Dapoli Education Society's

DAPOLI URBAN BANK SENIOR SCIENCE COLLEGE DAPOLI.

Presenting

Eureka

E-info letter

VOL.- I
ISSUE - 10

SCIENCE

COMMERCE

SOCIAL SCIENCE

NAAC Accreditation B++ Grade
www.dubsscdapoli.in

Principal & Chief Editor:
Dr. Sandesh Jagdale

Member of Editorial Board:
1. Dr. G.B. Sathe
2. Dr. R.S. More
3. Dr. R.L. Ghalme
4. Mr. D. D. Kulkarni
5. Mr. S.S. Dongare
6. Mrs. J.A. Chaugale
7. Mrs. A. A. Mohite
8. Miss. P.S. Salvi

Front Page Concept & Design:
Mr. A.V. Mulukh

Index

Eureka E-Info Letter

Form No. IV (Rule No. 8)
(Central Rule, 1956)

1. Place of Publication:
Dapoli Urban Bank Senior Science College, Dapoli
Dist. Ratnagiri

2. Publisher's & Editor's Name:
Dr. Sandesh Pandurang Jagadale
Nationality- Indian
Address:-
Principal,
Dapoli Urban Bank Senior Science College, Dapoli
Dist. Ratnagiri -415712
Phone- 02358 283256

3. Name & Address of Principal:
Principal Dr. S. P. Jagadale
Dapoli Urban Bank Senior Science College, Dapoli
Dist. Ratnagiri -415712
Phone- 02358 283256

I, Shri Dr. S. P. Jagadale hereby declared that the particulars given above are true to the best of my knowledge and belief.

Sign /-
(Dr. S.P. Jagadale, Principal)
(The editor and publisher may not agree with the views expressed in articles.)

Soil less farming Technique

India is a nation of farmers, where nearly 60 percent of people in India earn their living through farming. However, what many miss out on is also how India has the world's largest livestock population. Despite this, many farmers focus on crops as they cannot afford to feed their livestock and, at times this livestock is malnourished and are often subjected to deficiencies. Aiming to solve this problem, two students from the TERI School of Advanced Studies have developed a community level solar-powered hydroponic fodder unit that can grow rich, nutritious green fodder with very little water and soil-less farming technique, capable of increasing crop yields by six fold compared to traditional approaches. For this, they were also awarded a bronze medal in the Grand Final of the Efficiency for Access Design Challenge. We got to interact with the masterminds behind this, Souryadeep Basak and Lavkesh Balchandani to understand what ignited this idea in their minds.

How did this idea emerge?

Souryadeep left his job at PwC India and Lavkesh changed streams from mechanical engineering to study renewable energy as they shared a great concern for climate change and unsustainable agricultural practices. They came across the award-winning idea while they were working in the domain of the food-water-energy nexus. "(We) started out by exploring hydroponics, which is a water-efficient soilless technique of agriculture. Gradually, the idea was concretised in the form of a three-stage solution. The fodder unit is tailored for the Indian scenario owing to its affordability and low payback period, as well as high land-use efficiency due to vertical integration."

Focusing on issues faced by India

The engineers explained how their application works in the confines of the challenges that farmers in India are currently facing, "The design requires 95 percent less water than traditional fodder production. It takes 8 days from seed to feed and there is no downtime owing to the soilless nature. 0.5 units of electricity is required in a month, using energy-efficient cooling strategies."

They added, "On the social front, 10,281 farmers took their own lives in 2019, owing to crop failure, low produce prices and rising debt, which is indicative of a structural malaise in the agricultural sector, leaving behind widows with no source of income. This model provides a base income for such communities without any income security. On a national scale, India has a 32 percent deficit of green fodder. Unless decentralised fodder stations are commissioned, import independence may be hard to maintain. This is particularly important as India boasts the largest livestock population of any nation."

Harnessing tech to make farming better

One of the ways they're able to make this method more feasible is by the introduction of tech, explained Basak and Balchandani, "The automation is achieved using a microcontroller that interfaces a network of sensors and actuators. A smart cooling system turns on sprinklers and fans when temperatures go above a pre-decided set-point. Evaporative cooling, fans and sprinklers are the elements of the cooling system. Simulation and passive solar strategies were leveraged to create a standard design that is applicable to all five climatic zones of India as per the National Building Code." They claim that an extremely affordable and inexpensive smart fodder unit giving yields of 50 kilograms of

green fodder can be set up for Rs 7,500 and it is completely solar-powered using DC power.

