



# NATIONAL SCIENCE DAY OBSERVATION-2024



‘Indigenous Technologies for Viksit Bharat’

Date- 28<sup>th</sup> February, 2024  
(One Day National Conference)

**Abstract Volume**



Organize by  
**ALL SCIENCE DEPARTMENTS & IQAC**  
**Mahatma Gandhi College, Lalpur, Purulia**

*In collaboration with*  
**District Science Centre, Purulia**



*Venue and host*

**Mahatma Gandhi College Lalpur**  
**Daldali, Purulia**

Supported and Catalyzed  
*by*  
**Mahatma Gandhi College Lalpur**  
**Daldali, Purulia**

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## ABOUT THE INSTITUTION

It was in November 1981 that Mahatma Gandhi College was established at Lalpur, Purulia. From the date of foundation it is absolutely clear that the college is relatively a new one. But what began as a tiny seed grew into a reasonably moderate tree sheltering now more than 2500 students in its various departments. It was in recognitions of a sustained endeavour of a number of education loving people which ultimately transformed a tottering child into a resolute youth, striding forward to a new horizon of attainments, that on November 25th 2006, teachers, students, local enthusiasts, the district administration assembled to observe with considerable razz-ma-tazz the Silver Jubilee celebration of that cherished youth namely Mahatma Gandhi College.



### About the Seminar:

National Science Day is celebrated annually on February 28<sup>th</sup> in India to commemorate the discovery of the Raman Effect by Sir C. V. Raman in 1928. This scientific discovery earned us the Nobel Prize in Physics in 1930. With the entire country our college celebrated this occasion in its own way.

**History of the Science Departments:** Mahatma Gandhi College was established on November, 1981. With Very few students' strength and with a very little infrastructure our college was started its journey. In 2005-2006 that our college got affiliation to start Science Departments with subject Zoology, Botany and Chemistry as General Stream. It was quite unfortunate for us that we were unable to start science departments due to non availability of students. With the help of college administration, we were finally able to start the journey of Zoology, Botany, Chemistry, Computer Science, Mathematics as B.Sc. Bio and Pure three years General Degree Course from the session 2010-2011. Later in the Year 2017 Department of Physics was started successfully.

The Department of Zoology began its journey interesting Zoology as B.Sc. Honours with CBCS from 2018.

From 2023-24 session Science Department of our college has been following NEP-2020 as per schedule and instruction of the SKB University, Purulia. Currently we are offering Zoology, Botany and Mathematics as Major subject where as Chemistry, Physics and Computer science as Minor subject.



**Towards Science Block**

## Flayer

|   |  |  |
|---|--|--|
| <p><b>NATIONAL SCIENCE DAY -2024</b><br/>(A One Day Conference)<br/><b>THEME: 'Indigenous Technologies For Viksit Bharat'</b><br/>on<br/><b>28<sup>th</sup> February, 2024</b></p>  | <p><b>PATRON</b><br/>Dr. Santi Kundu<br/>Principal, M.G College</p> <p><b>CONVENOR</b><br/>Susanta Mallick<br/>Assistant Professor Head, Dept of Zoology, M.G College</p>  | <p>Dr. Manab Kumar Saha<br/>Assistant Professor, Dept. of Zoology<br/>Ramananda Centenary College, Lalpara<br/>Purulia<br/>Topic: Prani Jagate Ranger Mayajal</p>   |
|    | <p><b>ORGANIZING SECRETARY</b><br/>Dr. Kalyan Senapati (Joint Secretary)<br/>Assistant Professor Head, Dept of Chemistry, M.G College<br/>Asit Ray (Joint Secretary)<br/>Assistant Professor Head, Dept. of Botany, M.G College</p> <p><b>TREASURER</b><br/>Siddhartha Daripa<br/>Dept of Botany, M.G College</p>  | <p><b>CHIEF GUEST</b><br/>Mr. Gurupada Tudu<br/>President, Governing Body, M.G.College, Purulia</p>   |
| <p><b>ORGANISED BY</b><br/>ALL SCIENCE DEPARTMENTS &amp; IQAC<br/>MAHATMA GANDHI COLLEGE, LALPUR,<br/>PURULIA (W.B)<br/>IN COLLABORATION WITH DISTRICT<br/>SCIENCE CENTRE, PURULIA</p>  | <p><b>MEMBERS</b><br/>Sanat Kumar Murmu, SACT-II, Dept of Zoology<br/>Manidipa Mitra, SACT-II, Dept of Mathematics<br/>Animesh Hazra, SACT-II, Dept. of Physics<br/>Souvik Mahato, SACT-II, Dept. of Computer Science</p> <p><b>INVITED SPEAKERS</b></p>   | <p><b>NO REGISTRATION FEE</b></p> <p><b>ABSTRACT SUBMISSION</b><br/>Abstract/full paper from any areas of science related topic within 250/3000 words respectively should be typed in times new roman of front size 12 points along with authors names followed by address and e-mail of the corresponding author. Poster: There will be a poster session. Size 4X3(L X B) feet. Abstract may be sent to<br/>Email: <a href="mailto:mgscolalpur@gmail.com">mgscolalpur@gmail.com</a><br/>Last date of submission of abstract 25<sup>th</sup> February 2024</p> |
| <p><b>ABOUT THE INSTITUTION</b><br/>It was in November 1981 that Mahatma Gandhi College was established at Lalpur, Purulia. From the date of foundation it is absolutely clear that the college is relatively a new one. But what began as a tiny seed grew into a reasonably moderate tree sheltering now more than 2500 students in its various departments. It was in recognitions of a sustained endeavour of a number of education loving people which ultimately transformed a tottering child into a resolute youth, striding forward to a new horizon of attainments, that on November 25<sup>th</sup> 2006, teachers, students, local enthusiasts, the district administration assembled to observe with considerable razz-ma-tazz the Silver Jubilee celebration of that cherished youth namely Mahatma Gandhi College.</p> | <p>Shri. Dhruvajyoti Chattopadhyay<br/>District Science Officer<br/>District Science Centre, Purulia<br/>National Council of Science Museums<br/>Ministry of Culture, Govt. of India</p>  <p>Dr. Anirban Panda<br/>Assistant Professor, Dept. of Chemistry<br/>Jagannath Kishore College, Purulia<br/>Topic: Anabik Gyendagiri Ramaner Chokhe</p>  | <p><b>CONTACT</b><br/>Mahatma Gandhi College, Lalpur, Purulia- 723130<br/>Website: <a href="https://mahatmagandhicollegelalpur.ac.in/">https://mahatmagandhicollegelalpur.ac.in/</a><br/>Contact Information:<br/>Prof. Susanta Mallick – 8927568578<br/>Dr. Kalyan Senapati - 7908062509<br/>Prof. Asit Ray - 9064610518</p>  |

