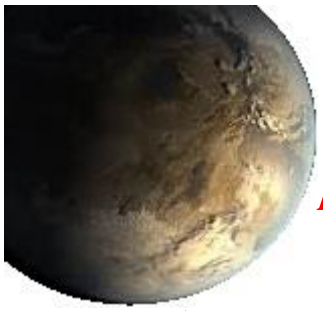
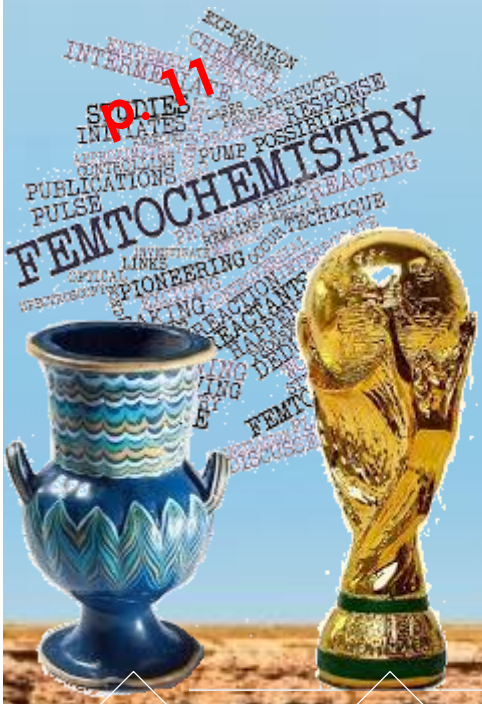
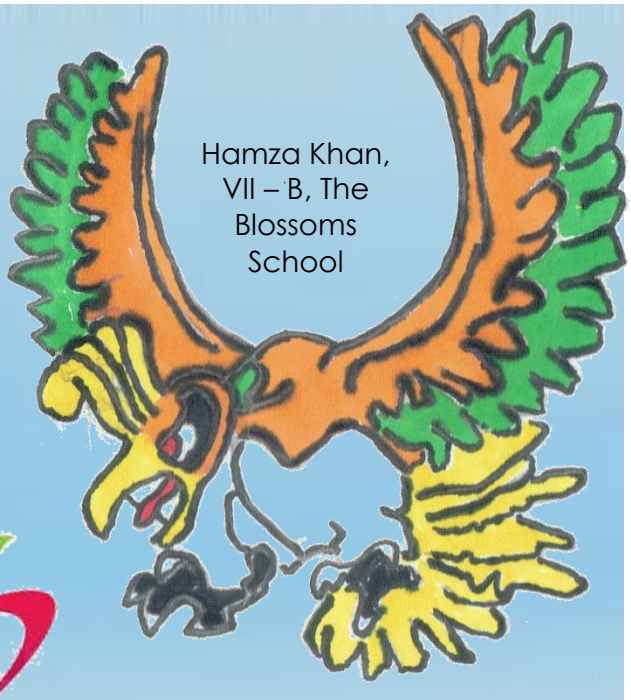


Get, Set, KNOW!

Issue 5, January 2017





Hamza Khan, VII – B, The Blossoms School

Dear Readers,

We have now taken over the responsibility of handling the content of the magazine (don't think us to be hijackers), and have also attached our own experiences along with the articles which we think you all would like. As you will notice in the tour, there will be a great mix of articles, but lesser stories. This is because of lack of contributions from little ones, the students, who are the primary means of story contributions. There are also many and larger images inserted than before, as you all would prefer. However in some articles, you may find not even a single photo or illustration. Please friends, don't skip these as we hope you to enjoy it within the text itself. Luckily this time we have included each of our featured topics, and have also received wonderful drawings from far and near and the same also applies for the advanced articles. You will also discover a shocking (most for those who read last times 'Cover Story') secret of one of our characters (Hint: We will have to escape as soon as this is over). We will discover unusual animals, radioactive elements present in a single cigarette and green living in a hilarious way, travel through the history of trains (onboard one) & football world cup, visit the largest piece of limestone, go beyond the poles to discover another world, interview another high speed chemist, eat a wonderfully bitter dish, take a test of our knowledge of elements, go around the universe searching for good exoplanet candidates, and finally dip in a set of paintings. We will come along with you through the issue, making you laugh where you would consider it most appropriate.

The GSK Toons
Editor – Muhammed Muaaz
Cartoonist – Muhammed Zaid
E-mail: getsetknowmagazine@gmail.com

A person who never made a mistake never tried anything new- Albert Einstein

CONTENTS

MEET THE GSK CHARACTERS

Warren

The wisest member of the GSK team, he is a product of the Oxford University and is found to use 11% of his brain, almost equal to Einstein. Pencil-Mind is one of his greatest creations. He writes the 'I Wonder Why?' section.

Craig

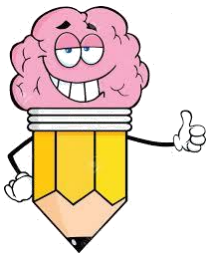
Claims himself to be one of the greatest mystery-solvers of all-time, he can be said as an adventure or mystery liker. Hates to sit idle and is super-determined. Writes the 'Mystery Talk' section.

Nigel

The most curious and impatient, has borrowed a time machine from Warren which he uses to interview famous personalities of our past and sometimes behaves strangely. Writes the 'Great Lives' section.

Wayne

An outer space alien who has settled in Pluto but birthplace is unknown. Has a special interest in Earth and its flora and fauna. Writes the 'Space Science' section.



Pencil mind

Warren's greatest creation, is a replica of the human brain and can write anything, anywhere. Writes the 'Train Your Brain' section. Now writes the whole puzzle section.

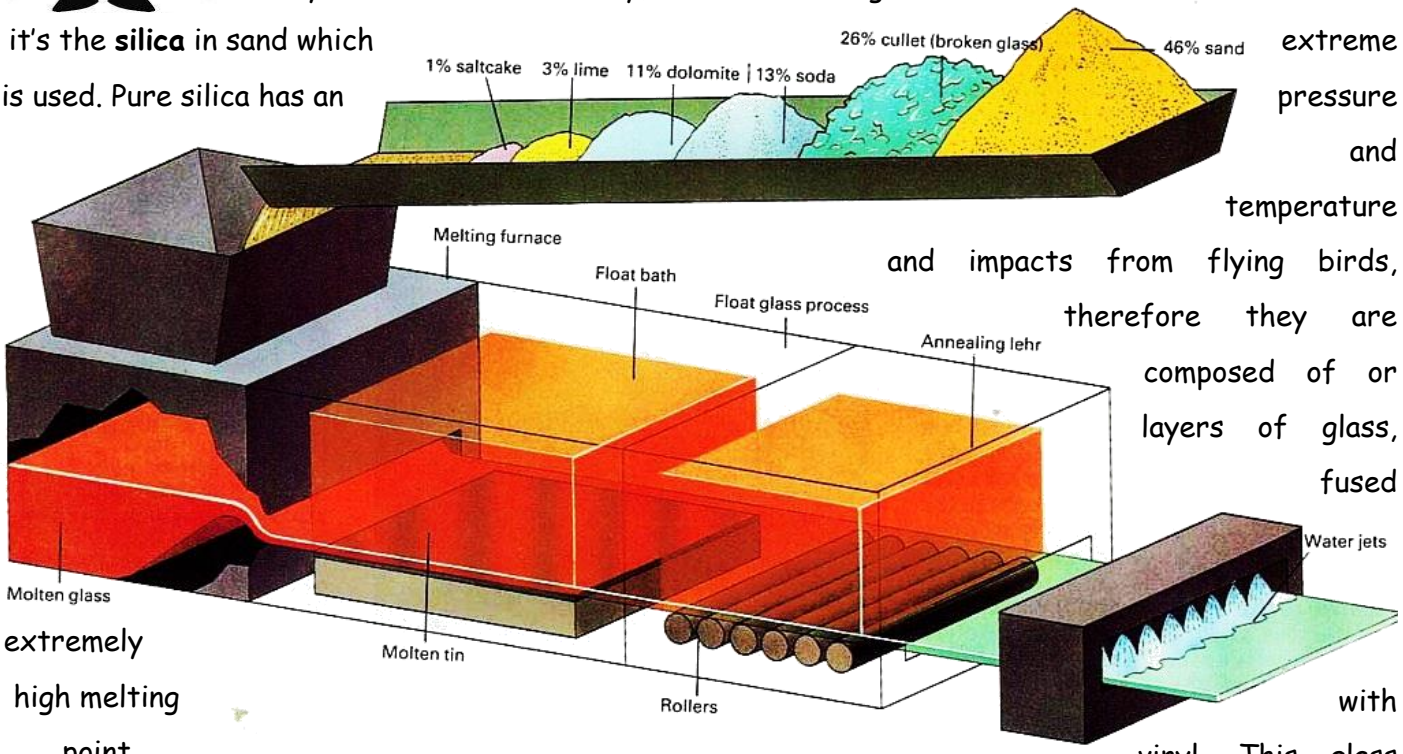
Nicola

Professional History guide and teacher, loves challenges and to learn from our past. Has the ability to blast the whole GSK HQ if disturbed or irritated. Writes the 'History Section.

I WONDER HOW? - *Making Glass from Sand*

By Warren

Making **glass** from sand – As eerie as it is modern glass is really made of sand. Actually, it's the **silica** in sand which is used. Pure silica has an extremely high melting point (1600°C), with no ordinary flame being able to convert it to glass. Lime and soda are mixed with silica which reduces the melting point of silica, used for making bottles, windows and drinking glasses.



By mixing 10-15 % boric oxide would produce a glass much more resistant to sudden temperature fluctuations, used in ovenware. And adding lead oxide would produce a shiny and glittering heavy glass.