A three-stage solution

Engineers state that this technology can be seen as a three-staged solution. They explain, "The first stage is the fodder unit, which provides increased income from enhanced livestock productivity. No additional supply chain is required. Payback periods can be as low as 5 months for direct sale of fodder and 20 months for the increased sale of livestock products." The second stage transitions from growing just fodder to products such as mushrooms, "The second stage is the mushroom cultivation unit, which uses the biomass (straw, hay) that is now under-utilised as a consequence of the fodder unit. Depending on the time of year, different mushrooms may be successfully sprouted within smart grow units. Medicinal and gourmet mushrooms may be grown, and maybe sun-dried to increase their shelf life, reducing pressure on the supply chain." The third stage takes it to a whole new level, allowing farmers to grow premium-grade produce, "The third stage is a greenhouse for exotic vegetables, herbs, flowers and other horticultural produce. This stage requires an established supply chain."

The impact they want this solution to bring Souryadeep and Lavkesh, with their solution, want to help the underprivileged communities in India who are affected by the disadvantages of caste, class, gender and disability, "Most of India's farmers are small and regional farmers, relying primarily on monoculture.

We are trying to create local entrepreneurship enterprises that increase resilience and income security. Widows, persons with disabilities, and other socially ostracised groups may be reintegrated into the social fabric by employment at these units. This is relevant owing to the lack of labour availability in rural areas."

What brings them immense satisfaction

The engineers state how gratifying the experience had been for them to use their engineering skills and knowledge to promote renewable energy and create affordable solutions for communities. They added, "Hands-on learning, sponsored by UK Aid and IKEA Foundation, in association with Engineers without Borders UK, made us aware of the subtleties of designing. Finally, having a theoretical concept practically validated is the greatest gift a research student can hope for."

Reference:-

Indiatimes.com
Mohit Khanna , June 29,2021

Article by-
Ms. Deepali V. Nagvekar
Department of Botany

Simple Chemistry Can Recycle Polystyrene into More Valuable Products

Most polystyrene waste isn't currently recycled

Researchers have found a way to upcycle plastic waste into more valuable products, which they say could help tackle the growing accumulation of non-degradable waste polluting our cities and threatening life in our oceans.

Guoliang Liu at Virginia Tech and his colleagues have developed a method to break down polystyrene and convert it into a chemical that is far more valuable. The process is energy efficient and adaptable to other plastics, the researchers say.

Less than 10 per cent of the world's polystyrene is currently recycled and many countries don't recycle it at all because there is no economic incentive, says Liu. Polystyrene waste is expensive to transport and costly to break down, and recycling it only creates more polystyrene, which has little value.

Discarded protective packaging and takeaway food containers made from polystyrene don't break down naturally. They often make their way into the sea through rivers or are sometimes burned, releasing toxic chemicals.

Liu and his colleagues used ultraviolet light as an energy source and aluminium chloride as a catalyst to break down the chemical structure of the polystyrene. They then used the same catalyst and added dichloromethane, a clear liquid commonly used as a solvent, to generate diphenylmethane.

Diphenylmethane is a chemical commonly used in fragrances and medicines. It is 10 times more valuable than polystyrene itself, so the conversion creates an economic incentive to reduce polystyrene waste.

The reaction takes place at ambient temperature and at atmospheric pressure, so it requires less energy than existing methods of recycling or upcycling polystyrene. The process is easy to adopt and could be profitable at a large scale, according to the team's economic analysis.

"The most interesting thing is this is standard chemistry," says Liu. "We're not using really strict conditions, an expensive catalyst or fancy reactions. All the components that we use for this process are pretty readily available."

Liu's team is developing a catalogue of other valuable chemicals that could be obtained by changing the chemical reaction used in the final step of the upcycling process.

The concept also applies to almost all other plastics, so could help turn one of the largest environmental threats into a sustainable circular economy, says Liu.
Although the process is more cost efficient than existing recycling methods, the drawback is that it could take more time as

it is scaled up, says Bushra Al-Duri at the University of Birmingham in the UK. The process also uses some environmentally unfriendly solvents, which could prevent it being carried out at an industrial scale.

