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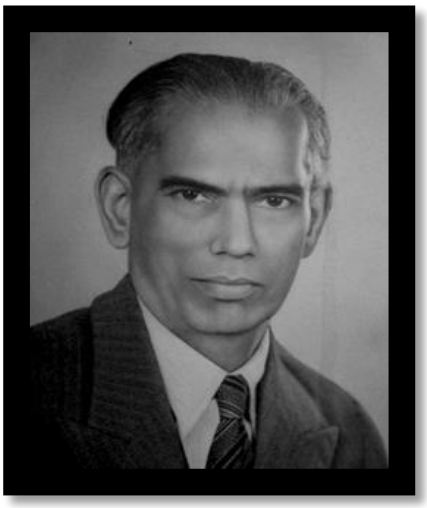
I, Shri Dr. S. P. Jagadale hereby declared that the particulars given above are true to the best of my knowledge and belief.

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

# Mandayam Osuri Parthasarathy Iyengar (1886–1963)



The passing away of Prof. M. O. P. Iyengar on the 10th of December, 1963, has deprived the world of one of the class of a great galaxy of algologists of this century, for, the last 15 years has witnessed the death of such men as Adolf Pascher, Frederick Boergesen, F. E. Fritsch, Harald Kylin, G. M. Smith, Nils Svedelius, Boye Petersen, Carl Skottsberg, Josef Schiller, Kathleen Drew, to mention some.

India lost her foremost algologist and a great Botanist. Professor Iyengar had been actively engaged in algal research till the last moment. On the 6th he was at the microscope from 8 in the morning till noon, and at lunch he had a stroke and became unconscious from which he never recovered. He died as he wished it all along in harness.

Mandayam Osuri Parthasarathy Iyengar was born in the city of Madras on 15th December, 1886. He belonged to an ancient family claiming descent from the followers of Saint Ramanuja, the great Vaishnavaite philosopher. The family had migrated from Mysore over a 100 years ago to Madras.

Mr. Iyengar matriculated from the Hindu High School and entered the Presidency College, Madras. One amusing incident is worth recording here. In those days, the Heads of various faculties used to hover around the Principal's office enticing boys to take up their special subjects, and it so happened that young Iyengar who had gone to seek admission for Botany found himself in the Philosophy class. Well, after a year Iyengar returned to Botany. He passed out of Presidency College taking his B.A. degree in 1906 and M.A. in 1909, the latter by a thesis on algal studies which branch having attracted him at such an early age. In 1909, Mr. Iyengar was appointed Curator in the Government Museum, Madras, and in 1911 he entered the Madras Educational Service as Lecturer and Head of the Natural Science Department in the Teachers' College, Madras. With his characteristic zeal and enthusiasm, he organised the Department and gave a new orientation to teaching of Natural Sciences.

Though he had already attained a position, his thirst for knowledge was such that he left for the U.K. in 1930 to work with

Prof. F. E. Fritsch in the Queen Mary College. A series of outstanding contributions on algae resulted, studies on colonial Volvocales of South India, on Fritschiella and Ecballocystopsis to mention some. Professor Iyengar was awarded the Ph.D. Degree by the University of London and was also elected a Fellow of the Linnean Society.

On return to India, Prof. Iyengar was offered the newly created Chair in Botany in the University of Madras and Director of the University Botany Laboratory. With his indefatigable energy, Professor Iyengar soon established a school of botanical research which won recognition as a leading centre of algological studies of world renown. The contributions from this laboratory by himself (over 30) and by his students have been many and covered all aspects of algal studies— taxonomy, ecology, physiology, cytology and so on. He has described a large number of genera and species and there are several new taxa named after him by his admirers.

Eminent algologists have borne testimony to Professor Iyengar's erudition and always referred to him with great respect. The writer has had the honour of listening to Prof. Fritsch, at his residence in Cambridge on many occasions, his reference to Prof. Iyengar's quality as a scientist and man and his admiration for him. The great Danish Algologist, F. Boergesen and Prof. Nils Svedelius of Sweden with whom the writer had the privilege of spending some time, used to speak very highly of the qualities of Iyengar. The former always referred to Professor's deep knowledge of the algal flora of India and the fruitful time he had during his tour of India in the twenties to collect algae in the company of Iyengar. Prof. Iyengar was invited by Prof. G. M. Smith to contribute the Chapter on Chlorophyta for his Manual of Phycology in which Prof. Iyengar's mastery of this group, his pet one, may be seen.