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|---|---|---|
| <p><b>INVITATION</b></p> <p>Dear Sir/Madam,</p> <p>We are glad to inform you that all science departments &amp; IQAC of Mahatma Gandhi College in collaboration with District Science Centre, Purulia are going to organize National Science Day-2024 on 28<sup>th</sup> February, 2024 in our college.</p> <p>We earnestly solicit your presence and active participation in this event of knowledge and idea sharing and exchange.</p> <p>With warm regards,</p> <p><b>Convenor</b><br/>Prof. Susanta Mallick<br/>M.G College</p> <p><b>Principal</b><br/>Dr. Santi Kundu<br/>M.G College</p> <p>Date:- 28.02.24      Time:- 11.00 AM<br/>Venue:- Seminar Hall, M. G. College, Lalpur</p> | <p><b>Scientific Sub Committee</b><br/>Dr. Santi Kundu<br/>Prof. Rahul Chakrabarti<br/>Dr. Kalyan Senapati<br/>Prof. Susanta Mallick<br/>Prof. Asit Ray<br/>Mr. Siddhartha Daripa</p>  <p><b>About the Seminar:</b><br/>National Science Day is celebrated annually on February 28<sup>th</sup> in India to commemorate the discovery of the Raman Effect by Sir C. V. Raman in 1928. This scientific discovery earned us the Nobel Prize in Physics in 1930. With the entire country our college celebrated this occasion in its own way.</p> |  <p><b>National Science Day-2024</b><br/>Organized By<br/>All Department of Science &amp; IQAC,<br/>Mahatma Gandhi College in Collaboration<br/>with District Science Centre, Purulia</p> <p>Name:</p> <p>Designation:</p> <p>Address:</p> <p>Phone:</p> <p>Email:</p> <p>Title of Research Paper:</p> <p>Mode of Presentation: Oral/Poster (tick)</p> <p>Signature with date:</p> |
|    |    |   |

## PROGRAM SCHEDULE

**Date:- 28.02.2004**

**Time – 11:00 AM to 5:00 PM**

**Venue- Seminar Hall, M.G college,Lalpur, Purulia**

**Registration and refreshment:- 10.30 AM onwards**

- Inaguration:11:00 AM
- Garlanded in the picture of Sir C. V. Ramon
- Lightning of the Lamp by the Honourable Guest

### Session 1

Chair Person– **Prof. SusantaMallick**, Assistant Prof. of Dept. of Zoology

- Principal's Speech: 11:10 AM.
- Speech of Chief Guest (President of G. B., M G. College ): 11:30 AM.

Speech of Invited speakers:

1. **Sri, DhrubajyotiChattopadhyay (DSO, District Science Centre, Purulia):** 12.00 noon
2. **Dr. Anirban Panda** (Assistant Prof, of Dept. of Chemistry, J. K college, Purulia): 12:30 PM
3. **Dr. Manab Kumar Saha** (Assistant Prof, of Dept. of Zoology R.C. College Purulia): 1:10 PM

**LUNCH BREAK: 1.45 to 2:30 PM.**

### Session-2

Chair person- **Dr. Kalyan Senapati**, Assistant Prof. of Dept. of Chemistry

Quiz contest: 2:30 p. m.

### Session – 3

Chair Persons: – **Prof. Asit Ray**, Assistant Professor in Botany

Model and Poster presentation:- 3.10 PM

Chair Persons :-**SanatkumarMurmu, SACT-II Zoology** for Oral Presenttion.

Oral presentation: 3:50 p. m.

