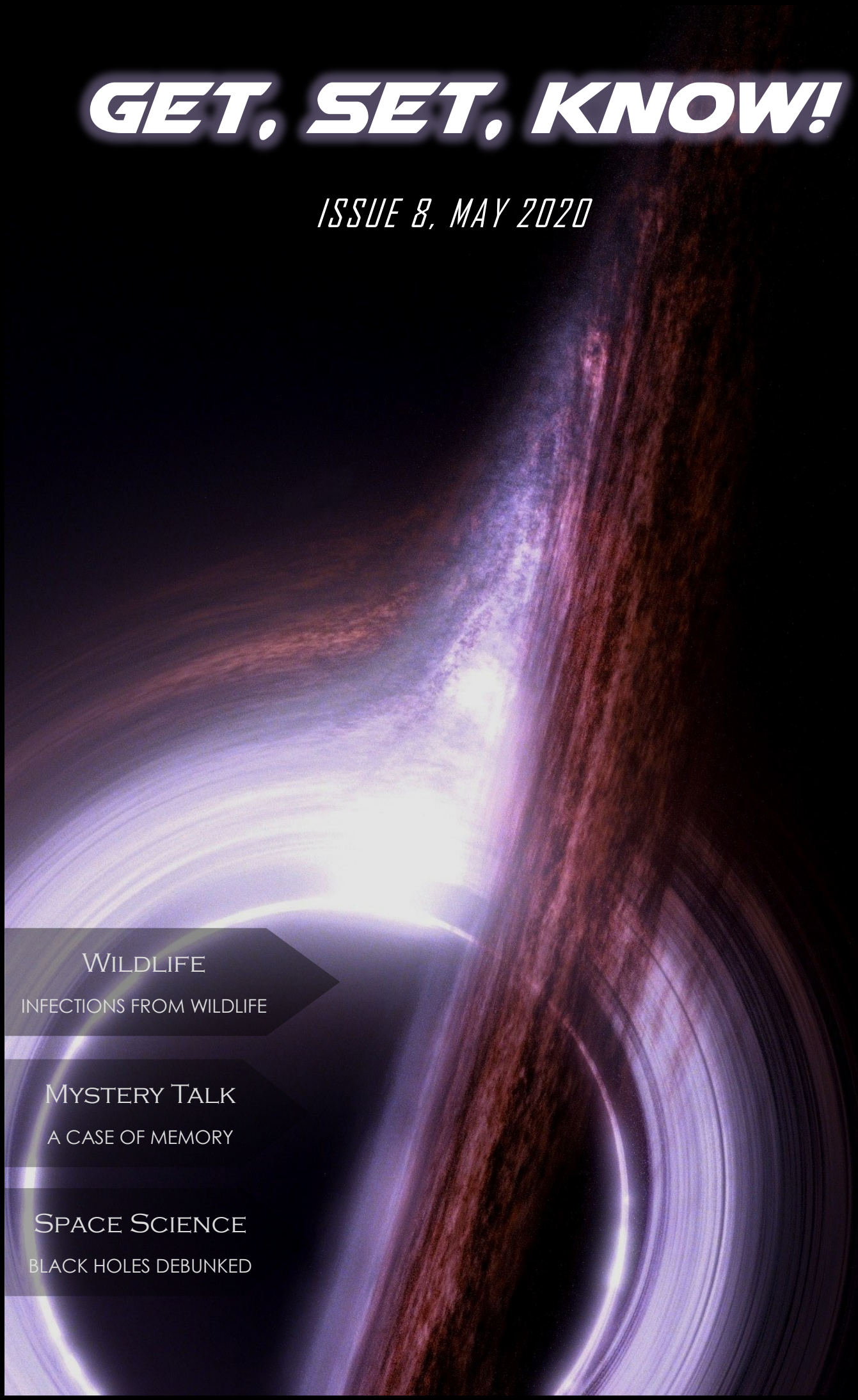
GET. SET. KNOW!

ISSUE 8, MAY 2020



Wildlife

INFECTIONS FROM WILDLIFE

Mystery Talk

A CASE OF MEMORY

Space Science

BLACK HOLES DEBUNKED

Dear Readers,

So we are back after a long time! The arrival of this issue was quite delayed, due to constant social and political unrest. As for now, the ongoing lockdown freed up some of our time, which we spent to put this issue together. My deepest thanks to all those who helped us pull this off, your contributions did matter a lot us. As for the general readers, there is a load of content for you, right from the heart of black holes, across the Chocolate Hills, to the history of flood control efforts in the Netherlands. And yes, make sure not to miss the various puzzles which await you in the nooks and crannies of the issue! Happy reading!

Yours,

The GSK team

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Previous puzzle answers

GREAT LIVES - Minhal Murtuza Zaidi, X, The Blossoms School

I WONDER HOW - M. Sarim Shamim, X, The Blossoms School

MYSTERY TALK - Munaf Nadeem Qazi, X, The Blossoms School

MONUMENTAL PUZZLES

Mohmammed Misbah Tamanna, X, The Blossoms School

Muzzammil Yunus, X, The Blossoms School (runner-up)

FIRST TILL THE LATEST – Munaf Nadeem Qazi, X, The Blossoms School

SNIPPETS – M. Sarim Shamim, X, The Blossoms School

Courtesy

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MEET THE GSK CHARACTERS

*Be sure not to miss the colours in the character descriptions! They correspond to the colours in the dialog boxes which indicate the speaker

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 the 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 described 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 of them all, uses Warren's stimulator and library to 'interview' famous personalities. Sometimes behaves peculiarly and mostly carries a microphone shaped recorder. Writes the 'Great Lives' section.

NICOLA *The Historian*

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.

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. The brain behind all puzzles and interactive content in the issue.

MR MOLE *The Archaeologist*

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

CAMERAS

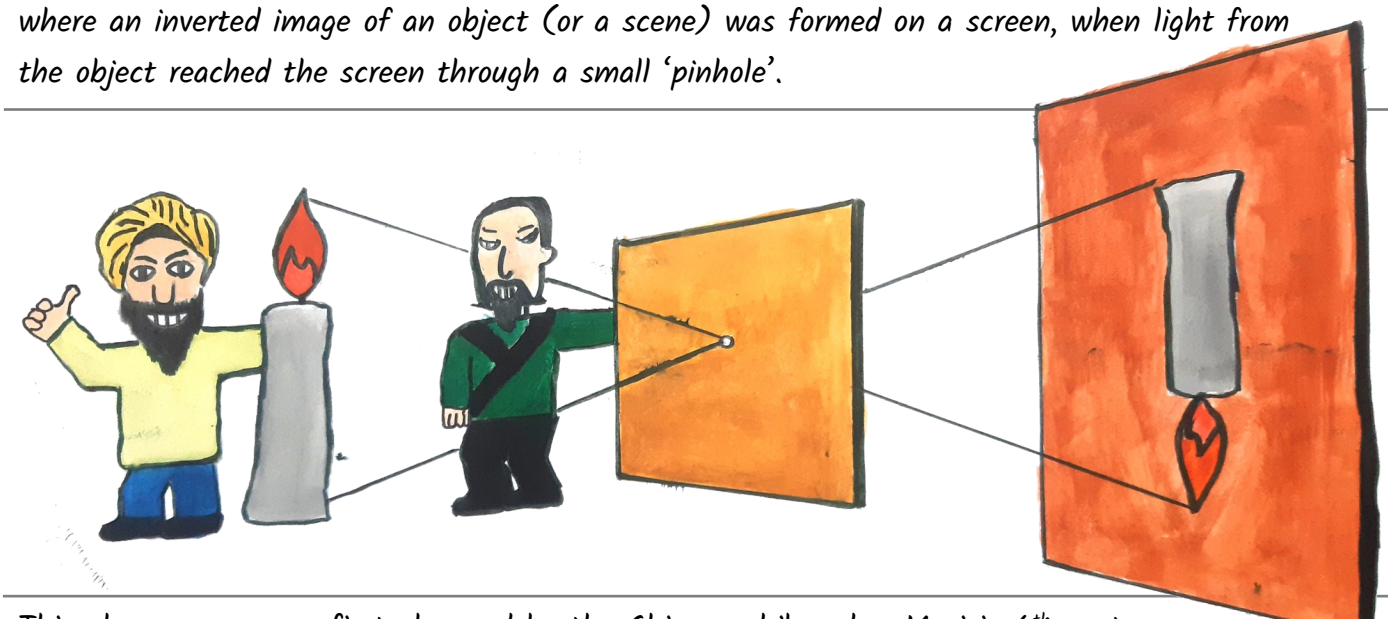
M. Huzaifa, VIII, The Blossoms School, Aligarh

Cameras are the ultimate tools which help us capture the treasured moments of our lives. Today, they are a common device in our daily lives, but there was a time, when the only form of pictorial records were hand drawn works of art. Let us delve into what made the camera such an efficient and essential invention in the modern world.

The History

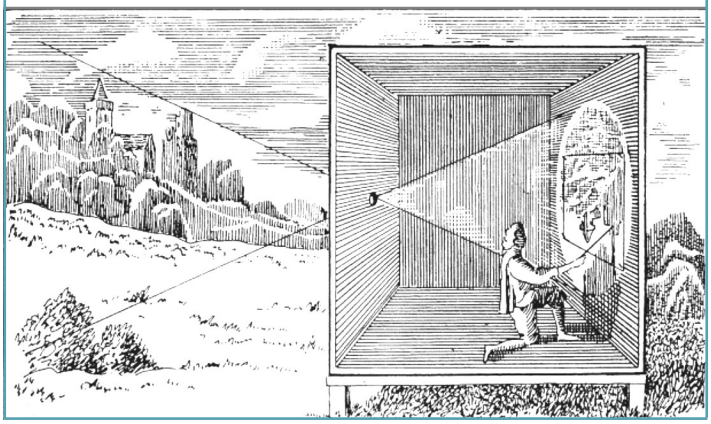
The art of sketching and painting along with writing texts in manuscripts was the normal practice throughout the globe for millennia. However the basic rudiments that would evolve into the camera had appeared long ago.

The early projecting devices were pinhole cameras, based on the principle of 'camera obscura', where an inverted image of an object (or a scene) was formed on a screen, when light from the object reached the screen through a small 'pinhole'.