During his collegiate days the Professor was an active sportsman, Captain of the College Football team ; an expert swimmer who won several cups competing with soldiers—he has saved the lives of many including two of his students in 1925 from the treacherous waters of the Pamban at great risk to his life. He was a billiard champion of Madras.

Prof. Iyengar was a man of very noble character and vision and modest; an engaging conversationalist with a fund of humour; free from all petty thoughts and feelings, never harboured ill feelings even against one who did him harm. He has been never known to lose his temper or use harsh language. All who have known him and come into contact with him both here and abroad will sadly miss him

**References:**

http://mbai.org.in/uploads1/manuscripts/Article%2019%20(311-314)2025404837.pdf

***Article by***
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# Crisp Packets Made Of a New Material Could Be Much Easier To Recycle

**Crisp packets aren't widely recyclable**

When people took to posting their crisp packets back to manufacturer Walkers to protest that they weren't easily recycled, the firm took notice and launched collection points for recycling. But the reality is the special scheme has addressed just a tiny fraction of the waste mountain – 3 million of the 4 billion bags the company sells annually just in the UK – and they still aren't accepted by household recycling schemes.

Researchers say crisp makers may have to come up with a new, greener alternative. The metallised films used for today's crisp packets, chocolate bars and much other food packaging are great for keeping the contents dry and cool, but hard to recycle as they are made from several layers of plastic and metal fused together.

"The crisp packet is quite a hi-tech piece of polymer packaging," says Dermot O'Hare of the University of Oxford. However, recycling it is difficult. While technically the metallised films can be recycled at an industrial level, says UK waste agency WRAP, it isn't economically viable to do so widely yet.

O'Hare and his team's proposed alternative is a very thin layer, called a nanosheet, made from amino acids and water, applied to a film of plastic (polyethylene terephthalate, or PET, which most plastic water bottles are made of). The benign building blocks of amino acids and water appear to make a material safe for use with food, says O'Hare: "In terms of the chemistry, that was the breakthrough, making synthetic nanosheets using non-toxic materials." But he says there will be a long regulatory process, and we shouldn't expect to see the material in packaging for at least four years.

Part of the challenge in designing the material was meeting industry demands for a good barrier to gases, to avoid contamination and keep the product fresh. To make the nanosheets effective, O'Hare's team created a tortuous pathway, a sort of maze at a nano level that makes it hard

for oxygen and other gases to diffuse through.

As an oxygen barrier, it appears to perform around 40 times better than metallised film, and the material also fared well in the industry's crumple test, which involves flexing and twisting it. The film also has the big advantage of being monomaterial packaging, in other words only having one material, the PET, which can be widely recycled.

The new film is up against rivals, including clay-based materials that are mined, though their natural origin means they suffer from concerns over impurities. The race is on to be the greener material of the future, with companies such as Walkers promising fully recyclable or biodegradable packaging by 2025.

**References:**

*Nature Communications*, DOI: 10.1038/s41467-019-10362-2

***Article by***
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# Service Quality Models

A service is frequently referred to as an act, a process, or a performance. The term "added value" is more broadly defined as economic actions that benefit clients or organizations and provide "added value." Basically measuring service is very difficult task for modern era. Because in traditional day customer satisfaction or requirement was depends on very basic things. However customer satisfaction in modern days depends on many factors such as quality of product or very innovative of the product, reasonable price, and continuous activity and so on. As well as measuring service quality is also very crucial or complicated process but some service quality model help us to measure service quality in a very way. So, we can understand various service qualities as under.

A framework or set of rules used by companies to evaluate and enhance the quality of their services is known as a service quality model. It often involves a number of parameters or elements that are used to assess the quality of a service, including dependability, responsiveness, assurance, empathetic response, and tangibles. A technique for obtaining consumer input and utilizing it to pinpoint potential improvement areas may also be included in the model. The SERVQUAL model and the RATER model are two illustrations of service quality models.

