

The Luminary



SCIENCE SECTION

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Editorial

Our entire lives are surrounded by things that were created as a result of our scientific knowledge. Without science we wouldn't have electricity, televisions, cell phones, air-conditioning or the Internet. Our lives are completely reliant on technology and all technology is the result of our scientific knowledge. Science is the study of the natural world by systematic methods of observation and experiment. Technology is the application of science to practical purpose.

Sometimes the work of scientists might seem impractical. How could learning about the fundamental particles of the universe really affect our lives? How could something like quantum mechanics change things for anyone who isn't a physicist? Why do we need to explore Mars, when we have so much to do here on earth? The problem is that there is a lag time between a scientific discovery and a practical application. The quantum mechanics of the early 20th century is why we have flatscreen TVs today. So scientific advances are important and they affect all our lives.

A paradigm, a term coined by the historian of science Thomas Kuhn in his book "The Structure of Scientific Revolutions" published in 1962, is a set of practices that defines a scientific discipline at any particular period of time. Furthermore, according to Kuhn, all sciences have been, and continue to be subject to fundamental changes, resulting in paradigm shifts which ultimately bring about scientific revolutions.

In the 1960s, Kuhn was studying the work of Isaac Newton and noted that Newton's views about the motion of bodies had replaced the previous understanding of the scientific community. He suggested that the replacement of the Aristotelian worldview with the Newtonian worldview should be regarded as a scientific revolution. Another significant scientific revolution, is the Copernican Revolution. This was the point when the Heliocentric Theory (the sun is at the center of the solar system) replaced the Geocentric Theory (the earth is at the center of everything).

Examples of such paradigm shifts include the theories of relativity, theory of continental drift, Quantum mechanics, Gene transfer and evolution. For centuries, science accepted the biblical doctrine that God had designed living species perfectly, so their forms hadn't changed since their Creation. Darwin postulated that species could change and new species could arise from older ones. He also showed that change was shaped by natural selection, rather than divinity.

There's no official standard for deciding what counts as a paradigm shift. A paradigm shift will usually not occur unless there are significant problems with the current paradigm. In recent history, modern science has underwent radical

transformation through the development of new theories.

If the pace of scientific progress continues, we could be soon living in a world where majority of life threatening ailments will be treatable, where clean nuclear power will end the threat of climate change, where the brilliance of genetics would be used to bring the benefits of cheap and healthy food to the poorest of the poor and where we would be able to colonize new planets and make them hospitable.

Dr. Ashwani Kumar Sharma

Student Editorial

Traditionally science is a systematic enterprise that builds & organises knowledge in the form of testable explanation and predictions about the universe. The basis of science now needs to be broadened to accommodate the problem caused by anthropogenicity in nature and natural processes. The humans are exploiting the priceless gifts of nature so are suffering from its consequences in the face of disasters and calamities.

The science section deals with all the problems, their solutions and innovations that have been put forth in past few months to make humans life more sustainable on this planet as well as to begin life on some other planets in outer space. This section includes varied topics like science snippets, weird flora, autism spectrum disorder, ultimate fate of universe etc. which will enhance the knowledge of the readers and put forth some new questions which need to be answered. I hope this gets through to the readers and alleviates and satisfies their curiosity at the same time.

Nitika

BSC-III (Med.)

Science Snippets

- * There are more trees on earth than stars in our galaxy. NASA experts believe there are about from 100 billion to 400 billions stars in Milky way galaxy.
- * Acc. to 2015 paper published in the journal 'Nature' estimated that around 3.04 trillion of trees are there in world.
- * Only one letter doesn't appear in the periodic table. It's the letter 'J'.
- * Bananas are radioactive. For one of our strangest science fact bananas contain potassium & since potassium decays that makes it slightly radioactive. But its nothing you need to worry about. You need to eat 10,000,000 bananas at once to die of radiation poisoning.
- * Water can exist in three states at once. This is called triple point, water exist as gas, a liquid & solid simultaneously at a particular temperature. It requires very specific condition to achieve.
- * Only one type of mammal has wings. Those

- mammals are bats
- * It's impossible to burp in space. When you burp on Earth, gravity keeps down the solid & liquid from food you just ate. so only the gas escapes from your mouth. In absence of gravity the gas cannot separate from liquid & solids, so burping essentially turns into puking.
- * Men are more likely to be colorblind than women. The gene responsible for the most common type of color blindness are found on X chromosome. If men inherit the gene on their only X chromosome they'll become colorblind.
- * Scientist may finally have an answer to why eggs come in different shapes & apparently, it is all down to the bird's flying ability. It seems the best fliers are the one that lay eggs more pointy or elliptical shaped. While others are more likely to lay rounded or oval shaped eggs.
- * Rabbits & Parrots can see behind themselves without even moving their heads.
- * Most of the dust in your home is actually dead skin.
- * A hippopotamus may seem huge but it can still run faster than man.

Bhavisha Jain
B.Sc.I (Med.)

Ultimate Fate of The Universe

The fate of the universe is determined by its density. The preponderance of evidence to date, based on measurements of the rate of expansion and the mass density, favours a universe that will continue to expand indefinitely, resulting in the 'Big Freeze'.

Big Freeze or Heat Death-is a scenario in which continued expansion results in a universe that asymptotically approaches absolute zero temperature. This scenario, in combination with the big Rip scenario, is currently gaining ground as the most important hypothesis. Stars are expected to form for 1-100 trillion years, but eventually supply of gas needed will be exhausted & universe will slowly grow darker & black holes will dominate the universe & thus disappear emitting Hawking radiation. Heat death states that the universe goes to a state of maximum entropy in which there are no gradients, to sustain life.

Big Crunch- This assumes that average density of the universe will be enough to stop its expansion & begin contracting, resulting in collapsing of universe into a dimensionless singularity.