Vote for Thanks by Prof Asit Ray 4:50 PM

It gives me immense pleasure to learn that the IQAC and all Science Departments of Mahatma Gandhi College, Lalpur together is going to celebrate the National Science Day (NSD) on 28<sup>th</sup> February 2024 in collaboration with District Science Center, Purulia. This very day is celebrated every year on to commemorate the discovery of the 'Raman Effect' by Indian Scientist Sir C. V. Raman in the year 1928 for which he was awarded the Nobel Prize in the year 1930. By celebrating this day we inspire and encourage our youth to develop an interest in science and acknowledge the contributions made by our scientists in different fields. The theme of NSD celebration for this year is "Indigenous Technologies for Viksit Bharat".



In recent past India has contributed significantly in research publications, patent filling etc. in the scientific world. This has been possible for the emergence of interest in the fields such as Artificial Intelligence, Astronomy, Solar & Wind Energy, Semiconductors, Climate Research, Space Research and Biotechnology. More recently India successfully landed Chandrayaan-3 on the south-pole of moon and became the first country to achieve this feat. Indian scientists have also shown their capability to develop vaccine during COVID pandemic. From these discoveries and inventions it is clear that our scientific endeavors have the power not only to shape the future of our nation but also contribute significantly towards global advancement. Through this celebration we all appreciate our scientists and encourage our youth to develop interest in science.

Dr. Santi Kundu

Principal

Mahatma Gandhi College

**Message from Dhrubajyoti Chattopadhyay, District Science Officer, for National Science Day at Mahatma Gandhi College**



Dear Students, Faculty, and Staff of Mahatma Gandhi College, It is with great pleasure and excitement that I extend my heartfelt greetings to all of you on the auspicious occasion of National Science Day!

Firstly, I would like to express my sincere gratitude to Mahatma Gandhi College for inviting me to be a part of this momentous celebration. National Science Day holds immense significance as it commemorates the remarkable contributions of Sir C.V. Raman and underscores the importance of scientific temper and innovation in our society.

As the District Science Officer, I am deeply passionate about fostering a culture of scientific inquiry, exploration, and discovery among our youth. Science education plays a pivotal role in shaping the future leaders, innovators, and problem-solvers of our nation, and it is heartening to see institutions like Mahatma Gandhi College wholeheartedly dedicated to this noble cause.

On this occasion, I urge each and every one of you to embrace the spirit of curiosity and exploration. Let us celebrate the marvels of science and its transformative power to create a better world for all. Through collaboration, experimentation, and perseverance, we can overcome challenges and unlock the boundless potential of science to address pressing global issues.

As we celebrate National Science Day, let us reaffirm our commitment to advancing scientific knowledge, promoting scientific literacy, and harnessing the power of science for the greater good of humanity. Together, let us inspire the next generation of scientists and innovators to dream big, think boldly, and push the boundaries of what is possible.

I am honored to be a part of this celebration, and I look forward to witnessing the incredible achievements and contributions that will undoubtedly emerge from Mahatma Gandhi College in the field of science.

Wishing you all a joyous and enlightening National Science Day!

Warm regards,

A handwritten signature in black ink, appearing to read 'Dhrubajyoti Chattopadhyay', written in a cursive style.

[D Chattopadhyay]  
District Science Officer  
District Science Centre, Purulia



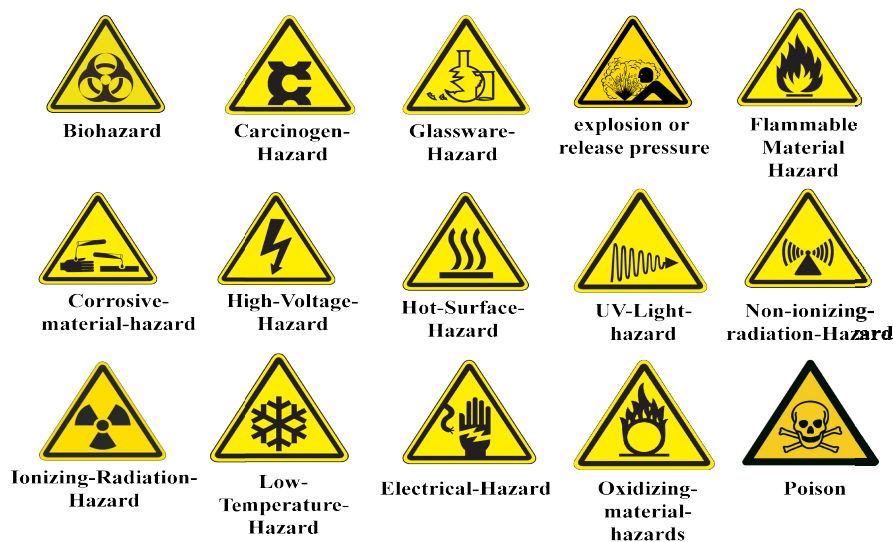
## Lab Safety and Safety Symbols

Kalyan Senapati

Department of Chemistry, Mahatma Gandhi College, Lalpur, Purulia-723130, India

[kalyanbubun@yahoo.com](mailto:kalyanbubun@yahoo.com)

Without science our life is dark. Science makes our life comfortable. Research and development of all branches of science working day and night to help us achieve the next sustainable level in our modern life. On the occasion of National Science Day, 2024 the message I want to convey to our undergraduate science students that contamination by toxic chemical or exposure of hazardous substance, instrument, radiation, etc, may cost us our life. So we need to be aware about the safety symbols and need to know about the extent and type of harm that we can face during our lab work. This safety symbol we can see on the instrument or on the reagent bottle used in the laboratory. Prof Karen, (Professor of chemistry at Dartmouth College, USA) died at the age of 48 due to accidental exposure of a few drops of organic Mercury compound on her hand. Few safety symbols are given below.