SERVQUAL Model: it is a technique for locating and resolving issues with service quality. In 1988, A. Parasuraman, V. Zeithaml, and L. Berry presented it. The central concept is built on five gaps that cause services to be of lesser quality than anticipated. The approach was one of the earliest techniques developed to assess and enhance service quality.

SERVPERF model: A framework for evaluating service quality is the SERVPERF model, commonly referred to as the Service Performance model. It is predicated on the notion that service quality may be assessed by contrasting client expectations with actual experiences.

RATER model: The SERVQUAL approach, introduced in 1988 by A. Parasuraman, V. Zeithaml, and L. Berry, evolved into the RATER model. The central concept is built on five gaps that cause services to be of lesser quality than anticipated. The authors suggested that 5 dimensions be used to assess the gap between expected and perceived quality:
The Grönroos service quality model, created by Christian Grönroos, is a framework that emphasizes the functional quality and technical quality as the two most important characteristics of service quality.

**References:**

**https://ceopedia.org/index.php/Service_quality_model**

***Article by***
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# What is 5G ?


5G is the 5th generation mobile network. It is a new global wireless standard after 1G, 2G, 3G, and 4G networks. 5G enables a new kind of network that is designed to connect virtually everyone and everything together including machines, objects, and devices.

5G wireless technology is meant to deliver higher multi-Gbps peak data speeds, ultra low latency, more reliability, massive network capacity, increased availability, and a more uniform user experience to more users. Higher performance and improved efficiency empower new user experiences and connects new industries.

**What are the difference between the previous generation of mobile networks and 5G ?**

The previous generations of mobile networks are 1G, 2G, 3G, and 4G.

**First generation - 1G**

1980s: 1G delivered analog voice.

**Second generation - 2G**

Early 1990s: 2G introduced digital voice (e.g. CDMA- Code Division Multiple Access).

**Third generation - 3G**

Early 2000s: 3G brought mobile data (e.g. CDMA2000).

**Fourth generation - 4G LTE**

2010s: 4G LTE ushered in the era of mobile broadband.

1G, 2G, 3G, and 4G all led to 5G, which is designed to provide more connectivity than was ever available before.

5G is a unified, more capable air interface. It has been designed with an extended capacity to enable next-generation user experiences, empower new deployment models and deliver new services.

With high speeds, superior reliability and negligible latency, 5G will expand the mobile ecosystem into new realms. 5G will impact every industry, making safer transportation, remote healthcare, precision agriculture, digitized logistics — and more — a reality.

**How and when will 5G affect the global economy?**

5G is driving global growth.

• $13.1 Trillion dollars of global economic output

• 22.8 Million new jobs created

• $265B global 5G CAPEX and R&D annually over the next 15 years

Through a landmark 5G Economy study, we found that 5G's full economic effect will likely be realized across the globe by 2035—supporting a wide range of industries and potentially enabling up to $13.1 trillion worth of goods and services.

This impact is much greater than previous network generations. The development requirements of the new 5G network are also expanding beyond the traditional mobile networking players to industries such as the automotive industry.

The study also revealed that the 5G value chain (including OEMs, operators, content creators, app developers, and consumers) could alone support up to 22.8 million jobs, or more than one job for every person in Beijing, China. And there are many emerging and new applications that will still be defined in the future. Only time will tell what the full "5G effect" on the economy is going to be.

***Article by -***
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# Sustainable Batteries ~ The Future of Responsible Clean Technology

Sustainable batteries play a crucial role in advancing clean technology for a cleaner and greener future. At the forefront of this transformative field is Sorbiforce, an innovative company dedicated to revolutionizing energy storage through sustainable solutions. With a strong commitment to environmental responsibility, Sorbiforce has successfully unveiled the world's first sustainable battery, marking a significant milestone in reshaping the energy storage landscape.

Batteries play a significant role in the energy transition, serving as a vital power source and storage solution for a sustainable energy future. By facilitating the efficient shift from fossil-based fuels to alternative, renewable energy sources, batteries play a pivotal role in reducing greenhouse gas emissions. With the main component being an ultra-porous carbon, other parts of the world's first sustainable battery construction come from plastic and agricultural waste. The use of these materials limits the issues commonly associated with battery disposal and thus further protects the environment.