Big Bounce theory states that the universe will continuously repeat the cycle of a Big Bang, followed up with a Big Crunch.

Choosing among these rival scenario is done by 'weighing' the universe. However, these observations are not conclusive & alternative models are still possible.

Pyusha
B.Sc. III (Med.)

Flowers that can grow in space

Plants in space is about plants in outer space. In late 20th and 21st century plants were often taken into space in low earth orbit to grow in a weightless but pressurized controlled environment, sometimes called space gardens.

The first challenge in growing plants in space is how to get plants to grow without gravity. This runs into difficulties regarding the effects of gravity on root development providing appropriate types of lighting and other challenges. In particular, the nutrient supply to root as well as the nutrient biogeochemical cycles and the microbiological interactions in soil based substrates are particularly complex, but have been shown to make possible space farming in hypo and micro gravity.

NASA plans to grow plants in space to help feed astronauts and to provide psychological benefits for long term space light.

1. *Zinnia*: Zinnias have opened their pretty petals for the first time on the international space station. The Zinnias, grown part of the veggie program, have had a rough path. They battled excessive water overdrying and even enterprising fold before beginning to recover in early January. It is more sensitive to environmental parameters and light characteristic. It has longer growth duration between 60 to 80 days.

2. *Arabidopsis*: Dry Arabidopsis seeds were anchored in root tray of growth chamber. These seeds were successfully germinated from May 10 until the end of June 2001. Arabidopsis plants grew and completed a full life cycle in micro gravity. This experiment demonstrated that scientists are capable of providing environment conditions suitable for plant growth and development in micro gravity.

Amandeep Sharma
M.Sc.-I (Ph. Chem.)

The 2018 Nobel Prize in Physiology or Medicine

For the discovery of cancer therapy is by inhibition of Negative Immune Regulation.

Cancer kills millions of people every year and is one of humanity's greatest health challenges. By simulating the inherent ability of our immune system to attack tumor cells this year's Nobel Laureates have established an entirely new principle for cancer therapy.

- * James P. Allison studied a known protein that function as a brake on the immune system. He realized the potential of releasing the brake and thereby unleashing our immune cells to attack tumor. He then developed this concept into a brand new approach for treating patients.

- * In parallel, Tasuku Honjo discovered a protein on immune cells and after careful exploration of it's function, eventually revealed that it also operates

as a brake, but with a different mechanism of action. Therapies based on his discovery proved to be strikingly effective in the fight against cancer. Allison and Honjo showed how different strategies for inhibiting the brakes on the immune system can be used in the treatment of cancer. The seminal discoveries by the two laureates constitute a land mark in our fight against cancer.

Gagandeep
B.Sc.-I (Med.)

Weird Flora

1. White Baneberry (*Actaea pachypoda*): It is a small ball type plant native to North American forests. It is also called as doll's eye because of its special shaped fruits. This plant stands 60cm tall and only has very few leaves. Its red thick stems also look very attractive. The fruits are toxic.

2. Venus Flytrap (*Dionaea muscipula*): It is a "carnivorous plant". It means the plant consumes small insects and animals as food. Venus flytraps can be found in the Eastern Carolia especially have in wet inhabitants. They have special lobes to trap the prey animals. They close their lobes immediately when the insects comes in contact with plant. This plant will digest the insects within a time span of 10 days.

3. *Rafflesia arnoldii* :- It is the biggest individual flower in the world. It is mainly found in forests of Sumatra. It can grow up to a size of 3 feet. It produces an unpleasant irritating smell. It is unisexual i.e. both male and female reproductive systems are present.

4. *Welwitschia mirabilis* : It is a unique plant that is only found in the desert of Namibia. The estimated life span of this strange looking plant is between 500 and 1500 years. The most interesting thing about *Welwitschia* is the plant only has two leaves that grow continuously over time. Its roots penetrates very deep in earth.

5. *Hydnellum peckii* : It is a special type of fungi that produce blood or juice like fluid on its surface. This plant also known as 'bleeding tooth fungus'. It is the scarlet pigment causes blood like color on the fluid of this plant. This strange plant mainly found across North America and Europe. It is edible, but the blood like fluid is extremely bitter in taste.

Nitika Singla
B.Sc.-III (Med.)

Autism Spectrum Disorder

Autism is a neuro developmental disorder that begins in childhood and lasts throughout a person's life. Most effects of autism are on social life of person. It affects how a person acts and interacts with others, communicates and learns. Autism affects information processing in the brain by altering how nerve cells and their synapses connect and organise. As per 2015, Autism is estimated to affect 24.8 million people globally. Autism's hallmark signs usually appear by 18

months.

Autism is known as "spectrum": disorder because there is wide variation in the type and severity of symptoms people experience.

One of the most gifted minds in our history, 'Albert Einstein' has been on autism spectrum and he has been a high functioning autistic person. Musical maestro, Amadeus Mozart was on Autism spectrum too with symptoms like ultrasensitive hearing and inability to relate to others.

Scientist like Nikola Tesla and 3rd U.S. President. Thomas Jefferson were thought to be on spectrum. The term Autism Spectrum disorder includes autism (autistic disorder) Asperger's syndrome and Pervasive Developmental Disorder (PDD).

Asperger's syndrome is on the milder end of the autism spectrum. Person with syndrome may be very intelligent and able to handle daily life, but have much harder time socially.

Autistic disorder usually have same symptoms of lack of social communication, sensitivity to bright light and louder noise but at a more intense level.

Children whose autism symptoms are more severe than Asperger's syndrome, but not as severe as autistic disorder as said to have Pervasive Developmental Disorder (PDD).

Children disintegrative disorder is rarest and most severe part of spectrum. In this children lose many social, language and mental skills and often develop seizure.