Glass tends to break instead of stretch which makes glass strong but fragile. Plastics, on the other hand are flexible, but not that strong. By combining these materials with their respective properties, we get **Glass Fiber Reinforced Plastic or laminated glass**, used in vehicle windscreens. Laminated glass is actually a layer of plastic sandwiched within two layers of glass. Impacts shatter the glass, but the splinters remain stuck to the plastic. Aircraft windshields are designed to withstand extreme pressure and temperature and impacts from flying birds, therefore they are composed of or layers of glass, fused with vinyl. This glass also protects pilots of military warplanes.

History of Glass

There is much controversy over the discovery of glass, is it Mesopotamia or Egypt? The archeological evidences are found in North Syria, where the two civilizations overlapped. Glass production started quite late compared to others in Southeast Asia (1730 BC). Ancient European glass was found to be used in funerary and domestic uses, in the manufacture of vessels, beads, and jewelry.


Egyptian glass bead

NUTRITION BITES A, B…'E'….Y, Z - *Eggplant*

Dr. Kamil Ashraf; Assistant Professor, Department of Medicine, JNMC, A.M.U

Did any of our readers also did (or does) separate the black brinjal out of the food (Like our Nigel used to)? The **eggplant** also known as **aubergine, garden egg, guinea squash, melongene, and brinjal**, is usually distinguishable by its signature egg-like shape and vibrant purple color.

Although the dark purple version of eggplants is best known, they actually come in a variety of shapes and colors from small and oblong to long and skinny, from shades of purple to white and green. Eggplants are now available in markets throughout the year, but they are at their very best from August through October when they are in season. Eggplants belong to the nightshade family of vegetables, which also includes tomatoes, bell peppers and potatoes. They grow in a manner much like tomatoes, hanging from the vines of a plant that grows several feet in height.

The ancient ancestors of eggplant grew wild in **India** and were first cultivated in **China** in the 5th century B.C. Eggplant was introduced to Africa before the Middle Ages and then into Italy, the country with which it has long been associated, in the 14th century. It subsequently spread throughout Europe and the Middle East and, centuries later, was brought to the Western Hemisphere by European explorers. Today, Italy, Turkey, Egypt, China and Japan are the leading growers of eggplant. Although it has a long and rich history, eggplant did not always hold the revered place in food culture that it does today, especially in European cuisines. As a result of the overly bitter taste of the early varieties, it seems that people also felt that it had a bitter disposition—eggplant held the undeserved and inauspicious reputation of being able to cause insanity, leprosy, itch and cancer (Only reputation, don't take this seriously, read further on). For centuries after its introduction into Europe, eggplant was used more as a decorative garden plant than as a food. Not until new varieties were developed in the 18th century, did eggplant lose its bitter taste and bitter reputation, and take its now esteemed place in the cuisines of many European countries, including Italy, Greece, Turkey and France.

White Aubergine

Health Benifits

In addition to featuring a host of vitamins and minerals, eggplant also contains important

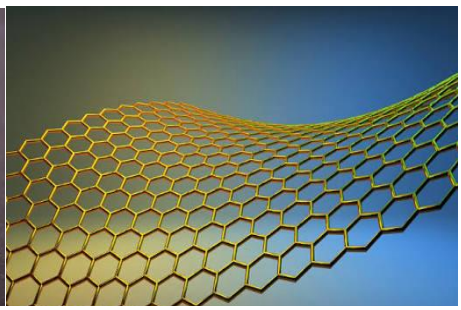
phytonutrients many which have antioxidant activity. Phytonutrients contained in eggplant include phenolic compounds, such **caffeic** and **chlorogenic acid**, and flavonoids, such as **nasunin**.

- Nasunin is a potent antioxidant and free radical scavenger that has been shown to protect cell membranes from damage. In animal studies, nasunin has been found to protect the lipids (fats) in brain cell membrane.
- Eggplants are rich sources of **phenolic compounds** that function as antioxidants. Plants form such compounds to protect themselves against oxidative stress from exposure to the elements, as well as from infection by bacteria and fungi.
- The good news concerning eggplant is that the predominant phenolic compound found in all varieties tested is chlorogenic acid, which is one of the most potent free radical scavengers found in plant tissues. Benefits attributed to chlorogenic acid include antimutagenic (anti-cancer), antimicrobial, anti-LDL (bad cholesterol) antiviral activities.

QUIZ WIZ - *Material that Matters*

Professor Tarasankar Pal, Department of Chemistry, Indian Institute of Technology, Kharagpur

1. What is the composition of writing chalk?
2. What the compound that makes the egg shell so hard?
3. What makes our teeth so sparking?
4. What are common calcium compounds available in the market?
5. Is carbon dioxide toxic?
6. What is the hardest common natural material available on earth?
7. What are the constituents of spider web?
8. What element bear the highest melting point?
9. What is the thinnest and strongest material discovered and for which Nobel Prize was awarded?
10. Which element can form highest number of compounds?



Answers on page p.26

GREAT EXPLORERS & MYSTERY TALK- *Admiral Richard Byrd*

By Craig and Nigel

Before you read- Craig also significantly helped me with this article, we say- dead sure you would like this and wonder (like us) - Why doesn't the world know about this?!

February 19, 1947. A plane soars above the Arctic. Below, along with the ice and snow, are linear yellow, blue and red coloured stripes. The magnetic and gyro compasses of the ship start to behave abnormally, unlike the sundial compass which is all perfect. Suddenly the crew on board sees mountains. After half an hour, beyond the mountain range is a small stream and a huge cluster of forests! The sun is out of sight and a strange beast is seen…

This strange story (or a part of it) is a description of a real existing underworld, the **inner earth**. The **hollow earth theory** is a disputed one, which says the Earth consists of layers, one enclosed in another. In the centre is another sun, maybe the earth core. So let's continue with our story-

Resembling a … Mammoth! The temperature is read as 23°C and radio contact is lost. Further ahead is a whole bustling city and light radiating saucers surround the ship, completely malfunctioning the control systems.

A strange voice comes through the radio welcoming the Admiral- **Richard B. Byrd**. Strange tall people with blond hair surround the aircraft and the next command is delivered to open the cargo door. The admiral – Richard B. Byrd, and the radioman were sort of 'welcomed' and served a strange warm beverage which resembled nothing on earth. Two of the creatures took the admiral to lighted hallway, via some sort of elevator. He stops in front of a door, onto which something is written in unknown script. The door slides open revealing an exquisite and delicate creature difficult to describe sitting at a long table. Here is the discussion (in English!) from Byrd's confidential personal writing.

It: I bid you welcome to our domain, Admiral. We have let you enter here because you are of noble character and well known on the surface World.

Me: (Gasping) Surface World!

It: (Smiling) Yes. You are in the domain of **Arianni**, The inner World of the Earth. We will not delay your mission for long, and you will be safely escorted back to the surface. But for now, Admiral, I shall tell you why you have been summoned here. Our tension mounts just after your race exploded the first atomic bombs over Hiroshima and Nagasaki. It was an alarming time so we sent our flying machines, the 'Flugelrads' to your surface to investigate what had happened but they were pursued and destroyed by your fighter planes as they thought them to be UFO's. The condition of the surface is deteriorating… We have chosen you to witness our world and spread our message.

So, that's how the discussion ended, they were allowed control over the craft and reached back just in time. Oh, we recommend that you now take a (little) break to digest that.

SPACE SCIENCE – *Habitable Planets*

By Wayne

Every one of our readers must have wondered how our alien brothers will look like. Apart from movie and comic illustrations, we will now explore the conditions feasible for earth like alien life to thrive as proposed by scientists.

The right object

On what you are searching for life matters most, you won't find alien wildlife on a red supergiant star or on Halley's Comet. Rocky planets and satellites (moons) are best.

The right parent

Imagine the condition of a planet between a binary star system in which usually a red giant and a white dwarf orbit each other, the white dwarf acting as a vacuum cleaner sucking material from the red giant by its enormous gravity. Sun like **main sequence yellow dwarfs** and **red dwarfs** are good parents.

Planet (if could exist) of a binary sta group as mentioned

Further Reference

Issue 4 'Space Science'

Suitable neighborhood

The best planet location is said to be in the **Habitable Zone**. Habitable Zone refers to intersection of the two locations of the planet, one planetary (such as within our Solar System), and the other galactic.

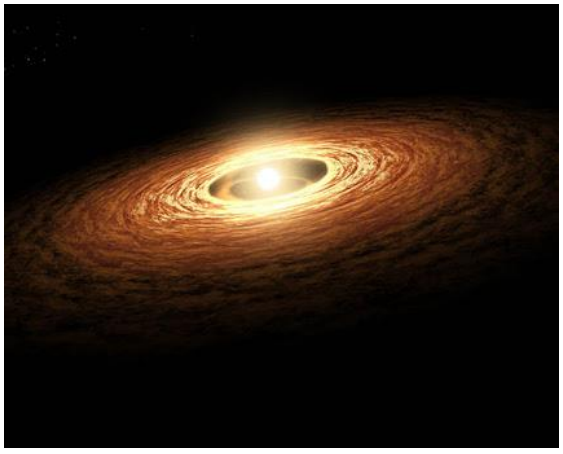
The planet in this location is (scientifically) called the '**Goldilocks planet**'.

The catch is that some planets have the possibility to sustain life in microenvironments.

However gas giants such as Jupiter can also be in the goldilocks zone, which do not support life.