The innovative use of waste materials means that Sorbi Force's revolutionizing battery technology is easy to recycle as all battery parts can be easily disposed of and recycled, and the organic raw materials can also be reused as a fertilizer. Recycling is as easy as depressurizing the unit, filling it with water, and discarding the materials in a designated organic or compostable waste container. This is possible due to the metal-free design, which contains no toxic substances. The market potential for a new kind of sustainable easy-to-recycle battery made from entirely renewable raw materials could prove to be game-changing in the energy transition.

## References


- 6 Top Secondary Battery Startups and Companies in United States (2023) F6s.com. "Sorbiforce". Sorbiforce.Com, 2023, https://sorbiforce.com/ (Accessed 7 Aug 2023.)



***Article by -***
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# Penicillin


**How do penicillins work?**

Penicillin's are a group of antibacterial drugs that attack a wide range of bacteria. They were the first drugs of this type that doctors used. The discovery and manufacture of penicillin's have changed the face of medicine, as these drugs have saved millions of lives.

**Fast facts on penicillin**

- Penicillins were the first antibiotic that doctors used.
- There are several antibiotics in the penicillin class.
- Experts credit Alexander Fleming with discovering penicillins.
- Penicillin works by interfering with bacteria cell walls.
- Less than 1 percent of people are dangerously allergic to penicillin.

**Function.**

Drugs in the penicillin class work by indirectly bursting bacterial cell walls. They do this by acting directly on peptidoglycans, which play an essential structural role in bacterial cells.Peptidoglycans create a mesh-like structure around the plasma membrane of bacterial cells, which increases the strength of the cell walls and prevents external fluids and particles from entering the cell.

When a bacterium multiplies, small holes open up in its cell walls as the cells divide. Newly-produced peptidoglycans then fill these holes to reconstruct the walls.Penicillins block the protein struts that link the peptidoglycans together. This prevents the bacterium from closing the holes in its cell walls.As the water concentration of the surrounding fluid is higher than that inside the bacterium, water rushes through the holes into the cell and the bacterium bursts.

**History**

People generally attribute the discovery of penicillin's to Alexander Fleming. The story goes that he returned to his laboratory one day in September 1928 to find a Petri dish containing Staphylococcus bacteria with its lid no longer in place.The dish had become contaminated with a blue-green mold called Penicillium notatum. Fleming noted that there was a clear ring surrounding the mold where the bacteria had been unable to grow.

By discovering this mold and recognizing its use, Fleming set the wheels in motion to create one of the most useful drugs in medical history.

In March 1942, Anne Miller became the first civilian to receive successful

treatment with penicillin. She narrowly avoided death following severe infection after a miscarriage.

Although Fleming technically discovered the first antibiotic, scientists had to do a lot of work before penicillins could become available for general use. Scientists with a superior laboratory and a deeper understanding of chemistry than Fleming carried out the bulk of the work. Howard Florey, Norman Heatley, and Ernst Chain performed the first in-depth and focused studies on the drug.

In Fleming's Nobel Prize acceptance speech, he warned that the overuse of penicillins might, one day, lead to bacterial resistance. This has since become a problem.

**Resistance**

Contrary to popular opinion, it is not the person who develops resistance to penicillins but the bacteria itself.

Bacteria have been around for billions of years. During this time, they have endured extreme environments and, as a result, are highly adaptable. They also regenerate very rapidly, making relatively quick genetic changes possible across a population.

There are three common ways in which bacteria can develop an immunity to penicillin:

- Penicillinase: Bacteria are sometimes able to produce penicillinase, an enzyme that degrades penicillins. This ability can spread throughout the bacterial population via a small ring of DNA in a process called conjugation. This is the bacterial equivalent of sexual reproduction, where individual organisms share new genetic information between them.
- Altered bacterial structure: Some bacteria can subtly change the format of the penicillin-binding proteins in their peptidoglycan wall so that penicillins can no longer bind to it.
- Penicillin removal: Other bacteria develop systems to export penicillins. Bacteria have efflux pumps that they use to release substances from the cell. The repurposing of some of these pumps can allow the cell to dispose of penicillins.
- Resistance