All these earlier were considered as types of autism but now they all are called Autism spectrum disorders. ASD can be a lifelong disorder, but treatment, services and care can improve a person's symptoms and ability to function and communicate.

Autism is challenging and rewarding complex and a lifelong process of overcoming barriers everyday.

Mansi Achhoda
B.Sc.-III (Med.)

Clistopyga crossicaudata

An international team of researches have discovered seven new wasp species belonging to genus *Clistopyga* from Peru, Venezuela and Colombia. The most notable among them is *Clistopyga crossicaudata*, named after its distinct thickened ovipositor.

The ovipositor of species is a tube like organ present in many insects that help in laying eggs and also injecting venom. It is the only species of the group with strongly widened ovipositor said Ilari E. Saaksjarvi professor in Biodiversity Research at University of Turku, Finland.

The researchers say that these new species could be parasitic wasps, which lay their eggs near a host which the larva then feed on and eventually kills. All female wasps lay their egg into spider or spider egg sacs. The wasps seek out spiders living in insects and paralyse them with quick venom injection. The

female wasp lay its egg on spider and hatching larva eats paralysed spider as well as possible spider eggs.

The research group of Biodiversity unit is currently applying for funding for new field studies, the purpose of which is to look for more *Clistopyga* parasitoid wasp in rainforest of western Amazon. The goal is to describe the habits of peculiar wasp species & to decipher their evolutionary history.

Harpal Singh
B.Sc.-III (Med.)

Geckos that can regenerate damaged parts of their brains

The finding could lead to treatments for replacing human brain cells that have been lost or damaged due to injury, ageing or disease. Leopard geckos are well known for being able to shed their tails when threatened by predators, only to grow it back again. But now researchers at the University of Guelph, Canada have found that they may also be able to regenerate parts of their brains. The team discovered that the stem cells frequently produce new brain cells in the medial cortex of the geckos, a part of the brain that is responsible for social cognition and behaviour. This part of the lizard's brain has a well-studied counterpart in the human brain-the hippocampus. "The findings indicate that gecko brains are constantly renewing brain cells, something humans are notoriously bad at doing". To make the discovery, the team injected the lizards with a chemical label that latched onto the DNA of newly formed cells. The next step in this area of research is to determine why some species like geckos, can replace brain cells, while other species like humans cannot. Geckos can also regenerate their spinal cords, which extend the full length of the tail. Vickaryous and his team have discovered cell population in the brain that activate following tail loss. Researchers are exploring the role of these cells with the goal of helping people with spinal cord injuries.

Pankhuri
B.Sc.-III (Med.)

Insects with Human like faces

These insects have an unusual appearance of human faces. Whether they are the result of evolution or a hybrid product of human, they seem to amaze us with their incredible human features.

Skull Crab Spider

- * The bloated abdomen of the sickly white of this crab spider bears a mysterious resemblance to a human skull.
- * The female of this species is much bigger than male. About the size of the dime, it sits ready to pounce on its prey.
- * It produces a web, but only for emergency purposes and for protecting its eggs.

Samurai Beetle

- * This beetle from Japan is doubly interesting the

fact being, it shows a different face depending on which direction it's viewed from.

- * Look from behind and you're reminded of a bearded sage.
- * From the front the image is even more remarkable - a samurai's face, right down to the distinctive to additional hairstyle!

Death's Head Hawk Moth

- * Death's Head Hawk Moth is a large dark hawk moth especially of Mediterranean regions with markings resembling a human skull on the back of the thorax.
- * Death's head moth is, infact, so named for the striking skull like pattern on its thorax. The moths have been spooking people for centuries, but their behaviour is stranger still.
- * This is the largest moth to appear in Britain sporting a wingspan of upto 12 or 13cm. This is a striking species, though not a native. Immigrants arrive from Southern Europe, usually several in each year during late Summer and Autumn.

Alampreet Kaur
B.Sc. -III (Med.)

Artificial Intelligence boosts drug delivery to eradicate Malaria :

Using the next generation Artificial intelligence based tools, a team of researchers has developed a new end to end drug discovery pipeline to eradicate malaria.

Insilico Taiwan, a Taipei based subsidiary of Insilico Medicine, announced the result in a paper published in scientific reports, a journal published by the nature publishing group.

Plasmodium falciparum the most dangerous human malarial parasite, is believed to cause hundreds of millions of illness and about half a million deaths a year. *Plasmodium falciparum* causes malaria in humans by destroying human haemoglobin through falcipain -2.

"The control of malaria has been hindered by increasing resistance of malaria parasites to available drugs. New Anti-malarial drugs, ideally directed against new targets, are urgently needed," said the researchers.

To counter this challenge, the team from Insilico extensively studied the mechanism by which the protease inhibitor E64 approaches, interacts with and inhibits FP2.

The result should that the binding of E64 and FP2 are facilitated by the "amino acids of EP2 located within and nearby the previously identified binding pocket of FP2. This suggests that the anti-malarial drug design should focus on finding drug candidates that will bind tightly to the residues of established binding pockets subsites.

Kamalpreet Kaur
B.Sc.-III (Med.)

Weird Plant- Animal Relations

Species do not evolve in isolation. The web of life means that difficult species must adapt as they interact with each other. The interactions between these species can be very much interesting & sometimes both the species evolve together in a way that benefit each other. Some of the examples of animal & plant species locked in weird relationships are :-

* **Mint-Sauce Worms and Algae :**

It is not so unusual for animals to live in plants. However, *Symsagittifera roscoffensis* is a worm that has evolved to have plants living in it. These mint sauce worms never eat instead get all their energy via the algae that live inside them. Due to absence of guts in juvenile worms do not digest the algae. Algae receive a safe home to live in. The worms live on beaches when the tide is out, they rise to surface to expose their symbiotic algae to sunlight. Thus mint sauce worms & algae act as a true animal plant partnership.