High Metallicity of parent star

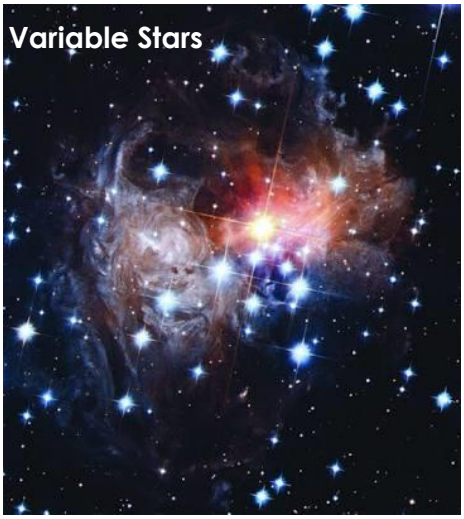
Metallicity of an object in cosmology is basically the proportion of matter consisting of elements other than Hydrogen and Helium. Astronomers collectively used the term 'metal' to describe all the other elements. Thus a star with low metal would reduce the chance of planet formation around that particular star.



Mass

Objects with low mass, would have less gravity, and would not be able to retain the life supporting atmosphere. Smaller planets and satellites also tend to lose the energy left after their formation, becoming dead of the geological activity such as volcanic eruptions and tectonic shift which provide the surface with life sustaining biomass. This would also result in continent creation, improving biodiversity.

Less luminosity alteration in star



Although fluctuation luminosity is common to all stars, some stars termed as **variable stars** experience sudden and intense fluctuations lasting from minutes to years. Changes in luminosity would also be accompanied by high doses of Gamma and X-Ray radiation. Temperature fluctuations, as we know, are not suitable.

Bodyguard

A huge **gas giant** bodyguard neighbor like our Jupiter would be in fact, good for our candidate in many ways. They have circular orbits, far enough from the habitable zone, to stabilize the orbits and therefore the temperature of the inner terrestrial planets and protect the candidate from comets and meteors.

The gas Giant's protector role was visualized in 1994 when Comet Shoemaker Levy 9 struck Jupiter. If not for its gravity…, oh… just forget that.

Magnetosphere

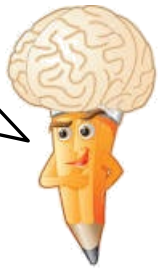
The endogenic forces taking place in the molten magma beneath the earth crust work like an enormous heat engine, which keeps the **magnetosphere** active. The magnetic shield protects life from highly ionized charged alpha particles along with high amounts of Gamma and X ray radiation.

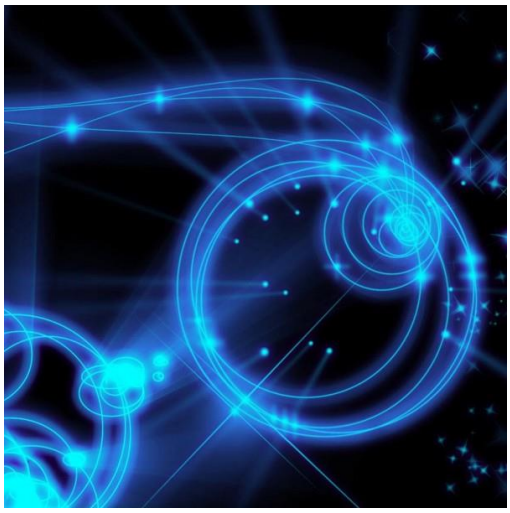
Further Reference

Issue 4 'Umbrella of our Earth'

Less eccentricity in orbit

Orbital eccentricity is the difference between the farthest and closest approaches of a planet's towards its parent star divided by the sum of the said distances.





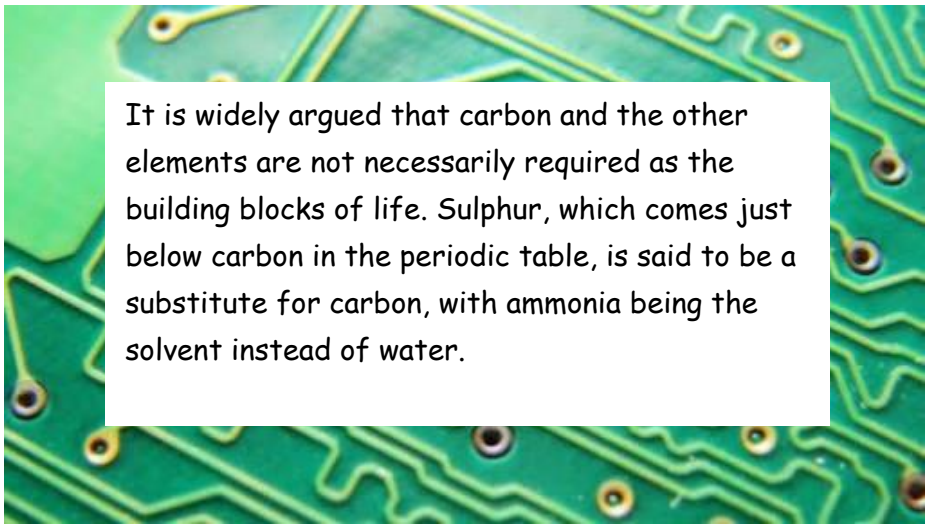
Eccentricity is basically the amount of orbit deviation from a perfect circle. The greater the eccentricity, greater will be the temperature fluctuations. Even with life's adaptive properties, the freezing and boiling points of the candidate's primary solvent mostly overlap. Our earth's orbit is almost circular with less than 0.02 eccentricity.

Tilt in Axis

We all know our planet is a bit tilted (23.5°).The advantage of this is that it brings the dynamism and diversity our life holds. And with a significant tilt, the intensity of radiation will be focused only within the equatorial areas, the warmth wouldn't move poleward and the entire planet would be dominated by colder climates.

Biomass

If we are to find life similar to ours, then we expect it to be based on the same biochemistry as ours, **Carbon, Hydrogen, Oxygen** and **Nitrogen** being the most common. The elements in fact, comprise over 96% of Earth's all biomass. Biogenic compounds, such as **amino acids** (simple proteins) have been found in meteorites and interstellar mediums.



It is widely argued that carbon and the other elements are not necessarily required as the building blocks of life. Sulphur, which comes just below carbon in the periodic table, is said to be a substitute for carbon, with ammonia being the solvent instead of water.

Carbon is the main basis for earth life, which can bond itself to form complex structures, Hydrogen and Oxygen combine to form the solvent of earth life i.e. water. The energy released by oxidation of organic compounds and formation of strong covalent bonds between Carbon and Oxygen, is the fuel of all living creatures of earth.

Time

Life, being an extremely sophisticated race, takes its time to develop. Humans, as we know them (read 'ourselves'), came to this stage after a 3.5 billion years of development of life. We also picture the future after 10 or 20 years. Can we even think the rate of development of life?

Intelligent Life

Till now we only discussed about simple life survival conditions. Let's now extend this idea further. Suppose we find a planet or satellite which is fulfilling all the requirements. So what will be our next step? After all, life and intelligent life are very distinct. If life on a planet has reached the stage of what would be some 2050 on earth? We would positively consider them to be more intelligent, right? Other than time, a few factors if included would produce the most complex and intelligent species ever imagined by us.

Super earths

A planet which would host such intelligent life would

- Orbit a red dwarf star (which has greatest life among all other stars without any significant size or luminosity fluctuation) and be in between the arms of a galaxy quite far from the centre. (the safest galactic location)
- Be terrestrial, ranging in size from 2 to 5 times larger than our Earth.
- Because it would have greater gravity (due to its size), leading to greater atmospheric retention and stronger magnetosphere.
- It would lack significant tilt and eccentricity.
- Life would have existed for more than 4.5 billion years.

AHMED ZEWAIL- *Father of Femtochemistry*

Ejaj Tarif, Doctoral student, SRF, S.N. Bose National Centre for Basic Sciences, Kolkata

Nigel: What did you do to my branded high speed camera?!

Warren: Some Hydrochloric and Sulfuric acid compound accidentally got spilled from my test tube.

Nigel: Accidentally?!

Warren: Perhaps. By the way, it's your mistake that you left it on my desk

Guess that happens when we combine optics with chemistry.

Ahmed Hassan Zewail is credited for developing the world's fastest camera to capture the motion of molecules and atoms. He was born on 26th February in 1946, in a little town called **Damanhur** (Egypt), the 'City of Horus' surrounded by **Rosetta** and **Alexandria**, two great historical places and raised in the city of Disuq, on the bank of the Nile, the Rosetta branch. He was so talented in his childhood that he was even called 'Dr. Ahmed' in his elementary school. At young age, he has done his first experiment in his own bed room with self-constructed apparatus, using his mother's oil burner and a few glass tubes, in order to see how wood is transformed into a burning gas and a liquid substance. At that time it was not clear to him that why he developed this attraction to science at such an early stage. But now we all know the result of that attraction of Ahmed Zewail, which gave a new field of chemistry i.e. **Femtochemistry** and help him to win the Nobel Prize on 1999. Zewail's key work was a pioneer of Femtochemistry. Femtochemistry is a study of ultrafast chemical processes, especially in the area of physical chemistry, on extremely short timescales, approximately 10^{-15} seconds (one femtosecond, hence the name).

