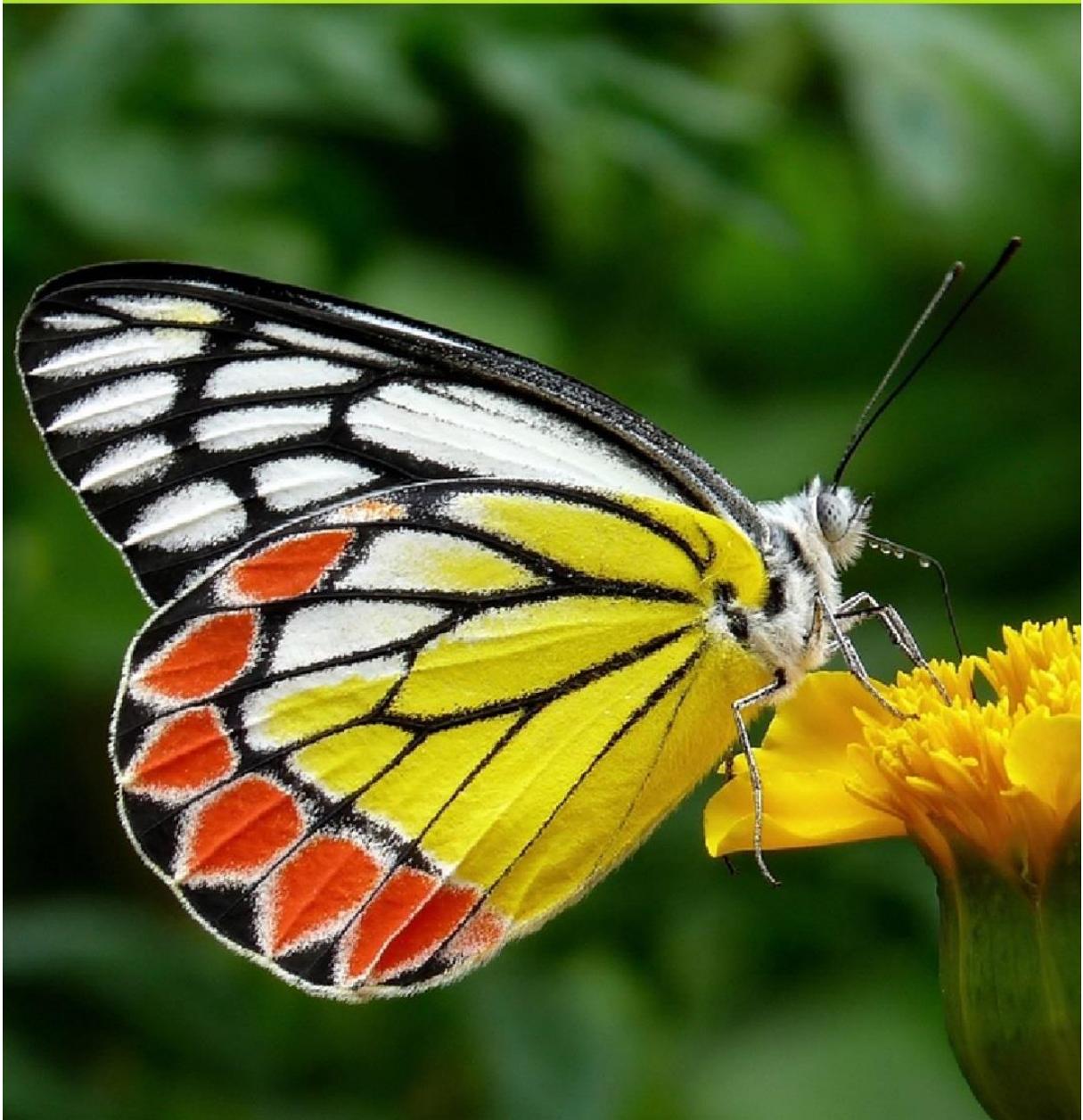




2026 ISSUE

# SHEKRU

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Nagpur Shikshan Mandal's  
**SHRI MATHURADAS MOHOTA COLLEGE OF SCIENCE, NAGPUR**

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# **SHIKRU**

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## EDITORIAL

Dear Readers,

On the great occasion of National Science Day, we welcome you all to the second annual issue of SHEKRU. Recently, the 2025 Nobel Prize in Physiology or Medicine was awarded to Mary E. Brunkow, Fred Ramsdell, and Shimon Sakaguchi for their discovery of regulatory T-cells (Tregs) and the Foxp3 gene, which are the key to peripheral immune tolerance. Their work identified the immune system's "peacekeepers" that prevent the body from attacking its own tissues, a finding that has opened new avenues for treating autoimmune diseases, cancer, and improving organ transplantation.

Last year can be called the year of artificial intelligence, as there was a lot of hype surrounding AI. In an era where AI creates life-like pictures and videos, extremely advanced telescopes peer into the farthest galaxies, and gene editing promises to provide a cure for various genetic disorders, science is no longer limited to the pages of textbooks, or the confines of laboratories. It is everywhere, shaping our minds and challenging our knowledge.

This issue of SHEKRU celebrates the spirit of inquiry that drives the pursuit of scientific knowledge. From the question of the fundamental elements we are made of to the question of habitat loss threatening biodiversity, we explore the subjects that inspire deep contemplation.

Science is not just a tool for understanding the world. It is a mirror reflecting our values, our hopes, and our fears. Let us use it wisely for the benefit of all humankind.

28 Feb 2026

Editor

SHEKRU

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## WILDLIFE PHOTOGRAPHY

Aachal Meshram (B.Sc. Sem-II)



Sambar doe with fawn



Gaur, the largest bovine in the world

Wildlife photography is far more than just capturing beautiful images of animals. It is a vital tool for conservation, education, and raising awareness about the natural world. It serves as a powerful visual medium to document species, especially those that are endangered or threatened. By showcasing the beauty and fragility of wild animals and their habitats, wildlife photographers can create an emotional connection with the public, inspiring a sense of urgency and action towards conservation efforts. A single, impactful photograph can tell a story of environmental plight or success, reaching a far wider audience than scientific data alone.

For researchers, wildlife photography is an invaluable tool. It provides visual data on animal behaviour, population changes and the health of ecosystems. Photographs often document species in remote locations, providing crucial information that aids in conservation

strategies and research.

In a world where many people are disconnected from nature, wildlife photography bridges that gap. It brings the wild into our homes, schools and colleges, educating us about biodiversity and the intricate relationships within ecosystems. These images foster a deeper appreciation and respect for nature, encouraging people to care about protecting it for future generations.

Wildlife photography requires patience and a deep understanding of animal behaviour, promoting a respectful approach to observing and documenting the natural world. It is a critical art form that goes beyond aesthetics. When practiced ethically, it tells an authentic story, and is a powerful instrument for scientific documentation and advocacy, playing a significant role in our collective effort to protect and preserve the planet's diverse and fragile wildlife.

## FISH MIGRATION

Anuj R. Onkar (B.Sc. Sem-II)



Migrating salmon



Migration is essential for many fish species

Migration is one of the most fascinating behaviours observed in the animal kingdom, and fish are no exception. Fish migration refers to the regular, large-scale movement of fish from one habitat to another, often driven by changes in breeding, feeding, or environmental conditions. These migrations are crucial for the survival of many species.

Fish migration can be classified into different types depending on their purpose and direction:

(1) Anadromous Migration: Fish move from the sea to freshwater to spawn. A classic example is the salmon, which hatches in rivers, grows in the ocean, and returns to rivers to reproduce.

(2) Catadromous Migration: Fish migrate from freshwater to the sea for spawning. The most classic examples of this type of migration are the eels belonging to the genus *Anguilla*.

(3) Potamodromous Migration: It is the movement of fish that occurs

entirely within freshwater habitats, such as rivers, lakes and streams.

Fish migrate for several biological and ecological reasons such as:

1. Reproduction: One of the primary drivers of migration is spawning. Many fish species move to specific habitats that offer safer or more suitable conditions for their eggs and young.

2. Feeding: Some fish travel long distances to find rich feeding grounds that sustain their growth.

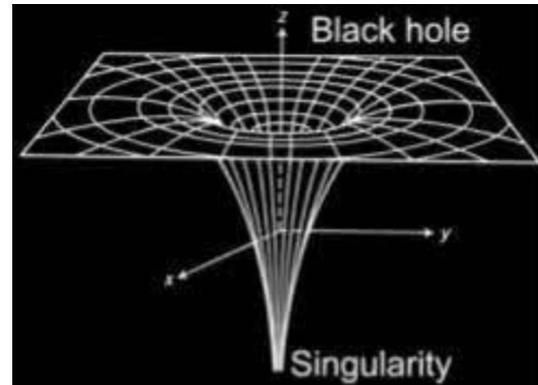
Overfishing, climate change, and dams and barriers on rivers are some of the major threats being faced by migratory fish species. To protect migratory fish, conservationists have taken several steps such as building fish ladders around dams, creating protected marine and freshwater areas, and enforcing fishing regulations. International cooperation is also necessary, since many fish migrate across national boundaries.

## BLACK HOLES: A COSMIC ENIGMA

Anushka M. Tiwari (B.Sc. Sem-II)



Black hole



Diagrammatic representation of black hole

Black holes are regions in spacetime where gravity is so intense that nothing, not even light, can escape. They form from the remnants of massive stars that collapse under their own gravity at the end of their life cycle. This process creates an incredibly dense object with an unimaginably strong gravitational pull.

When a massive star exhausts its nuclear fuel, its core collapses, leading to a supernova explosion. The remaining core, if massive enough, continues to collapse into a black hole. The density of a black hole is so immense that it warps spacetime around it, creating a point of no return known as the event horizon. At the core of every black hole lies a singularity, a point of infinite density where the laws of physics as we know them break down. Surrounding this singularity is the event horizon, the boundary beyond which nothing can escape. For rotating black holes,

there's also an ergosphere, a region where spacetime is dragged around by the black hole's rotation, forcing anything within it to rotate along.

Despite their invisible nature, scientists have developed ingenious methods to detect and study black holes, relying on their gravitational effects on surrounding matter. One primary method involves observing the intense X-ray emissions from matter spiralling into a black hole. As gas and dust are drawn in, they heat up to extreme temperatures, emitting characteristic X-rays that can be detected by orbiting telescopes. Another crucial technique is observing the gravitational influence black holes exert on nearby stars or gas clouds, causing them to orbit an unseen mass. Research into black holes is crucial for developing a grand unified theory that reconciles general relativity with quantum mechanics, providing a complete description of the universe.

## **IN SITU CONSERVATION: PROTECTING BIODIVERSITY IN ITS NATURAL HOME**

**Arsala Sheikh Haroon (B.Sc. Sem-II)**



**Cheetal deer in Pench Tiger Reserve**



**A male sambar in Pench**

*In situ* conservation is the conservation of ecosystems and natural habitats, and the maintenance and recovery of viable populations of species in their natural surroundings.