* **Plants that call to Predators :**

We know that plants provide a home for insect to protect themselves from herbivores but this relationship is bit clingy. Some plants wait until they are under attack to call in animal helpers. When a tobacco plant is damaged by a caterpillar munching on its leaves, the plant releases volatile organic chemicals, which rapidly spread through air which attracts predatory insects. They descend on the caterpillar & eat the caterpillars. The plant benefits, the predator benefits the caterpillar... not so much.

* ***Duroia hirsuta* and Ants**

The Amazon rain forest is famous for its biodiversity. Large number of species of plants & animals live together in one of the richest ecosystems of the planet. Yet there are patches on the rain forest that seem to consist of only a single species of tree - the *Duroia hirsuta*. It produces chemicals which inhibit the growth of other plants, but their dominance is due to an ant species. These ants act as an army to defend their home. They search the jungle floor for seedlings of other plants & poison them with their formic acid. This prevents other plants from stealing the light needed by *Duroia hirsuta*. In turn, this increases the size of ants home.

Nishtha Goyal
BSc- III (Med.)

Coconut oil more effective than insect repellents

Acc. to the study, compounds derived from coconut oil are better than DEET at preventing disease transmission and discomfort associated with insect bites.

For more than 60 years, DEET has been considered the gold standard in insect repellents - the most effective and long-lasting available commercially.

The study, published in the Journal scientific reports, identified specific coconut oil fatty acids that have strong repellences and long lasting effectiveness against-Mosquitoes, ticks, biting flies and bed bugs that can transmit diseases to humans and animals

A team of scientists led by Junwei Zhu found that the coconut oil compounds were effective against biting flies and bed bugs for two weeks and had lasting repellency against ticks for atleast one week in laboratory tests.

The coconut oil derived free fatty acid mixture-lauric acid, capric acid and caprylic acid as well as their corresponding methylesters provides strong repellency against blood sucking insects.

Against bed bugs and ticks, DEET lost its effectiveness after about three days, while the coconut oil compound lasted for about two weeks .

According to Mr. Zhu, coconut oil fatty acids also provides more than 90% repellancy against mosquitoes - including *Aedes aegypti* the mosquito that can transmit the Zika virus.

Dinkar
B.Sc.-III (Med.)

Hydrogen Finally Mega-Evolved

As reported back in September, two studies each with a different approach were attempting to create metallic H_2 , and now more than 80 years after it was predicted to be possible. The Harvard University team has finally managed to produce the elusive state. Physicists Isaac Silvera, who has been working on this problem for 45 years, and Ranga Dias published their study's results this week in the Journal science. To develop metallic H_2 , Silvera's team squeezed 2 opposing heavy duty diamonds and they transitioned it into its liquid state by lowering the temperature of -252°C (-423°F). They then gradually increased the applied pressure on the solid hydrogen by twisting a steel screw to exert force on the diamond anvil. It was then the changes were noticed. At about 2 million atm, the H_2 stayed transparent. It turned an opaque black at 4 million atm, pressure level. Then at around 4.95 million atm, the H_2 started to reflect 90% of light shone on it. This means it has become metallic a state of H_2 never existed. Silvera calls it " The Holy grail of high-pressure physics."

Shikha
B.Sc.-III (Med.)

Living In Space The Thrilling Life of An Astronaut

The International space station (ISS) is a habitable science laboratory flying at an altitude between 330 and 435 km from earth. On a clear day ISS is easily visible to the naked eye. From the ground as it is the third brightest object in the sky.

Living in space is not the same as living on earth. Many things are different. The way astronauts move, sleep, stay and clean is different. Learn some interesting facts about the thrilling lives of astronauts.

1. How do astronauts move around, inside the space station?
 - Astronauts float around inside the space station because they are in a free falling motion towards the earth. Since everyone floats inside the space station, none uses his feet to move around. As a result, the soles of the astronaut's feet start to shed from lack of use after the first couple of months. If a crew member removes his or her socks too quickly, a flurry of dead skin flakes will fill the cabin.
2. How can the astronauts sleep while their bodies are floating?
 - It is not good to be floating away somewhere while sleeping so the astronauts use small sleeping compartments and sleeping bags. They will strap their bodies loosely so that their bodies will not float around while they sleep in the space shuttle. Eye masks and Ear plugs are also available for the astronauts who are unable to sleep due to the noise from air conditioning and other machines.
3. How do toilets in space ?
 - The toilets look similar to a western style toilets that we use on earth. However, there is slight difference. The astronauts fasten their bodies to the toilets so that they would not float away. They then use a vacuum cleaner like machine to suck up the waste. The wastes are then vacuum dried.
4. What do they wear when they venture outside the space shuttle ?
 - When the astronauts venture outside the space shuttle to work in space, they wear space suits. These space suits are high performance suits with various functions that are designed to protect the astronauts from an environment that is too harsh for a human being.
5. How do they take bath ?
 - Since water does not flow under zero gravity environment, the astronauts cannot wash their hands under a faucet as you do on earth. When the astronauts want to clean their body, they simply wipe their bodies by using a wet towel soaked with a body shampoo. When the astronauts wash their hair they use waterless shampoo, which does not need any water for rinsing.
6. Do they need special clothes to wear?
 - Inside the space shuttle, the air pressure is kept at 1 atmosphere, which is the same level as on earth. The temperature and humidity are controlled so that the astronauts can live comfortably therefore, the astronauts dress in the same manner that we do on earth.

Aradhna
B.Sc.-III (Med.)