## **Anabic Gyendagiri Ramaner Chokhe!!! (Exploring Molecules: Through Raman's Eyes!!!)**

Dr. Anirban Panda

Jagannath Kishore College, Purulia, Post.& Dist.-Purulia, PIN-723101

Email: [anirban@jkcpri.ac.in](mailto:anirban@jkcpri.ac.in)

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This talk, especially designed for undergraduate students, aims to give some idea of Raman Spectroscopy and its Applications in various fields. The date, February 28<sup>th</sup>, which is celebrated as National Science Day, has a special significance in Prof. Raman's life and in Indian science as a whole. The talk describes a part of Prof. Raman's life and his work on 'the discovery of the effect named after him'. A lucid description of the theory involved and its subsequent applications will be given. Modern developments of the method by new technological advancements may be described as pertinent to the theme of this year's National Science Day, "Indigenous Technologies for Viksit Bharat."



## Significance of Water-body in the Diurnal Behaviour of Indian Flying Fox *Pteropus Medius* (Temminck, 1825)

Susanta Mallick

Assistant Professor, in Zoology, Mahatma Gandhi College, Lalpur  
Department of Zoology, Registered Research Scholar of SidhoKanhoBirsha University, Purulia,  
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*Pteropus medius* (Temminck, 1825), the Indian Flying Fox is solitary and true flight mammal in the world. They are habituated to spend the day time in big and tall roost-trees. In the summer, they are fanning arms continuously to cool the body for protection of scorching heat. A regular diurnal survey was conducted using binocular to observe all possible directions in the naked eyes followed by Direct Sampling Method to collect the primary data on the basis of water intake strategy in the afternoon, matter of colony size, nature of roost-trees and daytime behaviour of Indian Flying Fox. *P. medius*. During the period of last 7 years we had the opportunity to note the water intake strategy ( $P < 0.05$ ) in the afternoon in roost-tree by *P. medius* occurring in the village Simla (23.4420°N, 86.4702°E) of Purulia district, West Bengal, in respect to fluctuations of heat waves. *Tamarindus indica* is the main roost-tree and around 400 individuals could roost safely in that tree. But, when the temperature raised up most of the bats are forced to soak their ventral part in the nearby water-body.



Generally May to June when the ambient temperature is 45° C to 48°C at day time, they are unable to regulate their body temperature and heat wave; as a result mortality rate is in high.

In summer, they swoop down to the water-body for dip their belly fur in and land in a roost tree to lick the water. Such way they regulate their body temperature. Although they are poikilothermic but also they are victimized (most of the adult and pregnant female) by sun-stroke, heat exhaustion and suffer from hyperthermia and dehydration. They dip their muzzles (Iudica and Bonaccorso, 2003), breast (Geriach, 2003) and feet (Bergmans, 1978) in the water body.

Key words: Indian flying fox *Pteropus medius*, heat-wave, Simla, water intake strategy, sun-stroke

## **Socio-Economical Importance of Ants ( Hymenoptera: Formicidae ) in Agriculture Field**

**Sanat Kumar Murmu**

*SACT-II, Department of Zoology, Mahatma Gandhi College, Lalpur, Purulia, Pin- 723130, West Bengal,  
India*

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### **Abstract**

Ants are eusocial and colonial species in planet that plays a significant role in agriculture cropping systems. They have ability to make good quality of soil for agriculture by increasing water infiltration and soil aeration. Ecologically, Ants are increase organic carbon and nitrogen content in soil to contribute a major role in the course of crop production. This review article aims to provide a comprehensive knowledge of important roles played by the ants in soil as a biological control agents. By examining their activity in soil and ecological interaction with earth, this paper highlights the ecological function of Ants in Agroecosystems. Lastly, it demonstrates the ecological function of Ants having a significant role in soil of the planet. Ants colonies can be used as a bioindicator in crop land to determine good health of the soil.