*In-situ* conservation is achieved through the establishment and management of protected areas, such as national parks, wildlife sanctuaries, biosphere reserves, community reserves, sacred groves, and ecological hotspots. These areas aim to protect ecosystems, biodiversity, and genetic resources, while promoting sustainable development. Activities like forestry, grazing, cultivation, research, education, and sustainable human activities are permitted as long as they do not harm wildlife.

Conserving biodiversity through *in situ* conservation methods is cost-effective and convenient. It allows species to grow and evolve naturally.

Protecting the ecosystem ensures species survival, as carnivores rely on herbivores for food. *In situ* conservation preserves ecosystem integrity, maintain genetic diversity, facilitate natural evolution, and promote public participation, making it a cost-effective long-term approach to environmental protection.

India's Protected Area (PA) network, consisting of over 600 protected areas under the Wildlife Protection Act, covers 4.8% of the country's total area. The Biodiversity Act 2002 preserves biological diversity and provides equitable sharing of benefits. The Indian National Man and Biosphere Committee (MAB) is an advisory body for the government, focusing on issues related to the Biosphere Reserves Programme. These initiatives help sustain improvements in natural resources conservation.

## SALAMANDER DIVERSITY OF INDIA

Juhi S. Hedau (B.Sc. Sem-IV)



*Tylototriton verrucosus*



*Tylototriton himalayanus*

Salamanders are a group of amphibians typically characterized by their lizard-like appearance, with slender bodies, blunt snouts, short limbs projecting at right angles to the body, and the presence of a tail in both larvae and adults. All types of salamanders are grouped together under the order Urodela. India is the abode of two species of salamanders: *Tylototriton verrucosus* and *Tylototriton himalayanus*.

The Himalayan Newt, *Tylototriton verrucosus* is classified under the family Salamandridae. It can reach a length of 20 cm. It has a wide head with a short snout. The tail is flattened to help in swimming. *T. Verrucosus* is found in the mountains of Yunnan, Kakhyen Hills, Sikkim, Manipur and Northern Myanmar. Conservation efforts are on in its habitat in Darjeeling (India), where it breeds in good numbers. It feeds on

spiders, worms, millipedes, scorpions, molluscs and a range of insects.

*Tylototriton himalayanus* is known from the Ilam District in eastern Nepal (its type locality from where it was described in 2015), Darjeeling in northwestern India, and western Bhutan. *T. himalayanus* occurs in subtropical hill forests near puddles, lakes, and rice paddies at elevations of 900–2317 m above sea level. They breed in permanent as well as temporary ponds after heavy monsoon rains, starting in March or April. Outside the breeding season they are more terrestrial and hide under logs, bushes, and stones.

## CRYPTIC COLOURATION

Kirti H. Kawale (B.Sc. Sem-II)



Mossy leaf-tailed gecko on a twig

Cryptic colouration is a survival adaptation where an animal's colours and patterns allow it to blend into its surroundings. It is a type of camouflage that helps it avoid being seen by predators or prey. This strategy is used by both predators to sneak up on prey, and by prey to escape being hunted. It includes methods like matching a background or using disruptive patterns to break up the body's outline.

Often an animal's colours and patterns match its environment, making it difficult to distinguish from its background. For example, the mossy leaf-tailed gecko uses cryptic colouration to appear just like the twig on which it rests. Similarly, the green colour of a grasshopper helps it to merge with the background.

Patterns on an animal's body, such as the stripes on a tiger or zebra, break up its body's outline, making it harder to recognize as a single form.

There are various advantage of cryptic colouration such as:



Spot a spider

**Predator Avoidance:** The primary function is to protect prey from predators by helping them evade detection.

**Predator Advantage:** Predators use it to ambush prey by getting closer before being seen.

**Increase Survival and Reproduction:** By avoiding predators, animals can survive longer, leading to greater reproductive success.

**Wider Range of Protection:** Some organisms use cryptic colouration for protection across a variety of background, such as a foxsnake which can blend in with fallen leaves, tree bark, and field due to its generalized cryptic colouration.

## LEECH THERAPY

Moushmi Chauhan (B.Sc. Sem-II)



Leech therapy in progress



*Hirudo medicinalis*

Leech therapy is also known as Hirudotherapy. It is one of the oldest medical practices used for therapeutic purposes. It has been mentioned in ancient Indian, Egyptian, Greek, and Chinese medicine. During leech therapy, a leech is placed on the patient's skin and allowed to suck blood. During this process, the saliva of the leech is released into the bloodstream of the patient. This leech saliva contains biologically active substances such as hirudin, calin, and hyaluronidase. These substances have anticoagulant, anti-inflammatory vasodilator, and anaesthetic properties, which makes leech therapy useful in many conditions.

In the modern times, leech therapy is used to improve blood circulation and prevent tissue death after plastic or reconstructive surgery. It has also been applied in cases of arthritis, varicose veins, hypertension, dental problems, and some skin diseases.

Because of its ability to improve the flow of blood, leech therapy is sometimes considered in cardiovascular disorders as well. However, leech therapy is not free from risks. It can lead to excessive bleeding, infections, allergic reactions, or transmission of pathogens, if non-sterile leeches are used. For safety, only medical grade leeches raised in a controlled environment are applied.

Leech therapy is an important part of ayurvedic system of medicine. It is believed to balance the proper function of body by removing impure blood and toxins. It is still practiced in India and many parts of the world.

Leech therapy represents a unique blend of traditional healing and modern medical science. With proper precautions and medical supervisions, it serves as a modern therapy for certain conditions, where the conventional treatment is limited.

## HABITAT LOSS

Nandini G. Samseriya (B.Sc. Sem-II)



**Deforestation causes loss of natural habitats**

A habitat is the natural home or environment of an organism. It provides the basic needs for survival such as food, water, shelter, and space. Habitats vary widely across the globe. Forests, grasslands, deserts, wetlands, mountains, rivers, and oceans are all unique homes for different species. Each habitat supports life in its own way and has special adaptations. Loss of habitat is one of the greatest challenges faced by wildlife and ecosystems today.

Habitat loss occurs when natural environments are destroyed, degraded, or altered. This prevents them from supporting the species that live there. It can happen due to human activities such as deforestation, pollution, urbanization, mining, and overfishing. Climate change also worsens habitat loss through rising temperatures, sea-level rise, and extreme weather conditions. Consequences of habitat



**Habitat loss causes reduction in biodiversity**

loss include:

1. Decline or extinction of species.
2. Disruption of food chains and ecosystems.
3. Loss of biodiversity.
4. Reduced clean air and water for humans.
5. Economic losses due to disappearing resources.
6. Global climate imbalance.

To prevent habitat loss, humans must take active steps such as conserving forests, protecting wetlands, reducing pollution, practicing sustainable farming, and restoring damaged ecosystems. Laws and policies should encourage conservation efforts. Every small action, like planting trees or reducing plastic waste, helps protect habitats. Habitats are the foundation of life on Earth. Protecting habitats is not just about saving animals and plants; it is about securing our own future.

## ARCTIC TERN: THE LONGEST MIGRATION

Nikita Mule (B.Sc. Sem-IV)



An Arctic tern



A flock of Arctic tern

The Arctic tern (*Sterna paradisaea*) is a medium-sized bird in the family Laridae. These birds have a length of 28-39 cm and a wingspan of 65-77 cm, and weigh around 100 gm. In the breeding season, they are mainly grey and white plumaged, with a blood red beak and feet, a black crown and nape, and white cheeks. They are long-lived birds, many reaching 15 to 30 years of age, with a record of 31 years.

The Arctic tern is most famous for the longest migrations known in the animal kingdom. They migrate between Arctic breeding grounds and Antarctic wintering areas, effectively experiencing two summers each year. Studies report average annual round-trips of roughly ~48700 km for birds from the Netherlands and ~70900 km for birds nesting in Iceland/Greenland, the differences coming from different routes and stopovers.

Tracked individuals have exceeded

80000 km, and one individual bird exceeded ~96000 km. A landmark tracking study (geolocators on 11 birds) showed round trips of >80000 km, and a later tracked individual (Newcastle University / Springwatch project) was estimated at about ~96000 km) in a single annual cycle.

These large distances are due to the fact that the routes are convoluted (not strictly pole-to-pole straight lines). Birds detour to forage, follow favourable winds/ocean productivity, and use different flyways in autumn vs spring, which increases total kilometres flown.

Recent work refines the understanding regarding wind, climate effects, and variation. Reviews and newer studies examine hypotheses about wind use, energy budgets, and how climate/ocean changes may alter routes and timings. Average values and exact extremes differ across studies and years.

## WE ARE MADE OF STAR STUFF

Riya Rehapade (B.Sc. Sem-VI)



Heavier elements like iron were formed in stars



Stars are stellar furnaces

Long before humans learned to name the constellations, the story of our origin was already written in the stars. When astronomer and science communicator Carl Sagan said, “We are made of star stuff,” he condensed an enormous truth into a single poetic line. It may sound like a piece of science fiction, but it is actually a precise description of how you, me, and everything we see came to be.

The universe began about 13.8 billion years ago with the Big Bang, producing mostly hydrogen and helium. For hundreds of millions of years, there were no planets, no oceans and no organisms, but only clouds of these light gases. Then the first stars were born. Inside their fiery cores, under crushing pressure and unimaginable heat, these stars began to fuse simple elements into heavier ones such as carbon, oxygen, nitrogen and iron. These are exactly the elements that make up our blood, bones, muscles, and DNA.

Stars are not eternal. When very

Massive stars run out of fuel, they explode as supernovae, blasting newly formed elements into space at incredible speeds. This cosmic recycling plant is how the raw materials for future stars, planets, and living beings are spread across the galaxy. The calcium in your bones, the iron in your blood, even the gold in your jewellery was once part of such a stellar explosion.

So, the next time you look at the night sky, remember that those shimmering dots are not just far-off suns, but your ancient relatives. The dust on your bookshelf, the water in your glass, and the cells in your skin all carry atoms forged in stellar furnaces. In a very literal way, we are walking, breathing pieces of the universe looking back at itself. Recognizing that we share our origins with the stars can inspire a sense of unity with all living beings and a responsibility to protect our precious planet.

## SEED BANKS: REPOSITORIES OF PLANT DIVERSITY

Ruchika A. Khadse (B.Sc. Sem-II)



Svalbard Global Seed Vault, Norway



Seeds of different crops

A seed bank stores seeds to preserve genetic diversity. Hence, it is a type of gene bank. There are many reasons to store seeds. One is to preserve the genes that plant breeders need to increase yield, disease resistance, drought tolerance, nutritional quality, taste, etc. of crops. Another is to forestall loss of genetic diversity in rare or imperiled plant species in an effort to conserve biodiversity *ex situ*.