He received Bachelor and Master Degree in science in Chemistry from Alexandria University and he was awarded his PhD degree from University of Pennsylvania, United State. After PhD, Zewail did his postdoctoral research at the University of California, Berkeley, supervised by Charles Bonner Harris. He was appointed as faculty at the California Institute of Technology in 1976 and he was made the first Linus Pauling Chair in Chemical Physics. He became a naturalized citizen of the United States on 5th March 1982. Last but not the least Zewail was the director of the Physical Biology Center for Ultrafast Science and Technology at the California Institute of Technology. Zewail died on August 2, 2016 at the age of 70. (Rest in Peace)

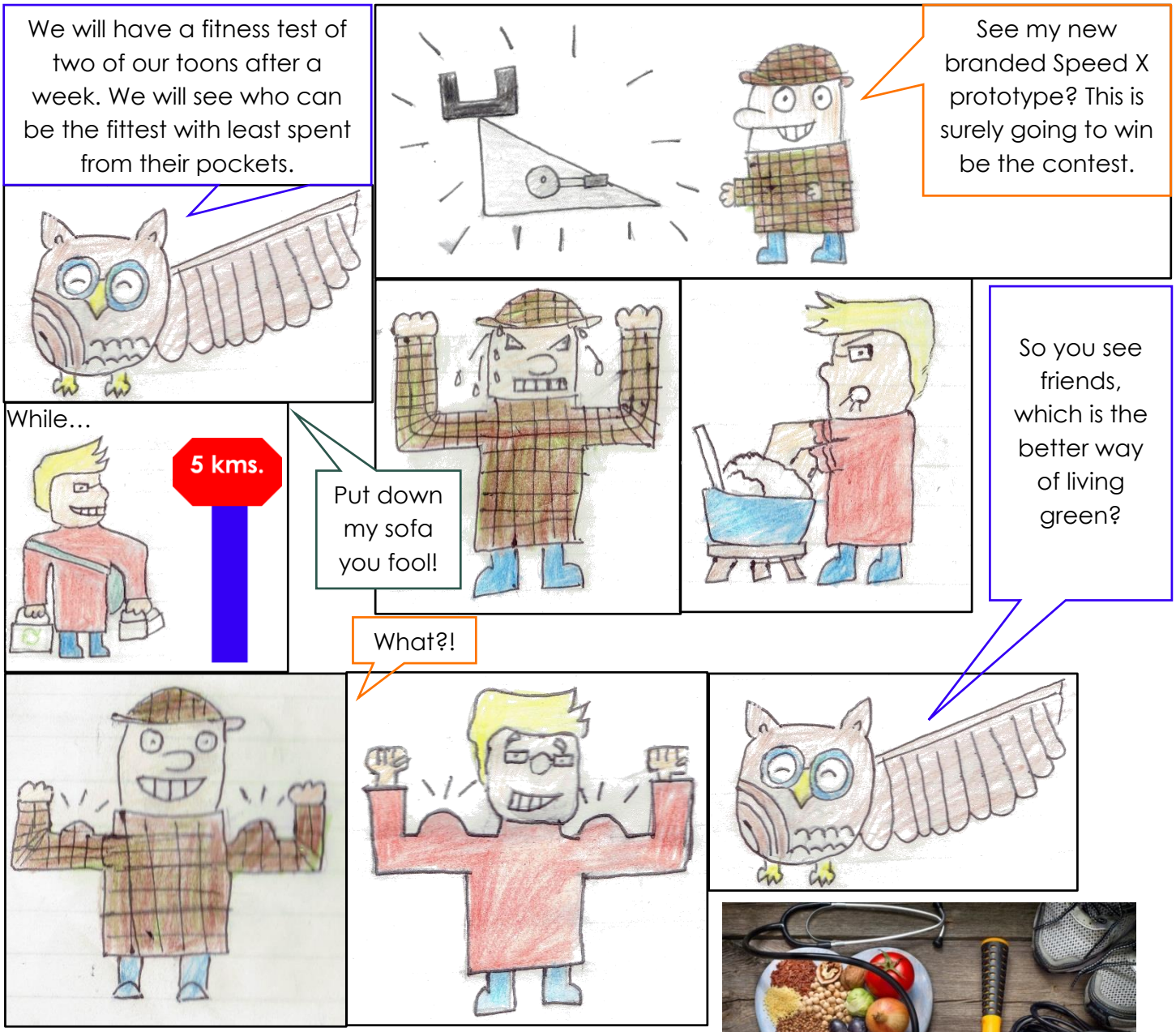
At the Opera

Dania Hasan, VII-A, The Blossoms School, Aligarh

I was at the La Scala Opera in Milan, Italy. I was there after a tiresome day of my stay in Italy, and thought it would freshen my mind. A Shakespearean play was going on an I was in the front row, having a perfect view. Because of some reason, I left the hall before the end. The whole exit passage was empty, except for a strange man. From hat to toe- everything he wore was pure black. His lowered hat hid his face. Mysterious ghostly blue eyes seemed to search someone. I went past him, trying to think as I saw nothing. Just then, I felt a hand placed at my shoulder. I suddenly turned, by which he moved back, his skeleton like hand still clinging to my coat. Instead of screaming, I tried to hide my fear and simply removed the hand and walked out. The person still fascinates me and wish to encounter him once again...

GREEN-LIVING

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



Green-living refers to the lifestyle that would have no or the least negative impact on our environment. One of the many ways of living green is by reducing unnecessary consumption and wastage. Our lifestyle should contribute to the conservation and preservation of the Earth's natural resources, habitats and biodiversity.

Many of us are misinformed about green living, which has resulted in green-washing. **Green-washing** means the use and production of unnecessary, wasteful and unsustainable materials with the false promise of being green.

Some examples of such green-washing are:

- **Paper towels made completely or partially of recycled materials:**
  Paper towels, no matter what they are made of, are almost always unnecessary and wasteful.
- **Compostable disposable dishes:**

Composting something doesn't negate the effect of continual mass production and shipment of single-use products.

- **Water bottle companies producing bottles with less plastic:**
  No amount of plastic bottle waste is okay, especially when much better options exist.
- **A new Fall line of clothing made from organic cotton:**
  Most highly fashionable clothing is out of fashion quickly and rarely worn long enough to be considered sustainable.
- **Biofuel made from ethanol:**
  Ethanol is a corn-based product. Not only does it use land area that could be used for natural habitat or food production, it requires the use of over 1 gallon of oil to produce 1 gallon of ethanol.

For a green living lifestyle, we need to know/or ask ourselves "What are we sustaining". We must avoid sustaining unhealthy foods or agricultural systems or social system that takes us further away from our goal (of green living). We should remind ourselves that our goal, of a sustainable environment, could be achieved by reducing our energy consumption and following a healthier and reasonable/rational living.

WHAT WILL IT SAY? – *Electrocuted!*

By Pencil Mind

Answers of previous puzzle

1. **"It was obvious, 'cause it proved you are as wild as your master."** – Maisha Noor, Vii – B, The Blossoms School.
2. **"I thought this was a good horse…but as always…I was wrong."** - Hamza Khan, VII – B, The Blossoms School.
3. **"Never mind, He's just playing with me."** - Omar Imteyaz, Vii – B, The Blossoms.
4. **"My friend betrayed me"** – Hisham Akhtar, X, St. Xavier's, Kolkata.
5. **"Who says this guy knows horse-riding"** – Syed Ali Atiq, VII – B, The Blossoms School

RADIOACTIVE CIGARETTE

Abdul Wajid, Doctoral Student, Department of Physics, AMU.

It's well known that smoking cigarettes can cause lung cancer. But do we know what exactly is in the cigarette that causes cancer? Lots of research has been carried out on it, and the factor behind it was found to be polonium-210, which is a highly radioactive element that releases alpha particles. It is chemically toxic too. People smoke almost six trillion cigarettes worldwide a year, and each cigarette delivers a small amount of polonium-210 to the lungs.

Puff by puff, the poison builds up to the equivalent radiation dosage of 300 chest x-rays (160000 micro Sievert) a year for a person who smokes one and a half packs a day. It will shock the readers what ingredients in cigarettes are, and how they come in it? The list includes 599 additives. Since burning alters chemical compositions, more than 4 thousand are created when cigarettes are burned. Among the most hazardous ingredients in cigarettes are the following:

Ammonia: Household cleaner.
Arsenic: Used in rat poisons.
Benzene: Used in making dyes,
Butane: Gas, used in lighter fluid.
Carbon monoxide: Poisonous gas.
Cadmium: Used in batteries.
Cyanide: Lethal poison.
DDT: A banned insecticide.
Ethyl Furoate: Causes liver damage in animals.
Lead: Poisonous in high doses.

Formaldehyde: Used to preserve dead specimens.
Methoprene: Insecticide.
Maltitol: Sweetener for diabetics.
Napthalene: Ingredient in mothballs.
Methyl isocyanate: It was accidentally released in Bhopal gas tragedy which killed 2000 people.
Polonium: Cancer-causing radioactive element and
Synthetic rubber.

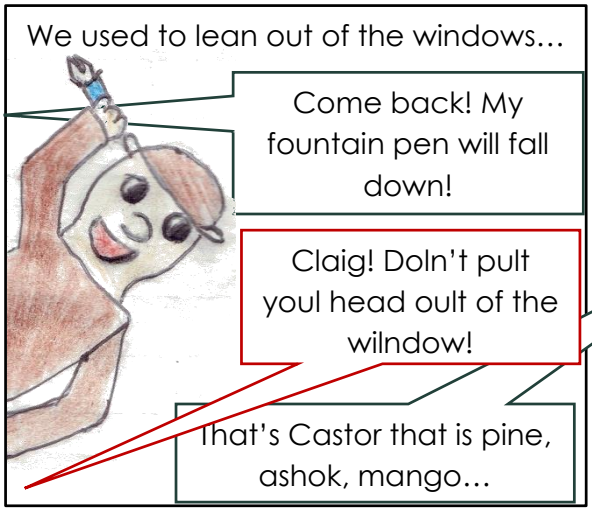
For the whole list of 599 additives used in cigarettes, see the BBC World Service page 'What's in a Cigarette'.