**Keywords:** Ants; Agriculture cropping system; soil aeration; Biological control agent; Bioindicator; Agro-Ecosystems

## Coronavirus Disease (COVID-19)

**Animesh Mandal**

Assistant Professor in Zoology, Nistarini College, Purulia

Email:animandal2014@gmail.com

Coronavirus disease is an infectious disease caused by a very new virus that had not been previously identified in humans. WHO announced COVID-19 as the name of this new disease. International Committee on Taxonomy of Viruses (ICTV) announced the name of the virus responsible for COVID -19 as Severe Acute Respiratory Syndrome Corona virus 2(SARS-CoV-2) on 11 February 2020. This name was chosen because the virus is genetically related to the Corona virus responsible for the SARS outbreak of 2003. It is a large enveloped positive sense RNA virus and has significant impact on human health and animal productivity. It has appeared to be spread among people involved in close contact through respiratory droplets when an infected person coughs (or sneezes) or by touching eyes, nose and mouth after touching things contaminated with respiratory droplets. This viral infection has symptoms similar to flu, like fever, cough, dyspnoea etc. An ongoing outbreak of pneumonia associated with this virus started in December 2019 in Wuhan, China. Information about critically ill patients with SARS-CoV-2 infection is scarce. Several drugs are tested for this disease, but none found appropriate. Only symptomatic treatments can be offered. We can prevent the infections by following ways: maintain hand hygiene, cover mouth and nose when coughing and sneezing, avoid close contact with infected person, wearing a mask. We should improve our antiviral immunity with fresh vegetables, fruits, hydration, sunlight exposure and proper sleep.



**Keywords:** Coronavirus disease, respiratory droplets, symptomatic treatments, hand hygiene, antiviral immunity

## Efficacy of some insecticidal treatment schedules against major sucking pests on potato

**Biplab Kahar\***

\*Department of zoology, panchakot Mahavidyalaya, Purulia, W.B.- 723121, India

Email: [biplab.kahar1984@gmail.com](mailto:biplab.kahar1984@gmail.com)

### Abstract:

Efficacy of four different insecticidal treatment schedules i.e. T<sub>1</sub> (control), T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub>, were evaluated against sucking pests, viz, aphids [*Myzus persicae* (Sulzer) and *Aphis gossypii* (Glover)] and whitefly [*Bemisia tabaci* (Genn)] on potato during *rabi* season of two potato-growing years in 2021-22 and 2022-23 from November to February. Among these treatment schedules, T<sub>4</sub> treatment, (seed treatment with imidacloprid + foliar spray with cartap hydrochloride + chlorpyrifos and cypermethrin) was recorded most effective than other treatments as well as untreated control in reducing the population of aphids and whitefly on potato and T<sub>4</sub> is followed by T<sub>2</sub> (with spraying phorate + acephate+ azadirachtin + chlorpyrifos) and T<sub>3</sub> (seed treatment with *Bacillus thuringiensis* var. *Kurstaki* + foliar spray with azadirachtin + chlorpyrifos and *Bacillus thuringiensis* var. *Kurstaki*) treatment, respectively. The efficacy of different treatment schedules was in order of T<sub>4</sub>>T<sub>2</sub>>T<sub>3</sub> as compared to control (T<sub>1</sub>). The maximum yield of potato tuber (t/ha) was found in T<sub>4</sub> (26.93 t/ha) followed by T<sub>2</sub> (25.42 t/ha) & T<sub>3</sub> (23.34 t/ha) respectively, than control T<sub>1</sub> (15.93 t/ha).



## Studies on Prey Capture Efficiency of Five Wading Birds, India Pond Heron, Cattle Egret, Bronze-Winged Jacana, White-Breasted Waterhen, and Common Moorehen

Subhankar Dey<sup>1</sup>, and Sangeeta Saha<sup>2</sup>

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A study was conducted in Kolkata and its adjoining area to analyse the prey capture efficiency of five wading birds viz. India pond heron, Cattle egret, Bronze-winged jacana, White-breasted waterhen, and Common moorehen. Foraging behaviour is one of the most important activities in avian species in terms of survival and reproduction. Most birds spend the majority of their time in foraging for gathering their food or care for a brooding mate or hatchlings. The study was done during both morning and evening time and sampling was done by focal sampling method. The prey capture efficiency is the ratio that represents how prey an organism captures per unit time, and it is a key indicator of foraging strategy and foraging success of animals. In the present study it has been observed that Bronze-winged jacana shows highest prey capture efficiency ( $1.76 \pm 0.04$ ) followed by common moorehen ( $1.66 \pm 0.13$ ), white-breasted waterhen ( $1.60 \pm 0.07$ ), Indian pond heron ( $1.24 \pm 0.19$ ), and cattle egret ( $0.50 \pm 0.06$ ). No significant difference has been observed in prey capture efficiency between morning and evening for the studied birds.



Keywords: Prey capture efficiency, foraging, wading birds, Kolkata

## The illusion of colour and its effects on the animal kingdom.

Dr. Manab Kumar Saha  
Assistant Professor  
Dept. of Zoology  
Ramananda Centenary College, Laulara, Purulia, West Bengal.

