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DEPARTMENT OF ZOOLOGY BARASAT GOVERNMENT COLLEGE







Department of Zoology

BARASAT GOVERNMENT COLLEGE

ANNUAL MAGAZINE 2023-2024

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From the Principal's Desk



I am pleased to know that the Department of Zoology is releasing the fourth volume of their magazine, "ZOOLOGICA," for the academic year 2023-2024. It is with great joy and anticipation that the Department of Zoology commemorates the launch of this publication with an inaugural event. This magazine serves as a valuable tool for skill development among students. It offers an excellent platform for the exchange of information in various formats, including survey reports, work-in-progress updates on promising developments, and case studies or best practice articles authored by both students and faculties on emerging biological advancements. Th<mark>e</mark> publication ignites me with immense pride as I observe the remarkable progress being made. Valuable things retain their worth primarily due to their rarity. I am delighted to contribute to this exceptional magazine as a token of appreciation for the outstanding efforts demonstrated by the students. I also commend the coordination and dedication of the team responsible for producing this volume. I wish all the students involved in the magazine's creation continued success in their future endeavours.

Principal Barasat Government College

Prologue

Welcome to the 4th Edition of our Annual Magazine '*ZOOLOGICA*' of the academic year 2023-24. Over the years, our magazine has developed its own unique identity and has become an integral part of me. I relate to the emotions portrayed on each page and view the magazine as a distinct entity. I almost perceive it as conveying its own narrative. Through the magazine we have tried to showcase our journey of memorable session. This platform serves as a conduit for showcasing your dynamic talents through creative expression. I congratulate all the contributors and editorial team members for their contribution as well as sincere efforts in bringing out the issue and hoping for more milestones to be achieved in upcoming period for the Department of Zoology, Barasat Government College.

Here lies a humble hope that you will enjoy and appreciate it.

My special accolades go to all those who have worked behind the screen for completing this novel venture.

Happy reading Give '*ZOOLOGICA*' to your dreams It's time to fly....!

Dr. Sumana Saha Head, Post Graduate Department of Zoology

Contents

Butterfly Gynandromorphism – A Dual Sex Surprise! – Dr. Sumana Saha	1
The Denizens of Amazon Rainforest and its Recent Threats – Salil Kumar Gupta and Anushka Sengupta	3
<i>Ringing Alarm for the Silent Killer, Tuberculosis</i> – Susraba Chatterjee	9
<i>Neutrophilia</i> – Koustav Bhattacharjee	12
The Behavioural Ethology of Jumping Spider – A Review – Avirup Ghosh	14
India: A Hub For Wildlife Trafficking – Ampita Bhadra	19
The Bright Predator – Sriparna Pakira	27
Neurological And Endocrinological Aspects of Reciprocal Altruism – Arghya Kamal Das	28
Enigma of Beetle and Fly Mimicry – Soumik Chowdhury and Sumana Saha	33
Who is much Immune – Male or Female? – Lighting on their Immunity Status – Diptarup Mallick	36
Technology for Enhancement of Beneficial Carotenoid Product for Human Health – Indrani Das	40
Déjà vu – A Temporal Lobe Epilepsy – Somnath Mondal	43
Idiopathic Pulmonary Fibrosis: Unraveling the Mystery of the Lung's Invisible Enemy – Sneha Paul	47
Victory by Chemicals: The Pheromonic Stratagem – Riju Jati and Sumana Saha	50
Amazing Facts of Meerkats – Shatavisa Sardar	52
Classic Rampage of Army Ants – Aishi Chowdhury	55
Orca: The Killer Whales – Anushka Ghosh	59
Surrogacy : A Journey to Parenthood – Mayurima Glosh	63
The Colourful World of Chameleons – Rajat Paul	67
Tiny Droplets, But Huge Roles – Basusri Dandapat	73
Resilin Protein - The Best Replacement for Rubber – Sayan Halder	75

Commemorative Days – Wild Life Week poster	77
Awareness Programme – Zoonotic Diseases	79
Awareness Programme – Vector Borne Disease	80
Departmental Seminar –	81
Awareness Programme – World Cancer Day	83
Commemorative Days – World Environment & World Wildlife Day	86
Parent-Teacher Meeting	87
Commemorative Days – Poster competition on World Cancer Day	88
Gender Sensitization Programme	89
Laboratory Visit – IISER, Kolkata Presidency College	90 91
Visit to Apiculture Centre (Madhuban)	92
Visit to Sewage Treatment Plant at Bantala, Manpur	93
UG Excursion (Backlog 2022-23)	94
UG Excursion (2023-24)	96
PG Excursion (2023-24)	98
Students' Seminar Presentation	101-105
M.Sc. Certificate Distribution Ceremony	109
Inauguration of Departmental Magazine (2022-23)	110
Students' Achievement	111-116
Teachers' Achievement	117-121
Participation of Students and Faculties in Lab Visits of School Students	124
Faculty Exchange Programme	126
Photography	131
Drawings	137
Extracurricular Activity – Science Club	139
Students Academic Achievement & Progression	140

Butterfly Gynandromorphism A Dual Sex Surprise!

Dr. Sumana Saha, Associate Professor & Head, PG Department of Zoology, Barasat Government College

I had a chance to visit butterfly gallery of Natural History Museum, London six years back in May, 2018. I was astonished to get a glimpse of butterflies there that I never experienced before though as an Entomologist working for three decades. A butterfly tray with two individuals, very unusual I ever came across till my research career - all had two equal-sized, perfectly formed halves - one of each gender. It's a phenomenon called bilateral gynandromorphism – rarer to get a perfect split – dual sex form. One of the Museum's gynandromorphs was a Great mormon (Papilio memnon) from Asia, which emerged in 2011. Its male portion was almost black, but the female portion was paler with blue, red and tortoiseshell flecks. Gynandromorphy quite rare in nature, happens at random, affecting one in 10,000 butterflies. The asymmetrical lepidopteran was split by a visible line down its body, with different antennae and legs on either side - as if a pair of butterflies had become fused together. After returning back to home, I started for searching literatures frantically on the mystery of the fact. This phenomenon was detected in 18 families of Lepidoptera, with a higher number of cases observed in the families Lycaenidae, Nymphalidae, Papilionidae, Pieridae, Saturniidae and Geometridae, and few cases in certain moth, including Noctuidae species like Agrotis segetum and Agrotis ipsilon. Lepidopterans are well known for their sexual dichromatism, expressed through wing coloration. There are a range of theories about how gynandromorphy occurs. Many possible genetic mechanisms of gynandromorphism have been recommended, including loss of a sex chromosome during mitosis, genetic modification by endosymbionts, and double fertilization of binucleate eggs. For Lepidoptera, and presumably for the Lycaenides bilateral gynandromorphs, double fertilization of a binucleate egg is expected to be the most common mechanism of gynandromorphism i.e. within a parent female an egg accidently develops two nuclei, each with its own replica of maternal DNA. When this female mates, this egg is then fertilized by two spermatozoids, one sperm fuses with the egg cell's nucleus and develops normally as a female. A second sperm develops within cell's fluid as a male, i.e. both the sexes grow in the same embryo. Thus, a cell bearing the sex chromosomes XXYY, instead of dividing into two male XY cells, divides into an X cell (female) and an XYY cell (male). That's how, in a butterfly, it develops into a half male-half female caterpillar, then pupa and then adult. Most gynandromorphs among lepidopterans are not male on one side, female on the other, but have only a portion of their body developing as the opposite sex. Scientists call such specimens as mosaic gynandromorphs. In reality they are mostly intersexes – genetically either males or females in all of their cells, but the opposite sex characteristics simply prevail. Sometimes mosaicism can also arise in Lepidoptera through loss of the W chromosome during a nondisjunction event in later stages of development. W chromosomes carry limited genetic information. Sex determination is based totally on the quantity of Z chromosomes in a cell, with males having two copies and ladies having one. The reproductive organs i.e genitalia of male insects have been extensively utilized in taxonomic categorization and



Great Mormon (Papilio memnon) Gynndromorph displayed at Natural History Museum, London



Morpho didius

Male Female

Eastern Tiger Swallowtail (*Papilio glaucus*) Gynandromorph reared in captivity at Michigan State University



Gynandromorph moth (Lymantria mathura)

systematic classification, serving as a crucial factor in upholding reproductive barriers between species. Despite the frequent use of sexual selection as an explanation for differences in genital morphology among populations and species, the role of developmental plasticity in contributing to this variability has been largely overlooked, especially in wild populations. Gynandromorphs may offer particular insights into developmental plasticity because people experience abnormal cell interactions on the genitalic midline. Developmental plasticity refers to the assets by which the same genotype produces distinct phenotypes depending on the environmental situations under which development takes place. By permitting organisms to provide phenotypes adjusted to the conditions that adults will reveal in, developmental plasticity can offer the method to address environmental heterogeneity.

Developmental plasticity may be adaptive and its evolution may be shaped by natural selection. It has additionally been counselled that developmental plasticity can facilitate adaptation and promote diversification. Scientists observed that after the Chernobyl nuclear disaster (started on 26th April, 1986), a population of butterflies were emerged in southern Russia with a high frequency of gynandromorphs. Again the witness remained in the Fukushima nuclear accident in Japan (began on March 11, 2011) prompted a detailed study of mutations in local populations of the Pale Grass Blue Butterfly, and it was found that caterpillars feeding on radioactive plants can result in increased mutations, including gynandromorphs. It was an incredible experience to witness a live gynandromorph butterfly, *Athyma nefte inara* (Westwood, 1850) (Himalayan Colour Sergeant) in the month of November, 2021 for the first time in India from Buxa Tiger Reserve, a forest located in Dooars, West Bengal - a destination that I have long dreamt of visiting for my research pursuits. The

moment was captured through a photograph taken by three members of the WLB team. This phenomenon was initially documented by Wankhar (2020) from an unlabelled museum specimen from India. Its image shows bilateral gynandromorphism, i.e. the right and left sides are of different sexes i.e. all distinguishing features of left wings similar to female characteristics, while all those of the right wings are male.



Gynandromorph of Athyma nefte inara (Westwood 1850) (Colour Sergeant)

Consequently, the study of gynandromorphism allows in finding the genetic diversity in related species that further contributes to the conservation and preservation. Research into gynandromorphy and different unusual sexual bureaucracy has essential implications for expertise and treating diseases and developmental disorders.

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The Denizens of Amazon Rainforest and its Recent Threats

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Introduction

Amazon rainforest is the largest and richest, tropical river-basin rainforest, spreads over 6,00,000 square kilometre (twice the size of India) and spans over 8 countries like Brazil (60%), Peru (13%), the rest of the area is shared by other countries like- Bolivia, Ecuador, Columbia, Venezuela, French Guinea and Suriname. It is considered as the "Lung of the World". It is estimated that it covers 40% of South America and 50% of total world forest. Amazon River is the second largest river and its tributaries rich with diversity of animal life. It is considered as the most bio-diverse forest having great diversity of land fauna as well as aquatic and semi aquatic fauna. It is having wide varieties of species including plants (40,000 spp.), insects, spiders, fishes (3,000 spp.), amphibian, reptiles (370 spp.), birds and mammals. Amazon rainforest, apart from animals, is also the home of 350communities of indigenous people and they depend upon the natural products of rainforest for their food, shelter, clothing and traditional medicines. It also contains 90 million to 140 million metric tons of carbon which stabilizes local as well as global climate. It is warm all round the year and is having excessive rain fall and that is the reason for plenty of vegetation and complex food-web which support the abundant life forms.

It is the home of Jaguar, Harpy eagle, Pink river dolphin, Black spider monkey, Poison dart frog, Red howler monkey, Black cap squirrel monkey, Giant otter, Pygmy marmoset, Golden lion tamarin, Green sea turtle, etc.



Common denizens of Amazon rainforest

Some of the most unique and common animals of Amazon rainforest are mentioned below:-

- ♦ Mammals:
- Giant Otter (*Pteronura brasiliensis*):- It is a carnivorous animal found in Amazon rainforest and is active during daytime. Due to poaching it is becoming endangered now.
- Amazon River Dolphin (*Inia geoffrensis*):- It is endemic to Amazon river and its weight may be as much as 185 kg and as long as 2.5 metre. This mostly feeds on fish, freshwater crabs and turtles. It is also an engendered species. This lives along river and in tropical wet land area. They have webbed hands and feet which are used for swimming and hunting.
- Red Howler Monkey (*Alouatta seniculus*):- They are abundant in Amazon rainforest and their roars can be heard from a very far distance which may be as much as 5 kilometers. They are commonly seen in Puerto, Maldonado jungles.
- Black Cap Squirrel Monkey (Saimiri boliviensis):- They are common in Brazilian and Peruvian Amazon part and as many as 40-75 monkeys form a family within the jungles. They balance themselves in trees with help of tail.
- Ant Eater (*Myrmecophaga tridactyla*):- Amazon rainforest has several ant eaters of which collared ant eater is the unique one, they climb the trees to find out their food which includes ants, termites, etc. and with their 15 inches long tongue they catch the insects.
- Puma (*Puma concolor*):- It is a thin build carnivore, inhabited the rainforest and this is not easily visible.
- Amazonian Tapir (*Tapirus terrestris*):-They are giant swimmers and can run very fast in water when chased by their predators.
- Jaguar (*Panthera onca*):- It is the top predator, controls population of other species and live near water. They have sharp teeth, can bite even a skull of crocodile, tortoise-shell or any animal like Armadillos, monkey, etc. They have spots on skin like those of Cheetah of Africa, Jaguars are the icon of South America. They are available deep inside the forest and only a lucky man can spot them out. They sleep in the tree branches to get away from enemy and Anaconda.
- Sloth (*Melursus ursinus*):- Sloths are lazy animals and are of two types like- two-toed or threetoed, the spotting of sloth in jungle is a matter of good luck.
- Amazon manatee (Dendrobatidae family):- It is a relative of elephant 2.8 metre long, 540 kg body weight.
- ♦ Birds:
- Macaw (Ara spp.):-A Macaw bird may be red, yellow, green, scarlet and blue and are very common in Amazon rainforest. The Puerto Maldonado is the place wherefrom seeing the Macaw is relatively easier.
- Royal Fly-catcher (Onychorhynchus sp.):- These birds have beautiful crests which are displayed when they faced threats. The bright feather in the crest may be yellow, red and purplish blue.
- Toucan (*Ramphastos toco*):- This beautifully coloured beak is most distinctive character of this bird. Tambopata region of Peru is the best place to see this bird.

♦ Amphibians and Reptiles:

More than 400 amphibians and 365 species of reptiles occur in Amazon rainforest. The Poison dart frog, Side necked turtle, Black caiman are some of the unique species of this group found in Amazon rainforest.