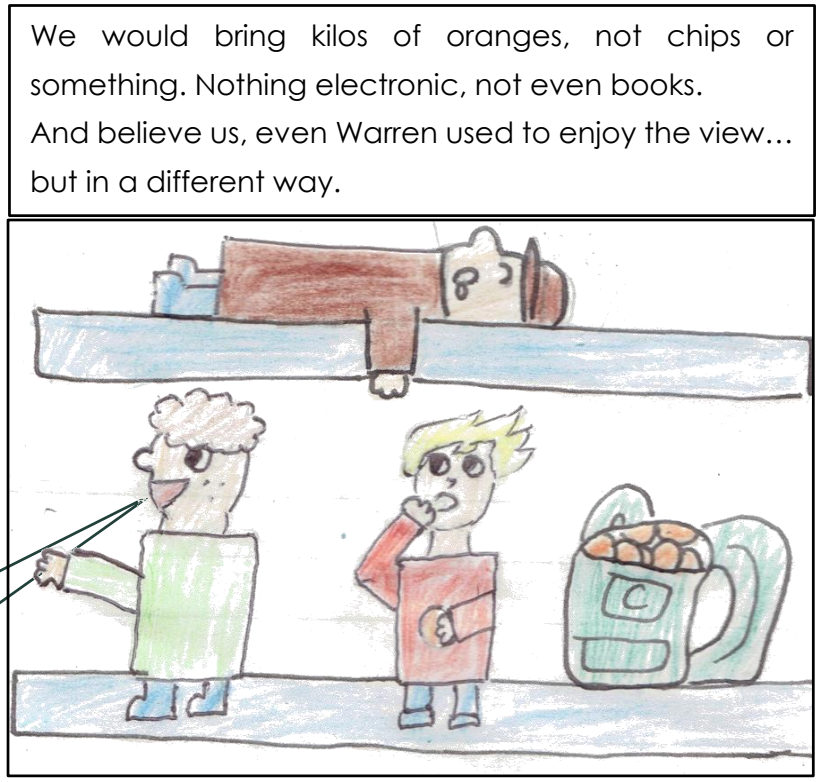
The tobacco industry is also well familiar about polonium in cigarettes. According to a 2011 report published in the journal 'Nicotine and Tobacco Research', secret internal documents obtained from the major tobacco industries in 1998 reveal that the industry was well aware of the presence of this radioactive element in cigarettes as early as 1959. But big tobacco companies consciously decided to do nothing and to keep its research a secret. The tobacco leaves become radioactive due to the fertilizers. The big tobacco companies all use chemical phosphate fertilizer, which contains radioactive metals. These metals mix up in the soil and attach themselves to tobacco leaves. Also, tobacco is especially effective at absorbing radioactive elements from phosphate fertilizers, and also from naturally occurring radiation in soil, air, and water. Acid wash was to be highly effective in removing polonium-210 from the tobacco leaves discovered in 1980. However, it have had been avoided by the tobacco industry.

THE FIRST AND THE LAST – *Trains*

By Nicola

Who wouldn't have enjoyed a visit to his or her grandparents' place? And that only by train? Apart from modern luxury trains, the pleasant rocking and the faint sounds of the wheels rubbing against the corroded tracks… here we bring a highlight from our characters' childhood.





The train as we know has a rich and interesting history. The primitive form of railway was the **wagonway**, the earliest evidence leads us to the **Diolkos highway** of ancient Greece, which transported boats across the Isthmus of Corinth, around 600 BC! Wheeled wagons ran in limestone grooves, pulled by animals or people. And it was that durable that it lasted over 650 years! Latters appeared in parts of the Roman Empire, with stone tracks. The first true railway has many traces, out of which, this one was in England and on which a single horse could drag 130-150kg of coal.


Diolkos Wagonway


Diolkos Track remains

The success of railways compared to roadways was much because of less energy requirement. The fixing of iron plates onto short lived wooden rails. Slowly, these got replaced with complete iron, and later, steel.

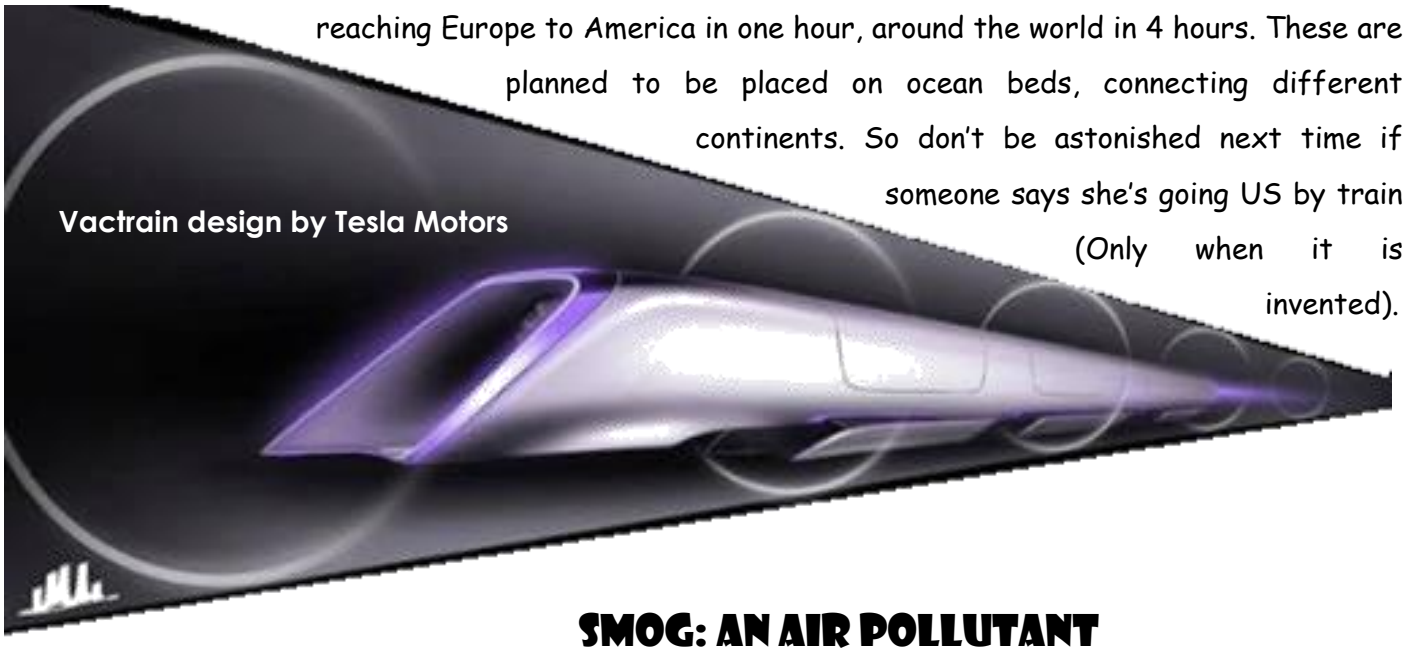
With James Watt inventing the steam engine, the story of trains took a big leap. **Richard Trevithick** later built a full scale **steam powered locomotive** which slowly finished the era of animal powered trains. Gradually steam engines were replaced with **diesel**, and further on electricity. These were fist used as subways, then as routes to connect major metropolitan cities. Later, in some countries, **bullet** and **high speed trains** were also introduced.


Steam Locomotive


High speed train

Trains of the future – Vactrains

You siphon the juice up through the straw- that's the odd concept of train design many high developed commercial countries are after. By sucking, you take in the air present in the tube, which generates a vacuum; that pulls the juice up. Now just suppose we are putting a whole train instead of the juice! Don't consider this as a silly idea, the trains inside (called **vactrains)** can reach speeds above 4000km/h



reaching Europe to America in one hour, around the world in 4 hours. These are planned to be placed on ocean beds, connecting different continents. So don't be astonished next time if someone says she's going US by train (Only when it is invented).

SMOG: AN AIR POLLUTANT

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

Smog refers to a smoky fog with opacity and odor

India and Beijing's detoriating situation this winter.

The air quality is measured by a relative scale called **PSI** (pollutant standard index). PSI is calculated by measuring the average concentration of a pollutant.

Clean air means air in which the concentrations of pollutants, namely CO, O_3, NO_2, SO_2, Sulfates, Lead, Hydrogen sulfide and Vinyl chloride, fall below the standards (PSI value). **Good air** refers to air having PSI value of 0-50.

Fog is the dispersed water drops, while **smoke** refers to a mixture of sulfur dioxide, soot and other gases and particulates.

Smog refers to a smoky fog with opacity and odor. The common constituents of smog are nitrogen oxides, sulfur oxides, sulfur, ozone, smoke or particulates among others (namely carbon monoxide, CFCs and radioactive sources). The major anthropogenic activities which release these constituents are coal emissions, vehicular emissions, industrial emissions, forest and agricultural fires and photochemical reactions of these emissions.

There are two types of smog:

Classical (also called **London-type**) smog is formed in the regions where emission of sulfur-bearing fossil fuels (Example: coal) occurs.

Photochemical (also called **Los-Angeles**-type) smog is formed in the regions where high emissions from automobiles, which contain reactive hydrocarbons, occur. The fuel, gasoline, is a mixture of over hundred different alkanes, alkenes, and aromatic hydrocarbons.

Travel and Leisure

THE GREAT NULLARBOR PLAIN & BUNDA CLIFFS

Dr. M. A. Laskar, Assist. Professor, Department of Chemistry, Jazan University, KSA

The Nullarbor Plain is the world's largest single piece of limestone.

The base (Wilson Bluff Limestone) was a part of an ancient seabed and came into existence when Australia and Antarctica got separated 65 million years ago.