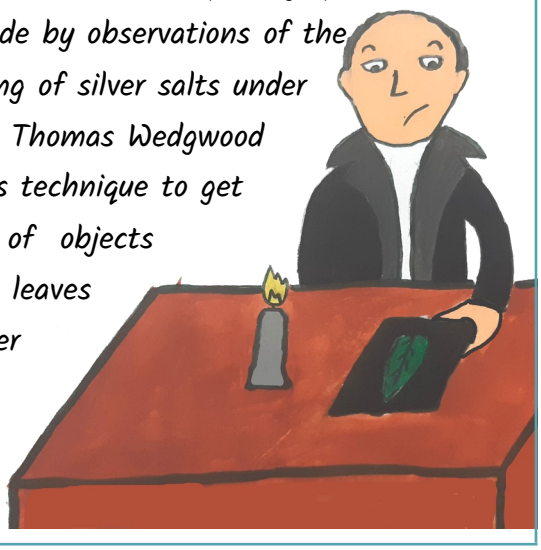


This phenomenon was first observed by the Chinese philosopher Mozi in 4th century BC, and later studied in-depth by Ibn al-Hathyam in the 9th century.

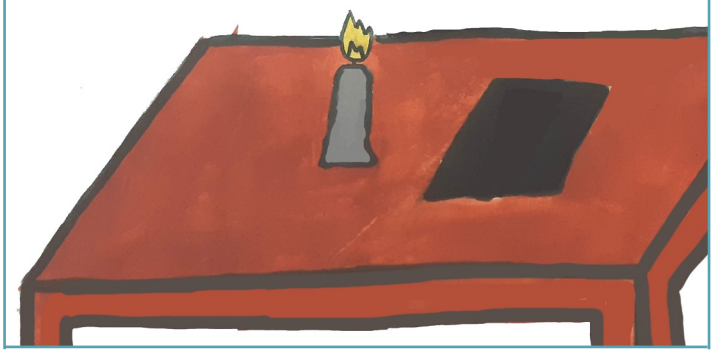
It was used in the Renaissance period by artists, for obtaining outlines for sketches.



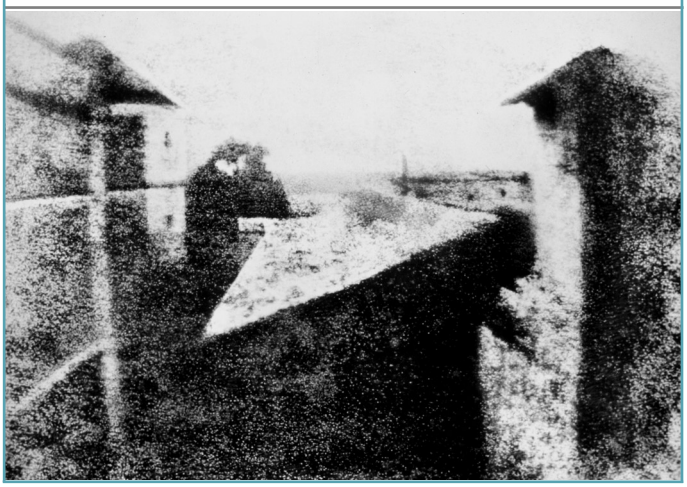
The foundations of the photographic camera were made by observations of the blackening of silver salts under sunlight. Thomas Wedgwood used this technique to get imprints of objects such as leaves on a layer of silver nitrate.



However, these images weren't permanent, and would black out all over, if exposed to more light.



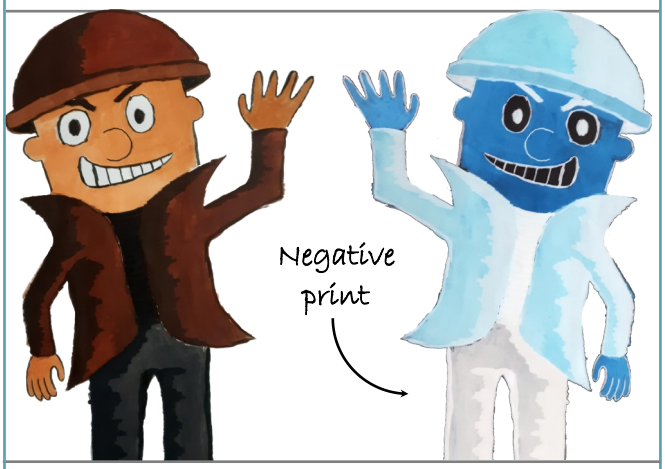
It was only in 1816 that Joseph Niepce collaborated with Louis Daguerre to generate the first permanent photograph.



This led to the creation of 'Daguerreotypes', which were images on silver coated copper pates, fumed with mercury vapor, and made permanent by common salt.

Popularized by Alphonse Giroux, the Daguerreotype camera was also the first commercial camera.

Henry Talbot, at around the same time, developed a process for generating photographs on paper, which involved the use of negative prints.



Such images, called Calotypes, were not as popular as their counterpart because of their cost and lack in clarity, but multiple copies of photographs could be made with the process.

The 35 mm camera turned out to be an important instrument in recording and conveying messages during the world wars.

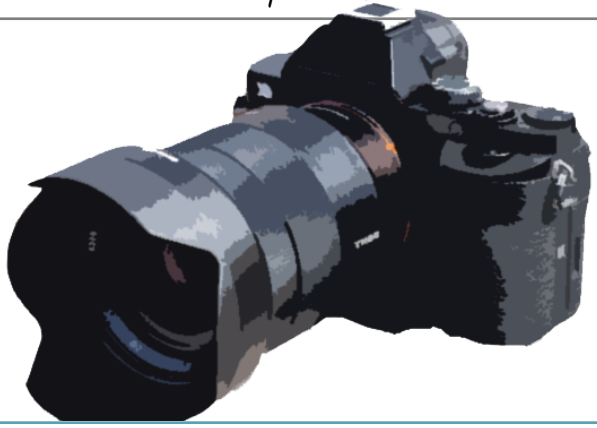
The SLR (single-lens-reflex) camera, innovated by the Japanese, was another step forward, as it allowed the photographer to view the image being shot.

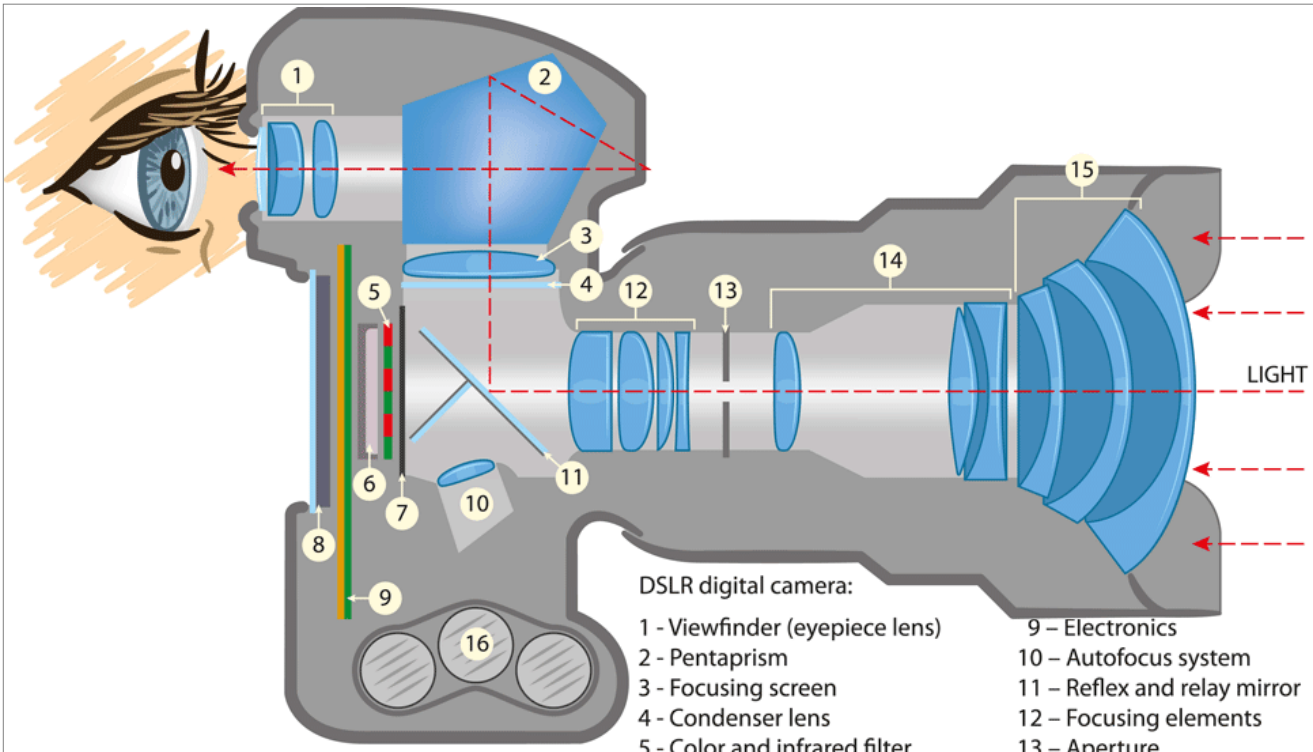
The camera was brought to the market by George Eastman and his company 'Kodak'.

It was the first camera equipped with film. The images had to be sent back to the factory for processing.

The Polaroid camera was the next landmark, which produced high quality images and could generate the positive photo in minutes.

The digital or filmless camera of today, allows easy storage and transmission, without the involvement of various chemicals. Moreover, their design allows them to be integrated within small devices such as mobile phones.