- Green Anaconda (*Eunectes murinus*):- It is a non poisonous snake belonging to Boa group. Its length may be up to 30-40 feet and weight may be 30-70 kg. It is olive green coloured with orange yellow stripes. It is a slow moving, occurs in stream, swans, marshes. They do not inject poison but they engulf the prey. They coil around the prey body and cause death due to suffocation.
- Black Caiman (*Melanos uchus niger*):- It is the largest crocodile found in the Amazon river and its tributaries. They are most dangerous and any animal coming near it is captured and eaten away. It is the massive carnivore maybe up to 5 metre long and their preys are-birds, mammals, fish and reptiles. Its population is increasing.
- Poison Dart Frog (Dendrobatidae family):- They are brightly coloured frogs and are known to secrete toxin from skin for defence purpose from predators. Local tribal people use the toxin.
- ♦ Fishes:
- Piranha (Pygocentrus nattereri):- It is a group of fresh water fish and is inhabitants of South America rivers. It is a very dangerous fish and is indeed a terror in river. They consume their prey alive. It has very powerful bite and has numerous sharp teeth like those of Shark.

♦ Insects and Arachnids:

A large variety of insect and tarantula are some of the common denizens of Amazon rainforest. This rainforest has very large varieties of insects and it comprises almost 90% of Amazon fauna. Therefore, so far hundreds and thousands of new insect species have been described from basin of Amazon material.

Brazilian Wandering Spider (*Phoneutria* sp.):- This is a very venomous spider in the world and occurs in Brazilian Amazon region. This long-length spider has a round body.

Amazon rainforest: Endangered species

Jaguar, Amazon manatee, Harpy eagle, Amazon river dolphin, Golden lion tamarin (*Leontopithecus rosella*), Green sea turtle (*Chelonia mydas*), South American Tapir, Giant otter.

Most dangerous animals in Amazon rainforest

Jaguar, Piranha, Red-bellied Piranha, Blue ant, Green anaconda, Anaconda, Black caiman, Poison dart frog, Harpy eagle, Pit viper, Viper, Vampire bat, Giant otter.

Threats to Amazon rainforest

The major threats which this rainforest are facing are:

1. The human encroachment mostly from Brazil and due to that a large area of the forest has been

severely damaged.

- 2. Excessive exploitation, indiscriminate increasing infrastructure, hydro-power, ranching of cattle, cattle grazing, agriculture expansion, unsustainable logging and infrastructure.
- 3. Deforestation is the major reason of destruction and the loss is to the tune of 0.4% per year during 80sand 90s.
- 4. In addition some fires also caused heavy damage to the rainforest. As much as 1,283,000 sq miles have been lost up to 1970.

Conservation of Amazon rainforest

WWF has taken up a project to study the effect of climate in the Amazon rainforest and that will bring into light many interesting information regarding how the rainforest was impacted because of the global warming and climate change. This project has impact on wildlife in the warmer world.

✓ What are being done to remove the threats?

World Wide Fund for Nature (WWF) and several other organizations have taken up projects to eradicate the threats and bring the forest back to the normal stage. A fund of \$215 million has been raised to clean up the Amazon rainforest, regenerates the plants and improve the ecosystem.

✓ What is needed now by the common people?

Common people should come forward and join hands in this programme and then only the Amazon rainforest can be protected and conserved.

Selected photographs



Photo source: Internet (Google)

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Ringing Alarm for the Silent Killer, Tuberculosis

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Introduction

Tuberculosis is an air-borne disease caused by acid fast bacillus Mycobacterium tuberculosis (Mtb) that mainly infects the alveolar macrophages but can affect any other site of the body. According to a recent report from World Health Organization (WHO), Tuberculosis is the second leading infectious killer after Covid-19 and it is assumed that one third of world total population have been infected with Tuberculosis. Currently, it is anticipated that there was a total of 1.6 million people who died globally due to tuberculosis in 2021. So, the situation is really alarming. At this scenario, WHO and the United Nations (UN) have already introduced "End TB strategy" globally to end TB epidemic by 2030. Unfortunately, the South-East Asian area had reported the most new cases of TB (almost 46%) in the last year. Luckily, Govt. of India has implemented a TB Control Program since 1962. Since then, it has undergone two modifications: in 1997 it became the Revised National Tuberculosis Control Program (RNTCP), and the second, in 2020, when it became the National Tuberculosis Elimination Program. The National Tuberculosis Elimination Program (NTEP) is the Government of India's public health initiative that includes its anti-tuberculosis efforts to achieve a "TB free India" by 2025,5 years ahead of the global SDG target with a strategy that comes under the broad themes of "Prevent, Detect, Treat and Build pillars for universal coverage and social protection". Consequently, India and other two countries accounted for the majority (67%) of the global decline in the reported number of new cases of tuberculosis between 2019 and 2020. But in the report of 2021, India alone was blamed for 36% of the world's TB mortality among HIV-negative person.

Obstacles of TB elimination programme in India

Non-Adherence to Tuberculosis Drug Regimen

At these circumstances, India needs to point out the main obstacles to accelerate the process of eliminating the disease by 2025. Throughout Asia and the Pacific region, the HIV pandemic have a significant and prolonged effect on TB. Together with the significant increase in HIV incidence, HIV also makes TB diagnosis more challenging, contributing to the burden of the disease. Concerningly, a recent report noted that India has the greatest number of unreported TB cases worldwide. In 2020, there were 18.12 lakh TB cases reported, which is 25% fewer than the 24 lakh cases notified in 2019. Also, India has been shown to have a high incidence of multidrug-resistant (MDR) TB in addition to an increasing number of unreported TB cases in the recent years. Beside these, primary challenges to eliminate TB from India include a lack of primary healthcare facilities in several states, rural areas and uncontrolled private healthcare. Another burning issue includes poor adherence to tuberculosis (TB) treatment and it is associated with mortality and disease recurrence. Incidentally, India has reported 50% prevalence of non-adherence to anti-tuberculosis medication. Anti tuberculosis drug is a complicated regimen spanning at least 6 months, it may lead to decreasing patient adherence over time.

Patients using ATT may have undesirable side effects. As a consequence, the number of defaulters remains greater in India. Inadequate ATT can lead to recurrence, worsening health outcomes, higher costs, longer treatment duration, and drug resistance at both the individual and communal levels. According to the literature analysis, little research has been undertaken to evaluate the factors that lead to ATT non-adherence, leading to fatal outcome. Furthermore, earlier investigations were done on TB patients undergoing directly observed treatment short-course (DOTS), in which healthcare personnel monitored dosage consumption. Due to multiple concerns about the patient and healthcare system load, India's National TB Elimination Programme (NTEP) implemented daily drug administration in 2014, replacing the previous dosing strategy. However, the most significant drawback of NTEP is the absence of direct monitoring by health care providers, which could end up in low adherence and emergence of resistant strains.

Diagnosis of Extrapulmonary Tuberculosis (EPTB) is still challenging

Simultaneously, the low sensitivity and limited accessibility of microbiological diagnostics impair the management of tuberculosis (TB). Approximately 10%-50% of EPTB patients have concurrent pulmonary infection. As a result, any possible cases of EPTB must be evaluated for simultaneous PTB to identify if the patient is contagious and to support in diagnosis. Despite having normal chest radiographs, few EPTB patients have sputum culture positive results. Surprisingly, in low- and middle-income countries like India, the older sputum smear microscopy technique, which has been developed more than a century ago, is still often used to diagnose tuberculosis and culture testing remains the reference standard for TB diagnosis. Though WHO have introduced NAATs for the rapid diagnosis of the disease along with drug resistance, but the sensitivity and specificity of these NAATs for Extrapulmonary tuberculosis samples remains low and unspecific. At the same time, diagnosing EPTB remains difficult because clinical samples acquired from highly invasive locations may be paucibacillary, reducing the sensitivity of diagnostic assays. So, the diagnostic dilemma still exists.

Co-infection of TB with HIV remains a challenge:

The vast majority of those infected with M. tuberculosis do not develop active TB. This circumstance is different for people who are co-infected with HIV. Around 5 percent of new tuberculosis cases in India are associated with HIV.On time detection of TB among people with HIV and evaluation for HIV among TB patients, prompt implementation of ART and ATT among coinfected individuals, provision of CPT and TB Preventive medicine, and management of air-borne infection are some of the most important activities to reduce mortality and morbidity among co-infected individuals. However, there are barriers to integrate therapy, as well as safety issues about the collaborative management of HIV and tuberculosis (TB), an absence of proper medical advice for identifying and controlling immune reconstitution inflammatory syndrome (IRIS), the development of potential interactions between drugs, additive medication adverse effects in patients, ATT and ART must be frequently monitored.

Absence of any effective vaccine

Most unfortunately, Bacille Calmette-Guérin (BCG) vaccine (which was developed 100 years ago) is the only licensed vaccine for prevention of severe forms of TB in children. As of right now, there is no licenced vaccination that can effectively prevent adult TB illness. However, findings from a Phase II trial of the M72/AS01E candidate are promising till now.

Conclusion



In order to successfully eradicate TB on a worldwide scale, TB control programmes must be strengthened and more people must have access to quick diagnoses and proper treatment. Awareness and mass education about the disease need to take forward in a scientific way. High burden nations like India will need to increase the effectiveness of their health care delivery systems and ensure greater adoption of new technology while transformative tools are being created. Active researches, new interventions and financial supports are necessary to curb the spread of the disease.

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Neutrophilia

Koustav Bhattacharjee, Ex-PG Student (2017-2019), PG Department of Zoology Barasat Government College

When the heart chuckles at the corner Reminds us to say 'I am the master' the boss of circulatory system. We found an underrated gem in our vascular system. It walks silently, effects massively We all misunderstand it as only slow man's folly. Our weeping blood vessels faces relentless pressure. Where the pathogens try to find ultimate pleasure. Then comes Mr. Neutrophil He knows how to climb up the heal. Bacteria and other pathogens feel the heat When you give them the most unpleasant treat

Phagocytosis to cell drinking

You are the ultimate warrior who prevents our immunity from sinking.

Multilobed nucleus bind inside as string

All pathogen finds it torrid to prevent their heart string. With azure granules make it azurophilic We are very fortunate to be neutrophilic Capturing pathogens to intracellular degradation. You have a solid idea of determination. You are abundant, never accepts to be dormant. A leader of the pack who lives for the group Like the Captain Smith of Titanic sinking in cold dilute soup. You are the mediator of inflammation.

We can never think without you even in imagination. You possess NET; Neutrophil extracellular trap. We found it more worthy than entertainment of 'The Mouse trap'. As you found your birth pleasure in bone marrow The Killer Squad

We start to think ourself as a trickstar like Captain Jack sparrow. High amount of you always alarm us from being infectious. We shouldn't always feel obnoxious No, no we don't want Neutropenia It's more painful than Shakira's Monotonia.

Cytososic

You control the function of eosinophil, monocytes You are a jealous pride of presbytes. After so many works to do

You are as cool as a good Nosferatu.

With all of the glam You will be remembered as eutrophil 'Garland of Gems'.



The Behavioural Ethology of Jumping Spider - A Review

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The family Salticidae includes a type of spiders known as jumping spiders. With more than 6,000 recognized species and over 600 defined genera as of 2019, this family is the largest family of spiders, which includes 13% of all species. Among all arthropods, jumping spiders have some of the best



vision, which they employ for navigation, hunting, and courtship. The majority of animals can leap quite quickly, especially when hunting, but they can also jump very quickly in response to sudden dangers or to travel large distances. They exploit both their tracheal system and book lungs, which are both fully formed (bimodal breathing). The eye pattern of jumping spiders is typically used to identify them. There are four pairs of eyes on a jumping spider, the largest of which is the anterior median pair. Due to their unique eye patterns and cephalothorax structure, jumping spiders

are among the easiest spider families to identify from others. The Corinnidae (characterized by prominent spines on all four legs), Oxyopidae (the lynx spiders), and Thomisidae (the crab spiders, distinguished by their front four legs, which are very long and powerful) are the families that resemble Salticidae the most in general appearance. But none of these families have eyes that are similar to the Salticidae family.

Four pairs of eyes make up jumping spiders: one moving primary pair and three stationary secondary

pairs. In many species, the posterior median eyes are vestigial, but in certain ancestral subfamilies, they are similar in size to the other secondary eyes and are useful for motion detection. The decreased pair of eyes is assumed to function similarly to insect ocelli, however without the ability to form images, by obtaining light from the sky. The posterior median eyes feature two distinct visual opsins that are sensitive to blue and UV light, in contrast to the photo receptors in the other secondary pairs, which are almost entirely green-sensitive. Motions from the side and rear are detected by the wide-angle motion



detectors known as the posterior lateraleyes, or PLEs. Of the secondary eyes, the anterior lateral eyes (ALEs) have the finest visual acuity. They can also discern certain details; without them, motion cannot cause a "looming response." The vision of the anterior median eyes is excellent. With a corneal lens in front and a second lens behind that concentrate images onto a four-layered retina—a thin, vertically oriented strip—this pair of eyes is constructed like a telescopic tube.

Behavioral ethology

Numerous other arthropods, such as sand fleas, grasshoppers, fleas, and leaf hoppers, are also known to jump. These creatures are not like jumping spiders, who are able to perform precise, focused jumps.



Jumps are utilized for hunting, evading danger, and navigating. By adjusting the pressure of their internal bodily fluid (hemolymph), jumping spiders' highly developed internal hydraulic system allows them to lengthen their limbs. Because of this, the spiders are able to jump without the need for big, powerful legs like a grasshopper. Different species have different maximum horizontal jump distances; some may jump two or three body lengths, while the highest jump of a single *Colonus puerperus* was recorded to be 38 time sits body length. Their highly evolved visual system and fast processing speed allow them to customize each jump, which improves accuracy. A jumping spider attaches a silk strand,

known as a "dragline," to its current host a sit travels, particularly right before leaping. This dragline offers braking and stability as well as mechanical assistance for jumping. and the spider goes back up the dragline in the event that the jump is unsuccessful.

The Salticidae family has a remarkably diverse range of hunting behaviors when juxta posed with the majority of other spider families. Given their highly developed vision system, salticids typically hunt

during the day. After that, it aligns its abdomen with its cephalothorax. Following that, it may examine the target of its attention for a while and assess whether a suspicious or camouflaged piece of prey is worth pursuing before beginning to move slowly forward. The spider waits till it is sufficiently close to connect a dragline before jumping onto the victim. The araneophagous Salticidae exhibit a variety of striking hunting behaviors, some of which differ significantly in technique. Many species that hunt spiders frequently attack other spiders, whether they are salticids or not, in the same manner as any other prey. However, some



species also use web invasion; nonspecialists like *Phidippus audax* occasionally attack prey that is entangled in webs, essentially engaging in klepto parasitism; at other times, they either walk over the web or leap onto it in order to consume the prey.

Courtship behaviour

Jumping spiders, known for their exceptional vision and agility, have a unique courtship behavior that involves a combination of visual displays and subtle movements. Here's a typical sequence:

- 1. **Spotting a Mate**: Jumping spiders use their keen eyesight to locate potential mates. When a male detects a receptive female, he initiates the courtship process.
- 2. **Approach**: The male cautiously approaches the female, often making deliberate movements to avoid startling her. He may use his front legs to signal his intentions, displaying vibrant colours or performing rhythmic movements to catch her attention.