Many plants that were used centuries ago by humans are used less frequently now; seed banks offer a way to preserve that historical and cultural value. Collections of seeds stored at constant low temperature and low moisture are guarded against loss of genetic resources that are otherwise maintained in situ or in field collections. These alternative "living" collections can be damaged by natural disasters, outbreaks of disease, or war. Seed banks are considered seed libraries, containing

valuable information about evolved strategies to combat plant stress, and can be used to create genetically modified versions of existing seeds. The work of seed banks often span decades and even centuries. Most seed banks are publicly funded and seeds are usually available for research that benefits the public.

The Svalbard Global Seed Vault has been built inside a sandstone mountain in a man-made tunnel on the frozen Norwegian island of Spitsbergen, which is part of the Svalbard archipelago, about 1307 km from the North Pole. It is designed to survive catastrophes such as nuclear war and world war. The area's permafrost will keep the vault below the freezing point of water, and the seeds are protected by one metre thick walls of steel-reinforced concrete.

The Millennium Seed Bank in UK was established in 1996. It is the largest seed bank in the world.

## HOW ANTIVENOM IS MADE

Saleha Ibrahim Khan (B.Sc. Sem-II)



Extraction of venom from a venomous snake



Polyvalent antivenom manufactured in India

Antivenom is a specific antidote for venomous bites, composed of antibodies from an immunized animal like a horse or sheep. It works by neutralizing the toxins in the venom, and while it is the primary treatment for snakebite, it should only be administered if there is significant toxicity and is most effective when given quickly. Antivenoms typically target the venom of one or a few specific species.

Antivenom contains antibodies that bind to venom toxins, preventing them from causing further damage to the body. However, it can not undo harm already done to tissues or cells by the venom. Since it neutralizes free-floating toxins, it needs time to circulate and act, making prompt administration critical.

Production of antivenom: Small doses of venom are injected into an animal, such as a horse or sheep, to stimulate an immune response. The

animal's blood plasma, rich in antibodies, is harvested. The antibodies are then concentrated and purified to create a pharmaceutical-grade antivenom.

Most antivenoms are highly specific and are effective only against the venom of the snake species used in their production, or closely related ones. The decision to administer antivenom should be made by a medical professional based on the patient's symptoms and the type of snake involved.

The availability of effective and affordable antivenom is a significant global health challenge. Allergic reactions are possible, and in severe cases, treatment may require additional medical intervention.

In India, polyvalent antivenom effective against the venom of spectacled cobra, common krait, Russell's viper, and saw-scaled viper is manufactured.

## **URBAN FORESTRY**

**Sandhya M. Bisen (B.Sc. Sem-IV)**



**An urban forest**



**Urban forests help to preserve urban biodiversity**

Urban forestry is the practice of planting, managing, and caring for trees and forests in and around cities to improve the urban environment and provide benefits to society. It encompasses the entire urban forest, including parks, street trees, and private yards, and aims to enhance the physiological, sociological, and economic well-being of urban populations. Key goals include combating pollution, mitigating the urban heat island effect, managing stormwater, and increasing aesthetic and property value.

Management of urban forests involves both the management of individual trees and the planning and management of the entire urban forest canopy. This includes maintenance operations and long-term programming.

Benefits of urban forestry:

(1) **Physiological:** Improves air quality by absorbing pollutants and

producing oxygen, and can reduce energy consumption by providing shade.

(2) **Sociological:** Provides recreational spaces, enhances the aesthetic appeal of urban areas, and can increase property values.

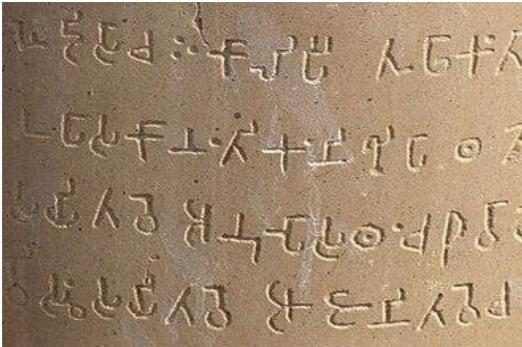
(3) **Economic:** Can lead to energy savings and increased property values.

In urban forestry, trees are planted in various urban settings, including parks, along roadsides, in green belts, and around public and private properties.

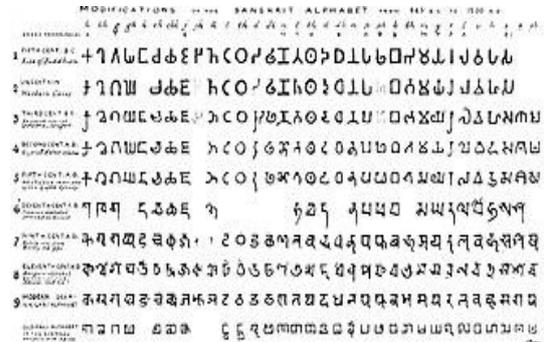
Urban forestry is a response to urbanization, which often has negative effects on ecosystems, to ensure that cities can continue to provide environmental and social benefits to their residents.

## THE ANCIENT BRAHMI SCRIPT

Shreya S. Dhomne (B.Sc. Sem-II)



An Ashokan edict showing Brahmi script



Brahmi script

Brahmi script is an ancient writing system from the Indian subcontinent and is the ancestor of nearly all modern scripts used in South and Southeast Asia. It is an abugida, where consonants have an inherent vowel that can be modified with diacritical marks, and it was first used during the third century BCE, most famously in the edicts of Ashoka.

The decipherment of Brahmi became the focus of European scholarly attention in the early nineteenth century. Brahmi was deciphered by James Prinsep, the secretary of the Asiatic Society of Bengal, in a series of scholarly articles in the Society's journal in the 1830s. Brahmi was at one time referred to in English as the "pin-man" script, likening the characters to stick figures. The origin of the script is still much debated, with most scholars stating that Brahmi was derived from or at least influenced by one or more contemporary Semitic scripts. Some scholars favour the idea

of an indigenous origin or connection to the much older and as yet undeciphered Indus script.

Brahmi is considered the "mother script" from which many modern writing systems, such as Devanagari, Bengali, Gujarati, and those for Tamil, Telugu, Malayalam, and Kannada, are derived. Unlike an alphabet, Brahmi is an abugida, a system where each consonant has an inherent vowel. Other vowels are created by adding diacritical marks above, below, or to the sides of the consonant.

The earliest known Brahmi inscriptions are the edicts of Emperor Ashoka, dating from the third century BCE. These inscriptions are found across the Indian subcontinent. The script developed regional variations, such as Tamil-Brahmi, which had some differences in its letters and vowel notation systems. Brahmi numerals for 1 through 9 were later used to develop the positional decimal system.

## SMOKING KILLS / TOBACCO KILLS

Tejaswini Khope / Sadiya Bazmi (B.Sc. Sem-II)



Tobacco is a global killer



Health warning on cigarette packs

Smoking is a leading cause of preventable death worldwide. Every year, millions of people die due to tobacco-related illnesses such as lung cancer, heart disease, stroke, and chronic respiratory conditions. Nicotine addiction, social habits, and peer pressure keep many people trapped in smoking despite knowing its deadly risks.

The harm is not limited to smokers. Second-hand smoke endangers children, family members, and colleagues by increasing their risk of respiratory diseases and cancer. Public awareness campaigns and health organizations constantly work to educate people about the devastating effects of smoking.

Smoking damages nearly every organ of the human body. It leads to cancers of the lungs, mouth, throat, and bladder. It weakens the immune system and accelerates ageing. In pregnant women, smoking can cause premature births, low birth weight, and developmental issues in babies.

Clearly, smoking destroys not only the smoker's health but also the well-being of loved ones. The good news is that quitting smoking brings immediate and long-term benefits. Within weeks of quitting, circulation improves, and lung function begins to recover. Over the years, the risk of heart disease, stroke, and cancer steadily decreases.

Many resources are available to help people quit smoking, including counselling, nicotine replacement therapy, and medications. Government policies such as banning smoking in public places, increasing tobacco taxes, and using graphic warnings on cigarette packs have also proven effective.

Quitting smoking is not easy, but each cigarette avoided means more life, better health, and a brighter future. Remember, smoking kills, and hence, choosing a smoke-free life is one of the most powerful decisions anyone can make.

## HEIRLOOM VEGETABLES

Trupti Hattimare (B.Sc. Sem-IV)



Heirloom vegetables have unique flavours



Heirloom tomatoes

**H**eirloom vegetables are open-pollinated varieties that have been passed down through generations, typically for at least 50 years, and are known for their unique flavours, colours, and histories. Unlike hybrid or GMO seeds, heirloom seeds are stable, meaning they can be saved and replanted year after year to produce plants with the same characteristics as the parent plant. Examples of heirloom vegetables include tomatoes, maize, beans, and lettuce.

**C**haracteristics of heirloom vegetables:

**O**pen-pollinated: They reproduce through natural pollination by wind, insects, or birds, not human intervention.

**T**ruely to type: Their seed can be saved, and the new plant will grow with the same traits as the parent plant.

**O**ld varieties: The term generally

refers to varieties that have been around for at least 50 years.

**B**enefits of growing heirloom vegetables:

**T**aste and variety: They often have richer and more complex flavours and unique colours that are not found in modern commercial varieties.

**S**eed saving: Their seeds can be saved for replanting the following year. This helps preserve the variety's legacy and reduces costs.

**B**iodiversity: Growing heirloom varieties supports agricultural biodiversity and keeps a wider range of genetic traits available for the future.

**H**istory: They connect cultivators to past generations of farmers and gardeners.

**R**esilience: Many heirloom varieties have stood the test of time, showing resilience in various growing conditions.

## **BEE POLLINATION**

**Priyanka P. Bhalavi (B.Sc. Sem-II)**



*Apis cerana indica*



**Bee pollination**

**B**ee pollination is the process where bees transfer pollen from the male part of a flower to the female part, enabling plants to produce seeds and fruit. Bees are attracted to flowers for nectar and pollen, and as they collect these resources, pollen sticks to their fuzzy bodies. When a bee visits another flower of the same species, some of the pollen rubs off, fertilizing the stigma and leading to the growth of seeds and fruit. This process is crucial for the reproduction of many plants, including fruits, vegetables, and crops.

