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In The News

Lessons from Lock Down

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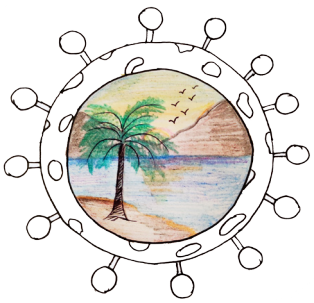
Once again mother nature has proven that man is not the king of all. The time has come to realize that humans are not at the peak of hierarchy in the ecosystem. The Novel Coronavirus outbreak makes us realize that the virus, as small as it could be, having a diameter of 60-140 nm could bring human activities all over the world to a complete halt. The new strain of the coronavirus called SARS-CoV-2 which originated in Wuhan, took no time to take over the world, even being able to bring major countries on their knees.

Being a novel strain, vaccines to the virus were not yet discovered. However, the high infecting capability of the virus had to be curbed. Thus countries in the world decided that social distancing and lack of human contact if not eradication, would at least help in lowering the rates of infection. Lockdown means all factories, markets, shops, places of worship, educational institutes will remain closed. All construction work would be stopped. In short, all human activities were to be halted and people were quarantined. While people stayed indoors, nature seemed to blossom. People read news of peacocks dancing on the streets of Mumbai. In a hustling bustling city like Mumbai people never saw peacocks, except in the zoo. Stoppage



of all human activities had led to a significant decrease in air pollutants in major cities in India, so said by the IQAir AirVisual's 2019 World Air Quality Report. Air quality index on 6th April 2020 showed most of the cities having a satisfactory or good scale. NO_2 levels fell drastically after lockdown from 52 per cubic meter to 15 in the period of 20th to 27th March, 2020 in Delhi. The same situation is seen in Mumbai, Bangalore, Chennai, Kolkata, according to CNN. Reduced fossil fuel emission due to transport and other sectors is one of the causes of decreased air pollution. Empty roads, beaches were taken over by nature. Staying at home and watching the free birds fly around, should have made us realize that maybe this break was needed. Humans have always been speedily working towards gaining the best without being considerate about nature. The COVID-19 pandemic has surely been devastating, but we humans with our wisdom, have always been able to overcome difficulties. It is time that we use our superior reasoning abilities to think not only about ourselves but also about the ecosystem we exist in. Was the ecosystem thriving and getting better with us being in? This indicates a very simple fact; nature can thrive without us. But we surely cannot do without her. The Corona outbreak was just a warning. COVID-19 has been an eye-opener. Shutdown due to COVID-19 has given us a glimpse, that if we are considerate and live sustainably, mother earth will turn into heaven.

Insight

Food for Thought and the Intestine!

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When one hears the term "microorganisms", they tend to think of vicious, ghastly little organisms trying to wreak havoc in their bodies. It is common to start visualising the ominous looking, hairy or spiky, irregularly shaped cartoons of microbes as often depicted in soap and disinfectant advertisements. Well, guess what, no matter how much you scrub yourself with soap, there are some microorganisms that will simply not leave your side. The average adult was believed to have carried 10 times more microbial cells than human cells. However, recent studies indicate that the number of bacterial cells equals our own cells. This is nothing to fret about, however, because research shows that these unusual companions of humans are actually quite beneficial for us.

Humans have clusters of bacteria living in various different regions of the body such as the skin, the oral cavity, the urogenital tract as well as the digestive or gastrointestinal (GI) tract. Of these, the microorganisms inhabiting the GI tract, commonly known as the 'Gut microorganisms' have recently drawn the attention of various research studies. At least a 1000 different species of known microorganisms are known to inhabit our intestines!

Studies show that a higher relative proportion of a group of microbes called *Firmicutes* in comparison to another class of microbes called *Bacteroidetes* in the large intestine,

is correlated with obesity. The converse is true for lean people. Another interesting study conducted on mice demonstrated that mice inoculated with *Lactobacillus rhamnosus* showed an enhanced ability to handle stressful tasks as compared to control mice. The bacteria fed mice may have altered neurotransmitters in the brain that could possibly account for lowered anxiety levels. Another group of bacteria called *bifidobacteria* produce propionates and acetates as the end products of fermentation. These end products increase the production of T lymphocytes, cells that are crucial in developing specific immunity to a variety of pathogens. Perhaps the most interesting of the effects of the gut microbiota though, is its interaction with the central nervous system. This interaction is commonly referred to as the 'gut-brain axis'. Recent studies have found compelling links between children with the Autism Spectrum Disorder (ASD)- a condition associated with severe impairment in social interaction skills; and a deficit of certain microbes in their gut microbiota. Such studies allude towards a possible connection between microorganisms in our gut and brain function. In addition to all of the above, commonly known functions of gut microorganisms include digestion of foods that our body cannot digest by itself, synthesis of essential vitamins and development of the host immunity.