DSLR digital camera:

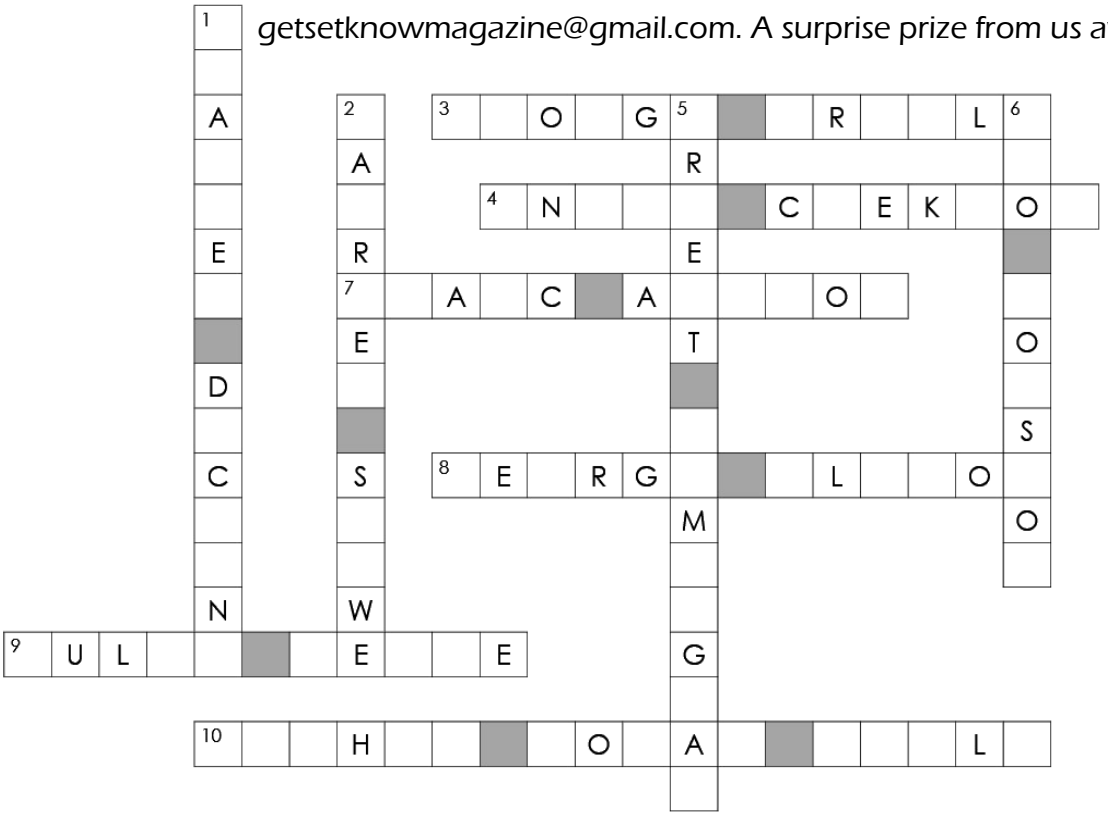
1 - Viewfinder (eyepiece lens)
2 - Pentaprism
3 - Focusing screen
4 - Condenser lens
5 - Color and infrared filter
6 - Digital sensor
7 - Shutter
8 – Display
9 – Electronics
10 – Autofocus system
11 – Reflex and relay mirror
12 – Focusing elements
13 – Aperture
14 – Zoom elements
15 – Front light gathering elements
16 – Batteries

The Working

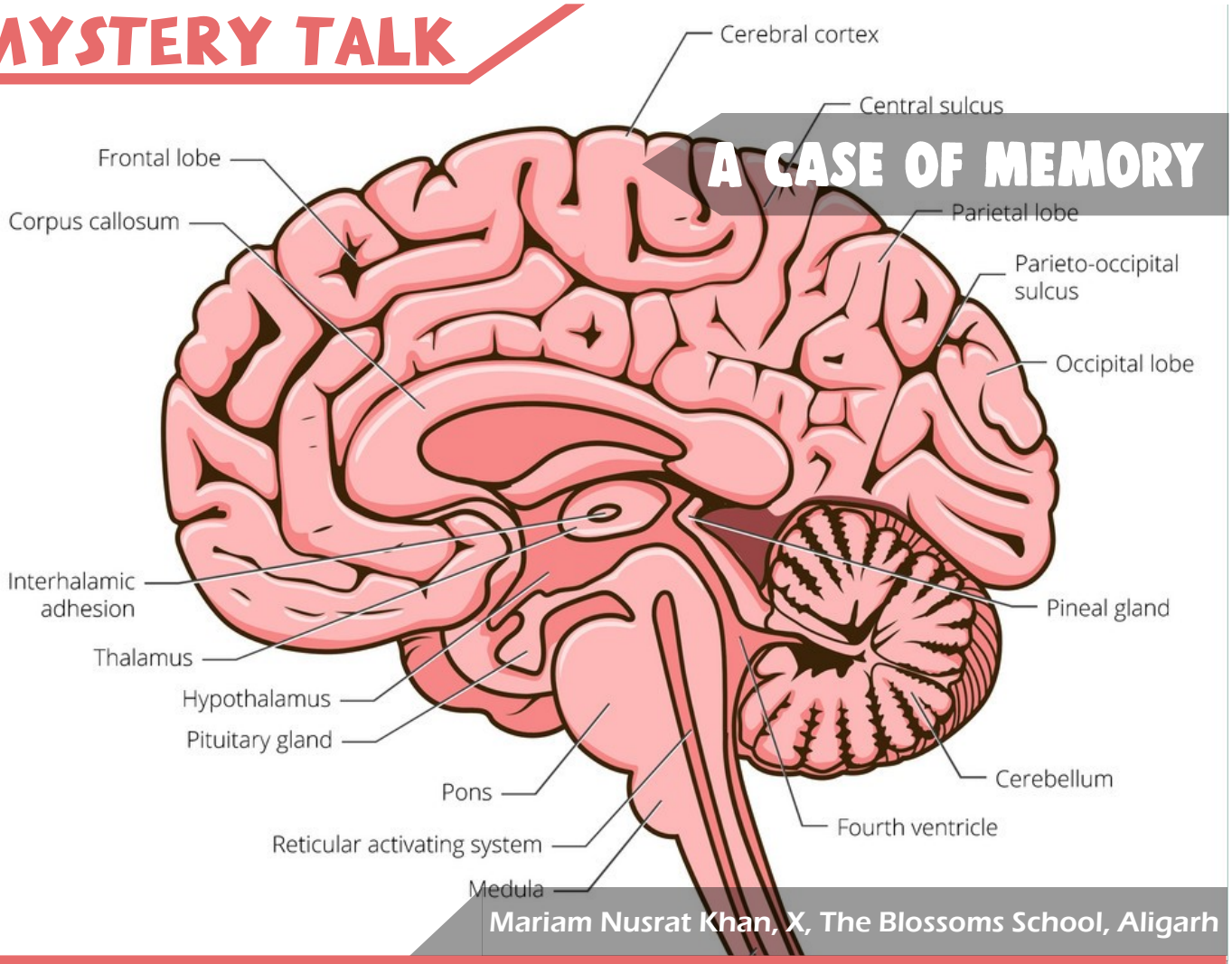
A modern digital camera focuses the light entering it from nearby sources with the help of several lenses. On clicking a photo, the reflex and relay mirror snap upwards and the light hits the Autofocus detector. The Autofocus detector determines if the image is blurry or not. If it is, then the detector signals the Autofocus motor to move all the elements in the direction which will most probably bring the scene into focus. A part of the light moves towards the viewfinder from where it is visible to us while capturing the photograph.

GREAT LIVES

Identify the following famous classic fiction writers (you won't need clues for this) and send the answers to getsetknowmagazine@gmail.com. A surprise prize from us awaits you!



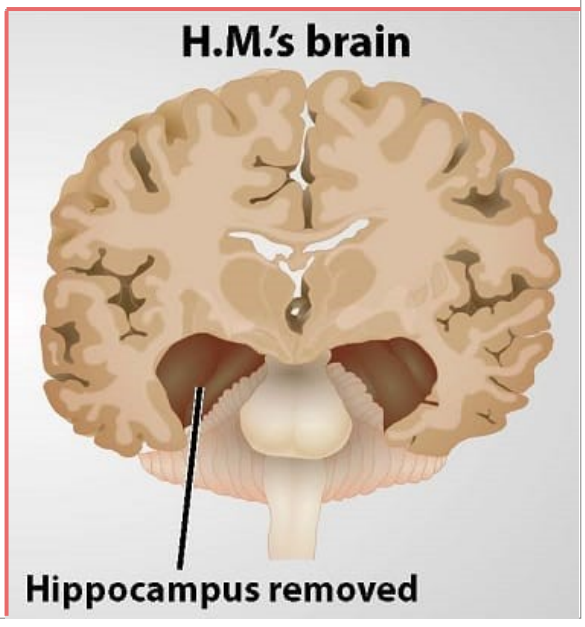
A CASE OF MEMORY



Mariam Nusrat Khan, X, The Blossoms School, Aligarh

One of the most perplexing wonders of nature is the human brain itself. Most of what we know of it today has been discovered by studying live cases of people in which their brains had been affected by an external source. One of the most popular of these is the case of the famous amnesiac Henry Molaison.

Henry had been suffering from epileptic seizures since childhood, because of an accident which had caused his skull to crack. At the age of 27, he met Dr. William Scoville, one of the most renowned neurosurgeons of the time. The determined that the seizures were caused by an excess of calcium in the brain. This was because of glutamate, a substance generated by the hippocampus. Two holes were drilled in the front of Henry's skull, and his hippocampus was sucked out through a metal tube. The procedure was a doubtful one, but it did succeed in getting rid of the seizures.



However, something else happened too. The surgery was followed by a memory impairment, the studies of which led to one of the most significant turning points in brain research. Back in the 1950's, neuroscientists only had roughly formed ideas about the functions of each part of the brain, and how they interacted with each other. Most of what was known was only

by the study of patients who survived brain injuries. That also meant, that there was a very fine line between research and medical practice on the human brain.