Bees are drawn to flowers by bright colours, strong scents, and the promise of nectar, which is their primary food source. As the bee moves around in a flower, pollen grains from the anthers (the male parts) stick to its body due to static electricity and the fuzzy hairs covering it. The bee then flies to

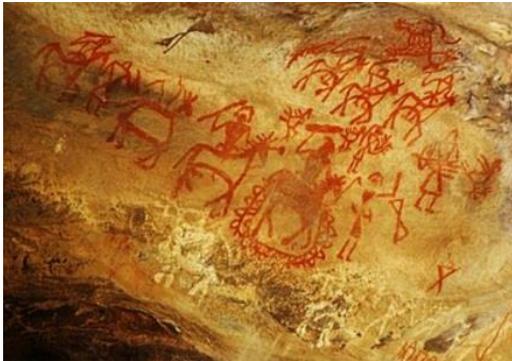
another flower. As it moves, some of the pollen from its body rubs off onto the stigma (the female part) of the new flower. The pollen travels down to the ovary, where it fertilizes the ovules, which leads to the development of seeds. Seeds can then grow into new plants, and in many cases, the seeds are protected inside a fruit, like an apple or a strawberry.

Bees are the most effective pollinators in the animal kingdom. They collect pollen to feed their young, so they are actively and constantly involved in moving it from flower to flower.

The fine hairs on their bodies are highly effective at picking up and holding pollen grains. Bees often focus on one type of flower at a time during a foraging trip. This helps ensure that the pollen is deposited onto a flower of the same species, which is necessary for fertilization.

## BHIMBETKA ROCK SHELTERS

Hitakshi Kale (B.Sc. Sem-VI)



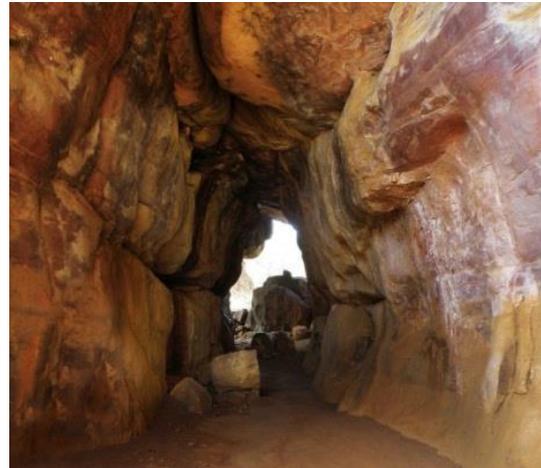
Rock art at Bhimbetka

The Bhimbetka caves are a UNESCO World Heritage Site near Bhopal in Madhya Pradesh. They are well known for having some of the world's oldest rock art and evidence of prehistoric human habitation.

Located in the foothills of the Vindhya Mountains, the site contains over 700 rock shelters, with more than 400 featuring prehistoric paintings that date back to the Palaeolithic and Mesolithic periods. These paintings depict scenes of hunting, dancing, and community life, offering insights into early human civilization.

The site is located in the Raisen district of Madhya Pradesh, approximately 45 km southeast of Bhopal. The site was discovered in 1957-58, and declared a UNESCO World Heritage Site in 2003. The paintings are classified into nine phases, with the oldest estimated to be over 30000 years old.

The Palaeolithic Period cave art



A Bhimbetka cave

depicts large animals like bison, rhinos, and tigers.

The Mesolithic Period rock art features stylized human figurines, social activities like dancing, and hunting scenes with weapons like bows and arrows.

The later period rock art has depictions like warriors on horseback.

The site provides evidence of early human settlement evolution from hunter-gatherers to agriculture and is considered one of the largest prehistoric complexes in India.

The site also includes natural rock formations and cup-like depressions that date back nearly 100000 years, according to the Archaeological Survey of India.

## KAAS PLATEAU

### Gauri Date (B.Sc. Sem-VI)



A view of Kaas Plateau



Wild flowers of Kaas

The Kas Plateau Reserved Forest is a plateau situated 25 kilometres west from Satara city in Maharashtra. It falls under the Sahyadri Sub Cluster of the Western Ghats, and it became a part of a UNESCO World Natural Heritage Site in 2012. It is a biodiversity hotspot known for various types of seasonal wild flowers, which bloom annually in the months of August and September. The plateau is situated at an altitude of 1200 m and is approximately 10 square kilometres in area.

Kaas has more than 850 different species of flowering plants. These include orchids, shrubs such as the Karvy, and carnivorous plants such as *Drosera indica*. Kaas is a plateau made from volcanic rocks. The flora of Kaas, i.e., the entire flowering plants and their related plants are typically restricted to that particular locality only. This is because the plateau is largely formed of basalt which is directly exposed to atmosphere.

The basalt is almost covered entirely by a thin cover of soil formed due to erosion and has accumulated a layer of not more than 25 mm or so.

The Kaas plateau turns into a 'valley of flowers' during monsoon season, particularly from August to early October. To control possible damage by tourists, the number of visitors to the plateau has been restricted to 3000 per day. In September, some of the most common flowering plants are *Eriocaulon* spp., *Utricularia* spp., *Pogostemon deccanensis*, *Senecio grahamii*, *Impatiens lawii* and *Dipcadi montanum*.

The plateau experiences a natural cycle of extreme conditions, with wet water-logged cool monsoons, very dry hot summer and dry winter. Extreme seasonality influences the ecology of the site.

## COMMON JEZEBEL (*DELIAS EUCHARIS*)

Karishma V. Vaidhya (M.Sc. Zoology Sem-II)



Common Jezebel (Wings closed)



Common Jezebel (Wings open)

The Common Jezebel, *Delias eucharis* (Family Pieridae) is a medium-sized butterfly found in many areas of south and southeast Asia, especially in the non-arid regions of India, Bangladesh, Sri Lanka, Indonesia, Myanmar and Thailand. The Common Jezebel is one of the most common of the approximately 225 described species in the genus *Delias*.

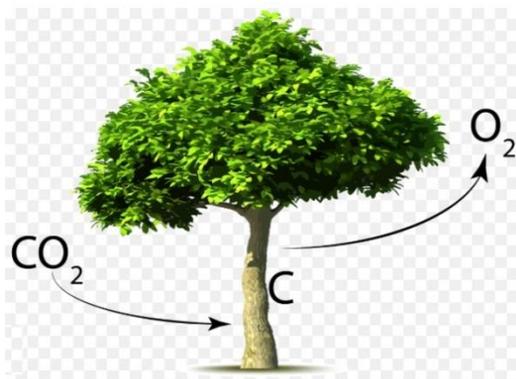
The Common Jezebel is a widespread butterfly found from sea level to high elevations in various habitats, including forests, open woodlands, and gardens. With a 6.5 to 8.5 cm wingspan, it is recognizable by its red and orange spots on the hindwings, a pattern that signals its unpalatable nature due to toxins from its larval host-plant, mistletoe (*Dendrophthoe* spp). The butterfly breeds year-round, laying eggs in batches on the host-plant's leaves. It is a common species in flowery gardens, and commonly visits flowering bushes.

These butterflies spend much of their lives high in the tree tops where their larval food plants grow as parasites on a variety of tree species. They can often be seen flying from tree to tree on sunny mornings. Periodically however both sexes will descend and embark on a “nectaring run”, fluttering swiftly from garden to garden, pausing here and there for a moment to sip the nectar of Lantana (Verbenaceae), Mentha (Lamiaceae), and other flowers. When nectaring, the wings are usually kept fluttering to support the weight of the butterfly.

The bright, contrasting colours of these butterflies, such as yellow, orange, and red, are aposematic, meaning they serve as a visual warning to potential predators that the butterfly is poisonous or at least unpalatable, a trait acquired from its host-plant during the larval stage, protecting it from being eaten.

## CARBON SEQUESTRATION

Harsha G. Raut / Himakshi R. Gedam (B.Sc. Sem-IV)



How plants sequester carbon



Forests are essential for biological sequestration

Carbon sequestration is the process of capturing carbon dioxide from the atmosphere and storing it in reservoirs like oceans, soils, vegetation, and geological formations to mitigate climate change. It can occur naturally through processes like photosynthesis in plants or through technological methods such as direct air capture and geological storage of industrial emissions. Key examples include forests absorbing  $\text{CO}_2$  through photosynthesis and industrial facilities injecting captured carbon into deep underground salt caverns.

**Biological Sequestration:** This type of sequestration leverages natural processes and systems to store carbon.

**Forests and Vegetation:** Plants absorb atmospheric  $\text{CO}_2$  during photosynthesis, storing the carbon in their tissues and soil.

**Soils:** Soil and the organic matter within it can store large amounts of carbon over long periods.

**Oceans:** Oceans act as significant

carbon sinks, absorbing  $\text{CO}_2$  from the atmosphere.

**Coastal Ecosystems:** Mangroves, sea grass meadows, and salt marshes are known as “blue carbon” ecosystems that sequester carbon.

**Geological Sequestration:** This involves capturing carbon, often from large industrial sources, and storing it deep underground.

**Industrial Capture:**  $\text{CO}_2$  is captured from power plants and other industrial facilities.

**Geological Storage:** The captured  $\text{CO}_2$  is transported and injected into deep geological formations, to be permanently stored.

**Technological Sequestration:** This encompasses engineered solutions and innovative methods to capture and store carbon.

**Direct Air Capture:** Technologies that remove  $\text{CO}_2$  directly from the atmosphere.

**Material Based Sequestration:** Methods that use materials to capture and hold carbon dioxide.

## BIOCHAR

Inshra Fatema Sheikh (B.Sc. Sem-II)



Biochar



Biochar can improve soil fertility

**Biochar** is a carbon rich charcoal-like material produced from the controlled oxygen poor heating of biomass (such as agricultural waste, wood, or manure) through a process called pyrolysis. Its primary purposes are carbon sequestration (storing carbon in a stable form) and soil remediation, where it improves soil structure, water retention, and nutrient availability. Biochar's high surface area and porous structure, a result of the pyrolysis process, also makes it valuable for energy production and water purification.

Agricultural biomass is considered as the most abundant renewable resource for producing biochar. Main sources and feedstock of biochar include crop straw and residues, animal manures, fruit pits, twigs, and leaf litter, forestry wastes, as well as food leftover and bagasse.

Biochar is typically black, lightweight, fine-grained, and highly porous. It consists mainly of carbon

(around 70%), along with nitrogen, hydrogen, and other elements, with its exact composition varying depending on the feedstock and production method.

Uses of Biochar

**Carbon Sequestration:** By locking carbon into a stable, durable form, biochar prevents it from being released back into the atmosphere as CO<sub>2</sub>.

**Soil Amendment:** Biochar can improve soil fertility and water retention and can last for hundreds or thousands of years, unlike compost.

**Other Uses:** It can also be used for remediating soil contamination and as a source of energy or fuel.

Biochar is applied to agricultural soils using a variety of application rates and preparation. It is often recommended to mix biochar with compost or other materials to inoculate it with nutrients and beneficial organisms.