A teaspoonful of neutron star weighs 6 billion tons

A neutron star is the remnants of a massive star that has run out of fuel. The dying star explodes in a supernova while its core collapses on itself due to gravity, forming a super dense neutron star. Astronomers measure the mind-bogglingly large masses of stars or galaxies in solar masses with one solar mass equal to sun's mass (i.e. 2×10^{30} kg) Typical neutron stars have a mass of upto three solar mass which is crammed into a sphere of radius ten kilometers - resulting in some of the densest matter in known universe!!

Nishtha Goyal
B.Sc.-III (Med.)

Plastic Eating Bacteria - A Great hope in Biodegradation

Polyethylene Terephthalate (PET) is a chemically stable polyester. The use of PET has increased by several times in past especially in making food and drink containers, electronic components etc. PET is mostly used in manufacturing of drinking water bottles. Used water bottles are regularly found littering in aquatic environment. Plastic also puts a big chemical burden on the environment. The major form of pollution is also associated with plastic.

Several groups of scientists are working throughout the world to find out ways of Biodegradation of plastics. Few species of fungus having properties of growing on plastics were isolated. But it is known that fungus can not be easily grown like Bacteria. Scientists has identified a species of bacteria which eats PET found in most disposable water bottles.

Scientists from Kyoto Institute of Technology and Keio University collected 250 PET contaminated samples such as sediment, soil and waste water from plastic bottles. Ultimately they discovered just one of the Bacterial species was responsible for the PET biodegradation. The Bacteria was named as "Ideonellasa kainesis". They also found that these bacteria used two enzymes to breakdown the PET.

After adhering to the PET surface the bacteria secretes one enzyme on to the PET to generate an intermediate chemical.

This chemical is then taken up by the cell where another enzyme breaks it down further and thus provides the bacteria with carbon and energy to grow.

The research team showed that the bacteria could break down to a thin film of PET over the course of 6 weeks at a temp. of 30°C.

It is not clear whether it could help in keeping plastic out of waste area or not.

The study has shown a great hope for biodegradation of PET.

Kusham Sharma
B.Sc. -III (Med.)

World of Medicine

In a National Institutes of Health study, vegan and vegetarian participants tended to score higher than meat eaters on a depression-measuring scale. While the results don't prove causality, it wouldn't be surprising if nutritional shortfalls were to blame, the researchers said. In particular, vegetarians and vegans are often low in vitamin B₁₂ and animal products are the only natural source of this nutrient. However, it's possible to reach the recommended level by taking supplements or by eating fortified foods such as soya milk & breakfast cereal.

Diabetes meds can combat Osteoporosis

Because type 2 diabetes affects bone metabolisms, it's not uncommon for people with the illness to develop osteoporosis. In fact, many medications treat both diseases. Researchers in the United Kingdom and Greece found that metformin (such as glycomet that cetapin), sulfonylureas (e.g. Amaryl), DPP-4 inhibitors (such as Galvus and Trajenta) and GLP-1 receptor agonists (e.g. Victoza and trubicity) work best to help strengthen bones and control diabetes.

Dim light making you dim?

Working in a poorly lit office isn't just depressing, it may actually make you dumber. In a study from Michigan State University, USA, Male grass rats who spent their days in dim light did not do well on spatial learning tasks and showed a 30% decrease in the number of dendritic spines - the connections that allow neurons to communicate. Rats were exposed to bright light, though improved their performance.

Tears help diagnose Parkinson's

Researchers found that tear samples from people with Parkinson's disease had higher levels of a toxic form of a protein called alpha-synuclein than those from healthy individual. This discovery might one day allow doctors to diagnose and even treat Parkinson's before symptoms appear.

Monika Thakur
B.Sc.-III (Med.)

Newly identified orangutan - World's Most Endangered great Ape species

A newly discovered species of orangutan is already teetering on edge of extinction. The Tapanuli orangutans (*Pongo tapanuliensis*) have been identified as the most endangered great ape species in the world consisting of less than 800 individuals. A population of orangutans that lives in a remote part of Northern Sumatra, that was only discovered in 1997, has now been identified as separate species. With only around 800 individuals known to exist, it's now also the most threatened of all great ape species.

It was once believed that all orangutans were one species but since 1997 science has recognised two : The Bornean & Sumatran orangutan (*Pongo*

pygmaeus & *Pongo abelli* respectively) but initially the apes were thought to be of the species *Pongo abelli*.

However, close study of an adult skeleton found has revealed significant differences in the skull and teeth of the Batang Toru apes, leading to their new classification : *Pongo tapanuliensis* or the Tapanuli orangutan. Genomic analysis suggests that the species must have split from *Pongo abelli* around 70,000 years ago.

With just 800 individuals known, *Pongo tapanuliensis* goes straight to the top of the endangered great apes league table, not least because large areas of its habitat are threatened. The discovery isn't great news for *Pongo abelli* in that regard either-there are now 800 less of them than was previously believed.

Nitika
B.Sc.-III (Med.)

Progeria (HGPS)

Progeria is an extremely rare autosomal dominant genetic disorder in which symptoms resembling aspects of ageing are manifested at a very early stage/age. Progeria is one of several progeroid typically line to their mid-teens to early twenties.

It is a genetic condition that occurs as a new mutation, and is rarely inherited as carriers usually do not live to reproduce. Although, progeria applies to our diseases characterised by premature ageing symptoms and if often used as such, it is often applied specifically in reference to "Hutchinson- Gilford Progeria Syndrome" (HGPS).

Children with progeria usually develop first symptoms during the first few months of life. The earliest symptoms may include a failure to thrive and a localised scleroderma like skin conditions. Later the condition causes wrinkled skin, Atherosclerosis. Kidney failure, loss of eyesight & cardiovascular problems.

The cause of this disease is due to LMNA gene, code for a structural protein called prelamin which undergoes a series of processing steps before attaining its final forms called Lamin A.