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Side effects

The most common side effects of taking penicillins include:

- diarrhea
- nausea
- a headache
- skin rashes and hives

Less common side effects include:

- shortness of breath or irregular breathing
- joint pain
- sudden light headedness and fainting
- puffiness and redness of the face
- scaly, red skin
- vaginal itching and discharge, due to either a yeast infection or bacterial vaginosis
- sore mouth and tongue, sometimes with white patches
- abdominal cramps, spasms, tenderness, or pain

## References

Medical new todays -Medically reviewed by Zara Risoldi Cochrane, Pharm.D., M.S., FASCP — By Tim Newman on July 30, 2018.

***Article by:***
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# HOMI BABA INSTITUTE

**INTRODUCTION**

The Homi Bhabha National Institute (HBNI) was established in 2005 under section 3 of the UGC Act. HBNI has the following Centres as its Constituent Institution (CI)/Off-Campus Centre (OCC): The Homi Bhabha National Institute (HBNI) was established in 2005 under section 3 of the UGC Act. The role of HBNI is to nurture in-depth capabilities in nuclear science and engineering and to serve as a catalyst to accelerate the pace of basic research and facilitate its translation into technology development and applications through academic programs, viz., Master's and Ph.D. degrees in Engineering, Physical, Chemical, Mathematical, Life and Medical & Health Sciences while encouraging inter-disciplinary research. Additionally, academic programs in the domain of Applied Systems Analysis have also been identified to ensure the availability of adequate qualified human resources to address issues pertaining to nuclear law, the economics of nuclear power, nuclear security, nuclear proliferation, intellectual property rights etc. HBNI has been accredited by NAAC with a score of 3.4, as a category 'A+' University in 2021. In the MHRD's National Institutional Ranking Framework (NIRF) exercise for the academic year the 2022, HBNI received 17th rank in the University, 15th position in Research Institution category and was placed at 30th position among 1657 institutions in the overall category. HBNI has the following Centres as its Constituent Institutions (CI's)/Off-Campus Centre (OCC):perty rights etc. HBNI received among 1657 institutions in the overall category.

**HISTORY**

The Indian Department of Atomic Energy (DAE) was set up in 1954 and its mandate includes research including fundamental research in matters connected with atomic energy and the development of its uses in power generation, research, agriculture, industry and health care and advancement of higher mathematics. In pursuit of its mandate DAE has established several research and development centres, grant-in-aid institutions and has taken in its fold several existing grant-in-aid institutions. All research institutions under the umbrella of the DAE have been pursuing academic programme right from their inception. Considering continued expansion of atomic energy programme and considering the fact that the DAE institutions are engaged in human resource development programmes, the DAE Science Research Council recommended in 2003 that the DAE should establish a university-level institution. After completing all formalities, Prime minister of India, Manmohan Singh, announced the approval of the government of India for setting up of HBNI on 4 June 2005. It is named after the late Indian physicist Homi J. Bhabha. The HRD Ministry of the government of India declared Homi Bhabha National Institute (HBNI) a deemed to be university along with ten Constituent Institutions (CIs).

The first director/vice-chancellor, Ravi Grover has written a brief history of the institute in an article published by him on the website of the Indian National Academy of Engineering. He has also written an article in Current Science (10 October 2019) explaining the rationale for setting up the institute.

For developing a well trained central government engineers in the area of nuclear science and engineering, DAE established the "Training School" in 1957 at Trombay, Mumbai. Courses are conducted at all CIs and at BARC Training schools

AFFILIATED INSTITUTE

i. Bhabha Atomic Research Centre (BARC), Mumbai
ii. Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam
iii. Raja Ramanna Centre for Advanced Technology(RRCAT), Indore
iv. Variable Energy Cyclotron Centre (VECC), Kolkata
v. Saha Institute of Nuclear Physics (SINP), Kolkata
vi Institute for Plasma Research (IPR), Gandhinagar
vii. Institute of Physics (IoP), Bhubaneswar
viii Harish-Chandra Research Institute (HRI), Allahabad
ix. Institute of Mathematical Sciences (IMSc), Chennai
x. Tata Memorial Centre (TMC), Mumbai
xi. National Institute of Science Education and Research (NISER), Bhubaneswar (OCC)

**ACADEMIC PRORAMMES**

For developing a well trained central government engineers in the area of nuclear science and engineering, DAE established the "Training School" in 1957 at Trombay, Mumbai. Courses are conducted at all CIs and at BARC Training schools

**RANKING**

The National Institutional Ranking Framework (NIRF) ranked Homi Bhabha National Institute 30th overall in India and 14th among universities in 2020. In NIRF 2021, in University category, it is ranked 18th.

