Stay Curious!

March, 2018

"Look up at the stars and not down at your feet. Try to make sense of what you see, and wonder about what makes the universe exist. Be curious."
-Stephen Hawking

Dear Reader,

As I was compiling this edition of the Delphic, I looked at the notes that I had taken, the lists that I had made; it was a complete mess. It was something that would have been absolutely incomprehensible to anybody who read them, but to me they made perfect sense. That is what I want you to see; how to find that one moment of clarity in absolute chaos, and then be able to see the world with a new perspective.

This edition is a tribute to chaos. Each article, if not directly, will somehow refer to the jumble that is our universe. Some might say that all that chaos doesn't quite make for a good omen for a first edition does it? But I think that it is the perfect way to start my tenure. We can find turmoil anywhere that we look. It could be the controversial and baseless statement made by a minister, or it could be found in a star eating another one. It could be the pandemonium you cause when your bubble gum gets stuck in your hair, or the confusion that you feel in seeing someone eating bricks and cement.

Of course, bedlam is not the only thing that the Delphic team is serving up to you. We have also included humour and a few reports along with a tribute to a legend whose absence in the scientific community will always be felt. There is also a list of space events that you should keep your eyes peeled for, although you might have to follow up on most of them through our trusty friend, the internet. Science can never be fit into one edition of a magazine; even if that were possible, there would probably be a new discovery with each turn of the planet. So I hope that you will look forward to the next edition of the Delphic as eagerly as I look forward to compiling it.

Editor-in-chief,
Diya Kalsi

Report

The Theory of Satyapal Singh

Have you ever thought about how humans have come on our planet? Of course, this question was answered by the famous scientist, Charles Darwin. He gave the theory of evolution in the year 1859, which said that apes slowly transformed into humans.

Recently however, this theory was questioned by an Indian Minister. Yes, Prakash Javedkar's Minister of State, Satyapal Singh. He said that this theory is 'scientifically wrong'. When he was asked for an explanation for his statement, he said, "Has anyone or anyone's ancestor ever seen an ape turning into a human? No." As students, we have studied the theory of evolution in some form or the other and clearly know that evolution of apes to the first humans took place between 5 million to 7.5 million years ago. So naturally, no one has actually seen an ape turn into a human! Naturally, people have come up with objections to his statement. Here is our objection.

The appendix, an organ in the large intestine in our bodies, is not of any use to us. Makes you wonder why it's there in the first place right? Many years ago, it contained bacteria which could breakdown cellulose i.e. the substance which constitutes the cell wall of plant cells. Since fire had not been discovered when apes first turned into humans, they ate plants and so needed the bacteria. After the discovery of fire, the evolving apes learned to cook. This bacterium was not needed anymore, and later completely vanished from our bodies. Now the appendix has no use at all and can even be removed without any side effects.

This evidence is one of the major ones used to support Darwin's theory of evolution. Now the question is: Who do you think is the right ape?

-Shreya Singh and Archie Khanduja
Class 7

Psychology

An Eating Trauma

If you see someone trying to chew their hair or nails you don't think that they have to go see a doctor. You think that they are just nervous or under some stress. But did you know that this could be a precursor to something more serious than you ever thought? Pica is the name of a psychic disorder in which people and animals, mostly dogs, start eating things that are non-nutritive, for example ice, hair, paper, drywall, paint, metals, stones, soil, chalk and even glass.

The criteria for these actions to be considered Pica is that they must persist for more than one month at an age where eating such objects is considered developmentally inappropriate, not part of any tradition sanctioned practices and sufficiently severe to grant clinical attention. It's interesting to see what the triggers of this disorder are- mostly stress such as emotional trauma, maternal deprivation, family issues, parental neglect and a disorganized family structure.

Frequently, due to the intake of things like paint, metal and stones, lead poisoning happens. In addition to poisoning, there is a much greater risk of gastro-intestinal obstruction or tearing of the stomach. According to DSM –4 (Diagnostic and Statistical Manual of Mental Disorders), there is no proper treatment for Pica, but to prevent this you can avoid emotional stress. Nutritional deficiencies and complications can be treated and blockages in the digestive tract normally require surgery but little is known about specific treatments for the psychological aspects of this disorder. The disorder can last several months, and then disappear on its own, particularly in children. Mental disorders like depression and anorexia are better known and thus easier to spot, even by a bystander. However, Pica is a highly unusual disorder and therefore harder to identify. This is the reason people should be made aware of such mental disorders. Let's hope that someone can find a way to cure this disorder very soon.