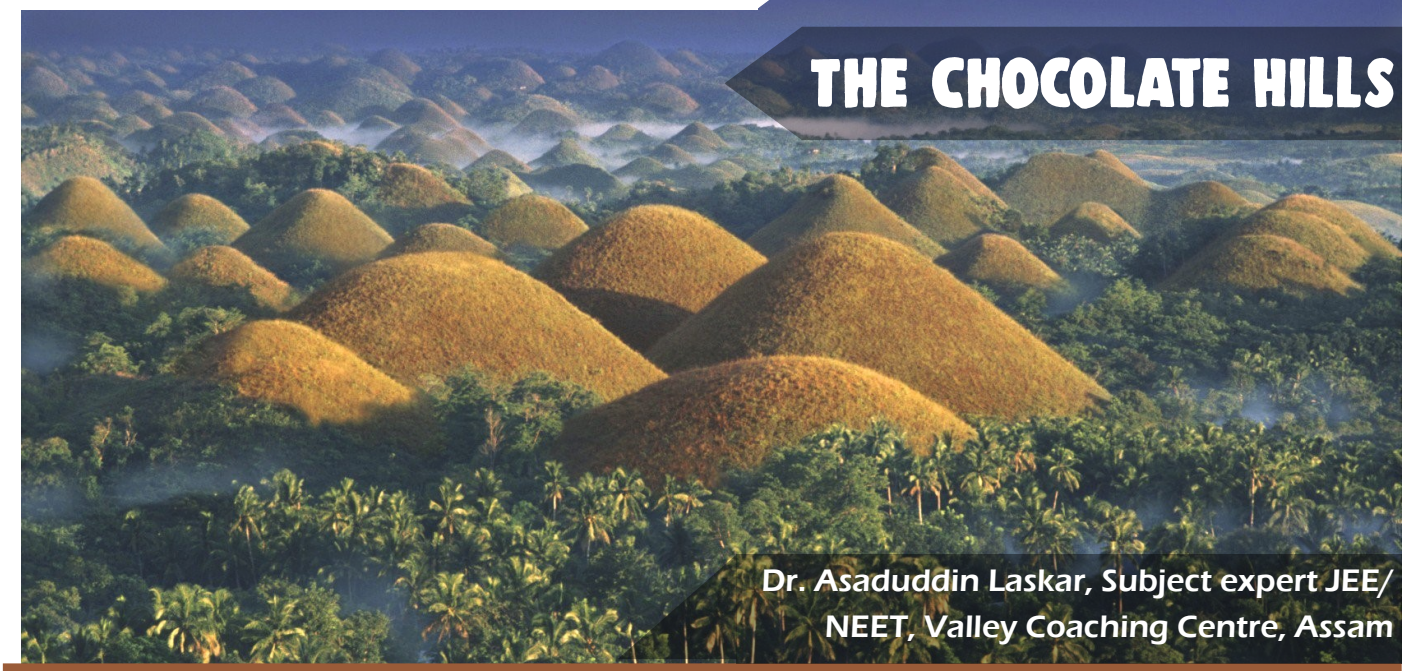
After the surgery, Henry suffered from severe anterograde amnesia. Anterograde amnesia is the inability to create and store new memories. At the time, it was not known that the hippocampus played a major role in memory. His new condition fascinated scientists and he was widely studied from late 1957 until his death in 2008, popularly known as 'Patient HM'.

Henry still possessed some memory of his life before the surgery. After the surgery, he woke up each day to meet the same people, yet did not remember meeting them. He greeted his doctors like he would have just met them, unable to recall anything beyond thirty seconds. "I've known Henry since 1962, and he still doesn't know who I am," noted Suzanne Corkin, PhD, a long-time researcher who directed the research. His memory never developed after the surgery, and he behaved like a 27 year old all his life. He was always "trapped in the moment". This way, scientists came to know that the brain organized memories into short term and long term ones.

During his study, Henry was given tests, like tracing shapes from their mirror images or doing crossword puzzles. He could not remember these tests, yet he would improve at them. Henry learnt to use a walker, which suggested that he could in fact remember what his conscious mind forgot. Evidently, the making of these non-conscious memories relied on different neural structures than the hippocampus. Long term memories were thus divided into implicit (non-conscious) and explicit (conscious). Thanks to his studies, the concept of sematic and episodic memories was also introduced. After his surgery, Henry could not remember most details of the unique events of his life (episodic memory) but could remember general knowledge of the world (sematic memory). The removal of the tissue left Henry devoid of autobiographic memories, which suggested that episodic and sematic memory were distinct.

After his surgery, Henry could not remember most details of the unique events of his life (episodic memory) but could remember general knowledge of the world (sematic memory)

Henry died aged 82 on December 2, 2008. His name was made public, and his brain was donated to Mass. General and MIT. It was kept at University of California, San Diego, and cut into 70-μ slices in 2009. The brain atlas constructed was made public in 2014. Henry's case has had a major role in the discovery of most of what is known about memory organization. His legacy still continues, as his case has since inspired hundreds of other researchers to use different approaches to investigate amnesia and memory disorders.



THE CHOCOLATE HILLS

Dr. Asaduddin Laskar, Subject expert JEE/ NEET, Valley Coaching Centre, Assam

*It is highly recommended that the readers abstain from all tourist desires until the current COVID-19 issue subsides. Stay safe at home and travel only in need. Till then, keep your list prepared...

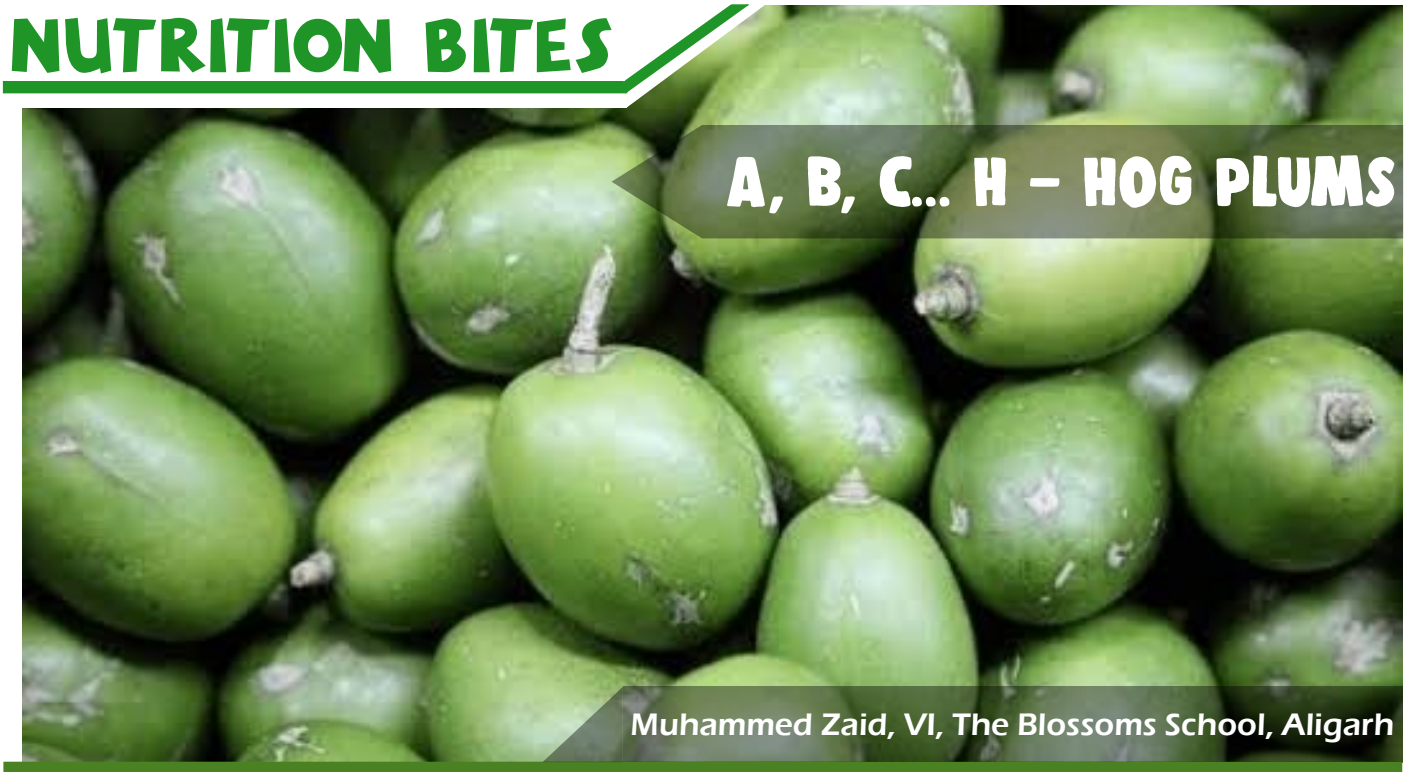
The Chocolate Hills of the Philippines are indeed a marvel of nature, however alien they might seem at first sight. A cluster of more than 1200 hills, in the shape of cone with heights varying from 100 - 500m, these hills are spread over an area of 50km^2. According to geologists, these hills were formed from marine limestone which weathered gradually over the years. Another theory on the formation of the wonder is that they were mounds of coral reefs which had come up to the surface by volcanic eruptions.

In the dry season, the brown colour of the dried and faded grass that covers the hills gives a chocolaty appearance to the cone-shaped hills of limestone. The lush green trees, forming a ring around each hill, give them a terrific look. The plains at the bottom of the hills are made green by growing crops like paddy and corn.

The chocolate hills may be seen from two popular viewing decks provided by two resorts, namely Chocolate hills complex in Carmen and the Sagbayan peak. The former is a government owned resort having restaurants, souvenir shops and a hotel, while the latter resort located at the mountain-top in Sagbayan has a butterfly dome, restaurant and a café in addition to that.

The Chocolate hills in the (a) wet and (b) dry seasons

A, B, C... H – HOG PLUMS



Muhammed Zaid, VI, The Blossoms School, Aligarh

*Dr. Kamil Ashraf is a regular contributor to this section. He was busy at the time of publication, and will continue the section henceforth.

The Hog Plum, also known as June plum, Spanish Plum, Gully Plum, Mope, Ambate and Golden Apple (yes, you read that right), is a fruit exotic to India. It is known for its plum-like shape and greenish-yellow leathery skin. The seed at its centre is generally spiny and tough to remove from the pulp and has an oil content of 31.5%. The pulp is mostly eaten fresh, but sherbets, chutneys, pickles, curries, jams, jellies and even ice creams are made from Hog Plums.

It was Introduced by the Portuguese in Southern Asia in the beginning of the 17th century, and is native to different parts of Africa, India, Bangladesh, Sri Lanka, Indonesia and the Caribbean islands.

Health Benefits

Hog Plums are rich in antioxidants. Antioxidants protect our cells against free radicals, which are molecules harmful to the body. Free radicals are produced in our body when it breaks down food or when we smoke. Various nutrients in Hog Plums including vitamin C support the immune system and help it generate antibodies. These very antibodies fight against harmful microorganisms that enter the body. They are rich in iron as well, which is essential for healthy blood. The leaves and flowers are good for stomach ache in tea form, and the flesh also prevents the risk of heart diseases. The ripe fruit is also said to be a good cure for sore throats and rheumatism.