The **Nullarbor Plain** is the world's largest single piece of limestone. It is located on the Great Australian Bight (Southern Australia). The plain spreads over 2, 70,000 square kilometers (extending 1000 km from east to west). The plain is horizontally flat and devoid of trees. The surface of the plain has areas of depression that were formed when the surface's limestone got dissolved due to rain. One can also come across dents, which were formed after the underground caves or sinkholes had collapsed. The surface is actually a whitish, grey or brown layer of limestone or crystalline rock, which are rich in marine fossils and **foraminifera** (marine sediment). Beneath this surface, the actual white colored base of the plain is formed by **Wilson Bluff Limestone.** A clear view of the layers forming the great Nullarbor Plain can be observed at the face of the **Bunda Cliffs**, which forms its southern edge. The base (Wilson Bluff Limestone) has a thickness of 300 meters. It was a part of an ancient seabed and came into existence when Australia and Antarctica got separated 65 million years ago. The Bunda Cliffs extend for 200 kilometers and curves the Great Australian Bight. Near the bottom of Bunda Cliffs' face, one can see a white colored base formed by Wilson Bluff Limestone. The Bunda Cliffs are capped by a hardened layer of windblown sand that was laid down between 1.6 million and 1, 00,000 year ago. The height of the Cliffs ranges from 60-120 meters. This spectacular landscape may be viewed along the Eyre Highway (that links east Australia to west Australia). There are five main signed and graveled roads that reach the Cliffs. The western most cliffs offer a vantage looking point through its accessible piece of rock jutting out of the Cliff. While at the eastern end of Bunda Cliffs, at the Head of the Blight, one can catch the sight of Southern Right Whales in the ocean below the cliffs.

COVER STORY

Prepare yourself to get a dose of nature at its best. We will present animals unheard of which you find unbelievable.

SUPER ANIMALS

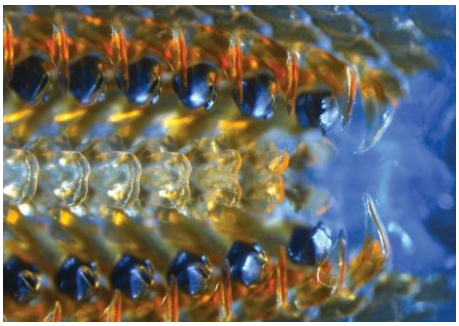
SUPER ANIMALS

"Someone's approaching!"

"Come on, we are late."

"One last try..."

Chilton's teeth are made of magnetite and have magnetic properties.



The Armour Ball

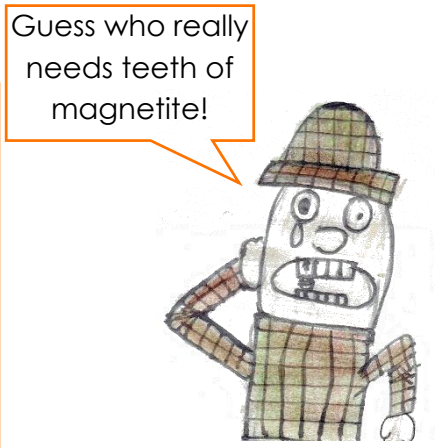
- Scientific name – Smutsia gigantea (Giant pangolin)
- Weight – 13 -18 kg
- Size – 30 -100cm
- Diet – Insectivorous
- Habitat - Grasslands and forested areas of Africa
- Predators (other than humans) - Leopard, hyenas, lions etc.
- Superpower - Bulletproof body and ability to curl into a ball.

Pangolins or 'scaly anteaters' are covered in tough, sharp scales composed of keratin. Their name comes from the Malay word 'Peggulin' which means "something that can roll up". They are nocturnal, and rampage anthills consuming ants and termites with their long tongues. On being attacked, they cover their head with front legs, exposing the scales.

Even predators like lions can't figure out what to do with the 'pineapple' since the bite cannot tear the hard scales. (But some still try it out).

Magnetooth

Scientific name – Chaetopleura apiculata
Size – 0.5 to 30cm
Diet – Algae on rocks, some even eat fish and shrimp
Habitat – Waters of Gulf of Mexico and North West Atlantic
Predators – Sea stars, Crabs, Anemones and seagulls
Superpower – Possesses teeth of **magnetite**, the hardest of any other animal.



Swimming in the seas for nearly 400 million years, these marine molluscs have an interesting speciality in the most unusual part of their body i.e. their

Chiton's fossils

teeth. Yes, these teeth have magnetic properties!, since they are made from magnetite, the primary material out of which magnets are manufactured. **Chitons**, have shells with eight segments, a muscular foot and of course magnetic teeth, sharp enough to scrape even bacteria along with algae on rocks.

Some scientists are getting mad (researching) on this and state that synthesizing such an iron oxide substance would require high temperature and pressure along with strong acidic or basic conditions. Fact is that these creatures are able to produce that only with the algae they eat and that only in ocean water surroundings.

They have the broadest visual spectrum of any animal discovered.

The Visionary

Scientific name – Stomatopada
Size – 10 cm
Diet – Fish, crabs, worms, other shrimp
Habitat – Tropical and Subtropical marine Habitats
Predators – Bluefin tuna, baraccudas
Superpower – Can see all sorts of light, including Ultra Violet and Infra-Red

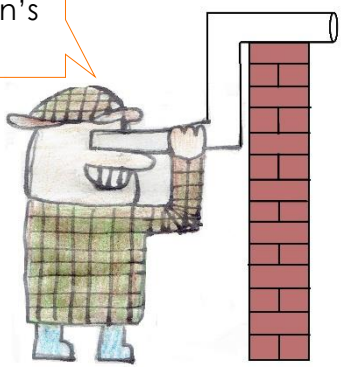
That incomprehensible body, bulbous elbows, segmented body, and those huge bulging eyes.

The **Mantis Shrimp** is widely famous for its punches, but we are not taking up on that topic.

Well, most of us (exception = Warren) don't know the superpower secret behind those monstrous eyes - They can see more than any other, having the broadest visual spectrum of any animal discovered. Scientists are studying the Peacock mantis Shrimp in an (till now unsuccessful) attempt to build cameras capable of seeing cancer cells at its very early stages.

Imagine having an extra pair of arms capable of moving freely in all directions with eyes on the ends!

A sneak peek into Warren's work...



They learn to imitate the different sounds of the forests they live in, wing beats, rustling of leaves, blowing of wind etc., if kept in captivity, hammers, drills, chainsaws, car silencers and horns, and many more.

The Copysinger

Scientific name – Menura
Size – 100 cm
Weight- 1 kg
Diet – Worms, grubs, insects
Habitat – Dense forests of Australia
Predators – Quolls, dogs, cats and foxes
Superpower – Ability to mimic any sound present in its habitat jungle.

Have you recently boasted about your favourite singer? Most likely to be yes. But now what you are going to read will completely change your mind.

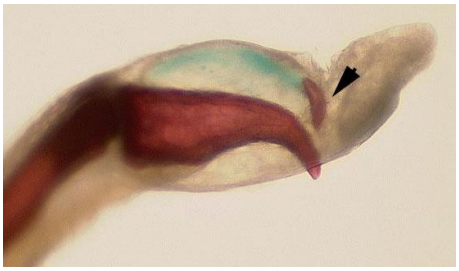
Lyrebirds, who get their name from the elaborate and unwieldy tail, shaped like a lyre. However its superpower i.e. its vocal abilities is what we will now discuss.

These birds actually mimic sounds of other birds during the breeding season to impress other females and probably fool some of other species. They even learn to imitate the different sounds of the forests they live in, wing beats, rustling of leaves, blowing of wind etc., if kept in captivity, hammers, drills, chainsaws, car silencers and horns, and many more.

They learn the mimicry mainly from older males, rather than the model species. But friends, don't think that our superbird can only copy, they even have their own songs and calls (perhaps to use as backup if the normal impression method does not work).

The Wolverine

Scientific name – Trichobatrachus robustus
Size – 11 cm
Diet – Worms, small fish, insects
Habitat – Central America
Predators – Storks, Herons and fish
Superpower – Pierce their bones through the skin to use it as a claw against predators



"On being provoked, our hairy amphibian friend forces the bone nodule through the skin, using it as a defensive claw."

Spanish newt protruding ribs

Sea cucumber passing through small space

Chocolate chip sea cucumber, Johnston Atoll

Remember your favourite hero Wolverine from Marvel Avengers who has retractable alloy claws? Well, here we have a real living version of that. And you wouldn't believe the 'claw' is actually its broken finger bone! It's the **Hairy frog** about which we are talking. The hair you see are not hair but are modified gills. On being provoked, our hairy amphibian friend forces the bone nodule through the skin, using it as a defensive claw.

Researchers couldn't figure out how it retracts the claw back that only without the pulling of a muscle.

Another salamander, the **Spanish Newt**, has a similar property. Its ribs protrude through the skin purposely which it also uses to fight off predators.

The Shapeshifter

Scientific name – Actinopyga echinites
Size – 10 – 30.5cm (Although size varies from 0.3 to 100cm depending upon species)
Diet – Algae, plankton and decaying organic matter (scavenger)
Habitat – Tropical shallow waters
Superpower - Ability to liquefy and solidify its body per will.
- Forces its organs through the anus during predator attacks.
- Breathe through anus
- Can reproduce through asexual reproduction

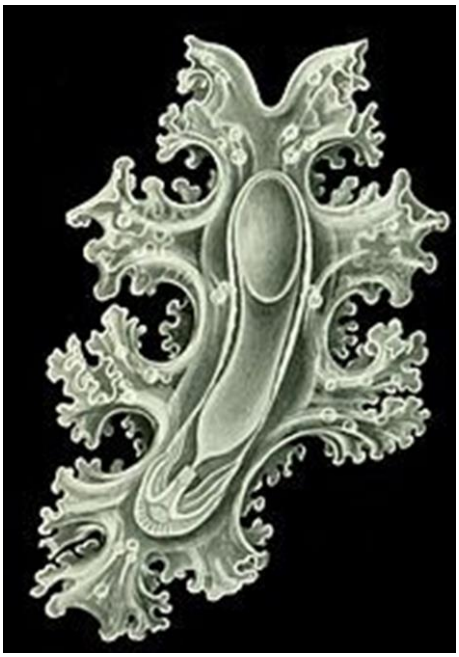
Don't consider this to be a tasty delicacy as is done in parts of Asia, just because the name stupid scientists gave it.

