill their prey with sound. For speed, these whales can swim 5 to 15kph and when speed up, approximately 35 to 45kph and maintain this speed for about an hour. The biggest threat to this whale (other than colossal squids) are killer whales, although sperm whales are too big and aggressive for any other animal to hunt them down. Not only aggression, these marine creatures have the biggest brain and head in the world, five times heavier than a human's. They store large quantities of a substance called *spermaceti* in their brain. *Spermaceti* is a waxy substance that helps in echolocation that is also used in candles, ointments and cosmetics, which led to large scale whale hunting in the nineteenth century.

Why did deep some sea animals develop good eyesight or bioluminescence while others didn't? What other adaptations did they achieve to compensate for this? Research and mail us the reasons with examples (at least seven) to win a special mention in the next issue.

ADHESIVES

Adhesives undoubtedly play an extremely useful role in our lives. Whether its joining machinery, sticking paper or joining wood, glues get in between two objects and help them stick together, without affecting the A history without adhesives is terrible right from the fact that our ancestors couldn't have made complex tools…

(Clockwise from left) Pitch was used to stick flint spearheads to bone or wooden handles; Superglue is a synthetic polymer based adhesive that has widespread modern uses; multi-part adhesives show a tendency to stick only when the components chemically react with each other; the glue behind the sticky note was an accidental revolution; tapes are a common example of pressure sensitive adhesives.

The History

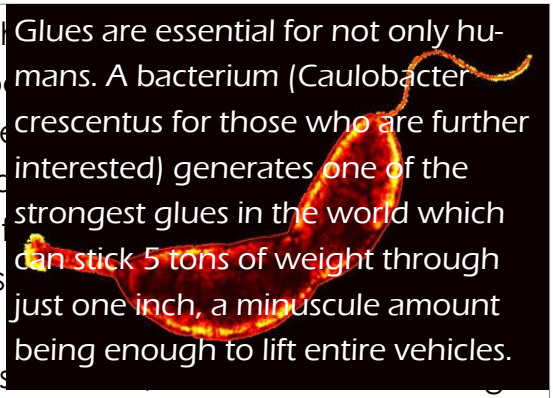
The earliest (human) applications of adhesives can be seen in the form of birch bark tar joining wood to a stone head, in early Neanderthal tools of 200,000 years ago in Italy. A slightly advanced gum appeared 70,000 years ago in Africa, where plan gum was mixed with red ochre to increase strength. Further applications could be seen in resins joining broken tribal pots, bituminous cements in Babylonian statues, pitch (heated tar) to connect metal heads to wooden handles. Egyptian paintings depict wood gluing procedures. They used casein based glues, starch based pastes, and calcified gypsum cement. Use of beeswax sealants and laminations in ship building were also detrimental in sea wars. The Romans and Greeks further extended the art of adhesive making in making monuments, mixing slaked lime with volcanic ash, sand, as mortar and cement. Certain varieties of cement in Roman harbours have proved to be stronger and more water resistant than modern commercial cement.

Commercialisation of adhesives started well from the seventeenth century, with the opening of various industries across Europe. The requirement of rubber-metal adhesives drastically increased with the automobile industry. This also gave rise to synthetic glues in the forms of thermoplastics and acids. Another sticky revolution took place in 1925 with the invention of pressure sensitive tapes. The demand of glues boomed in the World Wars. However, natural adhesives are still prevalent because to their relative cheapness.

The working

Nearly all adhesives require two types of forces to become sticky, namely adhesive and cohesive forces. Adhesive forces help in sticking the glue to the adherent (the ob-

ject to be glued) and cohesive forces help in sticking th
force between molecules of the adhesive. Cohesive b
slight electrostatic charges of the molecules. Both cohe
portant in sticking. A good example is that water can c
per, but the paper can be peeled of easily because of
Metals usually have high cohesive forces but no adhes
less as glues.


Glues are essential for not only humans. A bacterium (Caulobacter crescentus for those who are further interested) generates one of the strongest glues in the world which can stick 5 tons of weight through just one inch, a minuscule amount being enough to lift entire vehicles.

There are four widely accepted theories on how adhes
largely dependent upon the type of the glue and the nature of the adherents.

Adsorption: In this process, the adhesive spreads onto the surface of the adherents and generate Van Der Waals forces (weak electrostatic forces) that stick them together.

Chemisorption: Obvious from the name, the adhesive chemically reacts with the adherent to form very strong bonds.

Mechanical: The adhesive holds the adherents by surface irregularities, like a mountaineer holds onto a cliff face.

The presence of a solvent in some glues prevent it from sticking to its container.

Diffusion: Molecules of the adhesive get into the adherent and vice versa, this molecular swapping creates bonds.

The Types

Different types of adhesives bond stuff in different ways. Some common types of adhesives are-

Pressure sensitive: The most common example being tapes, this type of adhesive has and adherent and adhesive as its components and the adhesive being effective on application of pressure.

Contact: Usually rubber and neoprene is used for strong permanent bonds, in which the adhesive undergoes strain crystallization and molecules of the adhesive rearrange in stronger patterns.

Drying: Glues that harden and bond after the solvent evaporates, include solvent based adhesives like white and yellow glues and polymer dispersion adhesives used in fabric and packaging industries.

Hot: Solid thermoplastics are liquefied and used as adhesive, which cools on to the surface. Glue guns which use ethylene vinyl acetates as the adhesives are popular in the form of glue guns.

Multi-part: Usually composed of two components which work as an adhesive only upon mixing used in pipelines and other mechanical applications.

PMF: Common in military applications, these glues are pre-frozen, deaerated and mixed.

Which type of glues are the strongest? Research and mail us with examples to win a special mention in the next issue.

THE GSK CHARACTERS

(Descriptions from left to right)

Watch out for the dialog box outline colors! They indicate their speaker.

MR. MOLE - *The Archaeologist*

Has degrees and experience in archeological departments of various expeditions and is retired and recently working with the GSK characters solve the puzzle of the ancient underground anomaly. (refer to Monumental puzzles)

WARREN - *The Scientist*

The wisest member of the GSK team, he is a product of the Oxford University and is fond of rock climbing. The AI Pencil-Mind and a stimulator are his greatest inventions. Knows calligraphy and has a great fountain pen collection. Writes the 'Advanced Science' and 'I Wonder How?' section.

CRAIG - *The Mystery Hunter*

Claims himself to be one of the greatest mystery-solvers of all-time, he can be said as an adventure and mystery liker. Hates to sit idle and is super-determined. Frequently carries a magnifying glass, a Swiss knife and a hat. Writes the 'Mystery Talk' section.

NIGEL - *The Journalist*

The most curious and impatient, uses Warren's stimulator and library to interview famous personalities. Sometimes behaves peculiar and mostly carries a microphone shaped recorder. Writes the 'Great Lives' section.

PENCIL MIND

Warren's greatest invention, is a semi organic model of the human brain and can literally write anywhere using a gas filled liquid thermoplastic system. Handles all puzzles and interactive content in the issue.

NICOLA

Professional history guide and teacher, loves challenges and is interested in ancient technology, monuments and literary texts on real events and places. Is extremely short tempered and somewhat careless. Writes the 'History Section.

SNIPPETS

PUZZLE - Identify the photo

This picture is a representation of a sonar image taken of the seabed. A large circular anomaly of diameter 60m is seen which has staircase and other artificial seeming features. Divers who explored the site reported malfunctioning of electrical objects within 200m of the object. Samples show that metal obtained from the vicinity cannot be generated by natural means. Evidence of a long skid mark has also been found leading to the anomaly, which is still unexplained