INFECTIONS FROM WILDLIFE

Hamza Khan, X, STS School (Minto circle), Aligarh

Whenever the term 'wildlife' comes to our minds, the common conception is of a spider-monkey in the Amazon, lots of rain, deforestation, a 'roar' and of course 'lots of leaves'. Some minds might think about tourism, donation or infection. We are blessed to have some people who think about 'infections' from wildlife. The numbers have increased substantially, thanks to the current trending superstar- 'Novel Coronavirus'. But how did it manage to create the global havoc we are seeing around us?

The story of the COVID-19 virus or Coronavirus has been full of drama and action, somewhat like the climax of a movie. The hero suddenly appears from an unexpected place (Wuhan) and kills thousands, literally thousands, of villains (us humans) to save its mother (Nature). The planet has seen a massive environmental rehabilitation in the few months. With humans out of the way, Nature seems to have cleaned the air, rivers and cities all by herself. By the way, being on the villain's side, we didn't expect the hero to emerge from the raw uncooked meat of a bat, did we?

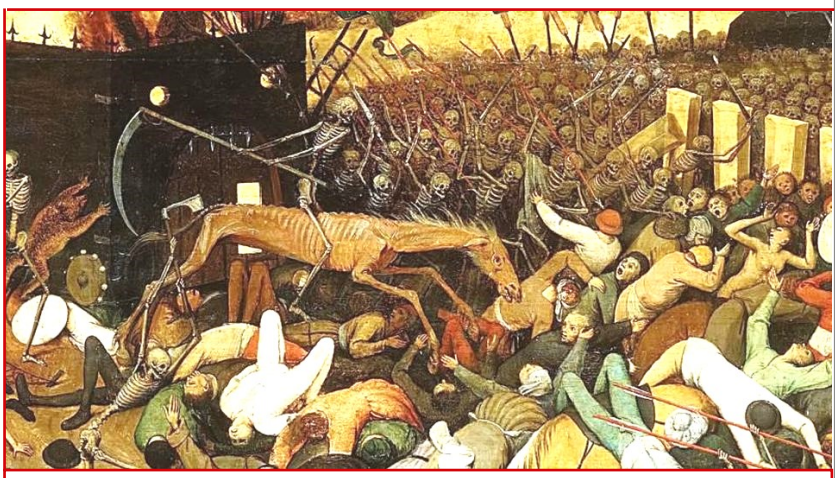
The Ebola and Nipah viruses are also believed to have been transmitted from bats to humans.

Maybe that's where we lost the battle. We didn't pay sufficient amount of attention to the diseases coming from animals, known as Zoonotic Diseases. But after 4.26 million cases and 292 thousand deaths (as of 13 May 2020) and still counting globally, I think we all should.

Three out of every four emerging infectious diseases come from animals. These zoonotic diseases can spread from both direct and indirect interaction. Direct interaction with animals includes ecotourism, bushmeat hunting, research and the movement of pets - which carries the risk of disease spread in both directions. In the case of the Coronavirus, this spread is unidirectional with your pets being the victim, as reported by CDC (Centres for Disease Control and

Prevention). Indirect interaction includes contact with animal faeces and with patients suffering from the disease. Some species of E. coli and Salmonella spread through both of these methods.

We had known about Zoonotic Diseases and the potential threats that they possess for ages, but COVID-19 has given us some life-affecting lessons related to infections from wildlife in the future and shown us our ground reality. It reminded us to give more respect and capital to the medical and research staff all over the world. Until now, scientists in India received a grant of $40 per capita. We would want this to go up.



Fleas living on black rats were considered responsible for bringing the bubonic plague to Europe in the fourteenth century, where it caused the worst pandemic of history, dubiously known as the 'Black Death'

Furthermore, when this pandemic will end, we will have some points to consider. We will have to pay more attention to the health and hygiene of animals around us. Vaccinate them as much as possible. We will have to watch out for emerging potential disease-causing microbes. Conduct regular check-ups for pets. After all, we don't want them to die, as well.

Look, every species is a part of nature. All have the right to live and sustain their identity. We all live on earth, the only planet which has life amongst the millions of planets discovered so far. Life is exotic to us. We have to be aware of the upcoming threats to your species. Let's not allow carelessness to affect our life too much. We would not want to die of negligence, would we?

PUZZLES

CAPTION THIS!

Anything that is quirky and out of the box, a single sentence which you think would describe this picture well...

For example-

"The $5 neighbourhood babysitter"

Email your answers to getsetknowmagazine@gmail.com

The best answers win a special mention in the next issue!

FLOOD CONTROL

Dr. Aminul Islam, Department of Chemistry, Aligarh

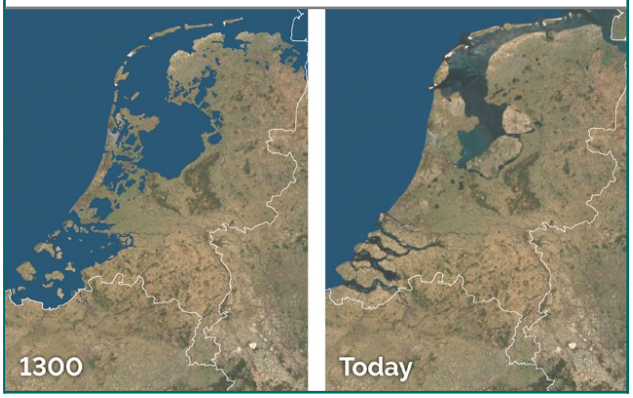
India witnesses heavy rainfall every year resulting in overflowing rivers (especially the Ganges and the Brahmaputra), lakes and dams, which cause huge amounts of irreparable damage to people and property. Floods occur naturally in places where the water cannot be drained adequately, as in Kerala or Assam.

However, most causes of floods are seen to be man-made; like the illegal conversion of canals meant for irrigation into municipal drains during the development of residential areas in Chennai-

Or negligence by the civil department, leading to non-functionality of an otherwise acceptable drainage system in Patna-

During 1901-2015, results show a three-fold rise in widespread extreme rainfall events across India. And this will continue to be the same until and unless people and the government begin to think seriously, and then take both long and short-term necessary actions to prevent climate change. The Indian Government does nothing significant other than sending NDRF teams for rescue, evacuation work and rehabilitation programs, inspecting the flood affected areas by choppers and dropping food and providing relief funds. These are all short term plans and do nothing to stop these floods.

The country of the Netherlands is a living example for us on tackling floods which constantly strike the nation-



Between 500 BC and AD 700 there were probably several periods of habitation and abandonment as the sea level periodically rose and fell. The Frisians were first to settle the Netherlands. They built terpen, which were earth mounds upon which they built houses or even entire villages.

Dams with culverts were built on the rivers to prevent floods but to allow drainage. Dikes were also built around fields to protect crops.

The word 'Netherlands' is derived from the Dutch word 'neder', meaning 'low'. About 27% of the Dutch land is below sea level and is home to over 60% of the country's population. Only about half of the Netherlands is more than a few feet above sea level. The country has 451 km of coastline along the North Sea and the mouths of three important European rivers- The Rhine, Schelde, and Meuse. Twice in every 24 hours, the vast tide from the North Sea sweeps in a flood over a large stretch of land. It remains controversial about whether this region belongs to the land or to the sea.

The country had been through several notorious floods, the most devastating being the First All Saints' flood in 1170, followed by St. Lucia's Flood in 1287 which killed over 50,000 people.

A result of the massive flood was the creation of a new bay, called the Zuiderzee (South Sea), by floodwaters that had inundated a large area of farmland, enlarged the Wadden Sea and connected the previously existing Lake Almere in the middle of the country to the North Sea.

Once salt water from the sea entered into the land and lakes during floods, it could not leave naturally because of its low elevation. Continuous drainage of salt water was attempted in the 15th and 16th century by installing polder windmills, later by mills equipped with scoop wheels and Archimedes screws. A system of canals and lakes connected the different polders, from which water could be let out to river or sea, either by a sluice gate at low tide or using pumps.

This system is still in use today, though the drainage mills have been replaced by first steam and later diesel and electric pumping stations.

Many thousands of local water control boards were constituted with the capability to hold separate elections, levy taxes, and function independently from other government bodies. The Directorate General for Public Works and Water Management was set up in 1798 to put water control under a central government.

With technological development in the 20th century two mega projects – Zuiderzee Works and the Delta Project were undertaken after the recent floods of 1916 and 1953 respectively, to further improve the safety against flooding and to reclaim large areas of land. The American Society of Civil Engineers declared these works as among the Seven Wonders of the Modern World.

Zuiderzee Works was a system of dams and polders, land reclamation and water drainage works, in total, the largest hydraulic engineering project undertaken ever. Under the guidance of engineer cum minister Cornelis Lely, the project sought to improve flood protection and create additional land for agriculture. It involved the damming of the Zuiderzee, a large, shallow inlet of the North Sea by building of an enclosure dam Afsluitdijk (1927-1933) which was 32 km long and 90 meters wide, rising to 7.25 meters above sea-level, thereby dividing it into the tame lakes of IJsselmeer and Markermeer. Shipping locks and series discharge sluices at the ends of the dam were used for discharging the IJsselmeer into the Wadden Sea. The reclamation of land (~1620 km2) by creating five polders in the newly enclosed water was done by damming and then draining water by pumping stations and mills.