These strange creatures live on the seafloor, functioning as a scavenging machine.

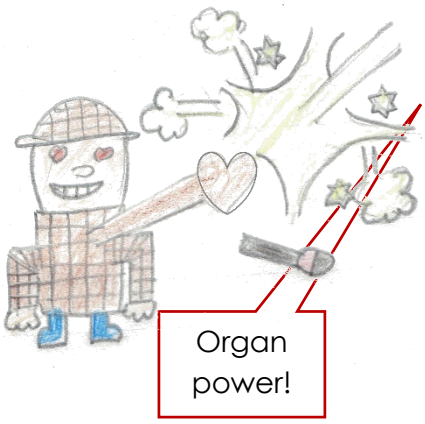
So let's now explore its capabilities, one by one.

Sea cucumbers have an endoskeleton in the form of plates beneath their skin, joined by connective tissue. The collagen bonds can be loosened and tightened per will, which means it can liquefy its body to fit through

Sea cucumber Larva



small cracks and crevices, and solidify it when a predator attacks. In case of sudden predator attacks, our super echinoderm forces its internal organs out through the anus, along with a toxic substance. The missing organs grow back in the next 1.5 to 5 weeks.



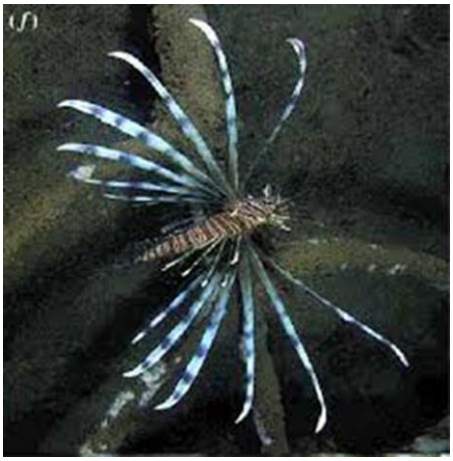
Sea cucumbers breathe (take oxygen) through the network of channels in the anus.

Possess alternative self or asexual reproduction, normal fertilisation occurs by fusion of cells released in the water.

The Mimicker

Flatfish

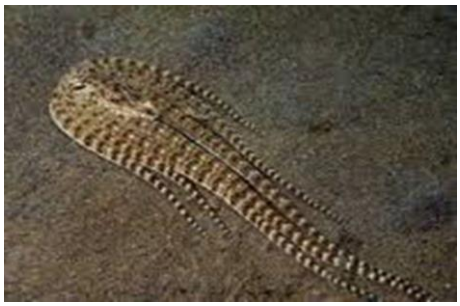
Lionfish



Sea Snake

Scientific name – Thaumoctopus mimicus
Size – 60cm
Diet – Algae, plankton and decaying organic matter (scavenger)
Habitat – Indo pacific
Superpower – Can see all sorts of light, including Ultra Violet and Infra-Red

Mimic octopus replicas



Mimic octopus in its regular form

Till now you may have wished of transforming into an animal of your choice, probably it may be from this article only. Consider transforming into a tiger if cornered by a group of school bullies! Well, our next contestant does exactly the same.

The mimic octopus, as its name suggests, mimics forms of over 15 different species. This behaviour is observed when it hunts prey or

Quiz Wiz Answers

1. Calcium sulphate
2. Pure calcium carbonate
3. Calcium fluoride
4. Quick lime, Slaked lime and Lime stone and they are oxide, hydroxide and carbonate respectively.
5. Surely no. It is produced even in our body and it is present in most soft drinks.
6. Diamond
7. Graphene and carbon nanotube
8. Carbon, 3500 degree in centigrade.
9. Graphene
10. Carbon

It has regeneration abilities by which it can grow back any amputated or cut part.

These creatures can receive transplanted organs from other individuals.

when cornered by predators. For example, if attacked by a damselfish, it becomes a sea snake, the attacker's predator.

Here are some of the mimic octopus's forms along with a description of how it transforms.

Sea Snake – It hides in a hole leaving two of its arms in the open, it opposite directions. The added length of the arms appears like a long thin object, which is mostly avoided.

Lionfish – By shaping its arms like spines of this highly venomous predator, it easily fools many a lot.

Flatfish- By pulling all its arms to one side and changing its colour, it quietly slips out of its astounded predator.

The Regenerator

Scientific name – Ambystoma Mexicanum
Size – 23 cm
Diet – Worms, small fish, insects
Habitat – Native to Lake Xochimilco and Chalco in Mexico
Predators – Storks, Herons and fish
Superpower – Ability to regenerate any amputated part of body.

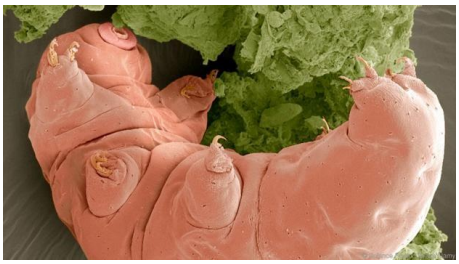
Wearing a feathered headdress, little black lidless eyes, wide head and pink complexion. You must wondering what creature we are now talking about. Well you wouldn't had recognised it by its name either (Neither did we) Even more fascinating is its regeneration abilities by which it can grow back any amputated or cut part! And yet more amazing is that these creatures can receive transplanted organs from other individuals.

Axolotls also possess a fascinating **neoteny** in which an individual retains its juvenile characteristics on maturing.

So, this animal is also our 'fascinating' dude.

Tardigrades can also survive temperatures above 150°C and as low as -200°C for 21 months and -272°C for 8 hours compared to the lowest temperature recorded on earth was -89°C.

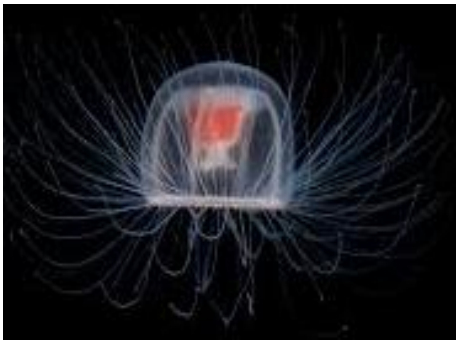
Due to their ability to resist high dose of X and Gamma rays, they can also survive in space without any protection.



The Supreme Survivor

Scientific name – Hypsibius dujardini
Size – 0.5-1.5 mm
Diet – Lichens and moss
Habitat – Every place on earth.
Predators – Spiders, mites, worms and insect larvae
Superpower – Ability to survive in most extreme conditions of earth (and space)

Greatly resembling creatures from a Horror movie, what you are now going to read is something literally "out of this world". **Tardigrades** or 'Water Bears' get their name from 'Tardigrada ' meaning "slow stepper". From the Himalayas to the ocean floor, from hot springs to Antarctica and even in your drain, these tough guys can survive much extreme conditions than that of earth, even the radiation and lack of air of outer space. Tardigrades can also survive temperatures above 150°C and as low as -200°C for 21 months and -272°C for 8 hours compared to the lowest temperature recorded on earth was -89°C. Water, an essential component of life, is a thing these creatures can do without for decades. In 1948, a scientist reanimated a tardigrade from a 120 year old museum sample after rehydration. The reason for this is the presence of a particular sugar, which stabilises the components such as proteins and DNA. After staying in this state called the tun state, tardigrades repair their DNA (damaged by staying in the tun stage for a long time) by antioxidants. Tardigrades produce ice nucleatic agents which doesn't allow the ice crystal to form inside the, instead it forms outside. The deepest point of the Mariana Trench has a pressure up to 100 MPa, tardigrades can resist 6 times more than that.