- 3. **Visual Displays**: Once close enough, the male may engage in intricate visual displays to impress the female. This could involve raising and waving his front legs, vibrating his body, or even performing a dance-like routine.
- 4. **Tactile Communication**: Jumping spiders also rely on tactile communication during courtship. The male may gently tap the female with his legs or antennae, conveying his interest and readiness to mate. These touches are often delicate and non-threatening, aimed at gauging the female's receptivity.
- 5. **Gift Offerings**: In some species, males offer gifts to females as part of the courtship ritual. These gifts, typically prey items captured by the male, serve as a form of nuptial offering and may increase the male's chances of successfully mating.
- 6. **Mating Ritual**: If the female accepts the male's advances, mating takes place. Jumping spiders employ a unique mating technique called "pedipalp insertion," where the male transfers sperm to the female using specialized appendages called pedipalps. This process can be brief or prolonged, depending on the species and individual behavior.
- 7. **Post-Mating Behavior**: After mating, the male may linger nearby to ensure the female's safety or to guard against potential competitors. However, in some cases, the male may quickly depart to avoid becoming a potential meal for the female, as sexual cannibalism is not uncommon in jumping spiders.
- Overall, the courtship behavior of jumping spiders is characterized by a combination of visual displays, tactile communication, and precise movements, reflecting the species' reliance on visual cues and complex signaling during mate selection.

Mimicry

- Jumping spiders are fascinating creatures known for their diverse and often elaborate forms of mimicry. Mimicry in jumping spiders can serve various purposes, including camouflage, predator deterrence, and prey attraction. Here are some examples:
- 1. Ant Mimicry: Some jumping spider species mimic ants in appearance and behavior. They may have elongated bodies and antennae-like front legs, resembling ants. This mimicry helps them avoid predation by other predators that might avoid or have difficulty capturing ants. Additionally, it can aid in hunting by allowing the spider to get closer to prey without raising suspicion.
- 2. **Spider Mimicry**: Certain jumping spiders mimic other spider species, such as larger or more venomous spiders, to deter predators. By resembling these potentially dangerous spiders, the mimics benefit from the predator's avoidance behavior without possessing the same level of threat. This form of mimicry is known as Batesian mimicry.
- 3. **Plant Mimicry**: Some jumping spiders exhibit plant mimicry, blending into their surroundings to avoid detection by predators and prey alike. They may have body markings or coloration that closely resembles the texture and pattern of leaves or bark, providing effective camouflage.
- 4. **Prey Mimicry**: Some jumping spiders mimic specific types of prey to attract their own prey. For example, certain species mimic ants or other insects to lure them closer, making it easier for the spider to capture them. This type of mimicry is known as aggressive mimicry and is used by the spider to exploit the behavior of its prey.

5. **Background Matching**: In addition to specific forms of mimicry, many jumping spiders exhibit general background matching, where their coloration and patterning closely match their habitat. This type of camouflage helps them blend into their surroundings, making them less visible to both predators and prey.

Overall, mimicry in jumping spiders demonstrates their remarkable ability to adapt to their environment and exploit ecological niches through deceptive strategies. These mimicry tactics not only aid in survival but also play a crucial role in hunting, avoiding predation, and reproductive success.

Conclusion

The behavior of jumping spiders is remarkably diverse and intricate, reflecting their adaptive strategies for survival, reproduction, and hunting. These fascinating arachnids exhibit a range of behaviors, from intricate courtship rituals to complex forms of mimicry. Key aspects of jumping spider behavior include:

Agile Hunting: Jumping spiders are skilled hunters, relying on their exceptional vision, agility, and precision to stalk and capture prey. Their ability to leap significant distances and execute precise strikes enables them to secure a wide variety of prey items.

Intricate Courtship: Courtship behavior in jumping spiders involves a combination of visual displays, tactile communication, and subtle movements. Males often engage inelaborate rituals to attract females, showcasing their fitness and signaling their readiness to mate.

Mimicry: Jumping spiders employ various forms of mimicry for camouflage, predator deterrence, and prey attraction. They may mimic ants, other spiders, or elements of their environment to avoid detection, exploit ecological niches, or lure prey closer.

Communication: Jumping spiders communicate through a combination of visual signals, tactile cues, and sometimes vibrations. These forms of communication play crucial roles in mate selection, territorial defense, and prey capture.

Parental Care: Some jumping spider species exhibit remarkable parental care, with females guarding their egg sacs and even tending to spider lings after hatching. This behavior enhances the survival chances of offspring and demonstrates complex social interactions within certain species.

Overall, the behavior of jumping spiders highlights their remarkable adaptability and sophistication in navigating their environment. Their hunting prowess, intricate courtship rituals, mimicry tactics, and social behaviors contribute to their success as one of the most diverse and fascinating groups of arachnids in the animal kingdom.

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India: A Hub For Wildlife Trafficking

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Introduction

India is not only a major source, but also a transit and a destination country for trafficked wildlife &wildlife products. International wildlife trafficking into and out of India mainly occurs through either the long international border along the Northeast or via airports. Chennai and Mumbai airports are major hubs for this illegal activity. Wildlife trafficking in India is driven by the demand for raw material like red sandalwood and ivory, and animal parts – particularly rhinoceros horn, tiger parts – for traditional medicine, demand for meat, and the attraction towards exotic pets. When exotic live animals that have been smuggled into India are seized, they are sent to rescue centres or sanctuaries. Several international and national governmental organisations are teaming up to develop tools and networks that counter wildlife trafficking.

Wildlife trafficking, which is the illegal trade of wild animals and plants, either as dead or live specimens, or their parts, has a huge negative effect on the world's environments, biodiversity, economies, governance, and health. It is a form of transnational organised crime that spans across many countries and involves poaching, smuggling, and illegal collection or capture, of protected wildlife. According to the World Wide Fund for Nature (WWF), wildlife trafficking is the fourth largest form of transnational organised crime (after smuggling of drugs, human trafficking, and counterfeiting) worth an estimated £15 billion per annum.

Despite being a part of the CITES (Convention on International Trade in Endangered Species of wild fauna and flora), India is currently one among the top 20 countries for wildlife trafficking, and among the top 10 for wildlife trafficking by air. Due to its megadiverse nature (India has 8% of the world's wildlife) &dense human population (which makes tracing illegal goods very difficult once they have entered domestic markets), India serves as both, a source, as well as a transit country for illegal wildlife

19



and wildlife products.

Several other factors have made the fight against the illegal wildlife trade increasingly difficult. Amongst these are the porous international borders with China, Myanmar, and other Southeast Asiancountries, a growing aviation market and the fast-expanding airport sector, and the use of social media as online marketplaces by wildlife traffickers.

Smugglers of exotic wildlife species in India have even resorted to misusing the Voluntary Disclosure Scheme

Fig. 1 : An emu at a zoo in Telangana. Smugglers of exotic wildlife species resort to misusing the Voluntary Disclosure Scheme issued by the MoEFCC in 2020.

issued by the Ministry of Environment, Forest and Climate Change (MoEFCC) in 2020 (Fig.1). The scheme aimed to regulate the growing market of exotic animals in India that boomed after the complete ban on trade in Indian species – by allowing Indians to declare the possession of exotic wild species without any documentation before March 15, 2021.

Besides these reasons, there are major lacunae in laws that pertain to the ownership of exotic animals in India. People caught transporting exotic wildlife species can be charged with the crime only if it can be proven that they crossed an international border illegally with those animals. "Once inside India, there are no policies or laws that regulate the ownership of exotic species. The Wildlife Protection Law only applies to Indian wildlife," says Sanjeev Pednekar- founder of Prani, an education centre and pet sanctuary for rescued birds and animals in the outskirts of Bengaluru.

Most common species trafficked in India

India is not only a major source, but also a transit, and destination country for trafficked wildlife and wildlife products, a large number of species are illegally transported out of and into the country. According to the Smuggling in India report 2020–21, the DRI's (Directorate of Revenue Intelligence) most common wildlife and wildlife products that were seized from being smuggled out of India are ivory, turtles and tortoises (especially the Indian star tortoise), and red sandalwood (red sanders or



lalchandan). Lately, there has been a decline in rhino horn trading from India; however, the country is fast becoming a major hub for pangolin poaching and trafficking. The trade in tiger parts also seems to be continuing unabated.

Fig. 2 : A pangolin brought to the Range Office at Kalakkad Mundanthurai Tiger Reserve, Tamil Nadu. Pangolin poaching is on the rise in India.

In addition, ornamental fish such as the Channa barca or snakehead (endemic to the upper Brahmaputra basin) and the zebra loach (in the Western Ghats) are being fished to extinction in their natural habitats to feed the international trade in live aquarium fish. Along with these, wildlife trafficking has expanded to include trade in body parts of pangolin, golden jackals, Asiatic black bears, leopards (for tantric uses and traditional medicines) and mongooses (for mongoose hair paintbrushes) (Figs. 2 & 3).

According to Trade Records Analysis of Flora and Fauna in Commerce (TRAFFIC) Runway to Extinction report established in 2020, although the trafficking of Indian Star tortoises out of India is declining, the smuggling of Red Eared Slider Turtles on the rise. Instances of exotic animals such as kangaroos, tamarins& birds such as macaws, parrots being transported across India are on the rise.

The latest in this string of reports rolled in during March & April 2022 with videos of dehydrated & sick kangaroos rescued in West Bengal .Apart from illegal import & export of wildlife and its products, India also has a huge market for wildlife meat and body parts for traditional medicine – which includes freshwater turtles, frogs, etc.



Fig. 3. Smuggling of wildlife expanded for their body parts

Common routes of traffecking in India

International wildlife trafficking into and out of India mainly occurs through two routes – one, through the long international border along the Northeast, and the other, through airports (Fig.4). The 2018 TRAFFIC report In Plane Sight notes that trafficking in rhino horns, tiger parts, and pangolin scales is especially rampant in the Indo-Nepal, and Indo-Myanmar-China borders, with Northeast Indian cities such as Dimapur, Guwahati and Imphal being used a transit sites. Trafficking of birds and reptiles along the India-Bangladesh border is also rampant. Most recently, the Dooars region in northern West Bengal, specifically, the town of Jalpaiguri, made news as an emerging transit point for trafficking of exotic animals and birds.

The trafficking of reptiles, specifically turtles and tortoises, into and out of India is especially rampant, with Chennai and Mumbai airports being major hubs for this activity. The Indian star tortoise, which is the most trafficked reptile in the world, is supplied from trade hubs in Karnataka, Andhra Pradesh, Gujarat, and Tamil Nadu, to Thailand, Singapore, and Malaysia, primarily by air. Seizure data from the website Reducing Opportunities for Unlawful Trade of Endangered Species (ROUTES) shows that more than 54% of the trafficked animals were in checked-in luggage and about 11% in air cargo. The top Indian cities where such airport seizures happen include Chennai, Kolkata, Mumbai, and Delhi, with reptile seizures being especially high in Chennai airport.





Fig.4 : Indian map showing Wildlife trade district hotspots

Factors driving traffecking in India

Wildlife trafficking in India is driven by many factors. The foremost of these is the demand for raw material like red sandalwood and ivory (used in manufacturing luxury products), and animal parts – particularly rhinoceros horn and tiger parts – for traditional medicine. The World Wildlife Crime Report 2020 states that although global markets for rhino horn and ivory have fallen consistently since

2011, new market demands such as those for pangolin scales and European glass eels have emerged.

In Assam, because of intense hunting of pangolins by local tribes, which eat the meat and sell the scales, this onceabundant animal is now relatively rare. The traditional medicine markets in China and Vietnam are major consumers of pangolin scales, rhino horns, and the skin and body parts of various big cats, birds, Asiatic black bears, musk deer, wolves, and jackals.



Fig.5 : Blue and yellow macaws. A major driving factor for wildlife trafficking in India is the rising demand to own exotic pets like macaws

Another factor that drives wildlife trafficking is the demand for meat – many animals such as the Bengal slow loris, softshell turtles from Uttar Pradesh, deer, antelope, wild cattle, and even sea cucumbers are mainly trafficked for consumption.

The third major driving factor for wildlife trafficking in India lies in the growing demand for exotic pets, especially birds like cockatoos, macaws, and grey parrots. In addition many Indian birds, fish, and reptiles are in great demand in global pet markets (Fig.5). What is even shocking is that zoos may also be involved in illegally buying exotic animals, as per a recent case involving indoor zoo & its connection to kangaroos being transported from a "farm" in Mizoram. The wildlife trade not only depletes environments of their natural inhabitants, but is also responsible for added threats like the spread of invasive species and emergence of new zoonoses. The three factors in combination can lead to whole ecosystem collapses and major disease outbreaks. Some of the most virulent viral diseases including Ebola, Marburg virus disease, SARS (Severe Acute Respiratory Syndrome), and the most recent pandemic – COVID-19 (Coronavirus disease-19) – have all arisen in areas where close human-wildlife contact occurred such as in wet markets.

Wildlife trafficking in India is rapidly wiping out populations of tigers, elephants, rhinos, pangolins, star tortoises, and many other native species. Simultaneously, invasive species like the red eared slider turtles (which are popular pets) and suckermouth sailfin catfish (a common aquarium fish) are destroying natural habitats. Wildlife smuggling or wildlife trafficking concerns the illegal gathering and trade of endangered species and protected wildlife, including plants and byproducts or products utilizing a species.Research on wildlife smuggling has increased, however, knowledge of the illicit trade remains limited. The differences between international policies and tendencies likely contribute to the extensive estimated range of wildlife smuggling, anywhere from \$5-\$23 billion, with an additional \$67-\$193 billion when timber and fish are included.

The prolific growth of wildlife smuggling makes it the fourth-largest criminal enterprise globally after drug, firearm, and human trafficking. Products demanded by the trade include but are not limited to ivory, bush meat, traditional medicine, and exotic pets. China and the United States are the largest buyers in the illegal wildlife trade. It often involves other illegal activities such as tranquilizing animals without proper authorization.

Measures to reduce wildlife trafficking in India

- The DRI, which is in the forefront of the battle against smuggling, has teamed up with the Indian Customs as a part of the Green Customs initiative of the World Customs Organisation, to counter wildlife trafficking into and out of India. To combat the rising use of air transport in wildlife trafficking, a suite of tools to help law enforcement agencies in India battle wildlife smuggling have been developed by TRAFFIC, along with the United Nations Environment Programme (UNEP), World Wide Fund for Nature India (WWF-India), and the Wildlife Crime Control Bureau (WCCB).
- Apart from this, the International Air Transport Association (IATA) also has a short 20-minute training module to help spread awareness on wildlife trafficking through air transport. Airport authorities in Bengaluru have even set up a forest cell to tackle wildlife smuggling. The Counter Wildlife Trafficking program, run by the Wildlife Conservation Society-India,

conducts training and sensitisation workshops for state forest departments, police forces, customs officials, border security force units, and even the judiciary, on conducting crime scene investigations and promoting inter-agency collaborations.