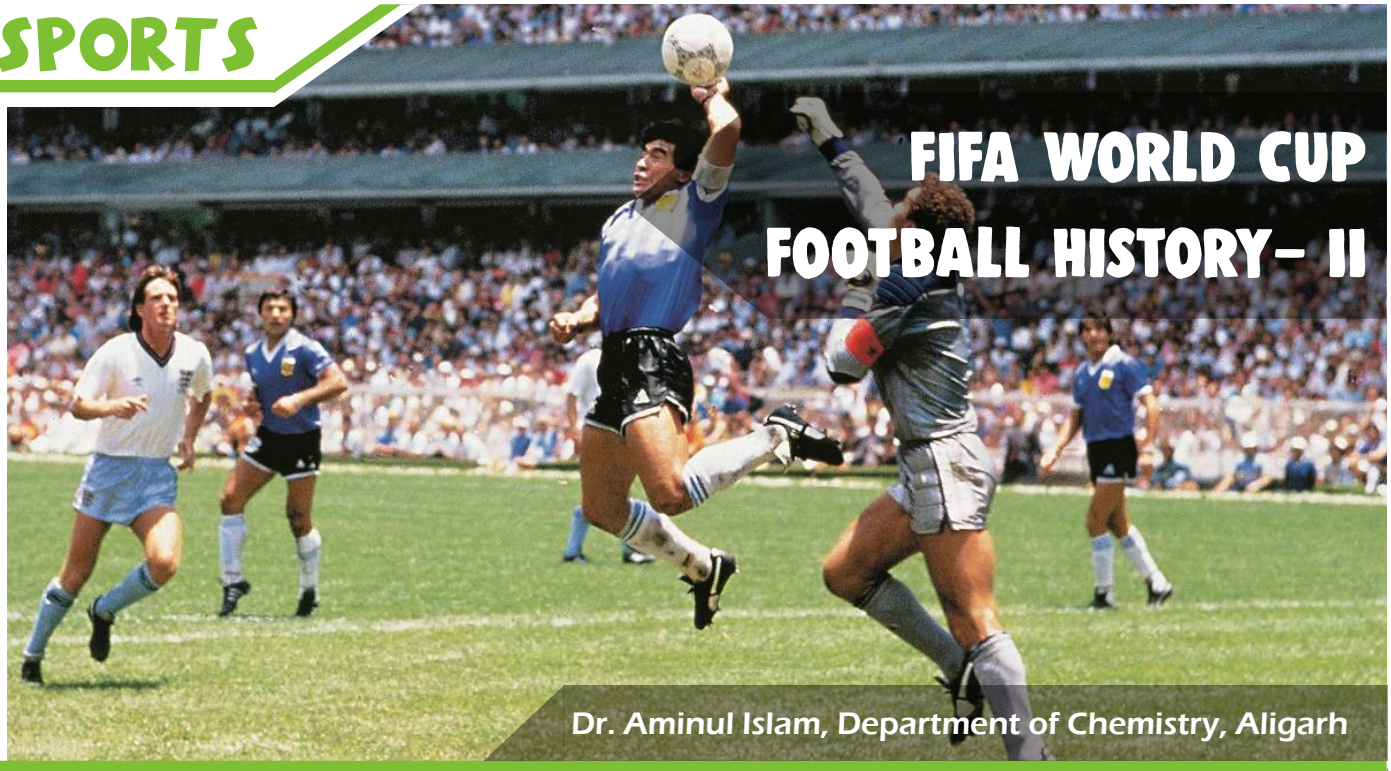
Culvert: A tunnel built for transporting water across obstructions like roads or hills
Dike: An embankment build for controlling and holding back water from the sea
Polder: Piece of land reclaimed by draining water from it
Estuary: The body of water at the mouth of a river, forming a transition between a river and the sea.

Delta Project, devised by the Dutch engineer Johan van Veen, in the southwestern Netherlands, was a giant flood-control project that closed off the Rhine, Maas, and Schelde estuaries with dikes linking the islands and created what amounts to several freshwater lakes that were free of tides. Four storm-surge barriers and six secondary dams were built to close off the mouths and inner reaches of the broad, long, interconnected inlets that for centuries had exposed the region to the destructive power of the North Sea. When the dams (~30 km) were completed, fresh water from the Rhine and from other rivers gradually replaced the entrapped salt water. The last barrier dam stretching across the three channels of the Oosterschelde consists of several strings of adjustable gates that, in normal weather, allow tidal seawaters to ebb and flow into it, thus benefiting the fish and bird life and the local fisheries.

In an attempt to restore and preserve the natural system surrounded by the dykes and storm-surge barriers, the concept of 'building with nature' was introduced in Delta Program updates after 2008. The new integrated water management plan not only takes into account protection against flooding, but also covers water quality, leisure industry, economic activities, shipping, and the environment.

The current sea defences are stronger than ever, but experts warn that complacency would be a mistake. The Storm Surge Warning Service makes a water level forecast in case of a storm surge and warns the responsible parties of coastal districts to take appropriate measures depending on the expected water levels, such as evacuating areas outside the dikes, closing barriers and in extreme cases, patrolling the dikes during the storm.

Global warming in the 21st century might result in a rise in sea level which could overwhelm the measures the Netherlands has taken to control floods. The Room for the River project allows for periodic flooding of indefensible lands. In such regions residents have been removed to higher ground, some of which has been raised above anticipated flood levels.



FIFA WORLD CUP FOOTBALL HISTORY– II

Dr. Aminul Islam, Department of Chemistry, Aligarh

(continued from previous issue)

The 10th FIFA World Cup tournament held in Germany in **1974** was remembered for the arrival of 'total football' and colour television. The first round group system followed by a knock-out in the second round was replaced by a group system in both rounds. Notable first-time qualifiers were East Germany and Zaire, which became the first sub-Saharan African nation to do so. Hungary, Spain, France and most surprisingly England failed to make it through. Scotland with one win and two draws failed to qualify for the second round, despite being the only undefeated team of the competition.

East Germany's 1-0 win over their political enemies from the west, on opposition territory too, might not have much meaning in the sporting sense since both teams had already qualified for the next round, but it did have an emotional effect. West German captain Franz Beckenbauer had to appear on television to explain the situation to an unsettled public.

Cruyff and Beckenbauer in the 1974 finals

The iconic final between West Germany and Netherlands had started off dramatically as Johan Cruyff was brought down in the German penalty area following a solo run. The Dutch took the lead from the ensuing Neeskens penalty before the Germans had even touched the ball and with just a minute gone on the clock. Even playing with the brand of 'total football' invented by the Dutch club Ajax, the Dutch could not overcome the hard-running, interchanging style West Germany possessed, and went down 2-1, Gerd Müller, "Der Bomber', typically scoring the winning goal.

Rarely has the run-up to a world cup been so filled with controversy as the 11th tournament held in Argentina (1978). Football, in fact, took a back with the debate whether or not to boycott the tournament in protest against General Videla's totalitarian regime and its violation of human rights. Finally, however, despite a widespread call to stay away, all footballing nations agreed to participate except Cruyff, the outstanding Dutch footballer and teams that had failed to qualify, such as England (for the second time running), Yugoslavia and the USSR. Scotland needed to beat the Netherlands by three goals in their final game to advance to the second round. They were at 3-1, one more goal would be enough... but when it came, it was scored by Dutchman Johnny Rep. They had to go home too soon even after putting such a brilliant performance.

To book a berth in the final, Argentina needed to beat Peru in its last game of the second round by at least four clear goals. But contrary to all expectations, Passarella and his team-mates put no less than six goals past the Peruvians, including two by Mario Kempes. This goal avalanche raised eyebrows among even the most casual of observers. In the final, however, Argentina were worthy winners (3-1 after extra-time) over a Dutch side out of sorts again at the final hurdle.

Football, in fact, took a back with the debate whether or not to boycott the tournament in protest against General Videla's totalitarian regime and its violation of human rights.

Italy survived the opening round on goal difference and then went on to win the trophy for a third time in 1982 after defeating a creative Brazilian team (Zico, Socrates) in an astonishing match in the second phase with the help of a terrific hat-trick by Paolo Rossi, who had earlier served a two-year ban for match-fixing. This World Cup is remembered for a game that has passed into football lore: the France vs. West Germany semi-final in which Germans took the lead, before Platini brought France level with a penalty. Substitute Patrick Battison got injured out of consciousness, but the referee didn't sanction the German keeper and not even a free kick was awarded. In extra-time the Blues led 3 -1 but Germany fought back to equalize and then won the game on a penalty shoot-out. This dramatic but ultimately cruel game became one of the most talked-about encounters of all time.

Battison being taken off the field

The 13th world cup (**1986**) was awarded to Mexico, after the original choice, Colombia, could not afford to stage the tournament due to terrible earthquakes. For the first time, second round games were played on a knock-out basis. Morocco became the first African nation to qualify for the 2nd round in a world cup competition. After winning against the world champions- Italy and then Brazil (Joel Bats saved a Zico penalty in the second half) in a nail-biting penalty shoot-out (Platini and Socrates missed the goal), the French, as in 1982, were again brought to a halt by the Germans in the semi-final. Argentina overcame West Germany 3-2 in the final.

This tournament is best remembered by two goals– the 'hand of God', which was actually a handball, and the 'goal of the century' both scored by Diego Maradona against England in the quarterfinal match, which became a part of football folklore. As for the second goal, he won the ball in his own half and set off down the right, escaping the attentions of two England forwards. The 115,000 fans at the Azteca stadium looked on in a trance as he headed straight for goal, glided past two more England defenders, before dummying and rounding Shilton - the England goalkeeper with 55 minutes on the clock. It was a one in a million goal.

Germany took revenge in the **1990** final beating Argentina by a late penalty converted by Andreas Brehme. Argentina became the first team not to score in the final and also the first team to have two players sent off in the final. Schillaci, better known as 'Toto', who had played only one international match before the World Cup became the tournament's top scorer and virtually lifted Italy into the semi-finals on his own. Cameroon's Roger Milla- the old "Lion", who came out of retirement to play, became at 38 the oldest goal-scorer in world cup history. They were beaten by England 3-2, after leading 2-1 with ten minutes to go in the quarter final. Cameroon's marvelous display, along with Egypt's excellent performance did not go unnoticed, and Africa was allowed to field three as opposed to two teams in the next World Cup.

Cameroon's Roger Milla, who came out of retirement to play, became at 38 the oldest goal-scorer in world cup history.