The exact biological mechanisms of how these fascinating organisms inhabiting the GI tract of humans for centuries impact human physiology and behaviour still remain to be studied. However, it is now clear that all microorganisms are not quite the villains they are always portrayed to be! Thus, it is very important to maintain a thriving diversity of microorganisms in our gut. How? Through the food we eat. Hence, the next time you eat an apple or your favourite flavour of yogurt, make sure you go check out what microorganisms you have consumed in the process!

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Through The Lens

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Can you identify this snake endemic to the Western Ghats?

Science In Daily Life

Soap Up Your Game

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'Stay home.' 'Practice social distancing.' 'Wash your hands with water and sing happy birthday twice while applying soap.' The above statements are a few slogans we hear almost every day. The novel coronavirus outbreak has affected almost every country and it has become an alarming situation. Thus, it has become very important for us to pay serious attention to 'Sanitation.' Washing our hands with soap for 20 seconds is very important and now let us know why.

Viruses are made up of RNA (Ribonucleic acids) or DNA (Deoxyribonucleic acids), proteins and lipids. They are not bonded strongly and have weak covalent bonds. When a person coughs or sneezes, the droplets can travel up to 8 meters. Some viruses like the novel coronavirus spreads via droplets and can remain on skin and objects for a very long time. The droplet may dry off but the virus remains viable and comes in contact with the proteins of the skin and are strongly attracted. Water helps clean our skin but it is not as effective as using a soap along with it. Soaps are amphiphilic, which means they are both hydrophilic (water loving) and lipophilic (lipid loving). The hydrophobic (water hating) end binds to the lipids (like the lipid envelope of the virus) and the hydrophilic end of the soap binds to water molecules forming micelles. Micelles are composed of lipid molecules surrounded by a shell with the hydrophobic tail on the inside and the hydrophilic head on the outside. Thus, the amphiphiles in the soap form micelles which disrupts the lipid envelope of the virus and destroys it. A sanitizer may be used too as it contains alcohol (mainly ethanol) and acts as a disinfectant. It uses the property of dissolution. The alcohol in the sanitizer acts like a solvent which can dissolve the lipids making up the lipid envelope. This property is because 'like dissolves like', that is, a solvent can dissolve a solute with similar chemical properties.

Soaps and sanitizers are not only effective against viruses but also against several types of bacteria. It is the first step to protect yourself. Amidst a pandemic or not, washing hands is a good habit to acquire and inculcate. It may seem like a small measure but can save one from severe repercussions. So, go wash your hands after reading this!

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Stimulate Your Grey

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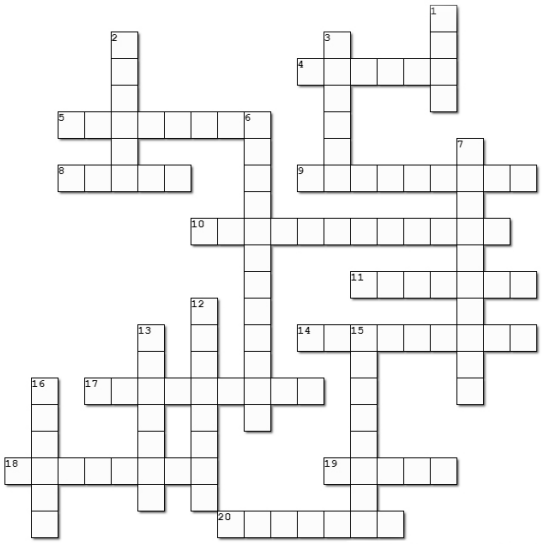
ASTRONOMY



Across

4. Belt of asteroids between Neptune and Pluto
5. A more common name for the Einstein-Rosen Bridge
8. Hottest planet in the solar system
9. Nearest spiral galaxy to the Milky Way
10. Occuring or situated between stars
11. Scientist who discovered radiation emission from Black Holes
14. Rover that discovered water on Mars
17. Stellar explosion of a massive star
18. Largest moon in the solar system
19. Largest moon of Saturn
20. Weakest fundamental force

Down

1. The Red Planet
2. Largest moon of Pluto
3. Process that powers stars
6. Point of no return in a Black Hole
7. Theory the unified space and time
12. Most abundan element in the universe
13. Planet with most number of moons in our solar system
15. Phenomenon by which space expansion is observed
16. A type of star system consistting of two stars

Long, Long Ago

Understanding Evolution-With Simple Examples

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We have all, in some context or another, heard or used the phrase "survival of the fittest", but have you ever wondered about its origin?

"Survival of the fittest" usually gives an idea of a struggle between species to outlive each other, bringing to mind a predator chasing its prey scene, when in fact, it is a much more subtle and gradual process taking place over generations.