- In addition to all these initiatives, the WCCB has begun profiling criminals in a real-time database and will soon network with neighbouring countries (Nepal, Bhutan, Bangladesh, and Myanmar) to stem transboundary wildlife crime. Molecular biology tools, including DNA testing and bioinformatics are also being used in wildlife forensics to identify the point of origin of trafficked animal products. In addition, citizen science initiatives, dog squads, and various DNA databases and reference libraries are being used to monitor animal populations susceptible to poaching and the wildlife trade. India also destroys seized wildlife products to send out a strong anti-poaching message.
- Despite these efforts wildlife trafficking in India is still rampant. India's CITES membership as well as its strong laws (Wildlife Protection Act, 1972) prohibiting the trade of over 1,800 species of native plants, animals, and their products are ineffective in tackling wildlife trafficking.
- Most often, when exotic live animals that have been smuggled into India are seized, they are sent to rescue centres or sanctuaries. Since zoos are usually meant to showcase Indian native wildlife, they often do not have adequate quarantine centres or appropriate enclosures to properly manage seized exotic animals.
- Sanjeev's sanctuary, Prani, currently houses many exotics iguanas, monitor lizards, red-eared sliders, and emus to name a few. "Nearly 90% of the exotic birds that we have at Prani, along with our iguanas, were given up by people who could no longer care for them. Sometimes, we also rescue animals meant for slaughter, such as our emus", says Sanjeev. "In addition, Prani also has also been working/volunteering with the airport authorities in Bengaluru, the Forest Department, and the Animal Welfare Board of India, who often hand over seized animals to us.
- One memorable instance that stands out in my mind was when we had to care for over a hundred tiny Hamilton turtles – one of the most endangered species of turtles in the world – that

were seized at the Kempegowda International Airport," he adds. Sanjeev ruefully admits that he often takes in red eared sliders out of fear that people will abandon them in local lakes and ponds, where these terrapins can destroy the ecosystem and kill off native species. Since the CITES rules do not usually allow for reintroduction of exotic species to their natural habitats (except under very stringent circumstances), humane euthanasia or a lifetime of captive care are the only ways to deal with smuggled exotics.



Fig. 6A. red eared slider turtle. Most often when people are unable to care for these exotic animals as pets, they leave them at care centres or sanctuaries.

Since most people will not even entertain the idea of euthanasia, most exotics are usually condemned to life in captivity. "And so many of the exotic species smuggled into India – such as capuchins, marmosets, and wallabies, which fetch good sums when sold – are returned to the pet market, while others, like the red eared sliders are either given up to rescue centres or subject to uncontrolled releases," he adds.

- > Wildlife SOS : Working against superstitions
- Myths and superstitions are a major cause for illegal wildlife trade, and our organisation works diligently to tackle this. Wildlife SOS has rescued owls, meant to be traded for occult practices, and snakes from snake charmers. Last year, wildlife SOS seized over 50 snakes from these charmers in Agra, in the month of Shravan. The Shravan month falls in August, and Hindu devotees visit temples to pray to Lord Shiva during this time. Since snakes are associated with the Hindu god Shiva, devotees offer milk to reptiles who are illegally used by snake charmers.

• Scientifically, snakes lack the ability to break down milk enzymes which react negatively with

their physiology. In an act of sheer brutality, snake charmers sew their mouths shut, leaving only a small gap open for them to drink liquid. The snakes drink milk out of desperation because they are dehydrated. Wildlife SOS conducted raids in temples across Agra, and also educated people about the heinous acts performed under the garb of snake charming (Fig.7).

Fig.7 : A rat snake bleeding from the stitch on its mouth.



- In another case of wildlife exploitation, an Indian Gray Langur was rescued recently from a house in Agra by wildlife SOS along with the Uttar Pradesh Forest Department. Wildlife SOS conducted eight such langur seizures across the city. Misguided by the myth that Rhesus Macaques are afraid of langurs, poachers capture Gray Langurs from the wild so they can be trained to drive off monkeys in the city
- After seizing the animals, the wildlife SOS and forest department teams also educated the local people about this illegal practice. The wildlife SOS-GSPCA (Gujarat Society for Prevention of Cruelty to Animals) team operating in Vadodara remains extremely active in terms of curbing poaching and wildlife trafficking. Last month, the team successfully busted a large-scale illegal trade racket consisting of wildlife contraband to be used in occult rituals in Navsari, Gujarat. The team seized rare black corals, porcupine quills, wild pig teeth, owl nails and peacock feathers.
- This anti-poaching operation involved months of undercover vigilance, followed by a covert operation by our team along with the Gujarat Forest Department. It led to the seizure of 990 black corals, 1,491 porcupine quills, 7 monitor lizard genitals and 14 wild pig teeth. Most of these animals are traded due to demands propelled by superstitions and irrational rituals. For instance, black corals are framed and kept in cash counters of shops and hotels since it's

25



believed to bring good luck.

• In another raid conducted in a small Surat shop, the Wildlife SOS-GSPCA team seized a total of 18 parakeets, shells (motisankh in Hindi), black corals and six genitals of monitor lizards in the raid. Monitor lizard genitals are passed on as the rare hatha jodi plant (Fig.8). It is believed that the

Fig.8 : The wildlife SOS-GSPCA team seized wildlife contraband in a raid in Gujarat

plant, found in parts of central India, brings good fortune and resembles human hands with clenched fists. These plants have an extremely high demand but since they are rare to find, people poach monitor lizards and sell their genitals, which are almost indistinguishable from the plant.

Fig. 9 : Monkeys are some of the most traded species when it comes to the pet trade



• Challenges and ways to overcome the demand for the

trade of exotic species stems from the rise of social media and e-commerce websites. Online advertisements highlight certain traits of exotic animals to make them coveted as pets. In many countries, breeding exotic animals in captivity is considered legal, as long as the right paperwork exists. This makes it even more difficult to distinguish between malnourished and trafficked animals. Social media has made it easy for photos of exotic animals to be exhibited, thereby luring a demand.

According to news reports, India is among the top 20 countries in terms of wildlife trade. The fast expanding airport sector has helped it grow even further. Smuggling takes place via air with airports in Chennai, Delhi and Mumbai being the primary channels. Wasim Akram, Deputy Director- Special Projects, Wildlife SOS informs that trade routes in few Indian cities are frequently used by trafficking cartels to move the contraband. Additionally, semi-porous international border areas of West Bengal-Bangladesh, Manipur-Myanmar and U.P-Nepal can also be exploited for such purposes.

Enforcement agencies are cracking down on crimes to make sure India's wildlife is protected. WPA, 1972 is one of the strongest wildlife protection laws globally, under which trade in 1,800 species of wild animals, plants and their derivatives is prohibited.

Combined with such a powerful law, improving on-ground enforcement, accessing remote areas, more human resources and logistics, and better legal prosecution can contribute significantly to wildlife protection and conservation. Today, wildlife trade poses the second-biggest threat to the survival of biodiversity, after habitat destruction. Wildlife SOS contributes significantly through various initiatives to curb poaching and wildlife trafficking. Our anti-poaching unit 'Forest Watch' assists State Forest Departments and law enforcement agencies to capture wildlife traffickers and smugglers, and recover animals and their body parts. Wildlife SOS also conducts capacity building training programs to prevent wildlife crimes from happening at all. If you want to play a role in preventing these activities, do consider becoming a monthly donor or sponsor for Wildlife SOS and support our work to put an end to the illegal wildlife trade.

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[Photos : Courtesy Wikimedia Commons]

The Bright Predator

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One of the ocean's top predators is Striped Marlin. During hunting in groups, individual marlin takes turns to attack schools of prey fish one at a time. A new study by Current Biology explains how they might coordinate this turn-taking styles of attack on their prey to avoid injuring each other. The way is rapid colour changes.

By using drones, the researchers found that the marlin going to attack 'lit up' and became much brighter than others as it made its attack and the colour rapidly returned to its 'non-bright' colouration after the attack. The stripes of individual marlins got much brighter as a fish moved in for an attack, and dimmed once they swam away.

This colour change might serve as a dependable signal of an individual's motivation to go in for an attack. It is known that marlin can change colour, but this is the first time it is been linked to hunting or any social behaviour. This discovery suggests that marlins have more complicated communication channels than had been suspected. The changes of colour might even serve a dual purpose to confuse their prey.

Now there is a curiosity to know whether they change their colourduring hunting solo and how the colour changing affect their prey.



Pic: Group's Non-Hunting and Hunting Marlin.

Pic: The attacking Marlin is brighter than the others.

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Neurological And Endocrinological Aspects of Reciprocal Altruism

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Fig. 1: Reciprocity in vampire bats; If a hungry bat approaches a satiated bat, she is much more likely to get a regurgitated blood meal if she has fed the satiated bat in the past (Dugatkin, 2014).

Most of the living beings have a natural tendency to help others in various situations. At that time, some positive triggers work in their brains. But most of us don't think about the reason behind the motivation of welfare. In this article, we will observe the changes in our brain and hormonal levels during helping others.

At first, we have to understand two terms of animal behaviour; altruism and reciprocal altruism. According to evolutionary biologists, altruism is a behaviour that decreases the fitness or genetic contribution of one individual while increasing the fitness of another. On the other hand, in psychological research, altruism is conceptualized as a motivational state that a person possesses to increase the welfare of another person. Reciprocity (Reciprocal Altruism) is a behaviour in which an organism temporarily reduces its fitness while increasing another organism's fitness. However, the organism expects that the other organism will act similarly at a later time.

Some recent studies help us to understand the modern aspects of reciprocity. Existing theoretical models as well as recent advanced neuroimaging research are reviewed to understand how altruism and reciprocal altruism are processed within the brain and which regions of the brain are associated with it. The brain activity pattern is monitored by aFunctional Magnetic Resonance Imaging Machine (fMRI) or a Positron Emission Tomography (PET) device. The endocrinological aspects of reciprocity are also examined by measuring the level of oxytocin in the blood.

Previous behavioural research suggests that humans interact with strangers in ways that are beneficial to others, even when it is not in their interest. Additionally, humans have been reported to engage in altruistic behaviour even in situations where there will be a chance of no future interaction. The research suggests altruism is a natural tendency for humans.

According to researchers, the people who exhibit altruism also benefit in another way. These benefits can be physical or psychological. Hunter and Linn demonstrated that when compared to those who did not volunteer, older adults who volunteered regularly showed greater life satisfaction and exhibited reduced rates of depression and anxiety. In a study of adults over 55 years of age, individuals were 63% less likely to die if they had volunteered for multiple groups at a given point in time. Together, these studies suggest that altruistic behaviour not only benefits others but also has a positive effect on the physical and psychological states of the person performing the behaviour.

To observe the neurological basis of reciprocity and cooperation, let us examine a study done by Rilling and his colleagues (Rilling *et al.*, 2002). Rilling and his team had women subjects to play the Prisoner's Dilemma Game. One of the subjects played from inside an fMRI machine that monitored her brain activity as she played, while the other subject played the game on a computer in a different room. Each subject saw the payoff matrix that represented her payoffs.



Fig. 2: Prisoner's Dilemma Game showing subject 1 and subject 2 (Dugatkin, 2014).

Rilling and his team found that even though the highest monetary reward (\$3) in this game was obtained when an individual cheated and her partner cooperated, they chose the most emotionally rewarding payoff that was associated with mutual cooperation (\$2 to each).

		Subject 2		
		Cooperate	Defect/Cheat	
Subject 1	Cooperate	Subject 1: R = S2	Subject 1: S = \$0	
		Subject 2: R = \$2	Subject 2: T = \$3	
	Defect/	Subject 1: T = \$3	Subject 1: P = S1	
	Cheat	Subject 2: S = \$0	Subject 2 P = \$1	

Fig. 3: Prisoner's Dilemma Game; the payoff matrix for the game played by women who were either cooperating or cheating (defecting) in an economic cooperation experiment. Subject 1's payoff in top left corner of each cell. Subject 2's payoff in bottom right corner of each cell (Dugatkin, 2014).
The mutual cooperation caused the greatest activation of areas of the brain associated with reward processing, namely the ventromedial/orbitofrontal cortex (OFC), the anterior cingulate cortex (ACC), and the nucleus accumbens.



Fig 4: The fMRI scans showed that, when both subjects cooperated, brain areas associated with reward processing the ventromedial/orbitofrontal cortex (OFC), the rostral anterior cingulate cortex (rACC), the anteroventral striatum (including the caudate nucleus and the nucleus accumbens), and the subgenual anterior cingulate cortex (ACC) were activated (Rilling *et al.*, 2002; photo credit: James Rilling).



Fig. 5: Schematic representation of brain networks associated with reward (green), mentalizing and theory of mind (pink), and emotional salience (blue) thought to be involved in altruistic behaviour (Filkowski *et al.*, 2016).

Researchers have also explored the endocrinological aspects of reciprocity in humans. Oxytocin is a neurohormone associated with behavioural acts. There is a dense accumulation of oxytocin receptors in the amygdala of the human brain, a region associated with social behaviour.

Paul Zak and his colleagues ran a series of experiments to show the role of oxytocin in behavioural tasks. In this experiment, player A was given \$10. He was then told to give some money to player B, and the given amount of money would be tripled by the experimenter. Then player B was given a choice to send back as much money as he desired (including \$0) to player A.

In this experiment, the blood from the subjects was immediately drawn after the experiment to measure the oxytocin level.



Fig. 6: Oxytocin and trust. The level of oxytocin was higher when subjects believed money was sent to them voluntarily and lower levels of oxytocin in random draw (Zak *et al.*, 2005).

Zak and his team also found that the more money A sent B, the more money B sent back, and the higher B's oxytocin level, but this was only true when B believed A had sent the money voluntarily.

Conclusion

Those experiments on altruism and reciprocity tell us about interpersonal relationships between people and also the understanding of advanced economic decision-making. Modern behavioural and neuroimaging research shows that humans mainly act altruistically and show reciprocity in many scenarios. The fMRI brain images can prove the fact that people get pleasure by helping others. However, those experiments are unable to give a sufficient idea about 'real world' reciprocity, and the

decision-making of people. So future researchers should give more focus on the altruistic behaviour and reciprocity of the people in their real lives.

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Enigma of Beetle and Fly Mimicry

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Mimicry is a phenomenon observed among various insect orders like Coleoptera and Diptera, where certain species have evolved to resemble other organisms in order to gain an advantage. This adaptation allows these insects to deceive potential predators or prey, increasing their chances of survival. The specific mechanisms and reasons for mimicry in these two diverse groups of insects are still being studied by scientists.

Fly mimics beetle

The Members of the Celiphidae family of order Diptera exhibit a striking resemblance to small beetles.