## MILKY WAY-ANDROMEDA COLLISION

Saniya R. Bhoskar (B.Sc. Sem-IV)



Milky Way and Andromeda galaxies

The Milky Way is our home, a vast, barred spiral galaxy containing the Sun, Earth, and billions of other stars, gas, and dust. It appears as a "milky" band of light across the night sky because we view it from inside, from the plane of its disk.

The Andromeda Galaxy (M31) is the closest large spiral galaxy to our Milky Way, located about 2.5 million light-years away in the constellation Andromeda, and it is visible as a faint object to the unaided eye.

Scientists have predicted that the Andromeda Galaxy is approaching the Milky Way at about 110 kilometres per second, as indicated by blueshift. For years, astronomers have believed that a collision between these two galaxies was a certainty, predicted for around 4.5 billion years in the future. This merger would create a single, larger elliptical galaxy called Milkdromeda, which would likely absorb other galaxies in the Local Group over the long term.



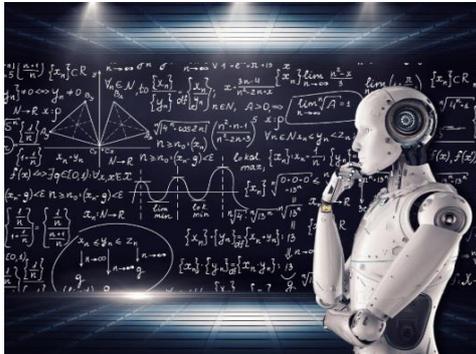
Galaxies approaching each other

While the galaxies' structure would change, stars would settle into new orbits, but there would be no effect on Earth or our solar system.

However, a 2025 study, using data from the Hubble and Gaia telescopes and running 100000 simulations, found only a 2% chance of a direct head-on collision in the next 5 billion years. Even if the two galaxies do collide, it won't be a head-on smashup but a more complex series of interactions over time, eventually forming a new, larger elliptical galaxy.

## ROLE OF AI IN ZOOLOGICAL RESEARCH

Tanushree S. Awasare (B.Sc. Sem-II)



AI keeps on improving itself



Artificial intelligence can be useful to humans

Artificial Intelligence (AI) revolutionizes zoology by automating species identification, analyzing massive datasets for behavioural insights, monitoring animal welfare, aiding conservation efforts, and improving understanding of complex biological processes and disease mechanisms.

### Applications of AI In Zoology

**Conservation and monitoring:** AI-powered systems enhance wildlife monitoring and conservation efforts. This includes using AI to process data from camera traps, audio sensors, and drones to identify and count species for biodiversity tracking.

**Behavioural Research and Monitoring:** AI-driven systems can track and analyze animal behaviour, identifying patterns in movement, feeding, and social interactions with high precision.

**Genetic analysis and breeding:** AI accelerates research in animal genetics and improves breeding

outcomes. Machine learning analyzes genetic data for genomic selection to identify desirable traits and predict breeding outcomes in livestock.

**Species Identification and Discovery:** AI tools, particularly computer vision and machine learning, can analyze vast datasets from images, sound recordings, and genetic sequences to identify species.

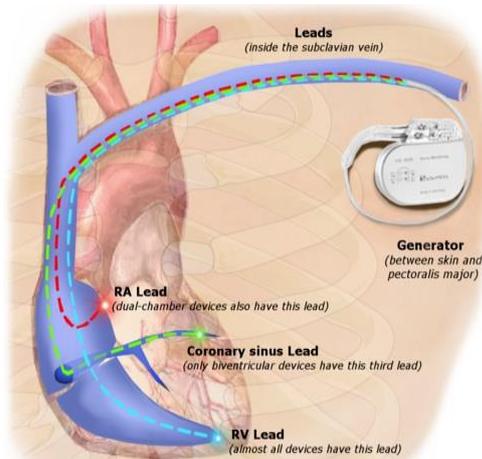
**Conservation and Ecology:** AI helps forecast ecological trends, predict species migrations, and identify areas at risk, enabling more effective resource allocation and proactive conservation strategies.

**Biomedical Applications:** In conjunction with zoological studies, AI streamlines drug discovery by analyzing biological activity and toxicity, improving the efficiency of preclinical testing.

Despite its benefits, AI integration in zoology faces challenges, including the need for high-quality data, especially for rare species.

## ARTIFICIAL PACEMAKER

Shruti Wankhede (B.Sc. Sem-VI)



**How artificial pacemaker works**

An artificial pacemaker is a small, electronic medical device that monitors the heart's electrical activity and delivers low-energy electrical pulses to maintain a normal, regular heartbeat. It is used to treat heart arrhythmias, where the heart beats too fast, too slow, or irregularly.

The device consists of a pulse generator (the main body containing a battery and computer) and one or more leads (wires) that connect to the heart, though wireless, leadless pacemakers also exist.

The pacemaker's electrodes, located at the end of the leads, continuously monitor the heart's natural electrical impulses. If the pacemaker detects that the heart rate is too slow or irregular, it sends electrical signals to the heart to make it beat at a normal rate and rhythm. In some cases, pacemakers help coordinate the



**An artificial pacemaker**

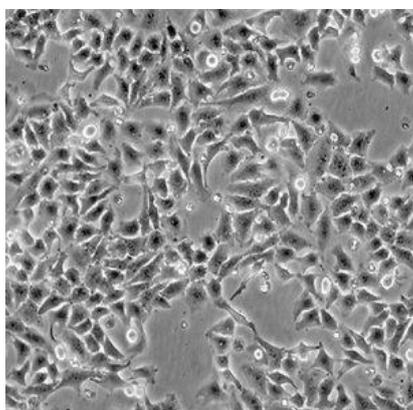
beating of the heart chambers, improving the heart's efficiency at pumping blood.

A doctor implants the pacemaker through a small incision. The pulse generator is placed under the skin, while the leads are guided to the heart using X-ray imaging. Most people can return to normal activities within a few days.

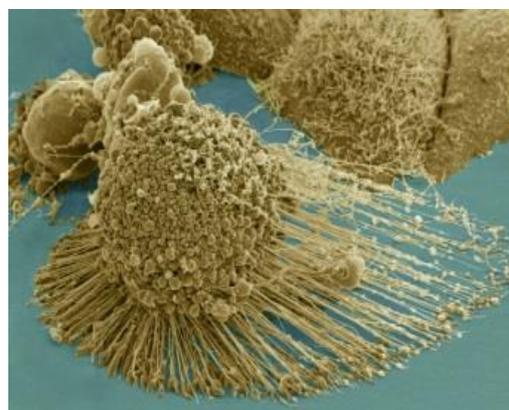
A pacemaker's battery typically lasts for 10 to 15 years. When the battery runs low, it can be replaced in a quick outpatient procedure. The different types of pacemakers include traditional (transvenous) pacemakers, leadless pacemakers, and biventricular pacemakers.

## HELA CELL LINE: AN IMMORTAL GIFT

Diya Lanjewar (B.Sc. Sem-II)



HeLa cells in culture



HeLa cell

The HeLa cell line is one of the most important tools in modern medicine and research. It was the first immortal human cell line, meaning the cells can divide and survive indefinitely under the right laboratory conditions. These cells were originally taken in 1951 from Henrietta Lacks, an African-American woman being treated for cervical cancer at Johns Hopkins Hospital, USA. Without her knowledge or consent, doctors collected a sample of her tumour that later gave rise to the HeLa cell line. The name "HeLa" comes from the first two letters of the patient's first and last names.

HeLa cells proved unique because they grew rapidly and did not die after a few divisions, unlike normal human cells. This discovery transformed scientific research. HeLa cells were crucial in developing the polio vaccine, studying cancer,

genetics, viruses like HIV and COVID-19, and even in space research to understand how cells behave in zero gravity.

However, the use of HeLa cells also raised serious ethical concerns. Henrietta Lacks and her family were not informed about the use of her cells for decades, and they did not receive any recognition or benefit, while companies profited from her cells. This sparked debates about patient rights, consent, and medical ethics.

Today, Henrietta Lacks is honoured for her immense contribution to science. The HeLa cell line remains a powerful reminder of both the progress of medical research and the importance of respecting human dignity in science.

## ORCHIDS: NATURE'S PRECIOUS GIFT

Kashish Patil (B.Sc. Sem-VI)



Many orchids are epiphytes

Orchids are a large family of flowering plants (Orchidaceae) known for their colourful and often fragrant blooms and unusual shapes. They are found on every continent except Antarctica and grow in diverse habitats, from tropical forests to temperate zones. There are more than 26000 known species of orchid. They grow in a variety of habitats, including on trees (epiphytic), rocks (lithophytic), or in soil (terrestrial).

Some orchids grow from a single stem (monopodial), while others grow from multiple stems (sympodial). Many are long-lived perennial herbs that can live for decades. The world's richest diversity of orchid genera and species is in the tropics. Many species such as *Vanda* spp are epiphytes, living on trees. The flowers and their pollination mechanisms are highly specialized, attracting insect pollinators by colour, pattern, scent,



Many orchids are grown as ornamentals

pheromones, and sometimes by mimicking female insects. Orchids have very small seeds, relying on fungal partners for germination. Some orchids have no leaves, either photosynthesizing with their roots or relying entirely on fungal partners for food.

### Uses of orchids

**Horticultural:** Grown ornamentally as houseplants and for cut flowers.

**Culinary:** Used for flavouring, such as the common vanilla orchid.

**Traditional medicine:** Used in some herbal remedies for health and skin soothing purposes.

Orchids represent some 6–11% of all species of seed plants. Horticulturists run many orchid societies around the world, and have produced many hybrids and cultivars.

## STINGLESS BEES

Komal Wankhede (B.Sc. Sem-VI)



*Melipona interrupta*



*Melipona bicolor*

Stingless bees belong to the tribe Meliponini, in the Apidae family and are closely related to the common honeybees, *Apis mellifera*. They are called “stingless” because their sting is highly reduced, and they do not use it for defence, instead, they defend their nest by biting.

The tribe Meliponini consists of over 600 species (61 genera) found in tropical regions all over the globe, with their highest abundance and diversity in the Neotropics (South and Central Americas), and also in tropical Africa, Southeast Asia and Australia. They are eusocial and live in colonies with one queen, with between a few dozen to several thousand workers.

Stingless bees produce honey, pollen, wax, and propolis/cerumen. However, unlike honeybees which build their nests primarily or even solely out of wax, most stingless bees incorporate plant gums, resins, or sometimes even soil for nest constructions. Cerumen is resin mixed with wax and is used to build

protective and supporting nest structures as well as honey pots.

The role of stingless bees in plant pollination is significant; they pollinate an estimated 40-90% of the native or cultivated species in the tropics. Domestication of stingless bees and exploitation of their products date to pre-Colombian times in the Americas.