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Animals use colour for a variety of reasons, including thermoregulation, mate attraction, and warning messages in addition to camouflage. The amazing adaptation known as mimicry frequently involves the use of colour to help one's own species survive. In the evolutionary arms race between predators and prey as well as in intra-species interactions, both coloration and mimicry are important. Mimicry occurs when a species evolves to resemble another for advantage or safety. There are two types: Batesian mimicry, where innocuous species imitate hazardous ones, and Müllerian mimicry, where undesirable species develop common traits, strengthening warning signals like yellow and black coloration in wasps and bees. Camouflage is the adaptation of animals' colors to blend into their surroundings, evading detection by predators or prey, such as speckled insects or green frogs. Coloration influences mating attractiveness in animals like peacocks and birds of paradise, with bright colors indicating reproductive ability, health, or genetic fitness. Via coloration, animals frequently communicate within their species. Dominant individuals tend to have brighter colours, which are used to indicate territoriality, dominance, submission, or readiness for mating. Chameleons can change their skin color for camouflage, thermoregulation, and communication, using chromatophores, specialized cells with pigments, which can be divided into three categories. Peacock feathers are iridescent because of tiny, nanoscale features that scatter and reflect light on their surface. The structural coloration of these formations varies depending on the angle at which light is incident and the viewing angle of the observer. The major colours are green and blue, with hints of brown, gold, and copper. Butterfly wings' nanostructures, resembling peacock feathers, produce vibrant colors through light interaction with ridges, scales, and photonic crystals, selectively reflecting specific wavelengths.





## Student Corner



Speed breaker power generation model demonstrated by Arijit mandal and Kiran Paramanik

# EVOLUTION OF MAN



## INTRODUCTION

Homo sapiens, the most prominent species on earth is the result of over 7 million years of evolution. The traces of human evolution have been obtained through fossil records, and morphological, physiological and embryological studies.

Man belongs to the family Hominidae of the order Primates. Humanlike apes belong to the same order. With the passage of time, their ancestors evolved and become more and more different.

The first ever ancestors of humans are believed to have originated in Africa, eventually migrating to Europe, Asia and the rest of the world.

## EARLIEST ANCESTOR

Australopithecus were one of the earliest ancestors to have been discovered, with fossils dating back more than 4.4 million years old. The details of human evolution are still debated as fossils evidence of many ancestors is quite vague. In fact, instead of the human evolution tree, a more accurate analogy could be drawn to an evolutionary bush.

Charles Darwin never implied the fact that humans evolved from apes, although many of his fellow contemporaries were misled that he had. Furthermore, the concept of a "missing link" between apes and humans was considered preposterous by scientists because we have evolved alongside the great apes. However, we do have a common ancestor that lived roughly 7 million years ago. Evolution points to the presence of gradual fossils meaning that humans evolved gradually, as compared to a sudden change.

## PROCESS OF HUMAN EVOLUTION

The evolution process involves a series of changes that cause the species to either adapt to the environment or become extinct. Evolution is the result of changes in the genetic material of humans. It does not change a single organism, but the entire group of organisms belonging to the same species.

## IV. Homo erectus

They were more evolved beings. They were also upright and had a larger brain size. They had a prominent speech. They invented fire and were omnivorous.



## I. Dryopithecus

It is the earliest known ancestor of man. They were found in some parts of Africa, Asia and Europe. The evolution of man began with him. Dryopithecus was followed by Australopithecus.



## VI. Homo sapiens

These were modern men. They developed the power of thinking, used tools, were omnivorous and produced art. Their brain size was reduced to 1300 cc.



## Neanderthals

Homo sapiens is the only extant species of hominid around today, but a few thousand years ago, there were a few other species that existed alongside anatomically modern humans - the Neanderthals, Denisovans and the Homo floresiensis. Today, scientists consider Neanderthals to be humans rather than a completely separate species.



## II. Australopithecus

They were 1.2 meters tall and could walk upright. They inhabited the African mainland. They had large jaws and human-like teeth.



## III. Homo habilis

They were five feet tall and could make use of tools. They are believed to have been able to speak.



**REFERENCE:** Source from <https://byjus.com/biology/origin-and-evolution-of-man/>

Name - Sushanta Sen  
Department - Zoology  
Sem - 6th



# PARENTAL CARE IN FISHES

Name - Sanjiban Chowdhury  
 Department - Zoology  
 Semester - 6th.



**Parental care** - Parental care can be defined as an association between the parents and the offsprings, so as to increase the chances of the survival of the young ones, and in fishes it includes all the post-spawning care of the offspring by the parent.

## Parental care in fishes -

Most fishes don't care for their eggs or youngs and leave the spawning grounds soon after fertilization. The lack of parental behaviour is correlated with production of great number of eggs and sperm. But there are many fishes where definite parental care has been evolved. Various devices have been adopted to ensure proper development of the eggs into adults. One or both sexes may participate in the process.

Fishes use various method to protect the larva -

**Deposition of eggs in suitable places** - A number of fish species have developed some design of depositing their eggs in suitably protected places. They do not build nest.

### Deposition of eggs in sticky covering

- (i) In carp, eggs are usually laid with some special sticky covering by means of which they are attached to each other or to stones, weach etc.
- (ii) In yellow perch (*Perca flavescens*) eggs are deposited in a rope-like structure. The eggs are held together by a long floating membrane.
- (iii) Angler fish (*Lophius*) lay their eggs incased by a gelatinous external coat that remain together to form a transparent mass of enormous size.
- (iv) Eelwing fishes, skippers, garfishes etc. secrete a sticky thread-like substance from their kidney, on which the eggs remain attached. The thread on one end remains adhered to any aquatic substratum while the other end remains free.