As a protective measure, they have a tough cuticular covering that encases their abdomen while resting. This covering also serves as a shelter for their wings which are neatly folded underneath it. However, unlike beetles, the Celiphidae's protective structure is not their modified forewings (or elytra), but rather their scutellum. This intriguing feature showcases an unexpected case of evolutionary convergence highlighting the similarities between these two species despite their different classifications. This family of flies comprises approximately 90 known species and is prevalent in the Indochina and Indomalay regions

globally.

They primarily inhabit grassy regions and can be found along river banks and ponds. Their clypeus is

33

enlarged and protruding, while their scutellum is significantly enlarged and often convex. The coloration of these insects varies depending on the species, with some displaying brilliant blue, green, or metallic violet hues. Interestingly, *Celyphusobtectus* individuals can be yellowish in colour and possess a smooth scutellum, whereas bluish individuals may have either a rough or smooth scutellum.

A single unidentified immature diptera very much close to celiphid fly was collected from the surrounding area of our lodge by pitfall trap at the time of our



excursion in Pench National Park, Madhya Pradesh on 29th February, 2023.



American Entomologist John Russel Malloch (1875-1963) conducted the initial thorough investigation on the species found in the Philippines, identifying five new species and two new genera - Acelyphus and Idiocelyphus. Malloch emphasized the significance of genitalia structure in species identification. Consequently, these flies, which bear a resemblance to beetles, are commonly referred to as beetle flies due to their batesian mimicry.

Weevil mimics Fly -

The members of Conoderinae subfamily of

Curculionidae (weevils) bear a striking resemblance to the flesh flies from the Sarcophagidae family. With over 200 genera and 1500 species worldwide, these weevils showcase a remarkable example of convergent adaptation during evolution. Timorussarcophagoides, in particular, exhibits a form of batesian mimicry, fooling predators into believing they are elusive flies that are difficult to catch. In reality, these weevils possess the same capabilities as any other weevil. This mimicry grants them a survival advantage by deterring potential predators.



Entomologist T.J. Guerra identified *T. sarcophagoides* in the exclusive vicinity of "Campos cave", situated close to the National Serra de Cipo Park in South eastern Brazil.

The weevils measure between 6.3-8.4 mm (males) and 8.7-10mm (females) in length having black body with colourful scales, ochre forehead, yellow at the top and behind the eye, and white scales on



the rostrum. The head features oval eyes similar to flies. Their elytra are 1.4 times longer than wide, wider than the prothorax. Both larvae and adult weevils feed on a single species of host plant, Psittacanthusrobustus (mistletoe). Adults are only active between November and February, during the flowering period of the host plant, where they feed on pollen grains, stamens, and ovaries by piercing the tissues. Eggs are laid in February in the root system of the host plant, where the larvae hatch and feed on the roots. Pupae are found inside the roots in October. These weevils are diurnal,

spending the night motionless on leaves, and are commonly found in rocky environments throughout the year.



Fig. The weevil *Timorus sarcophagoides* (bottom right) and its flesh fly model (top left) sharing microhabitat, a clear example of mimic and model co-occurrence in nature. [Photo courtesy : Tadeu J. Guerra (2019)].

Conclusion

Mimics assume the key roles in the evolutionary dramas that take place within ecological arenas. Amidst these elaborate tales of survival, predators, prey, and even unwitting allies fall victim to the mimics' clever deceptions. The practice of imitating other species serves as a compelling demonstration of the power of natural selection, intriguing observers throughout history. This illustrated example, a specialized form of protective mimicry, known as "evasive mimicry" or "locomotor mimicry", involves mimicking species that swiftly evade predators by flee away, making any hunting attempt an energetically costly endeavour.

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Who is much Immune – Male or Female? - Lighting on their Immunity Status

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Introduction

Males and females have immune responses to various diseases are quite different and that are reported in previous immunological studies. E.g. 80% of autoimmune diseases and inflammatory diseases occur in women rather than men. Men exhibit approx 2 times greater chance of mortality from lifethreatening cancers but these are comparatively low in women. Sex chromosomal genes and sex steroids may also influence the pathogenicity of such diseases sex-differentially. Previous studies also determine that women have enhanced vaccine efficacy and ability to faster pathogenic clearance than in men probably due to stronger feminine innate and adaptive immune responses. As well as women show adverse side effects following vaccination rather than men. Apart from non-communicable diseases, males are more prone to communicable i.e. infectious diseases than females (most mammals). If we look back at the time of birth, it will be seen that male babies are severely threatened from septicemia; chances for developing phthisis (also known as TB) are greater in men from childhood to last of the adult stages in compared to women. Nutritional status of male fetuses and infants may also lead to their immunosuppressiveness. Men suffered from various bacterial and viral diseases severely, for instance, pulmonary diseases(COVID 19, MERS, Legionellosis, Aspergillosis etc.), gastrointestinal diseases (Amoebiasis, Schistosomiasis, Hepatitis B etc.). Many immune-related diseases are implicated with genetic, hormonal and other factors, so this comprehensive study is important for conceptualization of proper and factor-based sex-specific treatments/ therapeutic interventions.



Males and Femaleshave different innate and adaptive immunity Figures :(Left)Males are more innate immune than females;(Right) Females have much stronger adaptive immunity than males.

What are the factors responsible for sex differential immunity?

Broadly there are three factors involved to differentiate male and female immunity -

- 1. Genetic factors (Sex chromosomes)
- 2. Hormonal factors (Sex steroids)
- 3. Environmental factors (Nutrition, Microbiome)

Genetic factors

The human Y chromosome consists of almost 100 genes, containing SRY and other immune response regulatory genes& X chromosome is composed of 1000 + genes, which is approx five percent of the human genome alongwith contain some important immunoregulatory genes, for example, TLR7, TLR 8, GATA1, IRAK1, CD40 L, FOXP3 etc.X chromosomes contain X inactivation centre (XIC) that is located in the q-arm and consists of *XIST* gene that initiate silencing. As feminine sex chromosomal complement is XX so there will be a chance to develop dual dosage effects of proteins. But actually this is not happens, single X chromosome is only active and continue to perform all biological functions lifelong from the initial embryonic stages of females and to avoid double dosages of proteins(X inactivation). Hence deleterious or harmful mutations in X linked genes (if occur) will lead to the formation of dysfunctional or less functional molecules that affect every masculine cells but only 50% feminine cells.



Hormonal factors

Sex steroids released from females have pivotal roles in case of enhancement of their immunity. Estrogen or 17-beta estradiol binds to estrogen receptors(ERs – ER-alpha & ER-beta) and stimulate production of TGF beta, IL-10, IL-4 but inhibit TNF-alpha, IL-6, IL-1beta production. Regulatory T cells are produced greatly by the action of estrogen. Progesterone (P4) also stimulateregulatory T cell differentiation and IL-4 production when binds to progesterone receptors (PRs-PR-a & PR-b).

Hormonal factors

Sex steroids released from females have pivotal roles in case of enhancement of their immunity. Estrogen or 17-beta estradiol binds to estrogen receptors(ERs – ER-alpha & ER-beta) and stimulate



Environmental factors

Nutrition of the fetus bring about sex differential immune responses in future. Sex differential development of fetuses begin within uterus and continued below 1 years of age, which indicate that nutrition may epigenetically influenced for prolonged time at the gestational period. Another studies reported that breast milk feeding of infants greatly affects their immune system — infant females are more immunologically benefited than infant males. On the other hand, host microbiome perform significant roles in several disease onset and progression like inflammatory diseases and lifestyle diseases whereas sex affects the host microbiome. Diet affects intestinal microbiota in humans in such a way that causes several autoimmune diseases like ulcerative colitis and Crohn's disease may develop in sexually dimorphic manner, associated with dysbiosis and the effects start from pre puberty.



Who are more affected by Immunosuppressive Diseases?

Autoimmune diseases affect females more than males whereas incidence of infectious diseases and risk and malignancy of non reproductive cancers are higher in males than that of females.

Female bias			
Autoimmune diseases	Infectious diseases		Non-reproductive cancers
 Graves disease Hashimoto thyroiditis Multiple sclerosis Rheumatoid arthritis Systemic lupus erythematosis Type 1 diabetes 	 HIV Influenza Toxoplasmosis Legionella Malaria Zika 	 Ebola MERS Hepatitis B Tuberculosis Leptospirosis Campylobacter Schistosomiasis Amebiasis Aspergillosis 	 Bladder Bowel Kidney Leukaemia Liver Lung Malignant melanoma Oesophagus Stomach

Immunity in both males & females following vaccination

There are many vaccines like DTaP & Td/Tdap, Hep A & Hep B vaccines, flu vaccines, PPSV23, rabies vaccines, MMR, smallpox vaccines, RTS,S vaccine, HPV vaccines are sex-differentially effective from infants to aged adults. Women show greater responsiveness of antibodies following vaccination against bacteria and viruses as compared to men i.e dosage administration is significantly reduced in women than men. As an instance, adult females required only half dose of influenza vaccine to boost up antibody concentrations but full dose vaccine may be effective to achieve equal antibody titres in males. Along with high immune responsiveness, females also exhibit frequently occurring harmful physiological reactions following vaccination (greater in younger and aged females), may be due to higher inflammatory responses occur in females than males.

Conclusion

In conclusion we can say that females are noteworthy more immune than males but for sustainable development of society we need cost-effective personalized treatments that have as possible as less side effects and will be helpful to all individuals suffering from immune mediated diseases. For short-term treatments it is essential to know appropriate factors affecting sex differential immunity. Further analyses are required to recognise these factors and they may possibly interact with hormonal, genetic and environmental factors.

Web links

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Technology for Enhancement of Beneficial Carotenoid Product for Human Health

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Using the CRISPR/Cas9 genome editing technology, scientists knockout Dschyb gene in *Dunaleilla salina* and several other algae; increasing the carotene content. Carotenoids are an accessory pigment present in chloroplast for capturing sunlight and conversion into chemical energy. Microalgae have major importance in carotenoid production, with Chlorophyta having major importance due to its low maintenance and low labour cost. Among these carotenoids lutein, astaxanthin, zeaxanthin, lycopene, β -carotene are becoming a huge marketing product for its major health benefits and disease-care in humans. As humans can't produce carotenoids in their own body, it can be applied on the skin. Carotenoids obtained from microalgae have been found to have anti-oxidant properties that can protect from oxidative stress, compromised immune response, aging and cancers.Lutein is one of the carotenoids, is being used for prevention of macular degeneration, cataract prevention and for preventing cardiovascular diseases; so the scientists found out a natural organism with carotenoid production.

Initially luteinwas extracted from marigold flower (*Tageteserecta & Tagetespatula*) from sources like India, China of Asian continent and Mexico of American continent and making of the commercial lutein product from marigold needs extensive steps of mechanism viz. cultivation, pre-treatment, processing and fine processing. In any year, from July to October; flowers have harvested and then process for lutein production.

Hu *et al.* (2021) reported β -carotene content enhancement using CRISPR/Cas9 system. β -carotene hydroxylase is an important enzyme converting β -carotene into zeaxanthin; so theoretically, if the enzyme gets silenced or blocked, there might be increase in β carotene production.

With CRISPR/Cas9 system , knocking out the Dschyb genein *Dunaleilla salina* , increase the β -carotene content. To knock out the gene, 23bp target site is manually searched, and three single guide RNA (sgRNA) are designed and two BasI flanking sites introduce in sgRNA1-F, sgRNA2-F and sgRNA3-F respectively.And golden gate cloning which is one of the accurate cloning technique was used for assemblage of sgRNA, allowing to obtain nearly 100% correct



recombinant plasmid. Those plasmids are pKSE401-sgRNA1, pKSE401-sgRNA2 and pKSE401-sgRNA3 which can correspond to the regions of Exon 1 and 3 of Dschyb respectively. Using these plasmids *D. salina* transforms separately with salt gradient method and culture in fresh medium in the

12-well plate at 26°C light incubator. Positive colonies are detected by PCR and gene sequencing. Single algae colonies have been handpicked from the plates and analysed in 1% gel electrophoresis and sequencing.sgRNA transcription in vitro and cleavage assay issued to obtain RNP complex, accommodating the pre-assembled Cas effector protein and sgRNA. Then purification of total RNAs is done with TRIzol and quantifies with spectrometry.

RNP Complexis obtained with sgRNA incubation. After 24 hoursof culture changes occurred in Dschyb mRNA levels and cellular carotenoids which is examined by RT-PCR. After that from the harvested biomass, pigments are extracted. The results of sgRNA cleavage efficacy assay, it has showed that sgRNA1-cas9 and sgRNA2-cas9 complex show full efficiency and yielded band of expected size. The HPLC analysis has demonstrated that Dschyb gene is successfully knocked-out. After the gene editing by CRISPR-Cas9 system, Dschyb gene was knocked out and β -carotenes content become 2.2 fold higher in the mutant strain of *D. salina*.

Although carotenoid has great use in food colorants, cosmetics and feed additives. Anti-oxidant pigments are found to reduce the risks of AIDS, diabetes, cataract, macular degeneration and neurodegenerative disorder. A person with these pigment deficiency may lead to exophthalmia, night blindness and conjunctiva keratinization. Astaxanthin, which is known for the pinkish colour it lends to aquatic fish and shrimps, boasts antioxidant activity several times stronger than vitamin E and β -carotene. B-carotene helps to prevent toxin accumulation in the liver, potentially enhances the immune system, and may play a role for preventing eye diseases such as cataract and night blindness. Lycopene has been marketed as an antioxidant and a potential treatment for cardiovascular diseases and prostate cancer.

The field of microalgal bioprocessing has great potential for growth and should be the focus of further research to increase productivity and reduce costs. To achieve this, advanced metabolic engineering tools such as CRISPR/Cas9 can be utilized to develop high-throughput strain development. However, it is important to consider the storage stability of carotenes. Wet extraction methods present a positive new direction of research for reducing drying costs. Additionally, production of multiple products can lead to a more economically attractive and sustainable microalgae industry. Despite the challenges faced in microalgal carotene production, it remains an attractive and rapidly growing field with much potential for innovation and cost competitiveness.

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Déjà vu – A Temporal Lobe Epilepsy

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Déjà vu, a term originating from French, which means "already seen." This term was first coined by St Augustine as "False Memoriae" in c 400AD. The term "Déjà vu" was coined in 1896 by FL Arnaud. Then this term has become widely accepted and number of references of déjà vu are found in proseand poetry, even in the writings of some writers like Sir Walter Scott, Charles Dickens and Thomas Hardy.



Lobes in brain

The formation of our brain consists two cerebral hemispheres. Each hemisphere has four sections and these sections are known as lobes. These lobes are: Frontal lobe, Parietal lobe, Temporal lobe and Occipital lobe. These lobes have their different functions.



So, what is temporal lobe epilepsy?

Fig: Different Brain Lobes

Temporal lobe epilepsy (TLE) is a form of epilepsy characterized by recurrent seizures that produced in the temporal lobes of the brain.