The Nature Index has ranked HBNI 10th in the world under the ranking of "Nine universities under 50 in the fast lane", published in 2019.

The Nature Index 2020 Annual Tables highlight the institutions and countries that dominated high quality research in the natural sciences in 2019 as tracked by Nature Index. The rankings are based on an institution's or country's share of articles published in the 82 prestigious scientific journals selected by an independent panel of experts and tracked by the Nature Index database. According to Nature Index 2020, HBNI ranked at second position, behind Indian Institute of Science, among all academic institutions in India based on publications (count as well as share) during the period 1 March 2019 to 29 February 2020.

**MISSION**

To encourage pursuit of excellence in sciences (including engineering sciences) and mathematics in a manner that has major significance for the progress of indigenous nuclear technological capability.

**VISION**

i) To provide an academic framework for integrating basic research with technology development.
ii) To encourage inter-disciplinary research.
iii) To nurture an environment for attracting high quality manpower in the sciences including engineering sciences to take up a career in nuclear science and technology and related areas.

**GUIDING VALUES**

i) Always adhere to highest ethical standards.
ii) Put good of students first.
iii) Value excellence in research and foster innovation and creativity.
iv)Recognize importance of science for the development of society.

**REFERENCES**

"The Beginning". Homi Bhabha National Institute. Retrieved 16 October 2015.
^ "Setting up of Homi Bhabha National Institute" (PDF). Retrieved 24 December 2017.
^ "HBNI -> Council of Management". Homi Bhabha National Institute. Retrieved 19 November 2017.

^ "Comparative assessment of the (Deemed to be University)" (PDF). Government of India, Ministry of Human Resource Development.
^ "Central Educational Institutions" (PDF). Ministry of Law and Justice.
^www.hbni.ac.in http://www.hbni.ac.in/main/NAAC/naacloi.html. Retrieved 23 November 2017. {{cite web}}: Missing or empty |title= (help)
^ "Dr Manmohan Singh announced the approval" (PDF). BARC. Retrieved 4 June 2005.
^ "Setting up of Homi Bhabha National Institute" (PDF). Retrieved 24 December 2017.
^ "Integrating the function of a university to a work place to promote post-academic research" (PDF). Retrieved 26 October 2019.
^ "Development of human resources for Indian nuclear power programme", Sadhana, Vol. 38, Part 5, October 2013, pp 1051-1064.
^ [1]. The Hindu (2011-12-26). Retrieved on 2023-05-14.
^ Jump up to:a b "National Institutional Ranking Framework 2020 (Overall)". National Institutional Ranking Framework. Ministry of Education. 11 June 2020.
^ Jump up to:a b "National Institutional Ranking Framework 2020 (Universities)". National Institutional Ranking Framework. Ministry of Education. 11 June 2020.
^ "Nine universities under 50 in the fast lane". natureindex.com. Retrieved 3 May 2020.
^ "Institution Output 1 March to 29 February 2020". natureindex.com. Retrieved 19 May 2020.
^ "HBNI - The Beginning". www.hbni.ac.in. Retrieved 8 February 2022

***Article by:***
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# The Fascinating World of Butterflies

With their delicate wings and vibrant colours, butterflies have enchanted humans for thousands of years. They symbolize transformation, hope and the beautiful beauty of nature. However, beyond their aesthetic appeal, they play an important role in our ecosystem. This article is dedicated to providing comprehensive butterfly information, ensuring that you learn about these fascinating creatures beyond their colourful facades.

**Life cycle of a butterfly**

The life cycle of a butterfly is a fascinating journey, a testament to the wonder of nature and an essential aspect of the butterfly. This is a process known as 'metamorphosis', which involves a complete transformation from one form to another, which takes place in four different stages.