Reference:

Journal reference: *PNAS*, DOI: 10.1073/pnas.2203346119

Article by-
Mr. Shantanu Kadam
Department of Chemistry

Game Programming

"I gained a lot of skills! These skills include more computer skills which I did not have before, along with a different outlook on life. I began to see all of the opportunities in everyday life for different games and ideas. I gained a new perspective on an old picture."

Art and creative expression have an interesting way of weaving in and out of classrooms, offering students the opportunity to explore their own ideas and minds. Video games are no different, and while most of the discussion about their use in classrooms canters on play, we at foundry10 wanted to examine the value of making games. Through easily accessible programs such as Scratch and Gamemaker, students from early elementary up through college are creating games and learning while doing it. We gathered surveys from 107 game design and development professionals and 300 middle school students, before and after a game development class, about the value of teaching game development in a middle school class. Then we compared the responses of the 7th- and 8th-graders with what the game developers said they felt would be important about making games. We hope this information will help teachers who are constructing game development classes, and show the broader view of the value inherent in game development that professional game makers can provide.

Game Development Is Far More than Just Plain Old Programming

Making computer games can be a great entry point into computer science. Writing code is a major part of making video games, and 58 percent of the professionals surveyed said that programming was a key element of game development. However, they were quick to point out that the great thrill of programming for game development is to make games enjoyable for others.

This consideration for how others experience games is at the heart of game development, in the form of both imagining another's experience of the game and direct feedback by users. It's not coding just to code, it is coding to create something fun for others. "Game creation is an art of understanding and bending perception of a user... Even if it is ultimately used outside the scope of game creation."

A two-page paper published by John Nash in 1950 is a seminal contribution to the field of Game Theory and of our general understanding of strategic decision-making. That paper, “Equilibrium points in N-person games”, introduced a cornerstone concept which came to be known as Nash equilibrium. Game theory is concerned with situations where decisions interact – where the “payoff” or reward for a decision maker depends not only on his or her own decision but also on the decisions of others.

Such situations are pervasive in real life. The payoff for a buyer in an auction, for example, depends not only on the amount he bids but also on the bids of the other buyers. If the buyer’s bid is not the highest, then he loses the auction. Likewise, the profit realised by a firm depends not only on the price it sets for its product but also on the prices set by its competitors. In a tennis match, the likelihood the server will win a point depends on whether she delivers the serve to the receiver’s left or right and whether the receiver correctly anticipates it. Auctions, price setting and tennis are all examples of “non-cooperative” strategic

interactions that mathematicians and economists refer to as "games". They are non-cooperative because decision makers take their actions independently and are unable to enter into binding agreements with others regarding their actions, either because such agreements are illegal (when setting prices) or because they have no incentive to do so (as in tennis). The notion of Nash equilibrium, developed in Nash's 1950 paper, is the basis of how economists predict the outcome of strategic interactions. Informally, a Nash equilibrium is a list of actions, one for each decision maker, such that each decision maker's action is best for him, given the actions of the others. Such a list of actions is an equilibrium (or stable point), since no decision maker has an incentive to change his action. Consider a driver approaching an intersection. She stops when she approaches a red light and she continues without concern when she approaches a green light. It is a Nash equilibrium when all drivers behave this way. When approaching a red light it is best to stop since the crossing traffic has a green light and will continue. When approaching a green light it is best to continue since the crossing traffic has a red light and will stop. Thus it is in each driver's own interest to play her part in the equilibrium, given that everyone else does. No traffic cop is required. Nash equilibrium also allows for the possibility that decision makers follow randomised strategies. Allowing for randomisation is important for the mathematics of game theory because it guarantees that every (finite) game has a Nash equilibrium.

Game theory is a theoretical framework for conceiving social situations among competing players. In some respects, game theory is the science of strategy, or at least the optimal decision-making of independent and competing actors in a strategic setting. The key pioneers of game theory were mathematician John von Neumann and economist Oskar Morgenstern in the 1940s.1 Mathematician John Nash is regarded by many as providing the first significant extension of the von Neumann and Morgenstern work.

The focus of game theory is the game, which serves as a model of an interactive situation among rational players. The key to game theory is that one player's payoff is contingent on the strategy implemented by the other player.

The game identifies the players' identities, preferences, and available strategies and how these strategies affect the outcome. Depending on the model, various other requirements or assumptions may be necessary.