What is the cause?

Inindividuals with temporal lobe epilepsy, seizures typically arise from abnormal electrical activity in the temporal lobes. This abnormal activity can result in various types of seizures, such as focal aware seizures (person remain sconscious and may experience unusual sensations or feelings) or focal impaired awareness seizures (unconscious or altered conscious ness).

Let's Know About Déjà Vu

In the year 1983,V.M Neppe presented a definition of déjà vu, according to him it is "any subjectively inappropriate impression of familiarity of a present experience with an undefined past."Déjà vu is a phenomenon that describes the feeling of having experienced a particular situation before, even though it is happening for the first time.

During a déjà vu experience, an individual may feel a strong sense of familiarity with their surroundings, events or conversations, as if they have already lived through that exact moment or situation before. It feels like a sense of surprise or confusion, as the person recognizes the familiarity but cannot recall when or where they encountered it before.

Bancaud's theory

In 1994, Bancaud and his colleagues studied16 patients with TLE. They implant stimulated electrodes before surgery and measured from hippocampus, amygdala and temporal lobe. They observed that automatically occurring 'dreamy states' resulting in the activation of all the three areas every time but the stimulation of deeper structures like hippocampus and amygdala was ten time more strong. So he suggest that hippocampus and amygdala are the key of déjà vu experience where temporal neocortex has a important secondary role.

His theory describes that a neural network in limbic areas and cortex encodes the total experience of an event. Temporal neocortex encodes perceptual information and it stored in the hippocampus with amygdala added some emotions (Fig:A).

In his theory, Bancaud suggests that déjà vu occurs due to an incorrect activation of deep memory structures by superficial sensory structures (Fig: B). This also known as "neuroanatomical tape recorder" model of déjà vu.



Déjà vu also has some explanatory theories like, **Psychological Theory** which suggest that déjà vu occurs due to the lost of synchronization between the two parts of our brain, **Parapsychological Theory** which suggest that déjà vu is a sense of our past life memories through reincarnation, and **Psychodynamical Theory** which suggest that déjà vu is initiated when we perceive a situation that bears resemblance to a suppressed fantasy, leading to the awakening of that fantasy as a desire to enhance the current situation.

Types of Déjà vu

1. Cognitive déjà vu: This is the most common type of déjà vu, where the feeling of familiarity is

45

electroencephalography (EEG) to assess for any underlying neurological conditions.

with temporal lobe epilepsy (TLE). In TLE, the activity of the neurons in the temporal lobe can become disordered, leading to abnormal electrical activity that can cause seizures. During a seizure, the abnormal electrical activity can stimulate areas of the brain responsible for processing memory, leading to a feeling of déjà vu.

feeling of familiarity.

But note very one who experiences Déjà vu

Fig: Seizure Activity During Epilepsy has Temporal Lobe Epilepsy, and not everyone who has Temporal Lobe Epilepsy experiences Déjà vu. Also, experiencing Déjà vu on its own does not necessarily indicate the presence of Temporal Lobe Epilepsy.

Treatment

In some cases, déjà vu experiences can be associated with certain medical conditions or factors, such as epilepsy, migraines, or sleep deprivation. If an individual's déjà vu episodes are accompanied by other neurological symptoms, such as seizures, unconsciousness, or changes in cognition, a healthcare professional may consider further investigations, such as brain imaging or

ELECTROENCEPHALOGRAPHY





Relation of Déjà vus temporal lobe epilepsy

Associative déjà vu: This type of déjà vu occurs when a new experience triggers an old memory that was previously forgotten or suppressed, leading to a feeling of familiarity.

it's associated with neurological disorders or brain

previously experienced event, but it's not exactly the same.

triggered by a situation or context that closely resembles a



injuries. It occurs when the brain misinterprets an unfamiliar situation as a memory, leading to a



Fig: Hippocampus & Amygdala in Brain

Some approaches commonly used in the treatment of déjà vu:

AntiepilepticMedications,

SeizureManagement,

BehavioralandCognitiveTechniques,

PsychologicalSupport.

It is important to consult with a healthcare professional for an accurate diagnosis and appropriate treatment plan for déjà vu.

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Idiopathic Pulmonary Fibrosis: Unraveling the Mystery of the Lung's Invisible Enemy

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Imagine taking a deep breath of fresh air, the most fundamental act of life, only to find it doesn't quite fill your

lungs as it used to.For those diagnosed with idiopathic pulmonary fibrosis (IPF), this disconcerting sensation becomes a daily struggle.IPF specifically refers to a specific type of ILD characterized by progressive and irreversible fibrosis of the lungs.Unlike other forms of pulmonary fibrosis, the term "idiopathic" signifies that the cause of this condition remains unknown, adding a layer of mystery and frustration for both patients and medical professionals.



So, what exactly is IPF?



IPF is a condition where the lungs progressively scar for reasons we still can't pinpoint. "Idiopathic" means "unknown cause," and "pulmonary fibrosis" refers to the thickening and stiffening of lung tissue due to the formation of scar tissue.Imagine your lungs are like a sponge, flexible and full of tiny holes (alveoli) that allow oxygen to pass through. In IPF, this sponge slowly turns into a rigid, brittle block, making it increasingly difficult to breathe.

The journey of an IPF patient often starts with subtle symptoms. Now imagine, you're climbing a set of stairs that you've always taken with ease, but now you find yourself out of breath, puzzled by your sudden fatigueor even getting dressed

can leave one gasping for air. This creeping breathlessness, paired with a persistent dry cough, often dismissed as signs of aging or minor respiratory issues. What makes IPF particularly cruel is its unpredictability, for some, the disease progresses rapidly, while for others, the decline is more gradual. Yet, the outcome is invariably the same elentless scarring (fibrosis) of lung tissue that impairs respiratory function and ultimately leads to respiratory failure.

IPF severity has traditionally been explained using different terms such as mild, moderate, severe, early or advanceddisease,this approach has not get widespread acceptance. Idiopathic pulmonary fibrosis (IPF) is a grave interstitial lung condition, typically granting a median lifespan of 3-5 years. Those afflicted with idiopathic pulmonary fibrosis often endure diagnostic delays, which can markedly impact their prognoses. Treatment options for IPF are largely ineffective, with a likelihood of

survival ranging from 20% to 50% at the five-year mark.Proportion of IPF may fluctuate between approximately 30%-45% in India.

Diagnosing IPF is akin to piecing together clues in a highstakes medical mystery. Doctors rely on a combination of clinical evaluation, high-resolution computed tomography (HRCT) scans, and sometimes a lung biopsy. The HRCT scan can reveal signs of lung scarring, like patterns of



HRCT cross sectional view of lung

honeycombing, which are as distinct to a trained eye as fingerprints at a crime scene. Pulmonary function tests add another layer of evidence, showing how much the disease has impaired lung capacity.

Who's at risk?

• Gender: A Male-Focused Mystery

Men, you're on IPF's most-wanted list. Statistics reveal that men are about 1.5 to 2 times more likely to be diagnosed with IPF than women. This gender bias suggests a significant male vulnerability. Women are not entirely out of the woods. While the risk is lower.

• The Golden Years Under Threat IPF

Lets imagine, you're enjoying your 60s or 70s, possibly relishing retirement, and then IPF makes its unwelcome entrance.Under 50? IPF is a rarity in your world. This disease seldom targets younger individuals, focusing its efforts on those who have a bit more life experience.

Genetic Culprits: The Main Suspects

• **TERT and TERC**: These genes are like the timekeepers of our cells, responsible for maintaining telomeres, which protect our chromosomes. Mutations in these genes can lead to telomere shortening, causing cells to age and die prematurely – a major clue in the IPF case.

• *MUC5B*: Imagine a gene that makes mucus. The MUC5B gene variant is a major suspect, with an overactive version leading to excessive mucus production in the lungs. This can contribute to the scarring seen in IPF.

- *Surfactant Proteins (SFTPC, SFTPA2)*: These genes produce proteins that help keep our lungs flexible and inflated. Mutations here can disrupt lung function, leading to fibrosis.
- Familial IPF: About 5-20% of IPF cases have a familial link, where multiple family members are affected. This familial form often points to inherited genetic mutations. Keeping an eye on family history can provide important clues.

Quick guide to fight against IPF

Frontline Medications

Pirfenidone: Slows lung scarring, acting like a shield. Nintedanib: Blocks multiple fibrosis pathways, a multiweapon system.

Supportive treatments

Oxygen Therapy: Provides essential oxygen, easing breathing.



Pulmonary Rehabilitation: Strengthens lungs and fitness, like training for a marathon.

Advanced strategy

Lung Transplant: Offers a new lease on life for severe cases.

Glimpse into tomorrow

- Bioengineered lungs and advanced regenerative therapies.
- Smart diagnostics and virtual care, powered by artificial intelligence.
- United efforts to accelerate research and innovation.

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Victory by Chemicals: The Pheromonic Stratagem

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In the heart of a lush green banana orchard, where the sun-kissed fruit hung heavy on the boughs, a quiet drama unfolded between two unlikely protagonists: the industrious weaver ants *Oecophylla smaragdina* and the notorious Mediterranean fruit flies, *Ceratitis capitata*.

In this orchard, the ants had long established their bustling colonies beneath the roots of banana trees. Their daily routines were meticulously orchestrated: scouts ventured out in search of food, soldiers defended their territory, and workers tirelessly carried crumbs and nectar back to their underground nests. It was a harmonious microcosm of order and purpose.

But amidst this harmony lurked a persistent evil—the Mediterranean fruit fly. These tiny insects, with their amber wings and insatiable appetites for ripe fruit, posed a threat to the orchard's bounty. Female fruit flies sought out the juiciest fruits to lay their eggs, which would hatch into voracious larvae that could decimate entire crops.

One sunny morning, as the orchard basked in the golden light of dawn, a group of ants stumbled upon a cluster of ripe figs nestled under the leaves. Excited by their finding, they began their coordinated effort to gather the figs' sugary sweetness back to their colony. Little did they know that nearby, a female Mediterranean fruit fly had been noticing those same figs as a perfect nursery for her offspring. She approached cautiously, assessing the ripest fruits with her sensitive antennae. But as she prepared to lay her eggs, she sensed a disturbance—a faint but unmistakable scent of ant pheromones. Curious and cautious, she peered around and noticed the ants, their movements purposeful and relentless. Sensing danger, the fruit fly hesitated. She had encountered ants before, and their presence of ten meant trouble. They were known to de fend their food sources fiercely, and their bites could be lethal to a fruit fly as small as herself. The ants, meanwhile, continued their diligent work, unaware of the drama unfolding just a few inches away. Their collective efforts seemed unstoppable, until one particularly vigilant ant caught wind of the fruit fly's presence. Sensing a potential threat to their precious figs, it quickly alerted its companions. In response, the ants mobilized swiftly. They formed a living barrier around the figs, their bodies intertwining in a complex dance of communication and defence. Their presence alone was

enough to deter the cautious fruit fly, who, sensing the army of the ants, decided to abandon her oviposition attempt and seek out a safer spot deeper in the orchard. As the sun climbed higher in the sky, the drama subsided. The ants resumed their foraging, their unity reaffirmed by the successful defence of their new found treasure trove of figs. Meanwhile, the fruit fly, though disappointed, continued her search elsewhere, mindful of the intricate web of interactions that governed life in



Fig.1. Oecophylla smaragdina Fabricius carries mediterrenean fruit fly pupa



the orchard. On the other side it was found that *Oecophylla* individuals carry so many pupae in their trail (Figs. 1 & 2).

In this quiet corner of the banana orchard, the daily interactions between ants and Mediterranean fruit flies continued to shape the delicate balance of nature—an unseen ballet of survival, where each species play edits part in the timeless dance of life.

Fig.2. Pupar of Mediterranean fruit flies, *Ceratitis capitata* collected from ant *Oecophylla smaragdina* trait

This fact actually illustrates the daily struggle for survival and the delicate balance of nature in an orchard ecosystem, where the Weaver ant & Mediterranean fruit flies plays a dramatic role in the timeless dance of life. The Weaver ants are able to deter the occurrence of a strongly harmful pest of

tree crops, the tephritid *Ceratitis capitata* (Wiedemann) (Diptera : Tephritidae) (Fig.3) a polyphagous, holometabolous and multivoltine insect considered an important economic pest worldwide, which lay eggs within fruits, by releasing special semiochemicals. This leads to a decrease in the number of progeny produced, indicating that flies are capable of detecting the chemical compounds emitted by ants. This study suggests that pheromones triggering this deterrence effect are conserved across ant subfamilies and encourages improving to achieve a new low-impacting control method against agricultural pests.



Fig.3. Mediterranean fruit fly nibbling on fig.

This ant - based integrated pest management technique has a promising future as an alternative to conventional chemicals against Mediterranean fruit fly where ants act as tools in sustainable agriculture.

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Amazing Facts of Meerkats

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Introduction

Meerkats are cute animals. Many people love these cute animals. But little is known about them. The meerkats (*Suricata suricatta*) are a member of the mongoose family (also known as Suricates). It has grey and brown hair with dark areas around eyes. They are highly social desert animals. Meerkats live in groups of 2 to 30 individuals and their habitat is approximately 5 square kilometers. Breeding occurs throughout the year but peaks during heavy rains, when 3 to 7 cubs are born after a gestation period of 60 to 70 days. They are found in southwestern Botswana, western and southern Namibia, and northern and southwestern South Africa, with many extending into western Angola. Meerkats mostly feeding on insects, beetles and lepidopterans, arthropods and amphibians, small birds, reptiles, and plant material in their diet.

Facts about meerkat

The meerkats are extrovert!

Meerkats are extroverts and are willing to speak in at least 10 different voices. Female tend to talk more than men. Some of their sounds include "whispering, threatening noises and spitting, scolding clucks and a defensive alarm bark." The meerkats, when on duty stand on their legs and make different sounds to alert the group whether the animal is coming from the ground or the air.



Smart and intelligent Meerkats

Meerkats live in a supportive community and everyone works to keep the group safe through different activities. Some have a guarding role, some have a foraging role, and some have a caring role for the young. While dominant individuals in the breeding group produce offspring, nonbreeding, subordinate members show altruism for the pups.

Watch keeper Meerkats

They stand on two legs and mark the horizon and if they see a predator they notify the group. They often find a higher place to look, such as a termite mound or rock. They have a great vision. The dark area of the eyes acts as sunglasses. Meerkats can detect prey more than 1000 meters away. In fact, baby meerkats are so afraid of birds that even they run home when they see a plane.

Teacher Meerkats

They teach their children how to hunt. Parents take the dead scorpions to the baby meerkats or pups and show them what they are. Parents then take live scorpions and bite off their stingers, so the children learn to hunt scorpions without hurting themselves. If the scorpion still has venom in its exoskeleton, theydrag the scorpion through the sand to remove the remaining venom.

Venom doesn't affect them!