-Himanshi Sharma
Class 9

Developing Science

Layman's Science

Robert Ingersoll, an American politician, once said, "We rise by lifting others." This ideal is best embodied in the concept of citizen science. Citizen science, also known as crowdsourced science, refers to public involvement in the discovery of new scientific knowledge. The most common features of citizen science are that anyone, even those without a scientific background, can participate. The data collected can help real scientists come to actual conclusions, and the data is available to a wide community of scientists and the public. The fields to which citizen science can be applied to include astronomy, genetics, medicine, psychology and statistics.

Mobile applications are used by a majority of the population and so scientists crowdsource their experiments utilizing this platform. A team at Michigan Technological University started a project called the Cyber Citizens project in 2011 in which they produced mobile and Web-based tools to help everyday people collect environmental information. The website Scistarter lists more than 600 active Citizen Science projects of which a third are backed by mobile apps.

Many recent Citizen Science projects include studying migration patterns of Monarch butterflies and the Microplastics Project conducted by Adventurers and Scientists for Conservation. When we wash synthetic clothes, plastic microfibers are released into the water which pollute our water bodies without us consciously doing so. The Microplastics Project helps in tracking microplastics and working towards solutions.

California condors would be extinct today if it wasn't for the breeding in captivation programs. Lead poisoning almost wiped them off of the face of earth. Condor Watch, a Citizen Science Project, helps scientists understand how lead poisoning affects their behavior by analyzing camera trap images.

There has to be public contribution if science is to progress. Help can be in the form of funds, petitions or voluntary work. When science formally became a profession in the 1800s, contributions from people with no scientific background continued. Data collected by volunteers is often regarded as reliable by many professionals. Citizen science bridges gaps between the public and the scientific community and projects which are crowdsourced often benefit from doing so. In the words of Henry Ford, "Coming together is the beginning, keeping together is progress and working together is success."

-Palak Porwal and Sulagna Tripathi
Class Ten

General Science

Bubble Gum

Be it for taste, relieving boredom, better protection of teeth, or to get rid of ear pains during flights, more than 374 trillion sticks of chewing gum are consumed worldwide on an annual basis, which is a lot! However, the gum that you chew today has gone through several transformations to become what it is today.
Up until WWII, chewing gum was made of a substance called chicle mixed with flavorings. Chicle is a latex sap that comes from the sapodilla tree (native to Central America). In other words, chicle is a form of rubber. Just like rubber bands don't dissolve when you chew them, neither does chicle. Chicle is a good bit softer than rubber bands and happens to soften more when it gets warm in your mouth. If you freeze chicle with ice, it gets very stiff -- chicle hardens and softens over a pretty narrow temperature range. After WWII, chemists learned how to make artificial gum bases to replace chicle. These gum bases are essentially synthetic rubbers that have the same temperature profile as chicle.
When Wrigley made gum famous, he inevitably made sure that everyone sat or stepped on spit-out gum at least once in their lives. Ever wondered why gum sticks to your hair, clothes and braces, but not your teeth? Well, bubble gums are made up of water-repellent polymers that don't stick to wet surfaces, but when they come into contact with oily surfaces, such as soles of shoes, fingers, and hair, they form a strong bond and stick tight. These same polymers, after the flavor of the gum is lost, extend to make bubbles.
It's just a pity that people who have orthodontic material stuck on their teeth can't eat gum until their teeth are straight!

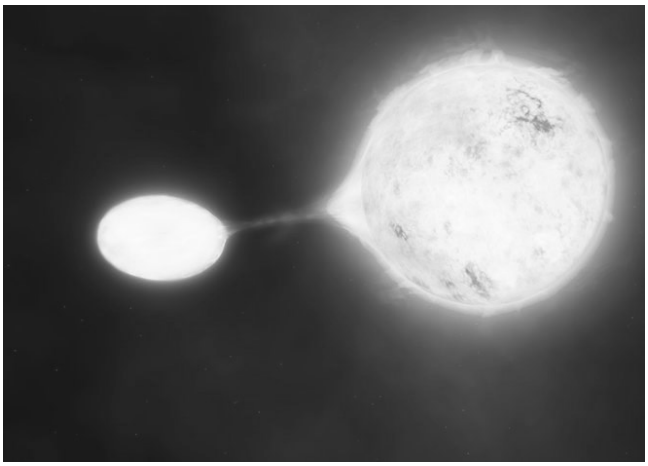
-Ananya Khanna
Class 9

Astronomy

Celestial Vampires

The universe is vast, full of crazy things and has a tendency to create wacky, strange and downright eccentric things that we couldn't imagine in our most outlandish dreams. Even though we know that our universe is crazy, none had ever thought of a star feeding on another star. We just weren't ready. However these "Vampire Stars" do exist in the universe and I'm not making it up, for example numerous massive stars coexist in a binary system. This stellar duo includes one massive star and a companion. The massive stars have a turbulent relationship with their companions; with one of the star either feeding of off the other or violently merging together to form one single more massive star than the pervious, rejuvenating their exhausted hydrogen supply; preventing them from turning into gas giants.