Diagnosis is suspected according to signs and symptoms, such as abnormal growth, loss of hair etc. A genetic test for LMNA mutations can confirm the diagnosis of progeria.

Treatment of this disease is not yet proven to be effective. Most treatment options are focussed on reducing complications with coronary artery, bypass surgery and low-dose aspirin. Also there has been attempted growth hormone treatment. As there is no known cure, few people with progeria rarely exceed 13 years of age.

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Transforming face of Environmentalism in India

Environmentalism is a broad philosophy, ideology and social movement encompassing concerns for environmental protection and improvement of the health of the environment. At its root, environmentalism is an attempt to balance relations between humans and the various natural systems on which they depend in such a way that all the components are permitted a proper degree of sustainability.

Indian environmentalism has always been drastically dissimilar to its western counterpart. The concept of 'protectionist conservationism' is what predominates across the archetypes of environmental management in the western world. The Indian environmental movement, however, was founded on the ideals of 'utilitarian conservationism'. This is simply because of the large populace whose survival depends on their environment— for firewood, food, water, building materials, medicines and fodder for their animals. The destruction of the forest would threaten their very livelihoods. Their cause, in fact, had little to do with trees; it was more selfish. Their own lives were so interwoven with the existence of those trees that they sensed their culture and survival to be in jeopardy. Hence, the protest and struggle.

This was also the groundwork of the nationwide environmental movement which mushroomed during the 1980s and 1990s with remonstrations against deforestation, construction of dams, destruction of wildlife, and growing pollution. India never witnessed the rise of green groups like Greenpeace or Friends of the Earth. It was not ecology but socio-ecology at work — a pro-underprivileged, anthropological-centered environmental ethic compared to the ecology-centered environmental ethic championed by the environmental campaigners of the West.

In the West, the environmental movement had evolved essentially out of a desire to protect endangered animal species and natural habitats. In India, however, it ascended out of the necessity of human survival. This was an environmentalism of the poor, which married the concern of social justice on the one hand with sustainability on the other. Back in the 1970s, when the state occupied the commanding heights of the economy, and India was close to the Soviet Union, the activists of Chipko and other such movements were dismissed by their critics as agents of Western imperialism. They had, it was alleged, been funded and promoted by foreigners who hoped to keep India backward. Slowly, however, the sheer persistence of these protests forced the state into making some concessions. In 1980, a Department of Environment was established at the Centre, becoming a comprehensive Ministry a few years later. New laws to control pollution and to protect natural forests were enacted. There was even talk of

restoring community systems of water and forest management. Meanwhile, journalists and scholars had begun more systematically studying the impact of environmental degradation on social life across India.

Through these varied efforts, the environmentalism of the poor began to enter school and college pedagogy. Textbooks now contained mentions of the Chipko and Narmada movements. University departments ran courses on environmental sociology and environmental history. Specialist journals devoted to these subjects were now printed and read. Elements of an environmental consciousness had, finally, begun to infiltrate the middle class.

In 1991 the Indian economy started to liberalize. The dismantling of state controls was in part opportune, because the license permit quota Raj had smothered innovation and entrepreneurship. Unfortunately, the proponents of liberalization mounted an even more unrestrained attack on environmentalists than did the votaries of state socialism. Under their influence the media, once so receptive to environmental matters, now began to demonize people like Medha Patkar, leader of the Narmada movement. Influential columnists accused that she, and her comrades, were artefacts from a bygone era, orthodox leftists who wished to keep India backward. In a single generation, environmentalists had gone from being seen as capitalist comrades to being damned as socialist puppets.

Environmentalists were attacked because, with the dismantling of state controls, only they asked the hard questions. In the intervening time, the environment continued to deteriorate. The levels of air pollution were now shockingly high in all Indian cities. The rivers along which these cities were situated were effectively dead. Groundwater aquifers dipped alarmingly in India's food bowl, the Punjab. Districts in Karnataka were devastated by opencast mining. Across India, the untreated waste of cities was dumped on villages. Forests continued to decline, and sometimes disappear. Even the fate of our national animal, the tiger, now hung in the balance.

In the 1980s and 1990s, the finest minds in the environmental movement sought to marry science with sustainability. They sought to design, and implement, forest, energy, water and transport policies that would augment economic productivity and human welfare without causing environmental stress.

A wise, and caring, government would have intensified the precocious, visionary efforts of our environmental scientists. Instead, rational, fact based scientific research is now treated with contempt by the political class. The Union Environment Ministry has warped completely to accomplish corporate and industrial interests. The situation in the States is even

worse. India today is an environmental cataclysm in the waiting; marked by polluted skies, dead rivers, falling water tables, ever increasing amounts of untreated wastes and disappearing forests. India needs a neoteric batch of environmentalists, who espouse the synergistic notions of utilitarian and protectionist conservation in order to sustain its ecological heritage for the imminent generations.

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CANNABIS SATIVA – A Medicinal Plant

Cannabis sativa is an annual herbaceous flowering plant indigenous to eastern Asia. It has been cultivated throughout and used as a source of industrial fiber, seed oil, food, recreation, religious and spiritual moods and medicine. The plant, *Cannabis sativa* contains many different compounds called Cannabinoids. The two most significant ones are tetrahydrocannabinol (THC) and cannabidiol (CBD). The compound CBD is of great interest to researchers for its medical properties. Cannabis oil is a general term for any liquid extract that's made from cannabis or hemp plants. CBD oil is derived from the *Cannabis* plant and used as cure for joint pain to epilepsy. The CBD oil is extracted from the plant, and then diluted with carrier oil like hemp seed. This oil can be consumed or mixed into food or drinks. It works as a chemical messenger in our brain and body. This substance act on our 'endocannabinoid system', a complex part of the nervous system that helps regulate a variety of processes – including our sleep cycle, appetite, pain sensation, mood and memory. The oil helps to relieve pain, inflammation and reduces anxiety. Its products are available in health food shops. One CBD-based drug which is licensed for use in the UK is Sativex, used for the treatment of multiple sclerosis. It contains CBD and THC. Epidiolex, a highly-purified form of CBD used to treat epilepsy, has been approved in the US.