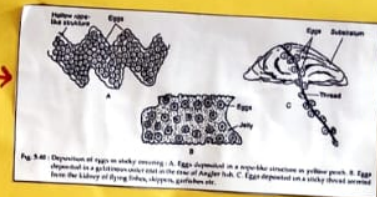


Fig. 3.46 Deposition of eggs in sticky covering. A. Eggs deposited in a rope-like structure on yellow perch. B. Eggs from the kidney of eelwing fishes, skippers, garfishes etc. C. Eggs deposited on a sticky thread.

### Deposition of eggs into self-made Nest.

- **Basin-like nests** - Male of Darter (*Etheostoma caeruleum*), during the spawning season, select a suitable place called domain, which it defends repelling with vigour any attempt by rival males. Any female Darter entering its domain is allowed to remain. The female darter then makes a basin-like structure depression, sinks into it and deposits the eggs. The eggs are immediately fertilized by the male who covers the fertilized egg by a sticky secretion, secreted from its kidneys. These sticky eggs remain attached to the stone till hatching.



Fig. 4.41 Basin-like nest of darter.

### Concealing Eggs and youngs in or on their body -

- **Eggs and youngs concealed in mouth cavity** - (i) In many cichlids (*Tilapia*), the female broods the fertilized eggs in her mouth. After hatching she allows the young to take refuge in her buccal cavity in times of danger.
- **Eggs in attached to cephalic hook** - The male nursery fish (*Kribia*) of New Guinea, carries the mass of eggs on the forehead, held in a cephalic hook.



Male nursery fish carrying egg mass on forehead.

- **Formation of egg ball** - The butter fish (*Pholis*) rolls the eggs into a round ball and then one of them remains on guard by curling around it. It is often the male that guards the eggball till hatching of young.



Fig. 3.47: A butter fish (*Pholis*) curling around the egg ball

- **Eggs kept in brood pouches** - (i) In sea horse (*Hippocampus*) fertilized eggs are transferred by the female into the brood pouch of the male. The brood pouch is found on the lower surface of the abdomen. During the males so called 'pregnancy', he provides nutrients and O<sub>2</sub> to the fertilized eggs for several weeks. Generally, A single large female produces enough eggs in one cycle to fill the brood pouch of nearly three large males.
- (ii) In the male pipe-fish (*Syngnathus*), a brood pouch is formed by his flaps of skin on the underside of the body on which eggs are placed by the female.



Fig. 3.50: Brood pouch in the males of A. Sea horse and B. Pipe fish

## Advantages of parental care in fishes -

- Survival
- Protection
- Contribute to reproductive fitness
- Increased growth rate and quality
- Better development

## Conclusion -

In fishes conspicuous parental care is not observed. The eggs are laid sufficiently in safe places and over production of eggs compensates loss by destruction. In most cases it is the male who takes care of eggs, young ones and defend them.

Reference - The Encyclopedia of Animal Behavior, Youtube videos, Google.com.

# NATURAL SELECTION & ADAPTATION

## \*SURVIVAL OF THE FITTEST\* → How Nature Shapes Adaptation

### INTRODUCTION

Organisms whose unique genetic characteristics are better suited to their environments have a greater chance of surviving and passing these traits onto their offspring.

Over time, this results in species changing, and becoming more adapted to their environments.

### NATURAL SELECTION PROCESS

**V** **VARIATION**  
No two organisms share identical DNA, and as such, natural differences exist within populations.

**I** **INHERITANCE**  
Traits are passed down from parents to their children, through genes.

**S** **SELECTION**  
Nature selects the unique traits to be passed down that help an organism survive and reproduce.

**T** **TIME**  
Over time, favorable traits increase in the population through reproduction.

**A** **ADAPTATION**  
When a previously unique trait becomes common in a population, the species has changed and adapted.

### ANIMAL ADAPTATIONS

Animals are incredible creatures that have special features to help them survive in their habitats. These features are called 'adaptations'!

#### CAMOUFLAGE

Some animals have special colors or patterns that help them blend in to their surroundings. Camouflage helps animals hide from predators or sneak up on prey.

#### SHARP CLAWS & TEETH

Animals like lions, tigers, and bears have sharp claws and teeth for catching and eating their food. These adaptations help them tear through skin or grab onto their prey. Other animals like squirrels use their sharp claws for climbing trees and finding food.

#### WINGS FOR FLYING


Birds have wings that allow them to fly through the air. Their wings are specially designed for different types of flight. Some birds, like hummingbirds, have wings that beat very fast, while others like eagles, have large wings for soaring high.

#### WEBBED FEET


Animals that live in water, such as ducks and frogs, have webbed feet. Webbed feet have skin between the toes, helping these animals swim and move easily in water. The webbing gives them better control and speed while swimming.

**Reference** → Encyclopedia, YouTube, Chat GPT  
[https://www.khanacademy.com/science/biology/evolution/a/what-is-natural-selection/](https://www.khanacademy.com/science/biology/evolution/a/what-is-natural-selection)


**APURBA MANDAL**  
SEM - VI



## Assisted Reproductive Technology




1.



2.


### INFERTILITY CAUSES

### Observes




1. Introduction
2. Infertility
3. Methods
  - A. Artificial Insemination
  - B. In vitro Fertilization
  - C. Zygote Manipulation
  - D. Zygote Manipulation
  - E. ZIFT, MZFT
4. Surrounding Factors and Complications
5. Statistics


3. Methods




A.