Game theory has a wide range of applications, including psychology, evolutionary biology, war, politics, economics, and business. Despite its many advances, game theory is still a young and developing science. According to game theory, the actions and choices of all the participants affect the outcome of each. It's assumed players within the game are rational and will strive to maximize their payoffs in the game.2

Useful Terms in Game Theory

Any time we have a situation with two or more players that involve known payout or quantifiable consequences, we can use game theory to help determine the most likely outcomes. Let's start by defining a few terms commonly used in the study of game theory:

- Game: Any set of circumstances that has a result dependent on the actions of two or more decision-makers (players)
- Players: A strategic decision-maker within the context of the game

- Strategy: A complete plan of action a player will take given the set of circumstances that might arise within the game
- Payoff: The payout a player receives from arriving at a particular outcome (The payout can be in any quantifiable form, from dollars to utility.)
- Information set: The information available at a given point in the game (The term information set is most usually applied when the game has a sequential component.)
- Equilibrium: The point in a game where both players have made their decisions and an outcome is reached

Reference

https://www.investopedia.com
game programming
https://www.uts.edu.au.com

Article By-
Ms. Netranjali S. Mahadik
Department of Computer Science

Trends of Packaging Material

INTRODUCTION:

The commercial demand for food products and nutritional supplements has increased drastically in the last few decades. The packed food products and nutritional supplements have made a profound impact on the modern human lifestyle. Since ancient times, storage and long-term use of food products remain a significant challenge for humans. There are different parameters for the evaluation of food products and relating to fast supplements broadly categorized as quality control and quality assurance. On an average million tons of food, materials get spoiled daily worldwide due to lack of storage and transportation point out packaging systems inequalities. To ensure the quality of packed food products and nutritional supplements among available measures, packaging remained an important event and had been refined from time to time to provide a standard. Over a period, the packaging industry has evolved using modern technology from the conventional methods of new generation packaging, including glass, wood, and paper to most new biodegradable materials.

The ancient pattern of packaging; manual packaging has been taken over by an automated system of packing, resulting in enhanced output with minimal chance of damage to valuable products for humanity.

TOP 10 PACKAGING INDUSTRY TRENDS

1. **Internet of Packaging:**

Internet of packaging brings technological disruption to traditional packaging and allows consumers to better connect with brands. Smart packaging leverages technology such as QR codes, smart labels, RFID, and near field communication (NFC) chips. Example: Langgeng Sukses Abadi Technology and Track Legit.

2. **Biodegradable Packaging:**

Now a day's consumers become more aware of the negative consequences of single-use plastic

Packaging, they demand eco-friendly alternatives. Biodegradable packaging and films gain traction and are suitable replacements for traditional plastic packaging. For example, starch, cellulose, PLA, polyhydroxybutyrate (PHB), polyhydroxyalkanoates (PHA), and other biopolymers. Apart from this, plant-based packaging from sugarcane, coconut, hemp, and corn starch also replaces plastic packaging. These innovations are economical for businesses to adopt and reduce the environmental impacts of the packaging sector.

2. **Digital Printing:**

Modern digital printing has a limited impact on the environment as it eliminates the need for prepress procedures or additional labeling, reducing waste and inventory requirements. With less turnaround time and more flexibility, digital printing enables customized packaging for brands to cater to different subgroups of consumers. Direct thermal printing is another printing technique that uses thermal imaging and is used to print labels and flexible packaging, without the use of inks.

3. **Packaging Automation:**

The major challenges associated with packaging are productivity, precision, and quality control. Automating the packaging processes, such as deplaning, filling, packing, and palletizing, is a big packaging industry trend. Packaging automation with the use of robotic arms and grippers not only eliminates human errors but also ensures the safe handling of delicate products. Wootzano is a UK-based startup that makes robotic systems to handle extremely delicate objects.

4. **Active Packaging:**

Active packaging increases the shelf life of the product and is a growing packaging industry trend, finding applications in the food, beverage, and pharmaceutical industries. For example, modified atmospheric packaging uses oxygen or ethylene absorbers and moisture regulators to keep food fresh. Another example of active packaging releases antimicrobial agents to prevent bacterial growth in the product.

5. **Custom Packaging:**

The appearance of a product plays a big role in attracting consumers to a product. Hence, the packaging holds as much importance as the product itself as a marketing tool for businesses. The challenge for the brands is to make the packaging eye-catching to boost sales

7. **Recyclable Packaging**

With countries banning single-use plastic, businesses now look for alternative materials for product packaging to comply with the regulations. The use of recyclable materials is one such packaging solution that enables businesses to integrate circular packaging practices. For example, post-consumer resins (PCR) are recyclable packaging material derived from post-consumer waste. Other than this, startups develop easily recyclable mono-material packaging instead of multi-layer packaging.