These massive stars were termed by the astronomers in Chile who used the European Southern Observatory's Very Large Telescope to observe them as massive O-Type stars. These massive O-type stars are very hot and incredibly bright. These stars have a surface temperatures of more than 54,000 degrees Fahrenheit (30,000 degrees Celsius), live short and violent lives, but they play a key role in the evolution of galaxies.



These celestial versions of vampires are termed as the blue stragglers. These cannibal stars seem to age slowly compared to their companions with whom they were formed this is due to the fact that they feed off of their companions; when they age and get cooler, making them look bluer and younger. Thus the name straggler comes because they straggle behind in their life cycle when compared to their companions. Astronomers suspect blue stragglers look so youthful because they've stolen hydrogen fuel from other stars, perhaps after colliding into their victims.

Blue Stragglers are found routinely in star clusters where they have the chance to feed off one another. However, scientists have now found blue stragglers in the Galactic Bulge of the Milky Way, a condensed region of stars and gases at the center. These 180,000 stars close to the bulge were viewed through the Hubble Space Telescope. The team discovered 42 unusually blue stars that appeared much younger than the other stars. The researchers had estimated that only 18-37 of these stars are the real blue stragglers, the rest might be the newly formed stars. They also believe these stragglers to be different than the ones found elsewhere. Researchers believe that they suck the hydrogen fuel from there companions rather than colliding with them. Thus making the stragglers younger, bluer and trimming with newly infused hydrogen fuel; while making their companions cold white dwarfs.

-Mohini Chandra
Class 11

For more information, visit-

https://phys.org/news/2011-12-vampire-star-reveals-secrets.html
https://www.space.com/16767-massive-stars-companions-merge-vampire-stars.html
https://www.space.com/31317-vampire-star-secrets-revealed-hubble-telescope.html
https://news.nationalgeographic.com/news/2011/06/110609-vampires-stars-cannibals-galaxy-space-science/

Curiouser and Curiouser

FALLACIES:

A fallacy is something that seems to be true but actually isn't. In mathematics, certain kinds of mistaken proofs are often shown as examples of a concept of a mathematical fallacy. So it might seem like the equation that you just solved by getting rid of a common term on both sides of an equation is correct, but it actually isn't. There is difference between a simple mistake and a mathematical fallacy: a mistake leads to an invalid proof whereas in mathematical fallacies the presentation of the proof is concealed. Here is a very famous example of a mathematical fallacy- 'The division by zero' fallacy.

1) Let a and b be equal, non-zero qualities; $a=b$
2) Multiply by a; $a^2= ab$
3) Subtract b^2; $a^2-b^2= ab-b^2$
4) Factorize both sides; $(a+b)(a-b)= b(a-b)$
5) Divide out $(a-b)$; $a+b=b$
6) Observing that $a=b$; $b+b=b$
7) Combine the like terms on the left; $2b=b$
8) Divide by non-zero b; $2=1$

This method can be used to prove any number equals any other number, which seems to be true because of the 'equals to' sign, but is actually not true, making it a fallacy.

PARADOX:

'The following sentence is true.'

'The previous sentence is false.'

Confused?

A paradox is a statement that though sounds true, leads to a self-contradictory or logically unacceptable conclusion. A paradox involves contradictory yet interrelated elements that exist simultaneously.

Can you touch the tip of your tongue to your nose?

Is the answer to this question 'no'?

Re-read the first question.