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X-ray Crystal Structure Enzyme that Drives New Broad Spectrum of Antibiotics from Fluorescent Soil Bacteria

Researchers have solved the X-ray crystal structure of the enzyme that makes obafluorin -- a broad spectrum antibiotic agent made by a fluorescent strain of soil bacteria. This new class of antibiotics might provide a powerful antidote to the growing scourge of antibiotic resistance. Understanding how antibiotic scaffolds are constructed in nature can help scientists prospect for new classes of antibiotics through DNA sequencing and genome mining. Researchers have used this knowledge to help solve the X-ray crystal structure of the enzyme that makes

obafluorin -- a broad spectrum antibiotic agent made by a fluorescent strain of soil bacteria. The new work from Washington University in St. Louis and the University at Buffalo is published July 31 in the journal *Nature Communications*. A multi-part enzyme called a nonribosomal peptide synthetase produces the highly reactive beta-lactone ring that is responsible for obafluorin's antimicrobial activity.

"Obafluorin has a novel structure compared to all FDA-approved antibiotics," said Timothy Wencewicz, assistant professor of chemistry in Arts & Sciences. "In the long term, we really need new structural classes of antibiotics that have never been contaminated by clinical resistance from established antibiotic classes." Obafluorin is made by a fluorescent strain of soil bacteria that forms biofilms on plant roots. Obafluorin was originally discovered in 1984, but it wasn't until 2017 that Wencewicz uncovered the genetic blueprint of the enzyme that makes the molecule's bio-active components. That discovery marked the first time that anyone had been able to pin down a beta-lactone forming enzyme from nature, and recreate it in the laboratory.

Like penicillin, obafluorin has a four-membered ring -- sometimes called an enchanted ring. A four-membered ring puts strain on bond angles that carbon prefers to adopt. But because a four-member ring is unstable, these molecules are also short-lived and difficult to make. For example, it took years for chemists to learn how to synthesize penicillin from chemicals and then figure out how fungi make it. This ultimately led to the global production of penicillin by fermentation. Finding an antibiotic from a source in nature is only a first step in a long process of drug development. With the structure and techniques reported in this research, it is now possible to quickly and easily create analogs of the natural product in the laboratory to optimize its molecular properties and bioactivity.

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IIT Indore Develops A Prototype 'Jellyfish' Robot to Record Marine Life.

The Indian Institute of Technology (IIT) Indore has developed a prototype version of a robot resembling a jellyfish, with the goal of documenting marine life at close ranges using an attached camera. Earlier Erik Engeberg, a mechanical engineer at Florida Atlantic University developed this robot. The device had eight tentacles made of soft silicone rubber. The water inflates the tentacles, making them stretch out. Engeberg group described it's robot in September 2018 in *Bioinspiration and Biomimetics*.

The head of IIT Indore's Mechatronics and Instrumentation Laboratory, I.A. Palani, said the prototype robot, which weighs around 250 grams, has been developed after six months of research. This

new robot has been developed in such a way that it looks like a jellyfish, so that marine creatures find it natural and they can go close to it. Its camera can capture their activities," he said, adding that a soft polymer has been used in its structure.

"A motor is used in the traditional robots developed for the study of marine life. This limits their functionality as aquatic creatures may get affected due to the sound of the motor. Hence, it may become difficult to capture the natural movement of marine creatures in the ocean," Palani added. Considering this shortcoming of motor-driven robots, new robot used the wires of shape memory alloys (SMA). The continuous heating and cooling of the SMA wire-based polymer structure subjected to expansion and contraction of its body with tentacles which generate thrust to make the jellyfish robot to move in water. jellyfish robot has been tested in the laboratory environment. It moved one centimeter per second during these tests. The robot can be recharged with the help of sunlight by keeping it floated on the surface of the ocean.

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Important Medicinal and Aromatic Plant Species Found in the Campus of Multani Mal Modi College, Patiala

Medicinal plants have gained popularity worldwide for the treatment of diseases and maintenance of health. There is a huge demand at the national as well as international level for herbal drugs, there is a need to maintain the quality and purity of plant material. Authentication of medicinal plants is of utmost importance for safety and efficacy of herbal drugs. The article aims to familiarize the reader with the medicinal plants found in the campus of Multani Mal Modi College, Patiala.

GURHAL:

Botanical name: Hibiscus rosa-sinensis

Family: Malvaceae

Description: A perennial shrub with alternate leaves and bright red coloured flowers.

Plant part used: Flowers, leaves

Active constituents: Flavonoids such as Rutein, Quercetin, Kaempferol, and Myricetin.

Therapeutic use: Usually red coloured variety is preferred. Decoction of leaves is used to regulate menstruation and blood circulation. Fruits are employed in cases of sprains, wounds and ulcers.

MARUA

Botanical name: Origanum majorana

Botanical name: Labiatae or Lamiaceae

Description: A small herb with fragrant leaves and creamish-white flowers.

Part used: Leaves and flowers.

Active constituents: Carvacrol, Thymol.

Therapeutic use: used for culinary purposes and also

in cosmetic preparations. Also used in cold and cough medicines for its antiseptic and antibacterial properties.

ALOE VERA

Botanical name: Aloe barbadensis

Family: Asphodelaceae

Description: Perennial fleshy plant, flowers yellow.