**Egg Stage –** Our journey begins when the female butterfly lays the egg. Depending on the species, these eggs can be applied to different types of plants, carefully selected to ensure the survival of each offspring. The eggs are small, often oval or round, and their exterior, called the chorion, is dotted with small ridges and valleys.

**Larval (Caterpillar) Stage –** The next stage begins when the egg hatches and the caterpillar or larvae emerge. This is a time of tremendous growth. A caterpillar's primary function is to eat and grow, storing enough energy for the metamorphosis process. They will shed their skin or molt several times as they grow.

**The Pupa (Chrysalis) Stage –** After reaching a certain size, the caterpillar enters the pupa or chrysalis stage. It finds a safe place, suspends itself securely and forms a protective sheath around its body. Within this mantle, one of nature's most extraordinary processes takes place. The caterpillar's old body breaks down and a new body is formed – this time, that of a butterfly.

**Adult Butterfly Stage –** When metamorphosis is complete, an adult butterfly emerges from the chrysalis. A newly hatched butterfly needs some time to dry and harden its wings before it can fly. The adult butterfly will then focus on the next generation – finding a mate and laying eggs to start the cycle again.

This cyclical butterfly pattern is a remarkable testament to nature's flexibility and adaptability. Each stage of a butterfly's life is marked by unique challenges and specific purposes, contributing to the survival of the species and the diversity of our ecosystems.

**Different Types of Butterflies**

More than 20,000 species of butterflies are known to us, each with unique characteristics, behaviour and habitat. Here, we are going to learn some fascinating butterfly information in Marathi (butterfly information) by highlighting some of the species that show immense diversity in the world of butterflies.

**Monarch Butterfly** – The Monarch is one of the most recognizable butterfly species, known primarily for its incredible migration. Each year, these orange and black beauties travel 3,000 miles from North America to Mexico for winter hibernation, a feat unmatched in the insect world.

**Painted Lady –** Painted lady butterflies are one of the most widespread species on every continent except Antarctica. Their distinct orange, black and white wing pattern is easily recognizable. They are also known for their large migrations in some parts of the world.

**Swallowtail Butterfly –** The swallowtail is one of the largest and most vibrant butterfly species. Named for the unique tail-like extension on their hind wings, they are found worldwide with more than 550 species. Eastern black and tiger swallowtails are commonly seen in North America.

**Blue Morpho –** Blue Morpho are known for their striking, metallic blue wings. They live in the tropical forests of Central and South America. The blue colour is not caused by pigment, but by how light reflects off the microscopic scales on their wings.

**Peacock Butterfly** – Native to Europe and Asia, peacock butterflies are named for their iridescent eye spots, which resemble peacock tail feathers. These eyespots can scare or distract predators, giving the butterfly an opportunity to escape.

These various species represent the vast biodiversity in the world of butterflies. Each butterfly species holds specific information about its habitat, behaviour and role in the ecosystem, underscoring the importance of conservation efforts to maintain this diversity.

**Anatomy of a Butterfly**

From their vibrant wings to their specialized feeding apparatus, every part of a butterfly's body has evolved to help it thrive in its environment. Here are the main elements:

**Wings** – Butterfly wings are made up of thin layers of chitin, the same protein that makes up their exoskeleton. The wings are covered with thousands of tiny scales that create the beautiful patterns and colours we see. These colours can serve many purposes, such as attracting mates, camouflage, and deterring predators.

**Body** – A butterfly's body, like other insects, is divided into three parts: the head, the thorax (the middle part), and the abdomen (the last part). The thorax is where you will find the butterfly's powerful flight muscles. The core contains various internal organs, such as reproduction and digestion.

**Head –** You'll find a pair of compound eyes on the head, allowing them to see UV and polarized light. They also have two antennae for balance, orientation, and sense of smell.

**Proboscis –** One of the most unique parts of a butterfly's anatomy is its beak. This long, tube-like "tongue" is used to absorb flower nectar. When not in use, it is rolled up like a garden hose. A good example is the proboscis, which helps butterflies play an important role as pollinators, allowing butterflies to feed on nectar.