The **1994** show had two unusual events- a drama when Maradona, Argentina's hero of 1986, tested positive for drugs and was expelled from the tournament and a tragedy when Colombian Andres Escobar was murdered days after returning home from scoring an own goal against the United States. France, the 1986 semi-finalists failed to qualify. The final pitted Brazil against Italy, two nations which had already won the world cup three

Baggio after missing the iconic penalty

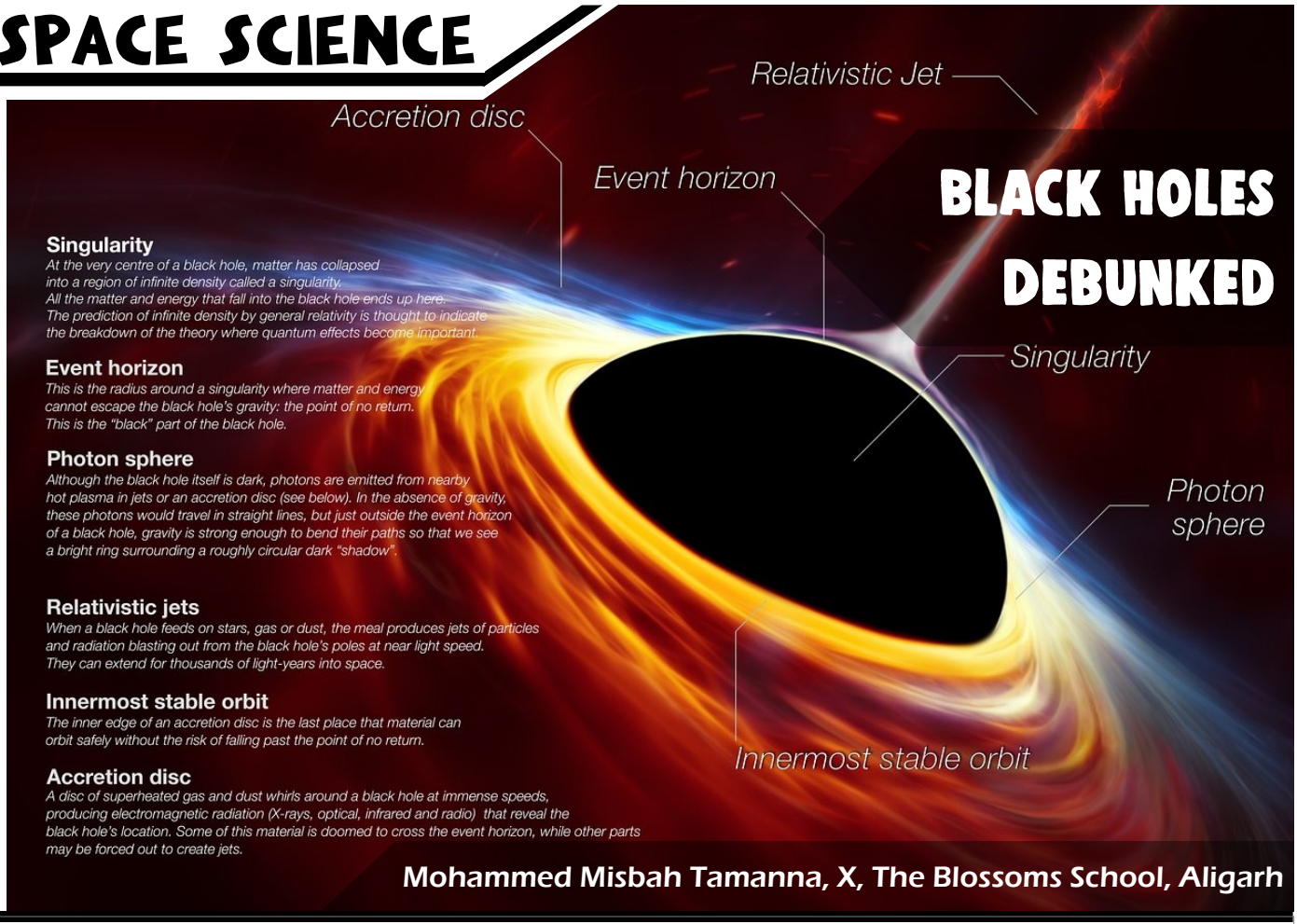
times. Brazil won their fourth title on penalties (first time in world cup history) against Italy. Roberto Baggio who had helped his country's win against Spain in the quarter final and Bulgaria in the semis, however, missed the penalty shot in the final. Roger Milla confirmed his "title" as the tournament's oldest goal-scorer, at 42 scoring lone goal against Russia.

World Cup **1998** saw the participation of 32 countries. An epic contest was played out in the second round between Argentina and England- a penalty each in the first ten minutes, Michael Owen's goal of the tournament, Javier Zanetti's clinical free-kick move on the stroke of half -time to equalize. High drama after the break- David Beckham sent off, Campbell's "winner" disallowed for a foul, extra time, more penalties... Argentinian keeper saved England's fifth and final spot kick to see them through to the final.

France needed the first ever (and to date only) golden goal in the 113th minute, courtesy of central defender Blanc. In the quarter final, they were up against Italy and this time it was the thickness of the woodwork which came to their rescue - Roberto Baggio flashed a free header past the post in the dying minutes of extra time, then Luigi di Biagio rattled the crossbar with the fifth and decisive penalty of the shootout. In the semi -final, their opponent was the surprise package - Croatia who had upset Germany 3-0 in the quarter final. The golden boot winner Suker gave them the lead after the break but France right back

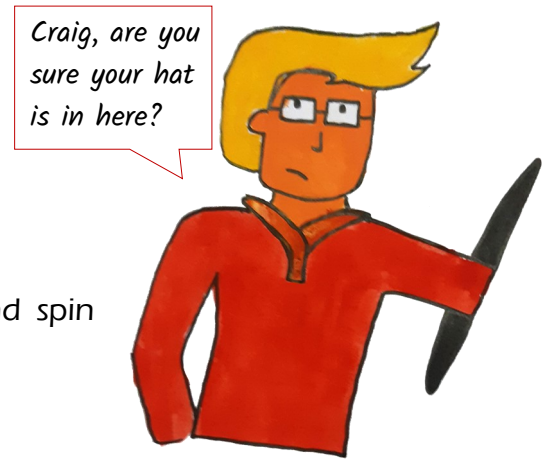
Lilian Thuram chose this moment to score his first, and second, international goals and set up a dream final against holders Brazil, who had overcome Netherlands in the semis. With a header in the 27th minute followed by a second in first half injury time, playmaker Zinedine Zidane sent shock waves through his Brazilian opponents from which they would never recover. Despite being reduced to ten men after Marcel Desailly's expulsion in the 68th minute, the French fortress not only withstood a final pounding from Brazil but even slotted in another goal after a counter-attack from Petit in the last minute.

(to be continued...)



Mohammed Misbah Tamanna, X, The Blossoms School, Aligarh

Black holes are perhaps one of the most mysterious objects in our whole universe. We all know that a black hole is defined as a region of space-time where the gravity is so strong, even light can't escape from it. Well, instead of just delving into the details of black holes, let us first clear our minds of some common misconceptions associated with black holes-



1. "Black holes are 'holes' in space"

Black holes are spherical, have mass, occupy space, and spin pretty much like any other astronomical object.

2. "Nothing can come out of a black hole"

The point is, only some of the matter pulled by its gravity manages to make it all the way into the black hole. The rest of the matter escapes along the black hole's axis, exiting the area, and often galaxies altogether. These outflows span tens or hundreds of thousands of light years across.

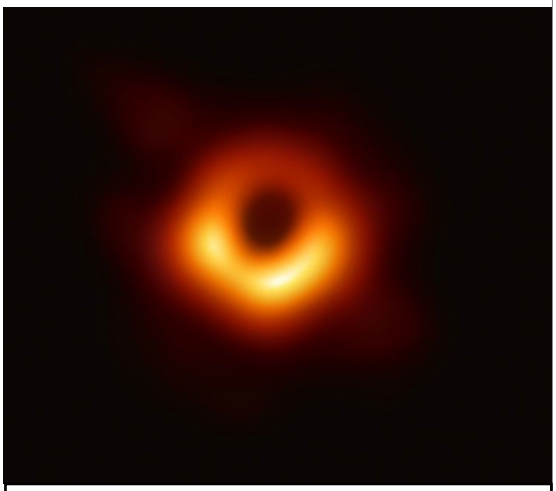
Besides this, all black holes give out a very faint glimmer of radiation, known as "Hawking radiation". In order to understand Hawking radiation, we must first look closely at what we think of empty space. In reality, empty

space isn't really empty. It is filled with virtual particles popping into existence all the time and annihilating each other. When these virtual particles pop up right at the edge of a black hole, then one of the virtual particles gets drawn into the black hole and the other escapes and become a real particle. So the black hole loses mass as energy comes out of it. One such outflow can be observed at our own galaxy- The Milky Way's Fermi Bubbles, which are named after NASA's Fermi Gamma-Ray Telescope.

3. "Black holes are black"

Contrary to the name, a black hole isn't black. Imagine that you are outside a black hole and you see someone moving towards the black hole as they pass the event horizon. You will see that the light emitted from them would get fainter, redder (its wavelength will increase) and their position would asymptote towards the event horizon. The photons (particles of light) that they emit would appear to get stretched out in space and in time. As you keep observing, you will see the light transition from infrared to microwave to radio frequencies and yet never quite disappear. Even infinitely into the future there will be light to observe from their fall into the black hole. With a large enough telescope that is sensitive to long wavelengths, you can theoretically observe light emitted from anything that falls into a black hole. As someone or something falls in, their light never completely goes away, just gets fainter, so as to speak.

Another point is that the object's light can still be emitted before it reaches the event horizon. Black holes power some of the brightest objects in the universe known as quasars. As some objects get closer to black holes, they speed up as they near the event horizon and they shine brightly until they pass the event horizon.



The first ever photo of a black hole's silhouette, taken by the Event Horizon Telescope. The glowing matter forms the accretion disk of the telescope.

4. "We can see black holes"

Black holes were first predicted in 1916, and it took us more than a century to get our first picture of the black hole. We also know that even light cannot escape from a black hole. But wait, if we cannot see black holes, then how do we find them and how did we take a photo of one?

Well, there are two basic ways of detecting black holes-

First, we detect black holes by observing how they influence or attract their surrounding matter by their gravitational pull. For example, at the centre of Milky Way, we see an empty spot where all the stars are circling around as if they were orbiting a dense mass. This dense mass indicates the presence of a black hole. The second way is by observing the matter that falls into the black hole. The matter that falls in settles as a disk around the black hole and it gets hot and starts emitting radiation in the form of light. Telescopes can detect this radiation emitted by the swirling matter falling into them.

5. "Black holes suck up everything that come near them"

Okay this is an easy one. Before we continue, we need to understand what an event horizon is. The event horizon is a boundary. The curvature of space is so strong inside the event horizon that nothing, not even light, can escape once it has crossed the boundary. It's a popular opinion among some people that black holes are like vacuum cleaners and that anything near a black hole would get sucked up inside.