Meerkats can resist the bites of some poisonous snake species. Since they belong to the mongoose family, they have immunity against the poison of some snakes. If they are bitten, they will be uncomfortable for a few hours but will fully recover.

Meerkats do not drink water

Although they live in the desert, they do not need water for their food. They get all the water they need from the insects and larvae they eat. Article

Sleeping in groups

They stacked on top of each other during sleep to keep warm each other. Meerkats do not enter REM sleep to stay alert for predators.



Meerkats are murderous!

Meerkats are very cute, but sometimes they can't be kind to each other. They will begin to defend their place and the fight can be serious. Scientists studied over 1,000 animals and found that 20% of meerkat deaths were murders.

They can get old

In the wild, meerkats usually live up to eight years. In the wild, meerkats live longer, usually around 12-14 years, but they have also been known to live up to 20 years!

Conclusion

They are widespread throughout their range and are therefore not considered threatened or endangered. But they live a very difficult life in the African desert, under constant threat from predators, meerkat rivals, drought and heavy rains that flood their caves.



Weblinks

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Classic Rampage of Army Ants

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One of the most notable forms of life found in the tropical forests is that of the army ants and their swarms made for war. Apart from mass raiding, army ants are also known for their nomadic lifestyle with groups of millions of individuals. They reproduce by colony fission and form large colonies of permanently wingless queens that do not indulge in a nuptial flight. This unusual combination of traits — mass-raiding, migrations, colony fission and dichthadiigyne queens — is commonly referred to as the 'army ant adaptive syndrome'.

Armed with large powerful mandibles and a painful sting, they are deadly predators. Their impact on prey populations is significant, rendering them top predators of leaf-litter arthropods and even of small vertebrates in some areas. In the tropics, army ants are an important factor contributing to the maintenance of biodiversity and also an extraordinary example of the long-term conservation of a complex combination of behavioral and morphological traits and consequently an evolutionary model of success.

Systematic Position

Kingdom:	Animalia	
Phylum:	Arthropoda	
Class:	Insecta	
Order:	Hymenoptera	
Family:	Formicidae	
Subfamily:	Dorylinae	
Genus:	Eciton	
Species	: E. burchellii	





General Features of Army Ants

- Army ants are dominant social hunters of invertebrates and thereby play an integral role in tropical ecosystems.
- Army ants are characterized by a complex combination of behavioral and morphological traits.
- $\circ \qquad \text{They show a unique combination of mass-raiding and recurrent migrations.}$
- \circ They range in size from about 2 to 25 mm (about 0.08 to 1 inch).
- Their color is usually yellow, brown, red, or black. A few genera have a metallic lustre.
- They are blind.

- Related to their predatory efficiency, army ants move to new foraging areas at more or less regular time intervals.
- Army ants reproduce by colony fission.
- Army ant queens thus never leave the ground for a nuptial flight and remain flightless throughout their lives.
- They are able to produce huge amounts of eggs in the relatively short time between successive migrations.



Collective Foraging and Group Predation

Army ants are formidable predators. Workers leave the nest in groups of up to several hundred thousand individuals in search for live prey, which they overwhelm and kill on the spot, partition if too large to carry, and transport back to the nest.

Most species attack the colonies of other social insects and some are quite specialized in their prey spectrum. Among the most spectacular combats between large societies are the attacks of the New World army ant Nomamyrmex esenbeckii on mature Atta leaf-cutting ant colonies.



Fig.3. Nomamyrmex esenbeckii

Fig.4. Atta cephalotes



Fig. 5. Illustration of a war between army ants and leaf-cutter ants

- (1. Army ants like Nomamyrmex esenbeckii observes the leaf-cutter ants and informs their colony as their diet mostly consists of the larvae of other ants.
- 2. The moment the leaf-cutter ants notice the army ant attack, they go into crisis mode and immediately alert their soldiers, who very quickly swarm to the site of attack and combat takes place between the two species of ants.
- 3. Small teams of leaf-cutter ants carry out attacks behind the frontline, where they dismember their enemies by ripping their legs from their bodies.
- 4. Despite the powerful defense of the leaf-cutter ants, the army ants defeat them as they are superior in numbers. If the leaf-cutters fail to defend their nest, the army ant swarms their nest, overrunning all opposition.
- 5. They penetrate deep into the hidden chambers and steal tens of thousands of the leafcutter's brood to eat them.)

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Orca: The Killer Whales

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Introduction

Orca *(Orcinus orca)*, also known as Killer whales, are not actually whales but the largest members of the dolphin family, Delphinidae. These gigantic creatures are the most powerful and apex marine predators, meaning they are at the top of the food chain, showcasing high social organization and great intelligence. Their black and white coloration at the top and bottom of their body surface, white patches

behind each eye, having large paddle-shaped flippers, and a pale grey saddle patch behind their dorsal fin make them easily recognizable. With their impressive size and remarkable abilities, Orcas truly stand out as one of the most fascinating and beloved by many people around the world for their beauty, intelligence, and awe-inspiring behaviors in the wild. The Latin name *Orcinus orca* also indicates about this behavior of orcas preying on bigger whales. 'Orcinus' signifies 'of the kingdom of the dead,' and 'orca' indicates a type of whale.



Fig: Killer whales (Orcinus orca)

Distribution and Habitat of Orca

Orcas can be seen in different oceanic habitats. Along the Northwestern coast of North America, the coast of Northern Norway as well as in the higher latitudes of Southern Ocean, orca's are greatly



Fig: Distribution of Orca

abundant. Orca can tolerate different climate, like in icy environment of Antarctic zone as well as in Arctic zone. In India , they can be seen occasionally , like- In the Arabian Sea, off the coast of Gujarat and Maharashtra, in the Bay of Bengal, near the coast of Odisha and Andhra Pradesh, Lakshadweep and the Andaman-Nicobar Islands.

Ecotypes of Orca

There are several ecotypes of orcas, each with unique characteristics and behaviors that distinguish them from one another like,

- Residents are known for their distinct vocalizations and diet consisting mainly of salmonid fish, squid etc.
- Transients are recognized for their impressive hunting skills and preference for marine mammals like seals, sea lions, whales as their primary food source.

59

• Offshore orcas are typically found further out at sea and are known to feed on fish and sharks.



Fig: Male orca (top), female orca (bottom)



Transien

Offici

North Pacific types

Behavioural Features of Orca

- 1. Orcas, are highly social creatures with a complex social organization. Living in groups called pods, these intelligent mammals exhibit strong family bonds and intricate relationships. Within a pod, there are different ages and sexes, with a dominant adult female leading a group of her descendants known as matrilines.
- 2. Orcas are formidable hunters with a diverse diet. Their prey ranges from fish like tuna, herring, and cod to larger marine animals such as penguins, seals, and even other whales. The hunting

behavior of orcas is a sight to behold, as they demonstrate cooperativehunting strategies and share their food among pod members after asuccessful predation.

- 3. These majestic marine mammals are not only skilled hunters but also excellent vocal imitators. They can mimic the calls of other animals, such as dolphins and sea lions, as well as human made noises like boat engines and even human speech. By mimicking different sounds, they can potentially communicate with other species, deceive prey, or even confuse predators.
- 4. Killer whales have been observed exhibiting playful behaviors, intricate communication skills. Killer whales can sometimes display aggressive behavior towards other animals, but it is typically for the purpose of hunting or establishing dominance within their social hierarchy.

Killer whales have been observed attacking or harassing 20 species of cetaceans, 14 species of pinnipeds, the sea otter and the Dugong.

5. It has been observed that kinship also play an important role in their association. As they are known for their strong social bonding, it is quite easy to understand the power of group living. Kin selection actually helps to determine cooperation among them. This social association reduces the predation threat, increases the fitness, improves foraging and mate choice, but increase the rate of transmission of infection.



Fig: Association in Orca

6. Most of the time, it has been seen that Orca intentionally target the liver to remove from prey's body during predation, as the liver is the organ full of protein, vitamin, fat and energy that



Fig: Orca group cooperatively hunting that seal



provides them good nutrition and also liver is easily accessible organ, like in seals, sea lions, it is located near the body surface, helps to minimize the effort for hunting.

Fig: Orca kills Great White Shark

Importance of Killer Whales

- 1. Killer whales, play a crucial role in maintaining the balance of marine ecosystems. As apex predators, they control the populations of various species.
- 2. Conserving killer whales also has cultural and economic significance. Many indigenous cultures revere these majestic creatures and consider them integral to their heritage and traditions. Additionally, killer whales attract ecotourism, which can be a sustainable source of income for coastal communities.

Conservation Status of Killer Whales

- 1. Southern resident killer whales are enlisted as Endangered.
- 2. Northern resident killer whales are enlisted as Vulnerable.
- 3. Transient killer whales are enlisted as Vulnerable.
- 4. Antarctic killer whales are enlisted as Least Concern.

Threats to Orca Survival & Measures for Conservation

- Shipping activities can cause disturbances by generating noise that interferes with their echolocation and disorients their behavior.
- Exposure to chemicals and toxic substances can result in serious health issues .
- Lack of prey species is a serious threat.

MEASURES should be taken like,

- I. Use of Legal protection.
- II. Habitat preservation.
- III. Research and monitoring.
- IV. Pollution control.
- V. Public awareness and proper education.
- VI. Collaboration with Indigenous communities.

Modern Conveniences for Understanding Orca Ecology and Behaviour

- Tracking By Satellite.
- Machine Learning And Use Of Artificial Intellligence.
- Acoustic Monitoring.
- Drone Technology.

- Genectic Analysis.
- Camera Tags.
- Ocean Observing System.

Conclusion

As we modernize, we must acknowledge the harm we're causing to the planet's ecosystem. We must recognize nature's value and our responsibility to protect it. We have no right to harm the creatures that sustain our planet's balance. Let's raise awareness, educate others, and work together to preserve the natural world for future generations. Let's be the planet's guardians, not destroyers.

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Surrogacy : A Journey to Parenthood

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History

The concept of family has played an important role in the formation of this society since ancient times (Fig 1). The right to marry and found a family was considered a basic human right. The Human Rights

Act upholds the positive right of all peoples to marry and found a family. Every society in various parts of the world has given the family institution a primary and important position as the most basic and fundamental unit of social relations. When two people come together and marry, a new family is born, and such a family is completed by the birth of children. Unfortunately, the gift of the birth of a child is naturally not distributed equally. This inability to bear a child is medically called infertility. The paradox of adding a child to the family and the inability to give birth leaves the married couple in a difficult situation. This social pressure on the married couple sometimes also causes the marriage to break up and also makes the couple a target of social ridicule.



Figure 1: Sculpture in Ancient Greece showing Surrogacy

Since ancient times, there has been a reference to another woman bearing a child for the couple to raise, with the male half of the couple usually being the genetic father(Fig 2). Babylonian law and custom allowed this practice, and a woman who could not give birth could use this practice to avoid divorce,



Figure 2: Wall Stone Carving in Ancient Greece showing Pregnancy.

which would otherwise be inevitable. 1944 -Harvard Medical School professor John Rock was the first person to fertilize a human egg outside the womb; the first "official" legal surrogacy contract was signed in the mid-1970s in the United States with a child named Baby M; 1978 - In England, Louise Brown, the first test-tube baby, was born as a result of the first successful IVjnmmmme; the world's second and first IVF child Kanupriya alias Durga was born in Kolkata on October 3, 1978; 1985-1986 - a woman carries a first successful surrogate pregnancy; Commercial surrogacy was legalized in 2002 and banned since 2016 (Surrogacy Act 2016) in India.

What is Surrogacy?

The word "substitute" comes from the Latin word "Subrogare" (to substitute), which means "appointed to act instead of". It means surrogate, especially a person who replaces another in a certain role, so surrogate means a woman who becomes pregnant and gives birth to a child with the intention of giving that child to another person or couple, usually called "intentionally". " or "subscribing" parents (as in Fig 3).



Figure 3: This picture represents a surrogate mother bearing a child for another couple or intended parents

Types of Surrogacy

Now there are different types of replacement based on methods and money. Based on the methods, there are two types of replacement:

- (A) Traditional or partial surrogacy (the surrogate uses his own egg, which has been artificially fertilized with the sperm of the intended father or donor. Thus, the child is biologically related to the surrogate). Single men, same-sex male couples and mothers who cannot produce healthy eggs are considered are the ones who considers this types of surrogacy.
- (B) Gestation period or total replacement (here an embryo is created by IVF from eggs and sperm of intended parents or donors and then transferred to a surrogate. Thus, the child is not biologically related to the surrogate, who is often referred to as a gestational carrier). People who have struggled with infertility, hopeful single parents, same-sex couples, people who do not want a genetic link between a surrogate and their child are people who may consider gestational surrogacy.

Based on money, replacement is further divided into two types:

- (A) Altruistic Surrogacy: This is a term used to describe a situation where there is no formal contract or payment or payment to the birth mother and is usually arranged between very close friends or relatives.
- (B) Commercial surrogacy: This involves paying a large sum of money to the surrogate as income for the services she provides, as well as all the costs associated with the pregnancy, and surrogacy is considered a commercial opportunity and is sometimes referred to as. potentially offensive terms such as "womb for rent" or "baby farms."(as in Fig. 4).



Figure 4 : Commercial Surrogacy or "womb for rent"

Phases or Process

Surrogacy involves the following steps as summarize in Fig 5, are :

- Step 1: Find a substitute (office, personal contact, online)
- Step 2: Examination and reconciliation (medical, psychological, legal)
- Step 3: Legal agreements (contracts, rights, obligations)
- Step 4: Transfer of embryos or artificial insemination
- Step 5: Pregnancy and childbirth
- Step 6: Postnatal court (paternity, custody)



Figure 5 : Pictorial representation of the process of surrogacy

Guidelines for Surrogacy in India under the Surrogacy (Rule), 2021

Therefore, to control the practice of surrogacy in India, there are several surrogacy guidelines under



the Surrogacy (Regulation) Act, 2021(Fig 6). India's new surrogacy law allows couples to opt for surrogacy for certain diseases, including MRKH, one-horned uterus, multiple IVFfailures, miscarriage or abortion.

In February 2024, the Indian government changed surrogacy rules to allow married couples to use donor gametes if one spouse has a medical condition that requires it.

Figure 6 : Surrogate mother giving off her parental rights to the intended parents

Why Surrogacy?

The biggest answer to the question "why surrogacy?" is the desire to help couples or individuals have a child of their own and to give infertile couples the opportunity to have their own genetically related child.

65

Criteria to become a Surrogate

However, there are certain criteria that must be met to become a surrogate:

- Generally good health and no medical complications.
- Must be under 35 years of age.
- He must not be overweight, heavy smoker, alcoholic or drug addict.
- You should have your own child.

Risks

- Multiple births (as in Fig. 7) associated with premature birth, low birth weight and infant health problems.
- OHSS (ovarian hyperstimulation syndrome) which can further lead to blood clots, kidney failure and death.
- Pregnancy-related risks, ie you may develop gestational diabetes, high blood pressure, bleeding and the need for a caesarean section or C-section.