Part used: Pulp

Active constituents: Pulp contains glucoside barbaloin, b-barbaloin, and aloe-emodin.

Therapeutic use: Used as bitter, stomachic, antihelminthic, and blood-purifier. Important constituent of skin care products.

AMLA

Botanical name: Emblica officinalis

Family: Phyllanthaceae

Description: Deciduous tree, flowers greenish, minute

Part used: Fruits, bark, leaves

Active constituents: Phyllembin, vitamin C, Gallic acid, tannins, and pectins.

Therapeutic use: Helps in maintaining proper hair health, prevents hair loss due to high content of Vitamin C. It also promotes digestion and has anti-inflammatory properties.

ANTAMUL

Botanical name: Tylophora indica

Family: Asclepiadaceae

Description: Evergreen climbing shrub, flowers pinkish-yellow.

Part used: Leaves

Active constituents: Alkaloids containing tylophorine.

Therapeutic use: Leaves are useful in cold, cough, and asthma. Roots are regarded as abortifacient.

ASHWAGANDHA

Botanical name: Withania somnifera

Family: Solanaceae

Description: Perennial shrub with greenish axillary flowers.

Part used: Roots, leaves.

Active constituents: Withanol, Withanine, Somniferene

Therapeutic use: Aphrodisiac, tonic, diuretic, narcotic, sedative, useful in rheumatism, cough, and general weakness.

BAEL

Botanical name: Aegle marmelos

Family: Rutaceae

Description: A large tree, with greenish-yellow flowers and large stony fruits.

Part used: Fruits, leaves, Roots

Active constituents: The fruits contain Marmalasin, bark contains coumarin and umbelliferone.

Therapeutic use: It is useful in dysentery, diarrhea, appetite, and digestion. The roots are one of the ingredients of 'Dasamool' of Ayurveda.

BHRINGRAJ**Botanical name:** *Eclipta alba***Family:** Asteraceae**Description:** An annual herb with lanceolate leaves and white flowers.**Part used:** whole herb**Active constituents:** Menthol, Stigmasterol.**Therapeutic use:** Used as tonic in hepatic and spleen enlargement. The 'Bhringraj oil' prepared from the herb is of great repute as a hair dye and also acts as a brain coolant.**BHUMI AMLA****Botanical name:** *Phyllanthus niruri***Family:** Phyllanthaceae**Description:** An annual herb with greenish-white flowers on lower side of leaves.**Part used:** Whole plant**Active constituents:** Phyllanthusolactone**Therapeutic use:** liver tonic, constipation, stomachache, dysentery, and diarrhea.**DHATURA****Botanical name:** *Datura innoxia***Family:** Solanaceae**Description:** An annual herb with large creamish-white flowers.**Part used:** Whole plant**Active constituents:** Atropine, Hyoscyamine, Scopolamine**Therapeutic use:** The herb is violently narcotic, and is used in insomnia and mental disorders.**GILOE, AMRITA****Botanical name:** *Tinospora cordifolia***Family:** Menispermaceae**Description:** A glabrous climber with heart-shaped leaves and greenish-yellow flowers.**Part used:** leaves, stem**Active constituents:** Tinosporin, Giloin, Giloinin**Therapeutic use:** Anti-helminthic, anti-pyretic, general weakness, and dengue fever.**HENNA****Botanical name:** *Lawsonia innermis***Family:** Lythraceae**Description:** A much branched shrub, with small fragrant white or pinkish flowers.**Part used:** Leaves, bark, and seeds**Active constituents:** Lawsone, Hennadiol**Therapeutic use:** Paste of leaves is applied on head and feet for relieving headache, and burning sensation in feet.**JAMUN****Botanical name:** *Syzygium cumini***Family:** Myrtaceae**Description:** A large evergreen tree with greenish-white fragrant flowers.**Part used:** Fruits, seeds**Active constituents:** Lauric acid, Myristic acid, Oleic acid**Therapeutic use:** Seed powder is used in curing diabetes. The bark is used in asthma, throat sores, and bronchitis.**MOR PANKHI****Botanical name:** *Thuja orientalis***Family:** Cupressaceae**Description:** An evergreen shrub with scented leaves.**Part used:** Leaves, fruits**Active constituents:** Thujone, Isothujone**Therapeutic use:** Anti-inflammatory, expectorant, antibacterial, anti fungal. Seeds are used as liver tonic. Leaf extracts are also used in perfumery industries.**NEEM****Botanical name:** *Azadirachta indica***Family:** Meliaceae**Description:** A large tree with pinnate leaves and fragrant white flowers.**Part used:** whole plant**Active constituents:** Margosine, Azadirachtin, Nimbidiol, Nimbosterol**Therapeutic use:** Leaf extracts are used as antihelminthic, insect repellent, intestinal worms, skin infections.**TULSI****Botanical name:** *Ocimum sanctum***Family:** Lamiaceae**Description:** A much-branched, aromatic herb with purplish flowers.**Part used:** whole plant**Active constituents:** Eugenol, methyl eugenol**Therapeutic use:** Antibacterial, Antifungal, cold, cough, and bronchitis.**SADABAHAR****Botanical name:** *Vinca rosea***Family:** Apocyanaceae**Description:** A small evergreen herb with pink coloured flowers.**Part used:** flowers, leaves**Active constituents:** Vincristine, Vinblastine**Therapeutic use:** Also known as 'Miracle drug', Vincristine and Vinblastine alkaloids are used in the treatment of Leukaemia, breast cancer.**SHATAWAR****Botanical name:** *Asparagus racemosus***Family:** Asparagaceae**Description:** A much branched perennial shrub with white flowers.**Part used:** Roots, flowers**Active constituents:** Shatavarin**Therapeutic use:** Diuretic, tonic, helps in reducing the symptoms of AIDS.

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