The Immortal Jellyfish

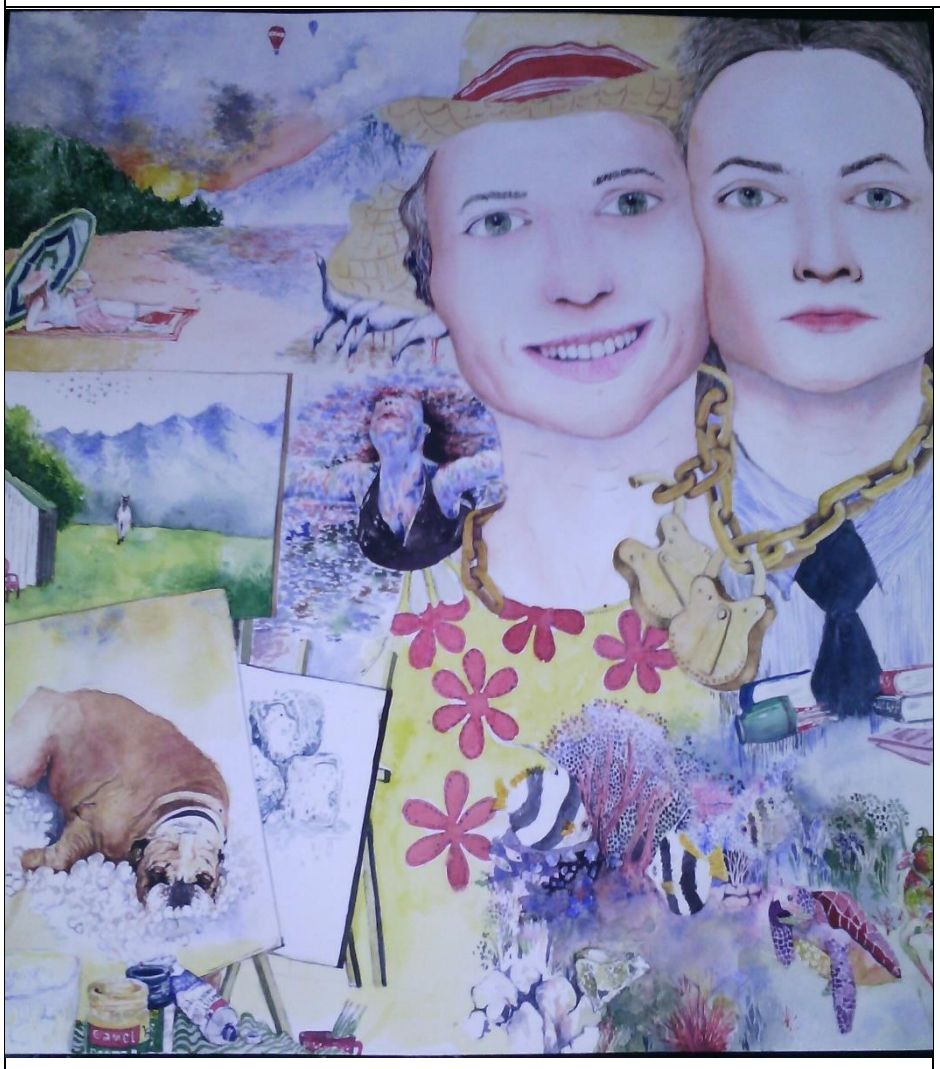
Scientific name – Turritopsis dohrnii
Size – 4.5 mm
Diet – Fish eggs and small crustaceans
Habitat – Mediterranean
Superpower – Ability to transform back to infant stage on maturing and declared **biologically immortal.**

Unbelievable as it is, these minor animals use the process of **transdifferentiation** to transform back to the infant stage when they succumb to injuries or become old.

These jellyfish begin their life as **planula**, the larva stage. As it settles down, it forms a colony of **polyps**. The jellyfish buds off from the cluster and forms an individual, the **medusa** stage, which we know as a jellyfish. Now comes the trick, since now when it gets old or injured, and it transforms back to the polyp stage.

So now comes an end to this cover story. If you liked it friends, then please! Do give us your compliments and feedback. Next cover story will be something more surprising. But of course, we will have to wait.

DRAWING GALLERY



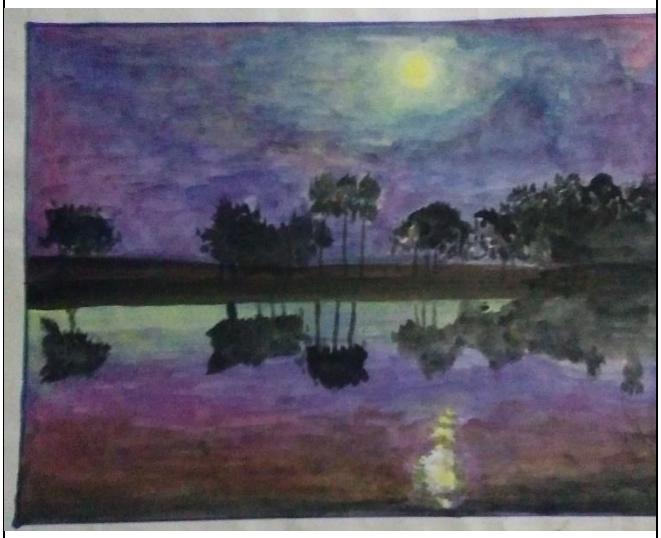
↑ **Kalaap Sadhu**, VIII, Triveni Tissues Vidyapith, Hooghly ↑

↑ **Azwa Reyaz**, II-D, The Blossoms School ↓

Anuska Chhatik, VII, Dhaniakhali-

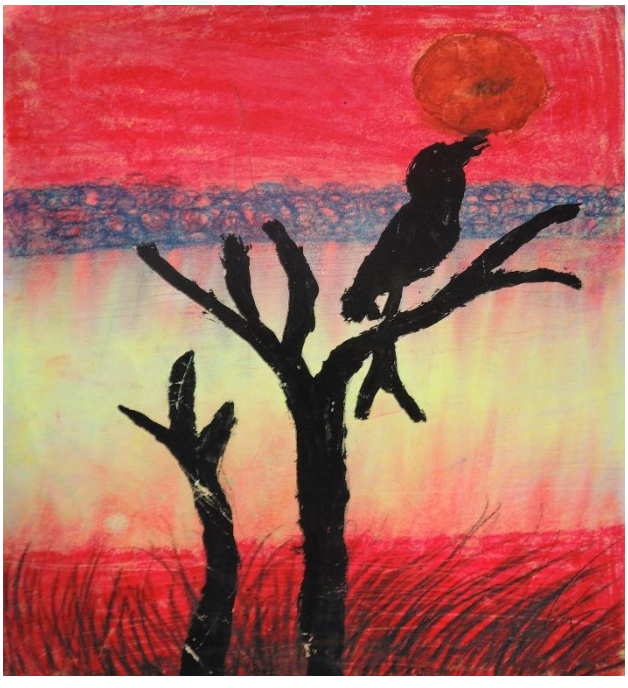
-Pankajini Devi Girls High School, Hooghly

Golam Qibria, Freelance Artist, B.A.,



Murshidabad Adarsh Mahavidyalaya

Ishita Dey, V,

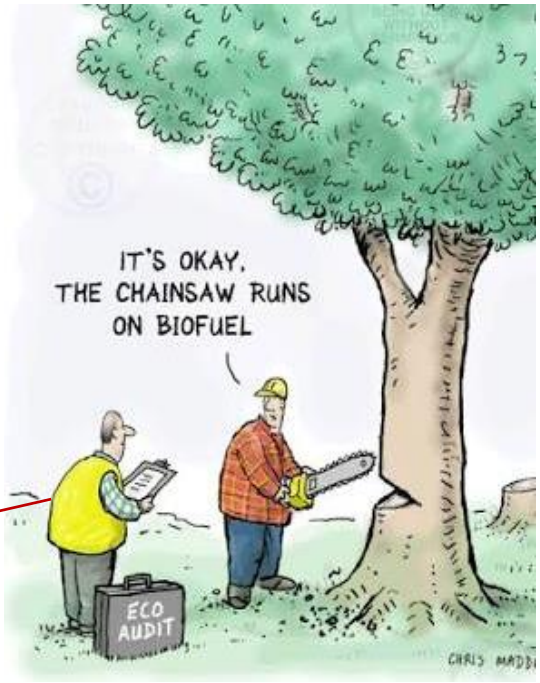


Vivekanand Mission, Harit, Hooghly

WORLD CUP FOOTBALL HISTORY

Muhammed Zaid, II – B, The Blossoms School

No.	Year	Place	Winner	Runner	Score	Semi final	Hero
20	2014	Brazil	Germany	Argentina	1:0 et	Ger:Bra-7:1;Arg:Hol-4:2ps	Messi
19	2010	south africa	spain	Hloland	1:0 et	Esp:Ger-1:0; Hol: Urg-3:2	Forlan
18	2006	Germany	Italy	France	5:3 ps	Ita;Ger-2-0et; Fra:Por-1:0	Zidane
17	2002	Korea&japan	Brazil	Germany	2:0	Bra;Tur-1:0;Ger:Tur-1:0	Kahn
16	1998	France	France	Brazil	3:0	Bra;hol-4:2;FraCro-2:1	Ronaldo
15	1994	USA	Brazil	Italy	3:2 et	Bra:Swe-1:0; Ita:Bulg-2:1	Romanio
14	1990	Italy	Germany	Argentina	1:0 et	Ger:Eng-1:1; Arg:Ita-3:2	Schillaci
13	1986	Mexico	Argentina	Germany	3:0	Arg:Bel-2-0; Ger:Fra-2:0	Maradona
12	1982	Argentina	Italy	Germany	3:1	Ita;pol-2:1;Ger:Fra-1:0	Paolo Rosi
11	1978	Argentina	Argentina	Hloland	3:1	3rd: Bra:Ita- 2:1	M. Kempes
10	1974	Germany	Germany	Hloland	2:1	3rd : Pol: Bra -1: 0	G. Lato
9	1970	Mexico	Brazil	Italy	4:1et	Bra:Uru-3:1; Ita: Ger-4:3	Pelé
8	1966	England	England	Germany	4:2et	Eng;Por-2-1; Ger:Soviet-2-1	Eusebio
7	1962	Chile	Brazil	Cze Rep	3:1	Bra:Chile-4:2;Cze:Yug-3:1	Garrincha
6	1958	Sweeden	Brazil	Sweeden	5:2	Bra:Fra-5:2;Swe:Ger-3:1	Pelé
5	1954	Switzerland	Germany	Hungary	3:2	Ger:Austria-6:1;Hun:Urg-4:2	Puskas
4	1950	Brazil	Uruguay	Brazil	2:1	3rd: Swe; 4th: Spain	Ghiggia
3	1938	France	Italy	Hungary	4:2	Ita:Bra-2:1;Hun:Swe-5:1	Meazza
2	1934	italy	Italy	Cze Rep	2:1 et	Ita:Aust-1:0;Cze:Ger-3:1	Schiavio
1	1930	Uruguay	Uruguay	Argentina	4:2	Uru:Yugo-6:1;Arg:USA-6:1	J. Nazassi



Nigel's Brother