In Southeast Asia, Africa and Australia, stingless bee rearing is not traditional but is gaining popularity. The products of stingless bees form an emerging market in several parts of the world, with the possibility of meliponiculture being practiced in places facing the most serious economic and social needs.

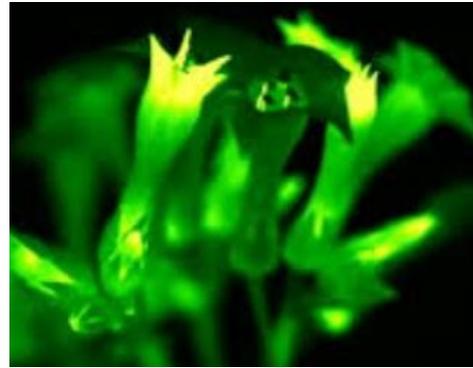
Stingless bees are vital pollinators for a wide range of crops and wild plants, including economically important ones like coconut, mango, and coffee. As effective pollinators, they play a very important role in nature.

## TRANSGENIC ORGANISMS

Mansi Mourya (M.Sc. Zoology Sem-II)



Bt cotton, a transgenic plant



Bioluminescent plant created artificially

A transgenic organism is a plant, animal, or microorganism whose genetic material has been altered by the addition of foreign DNA. This gene, known as a transgene, can originate from the same species or a completely different one, leading to the expression of novel traits. This process, often called genetic engineering, allows for the introduction of specific traits that are not naturally present in the organism's genome. The term "transgenic" is derived from "trans," meaning across or beyond, and "genic," referring to genes.

The organism containing the introduced gene is called a transgenic organism or genetically modified organism. The process of creating transgenic organism to become whole new organism with permanent change to their germline has been called either transformation or transfection. This technology has revolutionized various fields.

Transgenic technology has a wide

range of applications such as:

**Agriculture:** This is perhaps the most well-known application. Transgenic or genetically modified crops such as Bt cotton, can lead to increased yields, reduced pesticide use, and improved food security.

**Medicine:** Transgenic animals are used to produce therapeutic proteins and pharmaceuticals.

**Research:** Transgenic organisms are invaluable tools for studying gene function. This helps in understanding complex biological pathways, developmental processes, and disease mechanisms.

**Environmental Remediation:** Transgenic microorganisms can be engineered to break down pollutants, a process known as bioremediation.

While transgenic technology offers immense potential, it also raises significant ethical, social, and safety concerns. Risk assessments and regulations are essential to ensure the safe and responsible development and use of transgenic organisms.

## LONAR LAKE: A GEOLOGICAL WONDER

Gauri A. Tamne (B.Sc. Sem-II)



Lonar Lake

Lonar Lake, located in Buldhana District of Maharashtra, is a rare and fascinating natural phenomenon. It is the world's only known hyper-alkaline lake that has formed in a basaltic rock region. The lake is of both geological and cultural significance, making it a subject of intrigue for students, researchers, and tourists alike. Its origins date back approximately  $52000 \pm 47000$  years, believed to be the result of a meteorite impact, which created a unique ecological system that sets it apart from other water bodies.

The lake spans about 1.2 km in diameter and is surrounded by a forested area, offering an idyllic environment for biodiversity. It is categorized as a "crater lake," with its high salinity and alkalinity, making it inhospitable for most aquatic life, except for specific species like the Lonar water beetle. The water chemistry of the lake contributes to the presence of rare microbial species that could provide insight into extremophiles—organisms capable of thriving in harsh conditions.

In addition to its natural



Lonar Lake, as seen from above

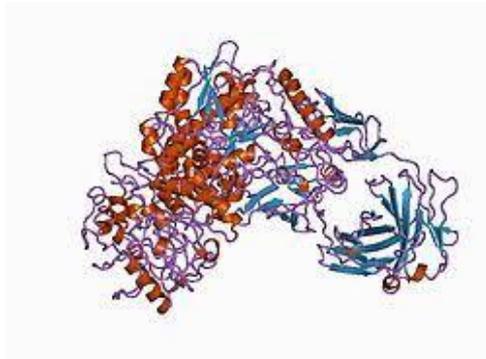
significance, Lonar Lake holds historical and cultural importance. The ancient temples around the lake, reveal its rich cultural heritage. These temples feature intricate carvings and inscriptions, dating back to the 6th century, suggesting that the area was once a thriving hub of religious and cultural activity.

For students, studying Lonar Lake presents a unique opportunity to explore the intersection of geology, biology, and history. The lake not only offers insights into Earth's natural history but also demonstrates how human civilizations have interacted with the environment over millennia.

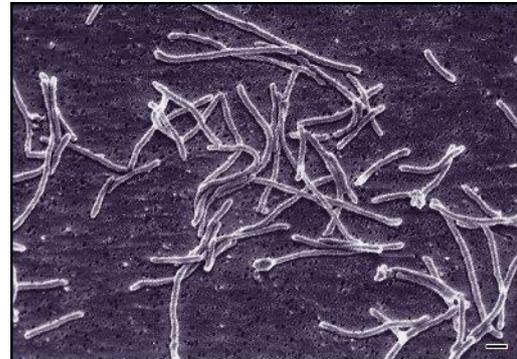
In essence, Lonar Lake is a stunning example of Earth's geological diversity, fostering interdisciplinary studies for those interested in the sciences and humanities.

## TAQ POLYMERASE: A GIFT TO SCIENCE

Vaibhav R. Khanorkar (M.Sc. Zoology Sem-II)



Taq Polymerase enzyme



*Thermus aquaticus* bacteria

Taq polymerase is a thermostable DNA polymerase enzyme named after the thermophilic bacterium *Thermus aquaticus*, from which it was originally isolated in 1976. It is frequently used in the polymerase chain reaction (PCR), a method for greatly amplifying the quantity of short segment of DNA. *T. aquaticus* is a bacterium that lives in hot springs and hydrothermal vents, and Taq polymerase was identified as an enzyme able to withstand the protein denaturing condition required during PCR. Therefore, it replaced the DNA polymerase from *E. coli* originally used in PCR.

Taq's optimum temperature for activity is 75-80°C, with a half-life of greater than 2 hours at 92.5°C, 40 minutes at 95°C and 9 minutes at 97.5°C, and can replicate a 1000 base pair strand of DNA in less than 10 seconds at 72°C. At 75-80°C, Taq reaches its optimal polymerization rate of about 150 nucleotides per

second per enzyme molecule, and any deviations from the optimal temperature range inhibit the extension rate of the enzyme.

Use of thermostable Taq enables running the PCR at high temperature (~60 °C and above), which facilitates high specificity of the primers and reduces the production of nonspecific products, such as primer dimer. Also, use of a thermostable polymerase eliminates the need to add new enzyme to each round of thermocycling. A single closed tube in a relatively simple machine can be used to carry out the entire process.

Thus, the use of Taq polymerase was the key idea that made PCR applicable to a large variety of molecular biology problems concerning DNA analysis. The implementation of Taq polymerase has saved countless lives. It has served an essential role in the detection of many of the world's worst diseases.

## HOW SWEDEN IS CONVERTING TRASH INTO ELECTRICITY

Swati Dhosewan (B.Sc. Sem-VI)



A WTE plant

In Sweden, trash is treated as a valuable resource rather than a disposal problem. Sweden converts trash to electricity by burning non-recyclable trash in high-tech, highly efficient waste-to-energy (WTE) plants. The burning of trash generates heat, which creates steam that powers turbines to produce electricity and heat for the national district heating network.

Sweden's WTE plants are among the most efficient in the world, recovering a significant amount of energy from trash. Stringent regulations and advanced pollution control technologies make the incineration process exceptionally clean, with minimal emissions of harmful substances.

This advanced waste management system reduces landfill waste to less than one percent, and is so efficient that Sweden does not have enough trash to fuel these plants.



Trash used for generating electricity

Sweden's high demand for waste-derived energy allows it to import waste from countries like the UK and Norway, providing them with waste management solutions.

Sweden is not only saving money by replacing fossil fuel with waste to produce energy, it is generating 100 million USD annually by importing trash and recycling the waste produced by other countries. The United Kingdom, Norway, Ireland and Italy are willing to pay 43 USD for every tonne of waste that Sweden imports to this end.

Sweden has transformed recycling into a multi-million dollar industry by proving that one man's trash is another man's treasure.

## BARBARA McCLINTOCK AND JUMPING GENES

Payal H. Kumbhalkar (M.Sc. Zoology Sem-II)



Barbara McClintock



Barbara McClintock's microscope

**Barbara McClintock** (16 June 1902 – 02 September 1992) was an American scientist and cytogeneticist who was awarded the 1983 Nobel Prize in Physiology or Medicine for the discovery of transposons (jumping genes). She received her PhD in botany from Cornell University in 1927. There she started her career as the leader of the development of maize cytogenetics, the focus of her research for the rest of her life. She was recognized as among the best in the field, awarded prestigious fellowships, and elected a member of the National Academy of Sciences in 1944.

From the late 1920s, McClintock studied chromosomes and how they change during reproduction in maize. She developed the technique for visualizing maize chromosomes and used microscopic analysis to demonstrate many fundamental genetic ideas. She demonstrated the role of the telomere and centromere,

regions of the chromosome that are important in cytogenetics.

Barbara McClintock's experiment involved observing variegated patterns on maize (corn) kernels to discover jumping genes (transposons). She showed that segments of chromosomes, named Dissociation (Ds) and Activator (Ac), could move to different locations, causing changes in gene expression that led to the spotted kernel colours. This groundbreaking discovery revealed that genetic material is not static. McClintock's groundbreaking research on mobile genetic elements was initially met with skepticism but is now a fundamental concept in modern genetics and genetic engineering.

Much of her career was spent at the Cold Spring Harbor Laboratory in New York, where she continued her maize research for decades. Today, she is a great inspiration for women scientists all over the world.

## CASE-BEARING CLOTHES MOTH

Saloni Sahu (B.Sc. Sem-VI)



Case bearing clothes moth larva and adult



Larva

*Tinea pellionella*, commonly known as the Case-bearing Clothes Moth, is a species of tineoid moth in the family Tineidae of Order Lepidoptera (Moths and Butterflies). Another common name is "bagworm" due to the case that their larvae carry around. It is of world-wide distribution and is of considerable economic importance. It has been recorded on a variety of substances, particularly those of a keratinous nature. In India, it has been found as an important pest of woollen textiles.

The adult of this species has a wingspan of 9 to 16 mm. It is silvery grey to shiny light brown in colour, with dark greyish hairs on the top of its head. The adult is typically encountered during summer and early autumn, but populations that live in human dwellings may be seen at other times of the year.

The larva eats mainly fibrous keratin, such as hairs and feathers. It

can become a pest when it feeds on carpets, furs, upholstery, and woollen fabrics. It also consumes detritus, cobwebs, bird nests (particularly of the domestic pigeon), stored vegetable produce and wallpaper. It stays inside a snug case it constructs from debris such as fibres and hairs.