**Legs –** Butterflies have six legs, each with small claws at the end that help them grip surfaces. Some butterflies also have special sensors on their feet that allow them to "taste" or learn the chemical composition of the plants they land on – especially useful for female butterflies looking for suitable plants to lay their eggs on.

**Butterflies and Their Ecosystem**

Butterflies are beautiful creatures to behold and make an important contribution to our ecosystem. Here are some of the major ways butterflies contribute to our ecosystem:

**Pollinators –** Like bees, butterflies play an important role in pollination. As they move from flower to flower, drinking nectar, they inadvertently pick up and deposit pollen. This cross-pollination helps plants to reproduce, which leads to genetic diversity in the plant population. Some plants rely heavily on butterflies for this process.

**Food Source –** During their various life stages, butterflies are an essential food source for many organisms. Birds, bats, spiders and other insects prey on butterflies and their larvae. Some species of ants feed on sugary secretions produced by butterfly larvae.

**Indicator Species** – Butterflies are often used as indicator species, meaning that scientists measure ecosystem health by studying changes in their populations. Because butterflies are highly sensitive to environmental changes, a decline in butterfly populations may signal pollution, climate change, or biodiversity loss.

**Enhancing Biodiversity –** Each butterfly species has specific plants it prefers to feed on or lay eggs on. This promotes plant diversity, as plants favoured by butterflies are more likely to thrive. In this way, butterflies indirectly increase biodiversity in their habitats.

**Cultural and economic impact –** Butterflies have long been important cultural symbols, representing transformation, beauty and freedom in many societies. Economically, butterfly farming can provide income to communities for butterfly tourism and educational purposes.

Butterflies are important threads in the intricate web of life. The existence of each butterfly provides information about the health and vitality of our ecosystem. We should appreciate their role and work for their conservation to maintain ecological balance.

**Fun Facts about Butterflies**

Dive into the world of butterfly facts, it's not all scientific facts and ecological significance. There are also countless fascinating and fun facts about these mesmerizing creatures that can pique curiosity and heighten a sense of wonder. **Here are some fun facts about butterflies:**

**Butterflies taste with their feet** – Butterflies have taste receptors on their feet, which they use to find suitable plants to lay their eggs on. Standing on the leaf, they can taste the caterpillar to see if they can eat it.

**Butterflies Can't Fly If They're Cold** – Butterflies need an optimal body temperature of about 85 degrees Fahrenheit to fly. Since they are cold-blooded, they can warm up by basking in the sun. If it's too cold, they can't fly.

**Butterfly wings are transparent** – Butterfly wings are covered with thousands of tiny scales, each a different colour. However, feathers are made of a protein called chitin and are transparent!

**World's Largest Butterfly Has Foot-Long Wings –** The female Queen Alexandra's wingspan is a giant butterfly with a wingspan of up to 1 foot (30 centimetres).

**Butterflies Remember What They Learned As Caterpillars –** Studies show that butterflies retain memories from their caterpillar stage. This means they remember some of the things they learned before they transformed.

**Some butterflies migrate long distances –** monarch butterflies are known for their large scale migrations. Every year, they travel thousands of miles from North America to Mexico – a feat for such a small animal!

**Butterflies see a range of colours –** Butterflies have a wide range of colour vision. They can see beyond the human visible spectrum into the ultraviolet region.

**These facts underscore just how remarkable butterflies are, reinforcing why we should appreciate and conserve these unique creatures**

**Conclusion**

With their striking colours and mesmerizing flights, butterflies have captivated our hearts and minds since time immemorial. They are an integral part of our ecosystem, serving as pollinators, indicators of environmental health and food sources for other animals.

Each butterfly has a story of resilience and transformation, reflected in its complex life cycle. Their diverse species represent the richness of our planet, while their unique anatomy makes them well-equipped for their unique roles in ecosystems. Unfortunately, these beautiful creatures face many threats such as habitat loss, climate change, pesticides and more.

We hope this article has increased your understanding and appreciation of butterflies. So, the next time you see a butterfly fluttering gracefully, stop for a moment and appreciate it, because it is not just a fleeting beauty but a small miracle of nature that encompasses a world of wonder in its delicate wings

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