-Tanvi Singh and Tarisha Kaushik
Class 9

Archaeological Humour

Fiction

Max's Onerous Odyssey

10:30 a.m.: Max's robot was discharged and his toddler daughter missing. This information was lethal were it to reach his wife Mary- he would never hear the end of it. That left him with little choice but to manually search each and every centre on his wing of the Axiom. And thus began Max's onerous odyssey.
10:45 a.m.: His journey began at the Sleep- Centre.
12:45 p.m.: Max's 'power nap' over, he quaked at the realization that his choice of the first centre was evidently a mistake. Just as he turned to make a move out of the Sleep zone, the no-gravity zone was switched back on resulting in him falling back to slee-
1:30 p.m.: Max rushed out of the Sleep Centre, dreading being around when they turned that wretched no- gravity zone back on. The next centre he picked was one where he figured she'd be likelier to wander off all by herself- the Gaming Centre.
1:45 p.m.: Wincing still at the impact of the misdirected ball that had hailed upon him at the Gaming Centre, Max presently turned his chair out of the Centre, having affirmed that his progeny was still too young to have been permitted in without an adult. Miserable, Max turned his chair toward the Kids' Play Pen. On the way, his stomach rumbling, he devoured a hot dog and grabbed an ice cream.
2:15 p.m.: Defeated and incomparably exhausted with his ice cream all over his shirt and face as put there by the wild toddlers of the Play Pen, Max went back to his apartment, prepared to tell his wife the truth. As he guiltily spelled out the truth of the matter to Mary, she rolled over with laughter. What could possibly be so funny? Their daughter could be on the other wing by now for all they knew! He puffed up his chest and was just about to tell her off, when with a great amount of effort she pulled herself together, turned her chair to the back of his and re-emerged with their toddler playing happily in her lap. Earlier that morning, he himself had attached his child's pram to the back of his chair, put her robot nanny to work to ensure she was taken care of for the day, switched on the silent bubble mode around her pram so he wouldn't hear her cry, and gone right back to watching his match after which he evidently forgot all about her. This time, as Mary burst out laughing once more, Max joined in happily.

-Nitya Jain
Class 12

Scheduled Events

Up in the Sky

Here are some of the scheduled events taking place in March and April. They include rocket launches, satellite launches and a meteor shower.

March 21: A Russian Soyuz rocket will launch the crewed Soyuz spacecraft to the International Space Station from the Baikonur Cosmodrome in Kazakhstan

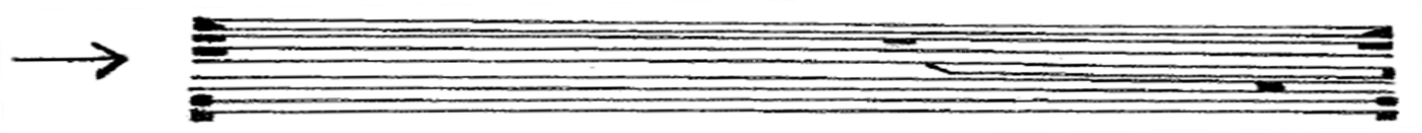
March 24: India's Geosynchronous Satellite Launch Vehicle Mk. 2 (GSLV Mk.2) will launch the GSAT 6A satellite from the Satish Dhawan Space Center in Sriharikota, India.

March 29: A SpaceX Falcon 9 rocket will launch the Iridium Next 41-50 satellites from Vandenberg Air Force Base in California at (10:19 a.m. EDT (1419 GMT).

April 2: A SpaceX Falcon 9 rocket will launch the Dragon CRS-14 spacecraft on a cargo delivery mission to the International Space Station from Cape Canaveral Air Force Station in Florida at 4:30 p.m. EDT (2030 GMT).

April 16: A SpaceX Falcon 9 rocket will launch NASA's Transiting Exoplanet Survey Satellite (TESS) from Cape Canaveral Air Force Station in Florida.

April 22/23: The Lyrid meteor shower will peak overnight between Sunday, April 22 and Monday, April 23.



Report

Mission Discovery

Seven girls from our school had attended 'Mission Discovery', held by NASA at Pathways school. They did not have to participate in workshops or attend lectures, but rather had to create their own experiments. These experiments were on various subjects of science like biology, physics, chemistry and even psychology. The girls who participated were Devangana Prasad, Palak Agrawal, Khushi Goel, Tarisha Kaushik, Aileen Dash, and Navya Mittal of class nine, and Shivanshi Gupta of class eleven.

The experiments that they conducted were- to test capillary force in microgravity in a porous medium, to test which enzymes out of α- amylase, serrapeptase and nattokinase will dissolve biofilms the fastest in microgravity, to determine if the bacteria *Geobacter metallireducens* will grow flagella in microgravity (*Geobacter metallireducens is an anaerobic bacteria that grows flagella to move towards its food source on earth. This bacteria destroys harmful organic compounds and is already being used for water purification on earth*), to check how much pressure is required to tear para- aramid synthetic fiber dipped in non-Newtonian fluid in microgravity (*Sheer thickening non Newtonian fluids are those which solidify when high amount of pressure is applied on them. Eg. - A mixture of cornstarch and water*), and to understand the psychological changes experienced by astronauts in space by observing behavioral patterns of cockroaches in microgravity.

Navya Mittal and her team won and their experiment will be conducted on the International Space Station. The experiment was-

Aim: To test the effectiveness of traditional natural antibacterials like ginger, garlic and turmeric in microgravity.