8. **Edible Packaging:**

Edible packaging is a revolutionary packaging industry trend that addresses these challenges and also enables a closed-loop for packaging. A good example is packaging made from milk protein used as casein film around food products.

9. **3D Printing:**

The technology offers greater design freedom to engineers and designers and empowers them to produce high-quality products. Additive manufacturing technology is also used by manufacturers to make prototypes of packaging machinery parts, for example, by printing robotic arms for a certain packaging line.

10. **Nanotechnology:**

From packaging material to product safety, authentication, and tracking, nanotechnology has applications at various phases of the packaging supply chain. The use of nano particles mixed with polymer chains enhances package barrier properties and tensile strength.

References:

- https://link.springer.com/article/10.1007/s13197-021-04964-2
- https://www.startus-insights.com/innovators-guide/top-10-packaging-industry-trends-innovations-in-2021/
- Abeer A, Choudhary R (2013) Current practices in bread packaging and possibility of improving bread shelf life by nanotechnology. Int J Food Sci Nutr Eng 3(4):55–60.

Article Written by

Mrs. Jyoti A. Chougale

Department of Commerce

Wonderful nets' of blood vessels protect dolphin and whale brains during dives

If you look at parts of the circulatory system of whales and dolphins, you might think that you are looking at a Jackson Pollock painting, not blood vessels. These cetaceans have especially dense, complex networks of blood vessels mainly associated with the brain and spine, but scientists didn't know why. A new analysis suggests that the networks protect cetaceans' brains from the pulses of blood pressure that the animals endure while diving deep in the ocean,

When whales and dolphins dive, they move their tail up and down in an undulating manner, which creates surges in blood pressure. Land animals that experience similar surges, like galloping horses, are able to release some of this pressure by exhaling. But some cetaceans hold their breath to dive for long periods of time (*SN: 9/23/20*). Without a way to relieve that pressure, those blasts could tear blood vessels and harm other organs, including the brain. The networks "equalize the [blood flow] in a way that you never lose that blood that's in the vein and it doesn't collapse down on itself, and you don't have that shooting arterial blood going really fast into the brain," says marine biologist Tiffany Keenan of the University of North Carolina Wilmington who was not involved in the study. "It's really neat to know what we've always wondered, but no one had been able to show."

Reference:

https://www.sciencenews.org/article/blood-vessels-dolphin-whale-brains-dives-retia-mirabilia

Article by
Ms.Amruta Mohite
Department: Environmental Science

Negative Energy

Negative energy is a mysterious concept in the world of physics that appears to be more suited to the pages of a science fiction novel than in real life.

Considering the universe to be approximately uniform, one can show that the total negative gravitational energy in it would exactly cancel out the total positive energy represented by matter. Hence the universe as a whole has zero total energy in it.

The great Albert Einstein said, how could the world around us be so random that even with physics, it would be impossible to make any prediction about it with certainty?

I must implore you before going to read further, keep your mind open to new concepts and thoughts, because in the world of quantum mechanics, rigidity of thought and imagination, has absolutely no place.

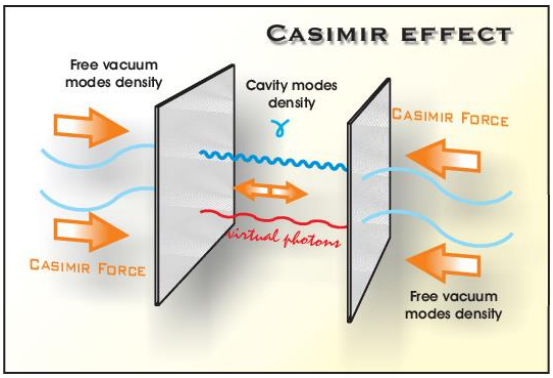
In 1928, British physicist Paul Dirac formulated and describe how could one electron have either positive or negative kinetic energy. This was the first time physics had indicated towards the existence of negative energy. But how could energy ever be negative. And if negative energy did exist, why don't we see or feel its presence? Dirac stated that in nature, the quantum states of positive energy are exactly balanced out by the quantum states of negative energy. As such, the net effect remains zero, and so we are unable to see or feel the effects of negative energy in normal everyday conditions. However, he did propose that if an ideal vacuum could be created wherein all effects of positive energy were eliminated, then the presence of the Dirac Sea and therefore of negative energy could be verified.