"Fitness" refers to the reproductive ability of a species as compared to others in the same environment. It is analogous to natural selection, a theory proposed by Charles Darwin and Alfred Wallace. This theory suggested that natural selection is the driving force of evolution; meaning that species better adapted to an environment will survive and reproduce unlike another species in the same environment that is unable to adapt and hence, does not reproduce.

The correlation between these terms can be better understood with the help of an example. Suppose you wish to buy a pencil. You visit a shop and test several different varieties (species). You try each one out to decide which you prefer more. A regular wooden, graphite-tip pencil, or one with an eraser at the other end, or perhaps a mechanical pencil with an eraser as well as refill lead-tips. You use each of them and find that the mechanical pencil is best suited to your needs since it eliminates the need for a separate eraser as well as sharpener, so no more pencil shavings or broken nibs. So from now onwards, you only buy mechanical pencils, and the sale and production of old-fashioned wooden pencils ceases. In this way, if mechanical pencils were a species, then they would be naturally selected over regular pencils due to their maximum efficiency. Here, you can be viewed as the environment to which a pencil needs to adapt to, to be selected over the other varieties.

Natural selection is just one of many phenomenons that influence evolution, genetic drift being one of them. Genetic drift describes random fluctuations in the numbers of gene variants in a population. In other words, Genetic drift is random inheritance of genes or traits based purely on chance. This takes place only in small populations, and unlike the other factors, leads to loss of variations(differing traits) in a species. The genes or traits passed on may not be the ones fitted to survive, but do so anyway. Considering our example, this can be understood as your friend who picks up a certain type of pencil randomly at first and continues to use that type of pencil for a long time such that the final number of pencil types is distinct from the initial number of pencil types.

Another example of natural selection is of antibiotic resistance in microorganisms. With the increasing use of antibiotics, bacterial strains develop resistance thus reducing the efficacy of these antibiotics.

Thus, evolution is a dynamic phenomenon whose effects can be seen in all species throughout generations. Were it not for evolution and natural selection, we would not be here, twiddling our opposable thumbs, pondering over our origins.

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Thought Byte

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"One morning on a sparkling clear day, I climbed to the barren, moonlike alpine meadows of Karisimbi to a vantage point that enabled me to see the entire twenty-five-mile-long Virunga chain of extinct volcanoes. With my binoculars I saw very promising gorilla country in the gently rolling saddle terrain between Mts. Karisimbi and Visoke.
More than a decade later as I now sit writing these words at camp, the same stretch of alpine meadow is visible from my desk window. The sense of exhilaration I felt when viewing the heartland of the Virungas for the first time from those distant heights is as vivid now as though it had occurred only a short time ago. I have made my home among the mountain gorillas."

- *Gorillas in the Mist by Dian Fossey*

Dian Fossey was a leading authority on mountain gorillas. She spent thirteen years in the remote volcanic Virunga Mountain ranges shared by countries such as Zaire, Uganda and Rwanda. In 1967 she established the world renowned Karisoke Research Centre in Rwanda at an altitude of 10,000 feet. Throughout her time at the site she fought through challenging weather conditions like torrential rains, hails and fog all the while combating poachers, gorilla hunters and even revolutions.
She was the member of an exclusive group of scientists called Trimates. The other two members include Jane Goodall who studied Chimpanzees in Tanzania and Birute Galdikas who studied Orangutans in Borneo. All three of them were passionate, determined and committed towards their respective causes and did not let stereotypes of the time hinder their mission of providing the world with scientific findings of unparalleled nature. They were not just great scientists, they were trailblazers.

Answer to 'Through the Lens': *Trimeresurus malabaricus* (Malabar Pit Viper) - These snakes against the normal trend of egg-laying in reptiles, give birth to live ones that are almost always brown in colour but later take on colours ranging from green and brown to yellow and orange (as seen in the image; rare) and even blue over the course of their lifetime. This phenomenon is called Polymorphism ("Poly"-many, "morph"-form). The reason why these snakes exhibit this is not yet know.

Answers to 'Stimulate Your Grey':
Across: 4. Kuiper 5. Wormhole 8. Venus 9. Andromeda 10. Interstellar 11. Hawking 14. Curiosity 17. Supernova 18. Ganymede 19. Titan 20. Gravity
Down: 1. Mars 2. Charon 3. Fusion 6. Eventhorizon 7. Relativity 12. Hydrogen 13. Jupiter 15. Redshift 16. Binary

This is a collaborative endeavour of the Department of Life Sciences, Sophia College - Autonomous, Mumbai and the Department of Life Science and Biochemistry, St. Xavier's College - Autonomous, Mumbai; under the DBT STAR college scheme.

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