The primary means of detection of case-bearing clothes moth is the presence of silken cases that contain larvae. To control case bearing clothes moth, items of natural fibres should be thoroughly cleaned by washing in hot water, dry cleaning, or freezing for at least two weeks to kill eggs and larvae. Susceptible items should be stored in airtight containers or sealed garment bags. Storage areas should be cleaned by vacuuming regularly.

## CORAL REEFS IN DANGER

Shruti N. Shahu (B.Sc. Sem-VI)



Coral reef

Coral reefs are among the most colourful and diverse ecosystems on Earth, often called the rainforests of the sea. They provide shelter to thousands of marine species, act as natural barriers protecting coastlines from storms, and support fishing and tourism industries. Sadly, climate change has become the biggest threat to their survival.

**Rising Sea Temperatures:** When ocean temperatures rise, corals expel the tiny algae (zooxanthellae) that live inside them and provide food. This causes coral bleaching, turning reefs white and weak. If the heat continues, corals die, leaving behind lifeless skeletons.

**Ocean Acidification:** Excess carbon dioxide in the atmosphere dissolves into the sea, making it more acidic. Acidic waters reduce the ability of corals to build their hard skeletons, weakening the entire reef structure.

**Extreme Weather and Human Impact:** Stronger storms, rising sea



Coral reefs are rich in biodiversity

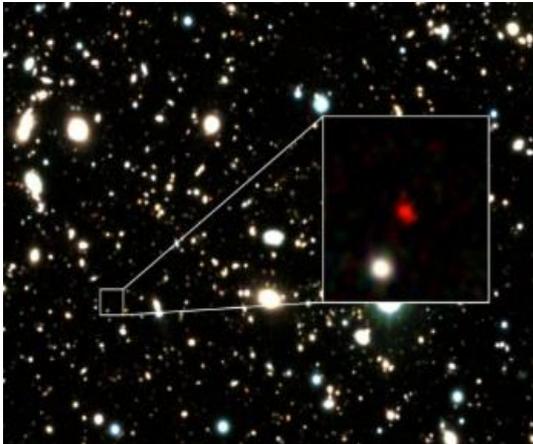
levels, and coastal pollution add further pressure. Cyclones can break reefs apart, while floods carry sediments and chemicals that choke coral growth.

The destruction of coral reefs means loss of biodiversity, decline in fish populations, reduced coastal protection, and threats to the livelihood of millions of people who depend on fishing and tourism.

Protecting coral reefs is possible if we act now. Reducing greenhouse gas emissions, controlling pollution, and establishing marine protected areas are crucial steps. We can also help by cutting down on plastic use, conserving energy, and spreading awareness. Coral reefs are not only beautiful underwater wonders, they are life-support systems for the planet. Protecting them today means securing our tomorrow.

## HD1: THE FARTHEST GALAXY

Ojaswini Mahakalkar (B.Sc. Sem-VI)



Location of HD1 Galaxy



The cosmos

HD1 is the most distant galaxy ever discovered, located approximately 13.5 billion light-years away and existing about 330 million years after the Big Bang. It is unusually bright and its composition is a puzzle, with theories suggesting it could be a primordial starburst galaxy or a galaxy hosting a supermassive black hole. Its extreme brightness in ultraviolet light is a mystery because it suggests either a massive rate of star formation, far exceeding normal expectations, or the presence of a very early supermassive black hole.

**Distance and age:** HD1 is thought to be one of the earliest and most distant galaxies in the observable universe, with its light travelling for 13.5 billion years to reach Earth. It existed just 330 million years after the Big Bang.

**Composition and brightness:** Its unusual brightness, is not yet fully

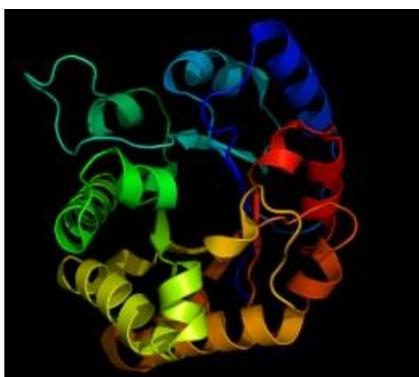
understood. One theory is that it is a starburst galaxy forming stars at an incredible rate. Another possibility is that the brightness comes from a supermassive black hole at its centre, potentially 100 million times the mass of the Sun.

**Discovery:** The galaxy was identified by a team of astronomers using data from multiple telescopes and was announced in April 2022. Astronomers are eager to use the James Webb Space Telescope to get a clearer picture and better understand HD1's nature.

Currently, HD1 is estimated to be approximately 33.3 billion light years away from earth (its present proper distance). This distance measurement accounts for the expansion of the universe.

## ENZYMES: NATURE'S LITTLE HELPERS

Padmashri R. Wankhede (B.Sc. Sem-IV)



Structure of an enzyme



Enzymes are necessary for making cheese

Enzymes are one of the most wonderful gifts of nature. They are small proteins that act like helpers inside our body. Their main job is to make chemical reactions happen faster and easier. Without enzymes, our body would not be able to digest food or produce energy on time. In short, life is impossible without them.

Enzymes work like tiny machines. Each enzyme has a special duty. For example, amylase breaks starch into sugar, protease breaks proteins into amino acids, and lipase helps in breaking fats into smaller parts. These reactions happen quickly only because of enzymes. If enzymes were not there, these processes would take a very long time.

Enzymes are not only present in our body but are also used in many industries. In the food industry, they help in making bread, cheese, curd, and juices. In the textile and paper industry, they are used to soften cloth and improve paper quality. In

detergents, enzymes help to remove stains from clothes. Medicines also use enzymes to prepare life-saving drugs. Thus, enzymes are important both for health and for modern industries.

Another amazing fact about enzymes is that they work at normal temperatures and save energy. They are also eco-friendly because they do not harm nature. For this reason, scientists are now studying enzymes to solve many environmental problems like waste management and pollution.

Enzymes are truly “nature’s little helpers.” They work silently, but their role is very big. From our body to industries, enzymes make life easier and better. We should respect and understand the importance of these tiny helpers of nature.

## HOW STUDENTS CAN REDUCE STRESS

Pranay Itankar (B.Sc. Sem-VI)



Stress reducing activities



Meditation

Student life is often considered the most energetic and creative phase of a person's journey. However, it is also the period when young minds face academic pressure, peer competition, and expectations from family and society. As a result, stress has become a common challenge among students. Learning how to manage and reduce stress is important not only for academic success, but also for overall mental and physical well-being.

To reduce stress, students should prioritize self-care, including getting enough sleep, eating a balanced diet, and exercising regularly. Students should aim for 7-8 hours of sleep each night to help the body and mind cope with stress. Maintaining a balanced diet and avoiding excessive caffeine, alcohol, and sugar is necessary, as these can negatively impact stress levels. Techniques like meditation or deep breathing can calm the mind and help focus on the present moment.

Engaging in activities that a person enjoys, such as playing music or spending time with pets, can provide a much-needed break from academic pressures. Reading, creative writing, gardening, drawing and painting, philately, numismatics, sports, fishing, cooking, hiking and camping, etc. are some of the hobbies that can reduce stress.

Students should plan out their schedule to include time for studying, socializing, and relaxation to help them feel more in control. Students can also manage stress by organizing their time, engaging in enjoyable hobbies, and building a strong support network of friends and family.

However, if stress becomes overwhelming, students should seek professional help or support from trusted adults such as parents, teachers and mentors.

## **MIYAWAKI FOREST**

**Rajeshwari Wankhede (B.Sc. Sem-II)**



**Miyawaki forest in Japan**



**Miyawaki forest in India**

Miyawaki forest is a unique method of growing dense, native forests in a short span of time. This technique was developed by the Japanese botanist Dr. Akira Miyawaki, who believed that planting indigenous species close together can restore natural ecosystems faster than traditional methods. Unlike conventional plantations, Miyawaki forests grow about 10 times faster, become 30 times denser, and are almost completely self-sustaining after a few years.

In this method, the soil is first prepared with natural fertilizers, and then a variety of local plant species, trees, shrubs, and herbs are planted very close to each other. Due to this closeness, the plants compete for sunlight and grow rapidly. Within two to three years, the forest becomes thick and capable of supporting birds, insects, and other wildlife.

The Miyawaki technique is highly useful in today's world where urbanization and deforestation are

major problems. It helps in reducing air pollution, increasing oxygen levels, conserving water, and controlling the temperature of cities. These forests also improve biodiversity by bringing back native species that might have disappeared due to human activities.

The Miyawaki Method is one of the most effective tree planting methods for creating forest cover quickly on degraded land that has been used for other purposes such as agriculture or construction. It is effective because it is based on natural reforestation principles, i.e., using trees native to the area and replicating natural forest regeneration processes. It has some significant benefits over more traditional forestry methods when used in smaller afforestation projects and is particularly effective in the urban environment. The trees planted by this method grow much faster, jump starting the forest creation process and capturing more carbon.

## MEDICINAL PROPERTIES OF TURMERIC

Sanskriti Bulkunde (B.Sc. Sem-VI)



Turmeric plant



Turmeric powder

Turmeric (*Curcuma longa*) is a spice that comes from the ginger family Zingiberaceae. It has been used in India for thousands of years as both a spice and medicinal herb. Research shows that turmeric has several potential benefits. Many of these benefits come from curcumin, its main active ingredient.

Curcumin is a bright yellow chemical, and is the principal curcuminoid of turmeric. It is sold as an herbal supplement, cosmetics ingredient, food flavouring, and food colouring. Chemically, curcumin is a polyphenol, belonging to the group of curcuminoids, which are phenolic pigments responsible for the yellow colour of turmeric.

In the past, turmeric has been used in traditional medicine in South Asia and India for various conditions such as rheumatism, severe pain, fatigue, and breathing problems. It is believed that the turmeric's healing powers can cure many illnesses.

Turmeric has been shown to be one of the best foods to maintain, protect, and boost immunity, reducing the risk of falling ill. Turmeric has antiviral, antibacterial and antimicrobial properties.

The best-known health benefit of turmeric is its anti-inflammatory and antioxidant properties, giving it the power to alleviate swelling and pain in conditions such as arthritis.

Inflammation is a very common cause of pain and discomfort. It can also contribute to the development of certain diseases. Turmeric usage reduces the risk of the side effects of taking prescription anti-inflammatory drugs.

## WALL GARDENING

Samiksha Paradkar (B.Sc. Sem-II)



Wall garden



Wall gardens can be used to beautify cities

Wall gardening, or vertical gardening, is an innovative method of growing plants on vertical surfaces, transforming walls into green spaces. It is a perfect solution for urban areas with limited horizontal space, offering aesthetic benefits like improved beauty and air quality, and environmental advantages by reducing temperature and providing insulation.