Ginger, garlic and turmeric have very useful antibacterial properties and have a traditional Indian flavor as well. We planned on testing their effectiveness on a strain of E.coli DH5 Alpha in microgravity and see if they are as effective in space as they are on earth. The most effective one among them will be grown in space.

Hypothesis: They will work better in microgravity than on earth.

Benefits: Natural antibiotics have very few side effects compared to medicines and these can also be used as a food source. So they work like a two-in-one.

Behind the Scenes

The Tragedy at Love Canal

When William T. Love wanted to create a 'Model City' in 1890, he envisioned connecting the two Niagara Rivers for hydro-electricity and making the perfect urban area. Although he started work to dig a canal that would join the two rivers, he had to sell the land and abandon his dream due to the Panic of 1907 and the discovery of the alternating current . In the 1920s, the canal, which had by then filled with water, was being used as a dump site by the City of Niagara Falls. In 1947, the canal was bought by the Hooker Chemical Company who drained the canal, sealed the walls with clay, and started to dump metal barrels full of chemical waste into it. In 1953, the Company covered the land with dirt and sold it the Niagara Falls School Board. Even though the school was built near the dumping ground and not on it, the parents of the 400 children who attended the 93rd Street School were not prepared for the disaster that followed.

By 1962, the supposedly impermeable clay cover of the canal began to crack and it turned into an overflowing pool of chemicals. The rotting drum containers caused the chemicals to percolate upwards through the soil and leach their contents into the backyards and basements of 100 homes. Soon after that, the medical crisis started. At first it was reports of high WBC counts and leukaemia, but it later progressed to the more serious issues of asthma, epilepsy, chromosomal damage, learning problems, nervous disorders and skin rashes. Many babies were born with birth defects.

When the city finally got the 19800 tonnes of chemicals analysed, they found that the sludge contained more than 82 compounds, 11 of which were carcinogenic. Eventually, nearly all the residents of Love Canal were evacuated, with pregnant women and infants being deliberately moved first. The government gave more than 221 families financial aid, and is detoxifying the canal by draining it. The Hooker company was sued for negligence, and despite clauses in its contract with the School Board, ended up paying $129 million. Love Canal is still occupied by a few residents who live far from the canal, but all of them remember the disaster that struck their community, and live in fear of the same thing happening to them as well.

-Diya Kalsi Class 12

R.I.P. Stephen Hawking

"We cannot teach people anything; we can only help them discover it within themselves."
-Galileo Galilei

The Italian polymath's 300th death anniversary was marked by the birth of a brilliant mind who took the world by storm. Stephen William Hawking was born in England on Jan. 8, 1942. He went to University College, Oxford and later graduated from Cambridge. He was diagnosed with motor neuron disease, or amyotrophic lateral sclerosis (ALS) just short of his 21st birthday. His life expectancy was estimated at two years; no one thought that he would even finish his PhD, but he attained his doctorate and forged new roads into the understanding of the universe in the years that followed. Over the course of his life, Hawking had to use a wheelchair as he started losing his mobility. In 1985, he also lost his ability to speak. However, a speech generating device designed at Cambridge allowed him to express himself by moving his cheek muscles.

We had commonly thought that whatever goes inside black holes can never find its way out as black holes are inescapable voids. But we were proved wrong when Hawking theorised that black holes radiate particles which possess energy, now called Hawking Radiation. It was a controversial theory in 1974, when he first published it, but now it is generally accepted by physicists, even though it has not been proven.

Another important achievement of Hawking's was his attempt to combine the two theories on which the universe works- Quantum Theory and General Theory of Relativity. Quantum theory is used to describe micro-particles, like atoms and their component particles, while general relativity is used to describe matter on the cosmic scale of stars and galaxies. These two seem fundamentally incompatible but Hawking wanted to combine both of them and create a "Theory of Everything". However, his analysis and research of black holes did not pretend to offer one. Instead, it used a sort of patchwork of the two existing theories.

We could argue for a Nobel Prize for the scientist, but most of his work lacked evidence- an important cornerstone of Science. Nonetheless, he has received many accolades like the Presidential Medal of Freedom, the Albert Einstein Medal, and the Gold Medal of the Royal Astronomical Society to name a few. He died a peaceful death at the age of 76, on the 14th of March this year. The whole world is deeply saddened by this loss. His thoughts and ideas gave rise to a vast array of theories and will continue to do so in the future.

R.I.P. Stephen Hawking. You will be profoundly missed.

-Ishita Agarwal Class 12

All the images have been taken from Google Images.