But the creation of an ideal vacuum seemed impossible at the time, and so the existence of negative energy could not be proven. This cast a large shadow of doubt on the very concept of negative energy. Dutch physicist Hendrik Casimir, through an innovative experiment, was able to show that it was in fact real and very much present.

Casimir Effect

Casimir argued that if the effects of gravity and electromagnetism were nullified, a nearly pure vacuum would be created within which, the effects of negative energy would manifest in an observable manner.

In his experiment it was observed that two metal plates kept apart by some distance of separation in vacuum and just attached with earthing wires, spontaneously moves closer to each other and superimpose on each other.



According to the uncertainty principle, an area of nothingness (a vacuum), can be full of an infinite number of microscopic particles known as virtual particles. These particles pop in and out of existence, appearing and disappearing randomly.

As there is only a small space present in between the metal plates, a limited number of particles having negative energy are able to manifest there. This causes a small pressure on the metal plates due to the associated wave of each particle to act from inside out.

Comparatively, a much larger number of particles with negative energy are able to manifest in the external space around the metal plates. Their associated waves together apply a much larger pressure in the

outside-in direction, resulting in the two metal plates being pushed closer until they come in contact.

Since the entire system was originally in a state of zero energy and no positive energy was introduced into it, the energy expended in doing the work of moving the plates together must be negative. Thus, the Casimir effect proves the existence of negative energy density in a vacuum.

In Modern Physics, Blackholes, Wormholes, Warp Drive etc are few examples which highlight the importance of negative energy in the modern times.

Thus, negative energy is a proven fact in physics that is known to exist all around us and everywhere in the Universe. This concept has found several applications in theoretical physics and may very well be the key for unlocking interstellar space travel one day.

Article by
Mr. Aniket Nandiskar
Department of Physics

OWL

1. Marathi name : Ghubad

2. English name : Owl

3. Size : 13.5 to71cm

4. Weight : 31 g to 4.2 kg

Information

Owls are mostly nocturnal birds of prey that belong to the order Strigiformes, dwelling in tall trees and bushy areas. The various owl species can be distinguished by their large, broad head, upright posture, a flat face, large eyes and ears, hawk-like beak, sharp talons, and easily noticeable circle of feathers.

Physical Description and Appearance

Color: Their feathers can be brown, tan, gray, white, and Rufous.

Face: They have oval faces, quite apparent in great gray owls and barn owls.

Ears: These are located at the side of their heads and are not aligned symmetrically.

Feathers: They have two types of feathers, comprising the outer layer of protective contour feathers and an inner layer of insulating fluffy feathers.

Owl Feathers

Distribution

Owls are found in all the continents, except for the Antarctic. Some owl species like the snowy owl occasionally wander southward during the winters. Areas, where the most number of owl species occur, include tropical Asia, Africa, and America, along with sub-Saharan Africa, the US, Canada, and Europe.

What Kind of Habitats Do Owls Live in

These birds are found in several different habitats, like forests, prairies, deserts, and the Arctic tundra. They live in trees, barns, caves, and are also found in holes in the ground.

How Long Do They Live

The lifespan varies across different owl species. The barn owl lives for approximately four years while the life expectancy of the great-horned owl is about 13 years. In the wild, the spotted eagle-owl lives for nearly ten years, but in captivity, it can live up to 20 years. Some of the longer-lived owls can have a lifespan of more than 20 years.

Owl Feet

What Do They Eat

Most owl species are top avian predators, and they hunt other animals like spiders, insects, snails, earthworms, crabs, reptiles, fish, birds, amphibians, and small mammals. Some species have food preferences. The scops and screech owls, for example, prefer eating insects, while the barn owls like feeding on voles, shrews, and mice. Larger species like the eagle owl preys upon ducks, game birds, hares, and young foxes. Owls are also opportunistic feeders, meaning they will hunt whatever prey they find in their area.

Behavior

- Owls are usually nocturnal hunters (a few exceptions are the burrowing owl and northern hawk-owl) that prey upon animals in darkness. Some owl species, like the pygmy owl, are crepuscular, meaning they are active at dawn and dusk.