C.



B.



D.



E.

4.


#### Consequences I

• Miscarriage (10-17), Multiple gestation pregnancies (10-17), Ecological and homeostatic (12-16), Increase the risk of premenstrual and PMS.

#### Overweight Factors I


• The most important factors include parental age, maternal body mass index, and the average age of the mother at delivery is increased to 35-37 years.

5.




Percentage of Assisted Reproductive Technology (ART) procedures by type of procedure

| Procedure Type                          | Percentage |
|---|------------|
| In vitro fertilization (IVF)            | 45%        |
| Intracytoplasmic sperm injection (ICSI) | 35%        |
| Zygote manipulation (ZM)                | 15%        |
| Zygote manipulation (ZM)                | 5%         |



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#### References

1. The original source of information is the following website: [www.assistedreproduction.com](#)

# GEOLOGICAL TIME SCALE



NAME: \_\_\_\_\_  
 DEPARTMENT: \_\_\_\_\_  
 DATE: \_\_\_\_\_

**DEFINITION:-** The geologic time scale or geological time scale is a representation of time based on the rock record of earth. It is a system of chronological dating and geochemistry. It is used primarily by earth scientists to describe the timing and relationships of events in geological history.

**DIVISIONS:-**  
**ERA > PERIODS > EPOCH**

**ERA:-** The major divisions of geological time are known as ERAs.

**PERIODS:-** The eras are subdivided into Periods.

**EPOCHS:-** The periods are further subdivided into Epochs.

**FATHER OF GEOLOGICAL TIME SCALE:-**

ARTHUR HOLMES

**IMPORTANCE:-**

Scientists use the geological time scale to illustrate the order in which events on earth have happened. The geological time scale was developed after scientists observed changes in the fossils going from oldest to youngest sedimentary rocks.

**REFERENCE:-**

- Youtube videos
- Google
- Wikipedia
- BYJU'S

| ERA        | SYSTEM PERIOD                        | ERAS  | SOME DISTINCTIVE FEATURES       | VEGETATION   |  |
|------------|--------------------------------------|---|---------------------------------|--------------|--|
| CENOZOIC   | Quaternary                           | Recent  | Modern man                      | Modern       |  |
|            | Pleistocene                          | Early man, modern glaciation                                    | 15,000 years                    |              |  |
|            |                                      | Later glaciation  | 10,000 years                    |              |  |
|            | Tertiary                             | Pliocene  | Large mammals                   | 25,000 years |  |
|            |                                      | Miocene   | First shrewlike flying squirrel | 25,000 years |  |
|            |                                      | Oligocene   | Large flying mammals            | 25,000 years |  |
| Eocene     |                                      | First modern type of mammals                                    | 25,000 years                    |              |  |
| MESOZOIC   | Cretaceous                           | First flowering plants, birds of dinosaurs and mammals appeared | 100,000 years                   |              |  |
|            |                                      | First birds, first dinosaurs                                    | 100,000 years                   |              |  |
|            | Jurassic                             | First dinosaurs abundant  | 200,000 years                   |              |  |
|            |                                      | First dinosaurs abundant  | 200,000 years                   |              |  |
|            | Triassic                             | First dinosaurs abundant  | 200,000 years                   |              |  |
| PALEOZOIC  | Permian                              | Extinction of most forms of animal life, including trilobites   | 200,000 years                   |              |  |
|            |                                      | First reptiles, first amphibians                                | 200,000 years                   |              |  |
|            | Carboniferous                        | First coal forests, first fish                                  | 200,000 years                   |              |  |
|            |                                      | First amphibians, first reptiles                                | 200,000 years                   |              |  |
|            | Devonian                             | First reptiles, first amphibians                                | 200,000 years                   |              |  |
| Silurian   | First fish, first amphibians         | 200,000 years   |                                 |              |  |
|            | First fish, first amphibians         | 200,000 years   |                                 |              |  |
| Ordovician | First plants, first amphibians       | 200,000 years   |                                 |              |  |
|            | First plants, first amphibians       | 200,000 years   |                                 |              |  |
| Cambrian   | First vertebrate animals, first fish | 200,000 years   |                                 |              |  |
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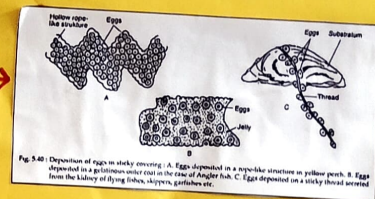


Fig. 5.40: Deposition of eggs in sticky covering. A. Eggs deposited in a rope-like structure on yellow perch. B. Egg attached to a gelatinous external coat in the case of Angler fish. C. Egg deposited on a sticky thread secreted

### Deposition of eggs into self-made Nest.

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Fig. 5.41: Basin-like nest of darter.

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Male nursery fish carrying egg mass on forehead

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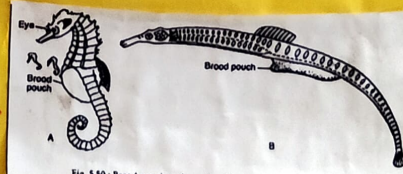


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