Wall gardens are designed with insulation irrigation systems to ensure consistent moisture, with automated options for challenging locations. Types include green facades that use trellises for climbing plants and living walls featuring pre-vegetated panels, creating lush, multi-functional urban ecosystems.

### Benefits of Wall gardening

**Aesthetic improvement:** Wall gardens enhance the appearance of buildings and urban spaces.

**Environmental Impacts:** Wall gardens help improve air quality by

absorbing pollutants and can contribute to a building's insulation.

**Space Efficiency:** Wall gardening is an excellent way to incorporate greenery into densely populated urban environments where land is limited.

So, gardening does not need to be restricted to the ground. Walls can be brought to life through vertical gardening. Many types of plants can thrive in a green wall, from herbs and fruit to grasses and ferns.

Gardeners have long been creating 'green walls' using wires or trellises to provide a framework for climbing plants. Plants such as clematis, honeysuckle, rose and jasmine can create an amazing scent, and are loved by many creatures from butterflies to bees.

The term wall garden can also mean plants growing in pots fixed to the wall, hanging baskets, or on ladders or steps, giving depth to patios, driveways and small spaces.

## PESTICIDE POLLUTION

Shagun Yadav (B.Sc. Sem-II)



Pesticides are hazardous chemicals



Pesticides pollute the environment

The environmental effects of pesticide use include many deleterious consequences of using pesticides. Heavy use of pesticides is one of the characteristic features of modern agriculture. Pesticides are meant to kill pest species, but also affect non-target species, such as plants, animals and humans.

Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, because they are sprayed or spread across entire agricultural fields. The negative effects of pesticides are not limited to the area of application. Runoff and pesticide drift can carry pesticides into distant aquatic environments or other fields, grazing areas, human settlements and undeveloped areas.

The extensive use of pesticides in agricultural production can degrade and damage the community of microorganisms living in the soil, particularly when these chemicals are

overused or misused, and toxic compounds build up in the soil. The full impact of pesticides on soil microorganisms is still not entirely understood. Many studies have found deleterious effects of pesticides on soil microorganisms and biochemical processes, while others have found that the residue of some pesticides can be degraded and assimilated by microorganisms.

The effect of pesticides on soil is impacted by the persistence, concentration, and toxicity of the applied pesticide, in addition to various environmental factors. In general, long-term pesticide application can disturb the biochemical processes of nutrient cycling in the soil.

Pesticides cause air, water, and soil pollution, as organic pesticides like DDT can persist in the environment for hundreds of years.

## **GEOTHERMAL ENERGY: RENEWABLE AND CLEAN**

Sneha M. Sidam (B.Sc. Sem-IV)



**Geothermal energy for power generation**



**A hot spring**

Geothermal energy is a form of renewable energy. It is the heat stored beneath the Earth's surface. The Earth's core is extremely hot (around 6000°C), and this heat naturally moves outward. In some places, it reaches closer to the surface as hot water, steam, or hot rocks. Humans can tap into this heat to generate electricity or provide direct heating.

Sources of Geothermal Energy:

1. Hot dry rocks – heated rocks that can be fractured and injected with water to produce steam.
2. Volcanic areas – natural steam vents, geysers, and hot springs.

Advantages of Geothermal energy:

Renewable and sustainable (heat continuously generated inside Earth).

Environmentally friendly (low greenhouse gas emissions).

Reliable (unlike solar and wind, not dependent on weather).

Small land footprint.

Limitations of Geothermal energy:

Location-dependent (best in volcanic or tectonically active

regions).

High upfront costs for drilling and exploration.

Possible release of trace gases (sulphur, CO<sub>2</sub>).

Risk of land subsidence or small earthquakes in some projects.

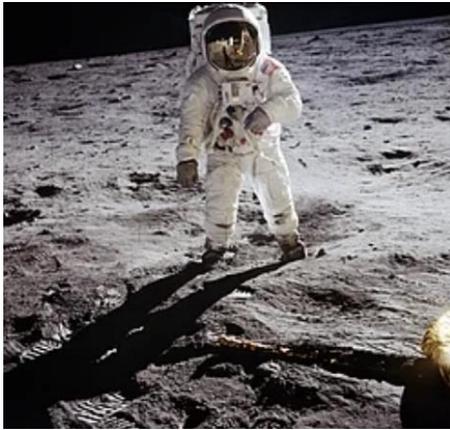
Electricity generation: The steam or hot water can be used to spin turbines that drive generators, producing electricity. Some plants use a binary cycle, where the geothermal fluid heats a second fluid with a lower boiling point, which then spins the turbine.

Direct use: The heat can also be used directly for applications like heating buildings, heating water, and for industrial processes.

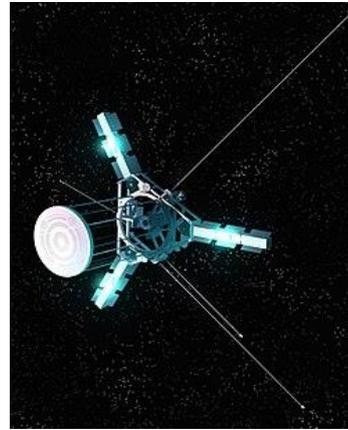
Geothermal heat pumps: These systems use the stable temperature of the shallow ground to heat and cool buildings, though installation can be more difficult in existing structures.

## BENEFITS OF SPACE EXPLORATION

Sujal S. Ingale (B.Sc. Sem-VI)



Astronaut on moon



A satellite

Space exploration has long fascinated humanity, pushing the boundaries of science, technology, and imagination. From the first human steps on the Moon to the ongoing search for life beyond Earth, exploring space offers a wide range of benefits that extend far beyond the final frontier. Here is a closer look at some of the most impactful advantages of space exploration.

One of the most immediate benefits of space exploration is the expansion of our scientific knowledge. Missions to planets, moons, asteroids, and comets provide insights into the origins of the solar system, the conditions that support life, and the behaviour of celestial bodies. Research aboard the International Space Station (ISS) also advances our understanding of biology, physics, and medicine in microgravity, with direct applications back on Earth. Satellites play a crucial role in

monitoring Earth's environment. They provide critical data on climate change, natural disasters, deforestation, ocean health, and urban development. This information helps governments and organizations make informed decisions, respond to emergencies, and plan for a more sustainable future.

Space exploration inspires people of all ages to learn more about science, technology, engineering, and mathematics (STEM). Iconic missions, like the Mars rover or the James Webb Space Telescope, capture the public's imagination and motivate students to pursue careers in scientific fields. The spirit of exploration also fosters international collaboration and a sense of global unity.

Space exploration is much more than a quest for knowledge. It is a powerful engine of progress, which benefits every aspect of human life.

**TREES OF MOHOTA SCIENCE COLLEGE CAMPUS**

Achal M. Jaiswal (B.Sc. Sem-II)



Mulberry (*Morus alba*)

Mango (*Mangifera indica*)

Indian Almond (*Terminalia catappa*)



Lime (*Citrus aurantiifolia*)

Palash (*Butea monosperma*)

Sweet Orange/Mausambi (*Citrus sinensis*)



Sheesham (*Dalbergia sissoo*)

Cheech Bilai (*Pithecellobium dulce*)

Gulmochar (*Delonix regia*)



Teak (*Tectona grandis*)

Golden Shower (*Cassia fistula*)

Drumsticks (*Moringa oleifera*)



Peepal (*Ficus religiosa*)

Jarul (*Lagerstroemia speciosa*)

Indian Beech (*Pongamia pinnata*)

**Programmes/Activities Conducted by Department of Zoology (2025-26)**



**One Day Online National Seminar (ERBAS-2025)**



**Guest Lecture by Prof. Arun Deore**



**Guest Lecture by Prof. Nitin Meshram**



**Online Guest Lecture by Dr. Tanveer Ahmad**



**Study Tour to Pench Tiger Reserve, Sillari**



**Study Tour to College of Fishery Science, Nagpur**



**On the Spot Painting Competition (World Tiger Day Activity)**



**Quiz and Debate (World Lion Day Activity)**



**Panel Discussion (International Culture Awareness Day)**



**Essay Competition (National Wildlife Week Activity)**



Field Work by UG Students to Measure Noise Pollution



Inoculation of Earthworms in Vermicomposting Pit



UG/PG Zoology Students visited Mogarkasa Reserve During Bird Week With College Environment Cell Members



Inter-College Online Quiz (World Environment Day Activity)



Field Work by UG Students to Study Campus Biodiversity



Counselling of Students during Anti-Ragging Week



Guest Lecture by Mrs. Pranjali Dhomne



Lecture by Dr. Bhavna Salame at K.Z.S. Science College

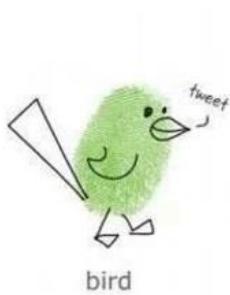


Two Day Workshop on Molecular Biology Techniques

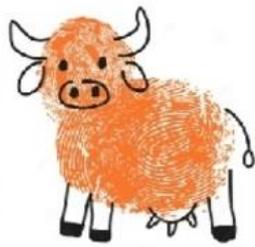


Visit to Dept of Biotechnology, Dr. Ambedkar College, Nagpur

**FUN ACTIVITY**  
**USE YOUR FINGERPRINTS TO DRAW ANIMALS**



bird



Cow



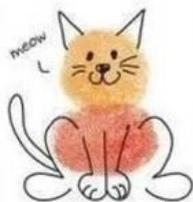
Lion



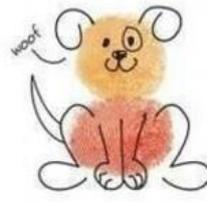
monkey



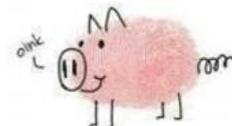
mouse



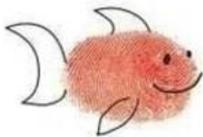
cat



dog



pig



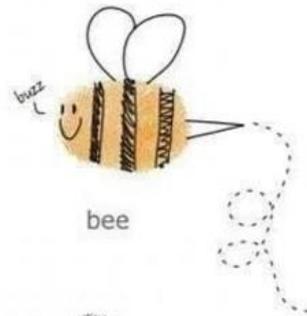
fish



Tiger



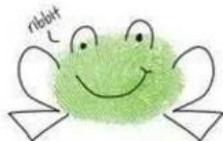
Horse



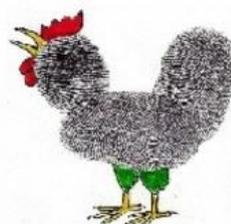
bee



ladybug



frog



Rooster