- They spend the daytime roosting and are not easily noticeable. Owls can roost individually, in pairs, or groups.
- Before leaving their roost, the owls occasionally give a call (particularly in the breeding season).
- They loosen or fluff up their plumage when relaxed but pull them in tightly when alert. Pygmy owls turn their tail up or flick it from one side to another when excited, and the little owls move their body up and down when alarmed.
- When defending themselves or protecting their babies against danger, owls display a specialized 'threat' posture, in which their feathers are ruffled, with their wings spread out and head lowered, making them appear larger.
- They have different types of vocalizations, varying from the hoots to screeches, whistles, screams, chitters, hisses, snorts, and purrs. Owls hoot as a territorial call as well as when they are courting.

Adaptations

- The feathers of an owl are larger in comparison to an average bird's feathers. It means owls do not have to flap their wings much to float through the air, thereby bringing down the noise while flying.
- Owls' flight feathers also have serrated edges, which together with a velvet-like structure on their feathers' surface help in absorbing the sound of wing movement. This feature helps them to fly silently and capture prey.
- They have 14 neck bones that allow them to turn their head 270° in both directions. This ability helps them to swivel their head around and see behind without turning their torso.
- Their frontally placed large eyes give owls binocular vision that helps them judge the distance of an object, its size, and the speed with which it is moving.
- The asymmetrical ear positions on their skull allow them to locate their prey with high accuracy. It is especially true for nocturnal species like the barn owl and boreal owl.
- Their powerful talons are used for crushing the skull and kneading the body of prey. Crushing power varies according to the size of the owl, as well as the size and type of prey.
- The downward-facing, short, curved beak with a hooked tip is specialized for gripping the prey and tearing flesh. Owls use a scissor motion of their upper and lower bill to kill the victim.
- Their feather color helps them to blend into the natural environment, making it invisible to their prey. The snowy owls bleach-white feathers serve for camouflage in their snowy habitat while the mottled wood-owl has shades of tan, brown, and black which help them hide in the surrounding trees.

Reproduction and Mating

Most owl species, particularly those found in the sub-Arctic or temperate regions, breed during the spring. The upbringing of young owls or the period of their fledging usually coincides with the time when prey is abundant.

The male generally uses special courtship calls, flights, and food offerings to attract a female. They mate once the female accepts food from the male.

Owls are monogamous, with the pairs consisting of a male and a female and neither of them are involved with the other nesting birds. In some species, like those that are migratory, the pair remains together only during the breeding season. However, in sedentary species like the little owl, the couple stays together all through the year.

They lay between 1-12 eggs, but the number varies across species. In most species, the incubation period lasts for approximately 30 days, after which the eggs hatch every two to three days. The chicks are fed about ten times per day by the male, and

they fledge (learn to fly) in about 5-10 weeks after hatching..

Conservation

Measures have been taken to monitor the owl population and keep a check on illegal trade after a 2008 news report from Asia indicated that poaching of owls might be increasing. All owl species are included in Appendix II of the CITES treaty, and their trade is subject to strict regulations.

Interesting Facts

- Owls regurgitate the indigestible parts (bones, fur, and scales) of their prey as pellets, which are usually dissected and studied by school students as a lesson in ecology and biology.
- They have tube-shaped eyes that are completely immobile.
- Parent owls feed the strongest and oldest owlet first, which means the youngest baby owl will starve if food is scarce.
- Owls are nocturnal birds and are associated with mystery, magic, and knowledge. They are also connected to the moon, symbolizing feminine, fertility, and wisdom. In Greek mythology, owls represent the goddess of wisdom (Athena).
- Owls and humans usually live together peacefully, but there have been occasional reports of owl attacks on humans. An eagle owl, measuring approximately 50 cm, attacked a Scotsman leaving him bleeding heavily and going into shock in January 2013.

Article by
Ms. Nanda Jagtap
Department of Zoology


मुंबई विद्यापीठ
UNIVERSITY WITH POTENTIAL FOR EXCELLENCE
Best College Award
Academic Year 2016-2017
Rural Area
is conferred upon
Dapoli Education Society's
Dapoli Urban Bank,
Senior Science College
Dapoli, Dist – Ratnagiri 415 712
in recognition of valuable academic achievements and participation of the college teachers in the university system through various mechanism of the University.
Mumbai, 26th January, 2018