This is, however, incorrect. Consider this, if we were to replace our own sun with an equally massive black hole, it won't disturb the orbit of the planets at all. The point is, that black holes have a limit i.e. the event horizon. It's true that anything that goes beyond a black hole would never return, but if a particle misses the event horizon and simply approaches near the black hole, it will experience just immense acceleration.

6. "All stars will end up as black holes"

Only stars with large masses become black holes. Our Sun at the end of its lifetime, it will die a quiet death and become a white dwarf star. Stars are sustained by the nuclear fusion reactions taking place in their cores. The heat energy that these reactions produce is enough to support their mass against their gravity. As a star runs out of fuel, it expands and starts to produce heavier elements like carbon and iron. Once it finally exhausts all its fuel, it collapses under it own gravity. It is at this stage when its mass decides its fate. A star needs to be at least 20 times the mass of our Sun to explode in a supernova explosion which leaves behind a black hole.

SEE ALSO...

SPACE SCIENCE - Stars
Issue 4

7. "The LHC can create black holes which could swallow up the Earth"

The Large Hadron Collider is the world's largest and powerful particle accelerator, built by the European Organization for Nuclear Research (CERN). With its 27-kilometre ring of superconducting magnets and with several accelerating structures, it lies as deep as 175 metres underneath the France-Switzerland border near Geneva.

While skeptics have accused the LHC, that it could create various catastrophes for our Earth, the most common of them is that it could create a black hole. At its current stage, it's impossible for the LHC to make a black hole. However, for the sake of argument, let's say that it can create, and it does. So, could the black hole now consume the earth? Nope.

Why? Because our hypothetical black hole would be microscopic. And this microscopic black hole would be extremely unstable and not survive because of Hawking radiation and would decay instantly.

As one Forbes' article states:

"For a black hole of mass 5×10^{-20} grams, the decay time in three dimensions would be 10^{-83} seconds, which is not even enough time to exist! For physics to be meaningful, we need a time of about 10^{-43} seconds or longer. Translated into black hole mass, we'd need it to be at least 0.00002 grams to have even a chance of existing."

I think we can safely say for now that the LHC cannot create a black hole which ends up consuming the earth and destroying humanity.

8. "Black holes can be portals to other places"

A simple answer to this question, as Professor Richard Massey puts it, is " Who knows?" He further explains, "Falling through an event horizon is literally passing beyond the veil– once someone falls past it, nobody could ever send a message back. They'd be ripped to pieces by the enormous gravity, so I doubt anyone falling through would get anywhere."

The idea that black holes could lead somewhere has arisen because of the wormhole theory or as Einstein called it- "white holes", in 1916. It was the hypothetical reversal of a black hole, into which, nothing could get in. Both "entrances" (the black hole and the white hole) would be connected by a space-time conduit. It would be just like a bridge through space-time, theoretically creating a shortcut between two different points that could reduce travel time and distance.

This idea was defeated because any object falling into the black hole would get torn apart by the black hole's gravity by the process known as spaghettification. It basically means, that the strong gravitational field of the black hole will pull you into a long, thin chain of atoms (like a spaghetti) if you venture close, and you will just add up to the black hole's mass. Thus, no object can really survive a fall into the black hole because of the impenetrable barrier of singularity that ends up crushing whatever it encounters. For now, the concept of black holes leading to places is just science fiction. We don't exactly know what happens what happens when the concept of a singularity comes into play.

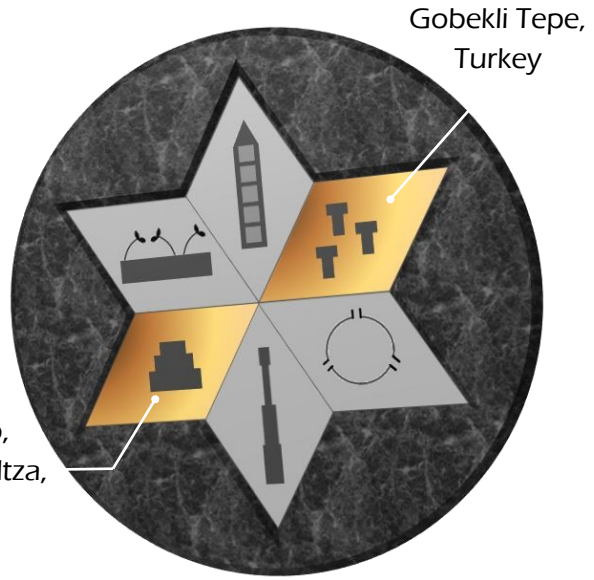
MONUMENTAL PUZZLES

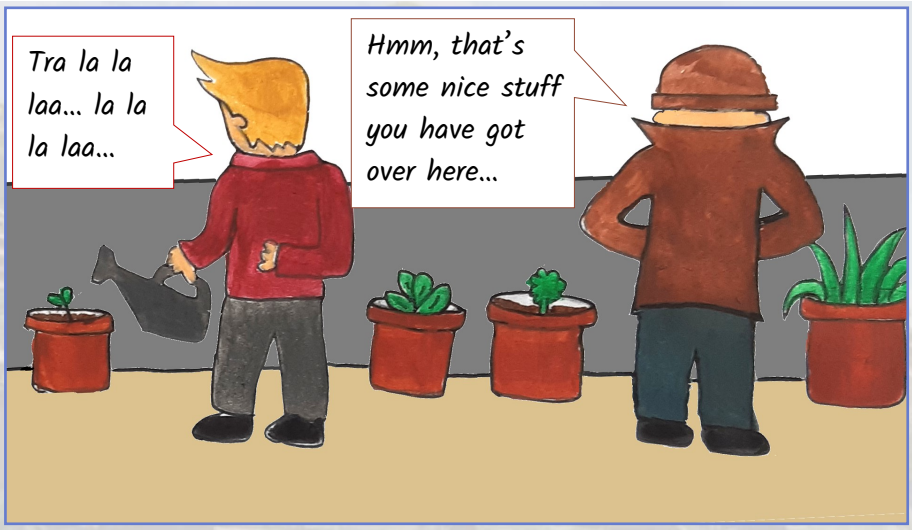
Muhammed Muaaz, X, The Blossoms School, Aligarh

Previously...

Mr. Mole was the new member of the GSK team. He had found an unusual underground anomaly and together with the team, they had managed to solve two fragments of the puzzle. Each time, the puzzle led them to an architectural wonder lost in time. Each solved piece acquired a metallic layer, and probably the artefact held a key to something perplexing...

*Winner of previous puzzle -
Mohammed Misbah Tamanna, X,
The Blossoms School, Aligarh






Hey, did you see that mint plant over there?
It finally germinated!
Which one?
Hold on a second...
You are eating up my garden!


C'mon, it's not even a garden. You call those few pots a garden?
Wait, I'll show you...
So what do you call a garden?
You need to have that much plants to make a garden!
What's... that... !?

Uh oh. It seems that some key terms of Craig and Nigel's discussion are missing. Fill in the blanks and send your answers to getsetknowmagazine@gmail.com to win a prize form GSK!

The (1 - name of the monument) of (2 - place) was one of the greatest wonders of ancient architecture. Various Greek and Roman accounts speak of the monument as being a 25m tall stone structure with vaults and terraces on which trees and other fauna were grown. It was believed to be built in the shape of a square pyramid, known in Mesopotamia as a (3 - name of the monument design). The vegetation was watered with the aid of water screws, which were used to lift water up. Water was brought to the monument from the nearby (4 - name of the river), via a set of canals and aqueducts. Soil was filled in the hollow walls of the structure, and stairs were present to reach to its upper levels.

The actual existence of the monument remains controversial, due to the lack of first hand sources of information. The earliest mention of the monument is of the account of (5 - name of the priest) of Kos, in around 290 BC. Its construction is most popularly credited to (6 - name of the ruler) of Babylon, who is said to have built it to console his wife, who had a longing to live amongst nature similar to that of her homeland. Other sources credit its construction to the semi-divine Assyrian queen Semiramis.

The lack of significant archaeological finds in Babylon makes some historians believe that it might not have existed at Babylon at all. The historical accounts might well refer to the extensive gardens built by (7 – Name of the ruler) of Nineveh, whose inscriptions as well as remains of canals and aqueducts have been found. The confusion might have arisen because of the Assyrian conquest of Babylon, after which Nineveh was labelled commonly as the 'New Babylon'. There is even a depiction of these gardens at one of the palaces at Nineveh.

Can you identify the city where these modern gardens (pictured below) inspired from this very monument are being constructed? C'mon, it's part of the puzzle!

Mother Nature planted all the trees
And the wonderful coming breeze
But everything can be misused with ease
Leading in future to disastrous disease
The current condition of the world
Lies in the hands of everyone.
So what can we do
To repent our sins?
Wear masks?
Or follow social distancing?
Everything Nature did,
Was for all,
Wise and stupid alike
The wrongdoers just don't know
How much the economy is low
Hangs loose the fate of the world,
On you and on me
To conflict destroy or to bombs deploy
What do you choose?
Instead of helping the poor, the hungry
Instead of hearing them cry
We fill streets with them
Leaving them to wither and die
The future is not spoilt yet,
With a virus or without its vibe
The choice is ours
To die or to survive.
So what are we reading more for?
Let us all take a step
In pure respect
Begging nature to not be cross anymore.

- Muhammed Zaid, VI, The Blossoms School, Aligarh

In between flickering hopes and silent goodbyes;
Empty roads and bright skies
Stands a lineage of helpless creatures
Sill carrying hopes for better futures.
Yes, our immense power and high prosperity
Has miserably failed to save humanity.
We might call it a curse from the lord
Or firmly claim it as a biological war!
We call for distancing
But we forget,
For how long the problem has been persisting
We never tried to fill the gap
'Cause communalism has blinded us
From seeing the real mishap
You lit the candles bright
But hatred was all you had, to ignite
You've been weak, astray
Ignorant and out of reach
Your claps have to be silenced
'Cause we see everything through the same eyes
Be it disease or violence.
Till when will we be fooled?
Wake up, see the problem
This is a pandemic, a virus.
See out of your window
Ask somebody who has seen their loved ones go.
Emotions won't save the planet, actions would
And it's the only thing we should!
In between flickering hopes and silent goodbyes;
Empty roads and bright skies
Shall stand a lineage of wise creatures,
Carrying hopes for better futures

- Zunaira Habib Alvi, X, The Blossoms School, Aligarh