- There is no guarantee that the pregnancy will succeed.
- Figure 7: Multiple pregnancy condition
 Emotional risk of miscarriage, complications and other health conditions.

Cost and sucess rate in India

Total Surrogacy package cost in India is 20-25 lakh rupees and with a healthy surrogate success rate ranges between 60-80%.

Conclusion

Surrogacy is a complex and emotional journey and the continuous refinement of surrogacy regulations in India demonstrates the nation's strong commitment to protecting all parties (both fertile and infertile couples or individuals) involved. Surrogacy is not just about carrying a baby, it's about carrying hope and dreams for a family.

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The Colourful World of Chameleons

Rajat Paul, PG Semester-II Student (2023-2025), PG Department of Zoology, Barasat Government College



Nature is incredibly colorful, and the chameleon is the perfect representation of this vibrant diversity. Before delving into the amazing facts about chameleons, I want to share a story. It's an incident that happened to me and sparked my curiosity to a new level.

A few months ago, I visited my friend's home and came to know that his cousin had a pet chameleon. I was very excited to see the chameleon, but I was even more interested in watching that how it changes its color. I requested my friend to place the chameleon on different colored backgrounds and waited for an hour, hoping to see it camouflage or change its color. However, to my disappointment, nothing happened. The chameleon walked upon those colorful backgrounds one by one, but it did not change its color. My expectations were completely shattered. From that moment, a question lingered in my mind: how do chameleons change their color? What role do cells and pigments play in this rapid color change, and under what conditions can they change their colors?



When we think of chameleons, we imagine a reptile with a prehensile tail, zygodactyl feet, independently rotating eyes, and a remarkable ability to change colors. From historical times, the color-changing ability of chameleons has fascinated humans on another level. Many myths revolve around chameleon coloration in our society. Understanding chameleon coloration not only enhances our knowledge of these reptiles but also offers insights into physiological color change in other species.

Let's explore some facts that influence chameleons to change their color. Communication is the first and foremost reason. Yes, chameleons can communicate with each other by changing their color, such as passing mating signals or displaying territorial behavior. Male chameleons exhibit brighter colors to attract females and signal their readiness for mating. They show darker colors to assert their dominance in a particular area.



Figure 1. Showing Chameleon camouflage, There are three different species of chameleons try to blend themselves with the back ground.

Chameleons use camouflage not only to hide from the outside world but also to avoid predator detection and to ambush prey (Fig.1). Chameleons also change their color to regulate their body temperature. They display dark colors to absorb more heat from sunlight and lighter colors to reflect most of the light when they need to cool down(Fig.4). They also express their mood, health, and submission through various wavelengths of color.

Now, let's dive into the cellular and molecular aspects of chameleon coloration. Chameleon skin contains chromatophore cells such as xanthophores, erythrophores, iridophores, and melanophores (Fig.2). Xanthophores are cells present closest to the skin and contain yellow and orange pigments, which control the yellow and orange hues of chameleon skin. Erythrophores, also located close to the skin, work alongside xanthophores. Beneath the xanthophores and erythrophores, iridophore cells contain guanine crystals. These crystals are responsible for reflecting various wavelengths of light,



Figure 2. Showing the diagrammatic representation of chameleon skin & how these layers reflects lights

from longer (red) to shorter (blue). Melanophores extend their dendrites over the xanthophore and iridophore layers, forming a reflective unit.

These three layers of cells work together to reflect light (Fig.3). When the chameleon needs to cool down, iridophores selectively reflect shorter wavelengths of light, while the melanophore layer absorbs the medium and longer wavelengths. When iridophores reflect medium wavelengths of light, such as yellow and greenish-yellow, the xanthophores and melanophores absorb shorter wavelengths, allowing the medium wavelengths to be reflected by the iridophores.



Figure 3. Showing xanthophore, iridophore and melanophore selectively reflects various weave length of light

Role of melanophores & iridophores in coloration

In melanophores, darkness is controlled by the aggregation and dispersion of melanin pigments. Motor proteins like dynein and kinesin are present in these cells (Fig.4). Kinesin disperses the pigments towards the periphery of the cell, while dynein aggregates them towards the center. Dispersion leads to the distribution of melanin pigments throughout the dendrites, causing more regions of the skin to get dark pigments and absorb more heat from sunlight. When the chameleon needs to cool down, all the



Figure 4. Showing the activity of motor proteins that leads to aggregation and dispersion of the pigments in the melanophore cells

pigments aggregate at the center of the cell, making the dendrites transparent (Fig.4). This transparency allows the xanthophore and iridophore layers to reflect shorter wavelengths of light. The iridophore cells are peculiar cells that contain guanine crystals and originate from neural crest cells. They have a specialized pathway for guanine crystal synthesis. These crystals are arranged in a triangular lattice (Fig.5). When excited, the distance between the guanine crystals increases, reflecting longer wavelengths of light (Fig.6).



Figure 5. Showing the structure of guanin crystals present in the iridophore cells and their lattice structure

When in a relaxed condition, they reflect shorter wavelengths of light (blue) (Fig.6).In fact, the iridophore layers are capable of reflecting infrared and ultraviolet wavelengths of light. That's why chameleons are more colorful in their own eyes, perceiving a broader spectrum of colors than humans can see. This advanced mechanism of color reflection and perception adds another layer to the fascinating world of chameleon coloration.

Time evolution (in the CIE chromaticity chart) of the colour of a single cell; both exhibit a strong blue shift (red dotted arrow in . (d) Variation of simulated colour photonic response for each vertex of the irreducible first Brillouin zone (colour outside of the Brillouin zone indicates the average among all directions) shown for four lattice parameter values of the modelled photonic crystal. L-U-K-W-X are standard symmetry points (Fig 7.).



Figure 6. Showing relaxed & excitated state of Panther chameleon & the distance between guanin crystals



Figure 7. CIE chromacity chart explains that how a single lattice of guanine crystals reflects various weave length light

Time evolution (in the CIE chromaticity chart) of the colour of a single cell; both exhibit a strong blue shift (red dotted arrow in (d) Variation of simulated colour photonic response for each vertex of the irreducible first Brillouin zone (colour outside of the Brillouin zone indicates the average among all directions) shown for four lattice parameter values of the modelled photonic crystal. L-U-K-W-X are standard symmetry points (Fig 7.).

Hormonal & neural regulation

The hormonal and neural regulation of pigment cells in chameleons, such as melanophores and iridophores, involves a complex interplay of intracellular signaling and extracellular cues, leading to dynamic color changes. In melanophores, cyclic adenosine monophosphate (cAMP) levels control pigment dispersion: an increase promotes dispersal, while a decrease leads to aggregation (Fig.8). In iridophores, cAMP influences reflecting platelets, with an increase causing aggregation. Calcium ions (Ca²⁺) are crucial for pigment aggregation in erythrophores (a subtype of iridophores); an increase in Ca²⁺ leads to aggregation, while a decrease combined with increased cAMP results in dispersion (Fig.8). Hormones like alpha-melanocyte-stimulating hormone (α -MSH) and melatonin play significant roles: α -MSH typically induces dispersion by increasing cAMP levels, while melatonin causes aggregation. Neurotransmitters such as epinephrine and norepinephrine also impact pigment



Figure 8. shows how neural hormons starts the cascade of signaling that leads to pigment aggregation & dispersion in the erythrophores

cells, with norepinephrine causing dispersion in teleost iridophores. Responses to these signals can vary among species.

Conclusion

Chameleons can change color through specialized cells (iridophores and melanophores) that manage pigment movement. Iridophores Contain guanine crystals for structural coloration, reflecting light and creating bright colors for communication and dominance displays. Melanophores Involved in camouflage and thermoregulation by adjusting skin darkness through pigment aggregation and dispersion. Excitability and Color Color change is often triggered by emotional states, such as excitement or perceived threats, to signal dominance or adapt to surroundings.

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Tiny Droplets, But Huge Roles

Basusri Dandapat, Ex-UG Student (2020-2023), PG Department of Zoology, Barasat Government College

When we use the word science it has got many branches under it. But we group all of them under this single term "science". This is because science is what we can define logically and a point can be achieved where all the branchessuch as biological science, physics, chemistry come together and meet at the same horizon. In this text we are going to know about one such discovery where an old concept of physics found its way to reach the biological cell.

The text explores the fascinating realm of cellular biology, focusing on a relatively recent discovery known as liquidliquid phase separation (LLPS). Within living cells, a





indicated that these droplets may act as concentrated hubs or compartments for specific cellular reactions or processes. These droplets are known as biomolecular condensates, are composed of weak, multivalent interactions between macromolecules–.These are formed through liquid-liquid phase separation (LLPS).

LLPS is a natural process where a uniform solution separates into distinct phases: a dilute phase and a dense phase. These condensates can exhibit various material properties such as viscous liquids, gels, or solid aggregates, and play essential





dance of proteins, RNA, lipids, and other molecules takes place in a fluid environment, crucial for various cellular Functions of biomolecular dropletsfunctions. While scientists have extensively studied organelles and molecular machinery within cells, the organization of proteins within this fluid has remained a mystery.

Recent research suggests that cells actively shape their internal landscape through LLPS, wherein proteins congeal into distinct droplets within the cellular fluid. These droplets, akin to blobs in a lava lamp, play a



Different types of biomolecular condensate

pivotal role in cellular processes. Studies have

roles in biochemical reactions, signalling and cellular structure.

LLPS occurs due to the properties of the cell's cytoplasm, which is dense with dissolved molecules, creating a viscous environment. Proteins within these droplets bind weakly to each other, forming a tangled network that holds the droplet together.

In the cytoplasm or nucleoplasm, macromolecules interact weakly and transiently with each other and with the solvent. These low-affinity interactions typically keep the molecules dissolved and the system



A few types of condensates in biological cell

well-mixed (entropy-driven). However, as the concentration of macromolecules increases to a certain threshold—the solubility limit—interactions between macromolecules become stronger than those between macromolecules and the solvent. This shift in balance causes the solution to undergo liquidliquid phase separation (LLPS). The threshold concentration, influenced by factors like salt concentration and temperature, is a key indicator of LLPS.

While cells have mechanisms to regulate LLPS, abnormalities in phase separation are associated with dysregulated cellular processessuch as: genomic integrity, RNA processing, chromatin organization, transcription and intracellular signalling. These are all related to cancer. Disruptions in LLPS have been linked to various diseases, including neurodegenerative disorders like ALS and Alzheimer's. Understanding and targeting these phase-separated droplets could offer new avenues for disease treatment.

Despite significant progress, much about LLPS and its role in cellular biology remains to be explored. Researchers have identified various types of phase-separated droplets, each with potentially distinct functions, suggesting a diverse landscape within cells that warrants further investigation. Overall, LLPS represents a new frontier in cell biology, promising to reshape our understanding of how cells operate.

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Resilin Protein - The Best Replacement for Rubber

Sayan Halder, UG Semester VI Student (2021-2024), PG Department of Zoology, Barasat Government College

Introduction

Resilin is an elastomeric protein found in many insects and other arthropods (Fig.1). It provides **soft rubber-elasticity** to mechanically active organs and tissue Resilin is currently the **most efficient elastic protein** known (Elvin *et al.*, 2005).

The elastic efficiency of the resilin isolated from locust tendon has been reported to be **97%** (only 3% of stored energy is lost as heat). Resilin doesn't have a regular structure but it comprises randomly



coiled chains (Fig.2) that are crosslinked by **di- and tri-**tyrosine links at the right spacing to confer the elasticity needed to propel some jumping insects distances up to **38 times their length** (as found in fleas). Its elastic efficiency ensures performance during the insect's lifetime. Resilin exhibits unusual elastomeric behavior only when swollen in polar solvents such as water.



Resilin Protein Vs Commercial Rubber

Resilin protein has a **higher elastic efficiency** than commercial rubbers used in industries for making products like shoes or any other product that makes use of rubber's elastic properties.

Resilin has a higher tensile strength of 100-300MPa as compared to 25-50MPa of general commercial rubbers. Resilin can be stretched far more and recovers far more energy than rubber and retains its original form. Its physical properties are far superior to rubbers used in products. Resilin maintains its flexibility as compared to rubbers in higher



temperature. It is more resistant to degradation, chemicals, UV than rubber.

Scope of Resilin in Industry

Resilin is **relatively new** and its **expensive to extract and produce**. However, with its mass production, it can **dominate the industries by replacing rubber**. Resilin is **superior to rubber** due to its higher tensile strength, elasticity, energy conversion and thus it can be a better replacement for rubbers in products like window rubber, shoes, household equipment, stretching bands, cables and so on (Fig.3).



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Our Departmental students prepared posters to celebrate National Wildlife Week, 2023







hana Khatu UG SEM 5 Our Students of Department of Zoology, aimed to boost up the level of knowledge and of awareness about Zoonoses diseases by submitting posters and short articles to know more about the transmission of diseases and awareness or July 6, 2023 for the session 2023-24.

78

Commemorative Dans



LEISHMANIASIS

-A neglected roomotic disease -Be Savan Hald UG wen-IV, mology/Hh

Less hearings is a purchic choose which is found in many parts of the woyard, interespiral, and occlum. Berope Causaline an anciented togetal decises (NTD), inductanases a caused by an addention protocous *Less Annue*, which are speed by de and *These Machineses* transition to the.

Leishmaniasis



Aerosol Occurs when droplets are passed through the air from an infracten and are breathed in by a person. Most exposure occurs when drop reached from himting trissuegiblearith airthing fluids) containment feces, unine or bacteria and a person breather in the dust particle

Oral I to by significant on water contaminated with a pathogen. This can if a wind products such as mill as mead are not partourised or cooke why. Easing or chicking often handleing animals without working your is could also lead to used councils of seven transmission.

Direct contact

puters the presence of a pathegen in the environment or writin an inflocted ball. A person become: exposed when the pathogen directly touches in wounds, muchus membranes or the skin.

open wounds muchas are to a participation from one aromal and transmits it to a person, decurs when an involut aquires a pathagen from one aromal and transmits it to a person. Fomite

Awareness Programme

Control of Arantice an inanimate (mon-likerg) object that can carry a pathogan from an animal to a person . Examples of formites include contaminated obstances chains, brushes, needles, clothing or ledding.

Malaria " Time to deliver zero malaria: invest, innovate, implea

Sharanya Chotterjee (UG Sem J, Zoology Honours)

In the easternic nontrive, the specific water scorepling matrix at a leading crude of mortality is a affect, about 500 million people waterwide. Also, septements 60% of the global matrix backet and 1000 cross of multicia are diagnosed in UKA such year.

Malaria is ensued by four specific of protocoa phomodorm - P. Siciparian, P. vvzz, P. evile and P. malarie. P. thicparian is the result unclear and mart pervalent of these protocoas species. There are some common symptom kile shalling shalling from: headerbe, marke acles, tendens, and animes. In some circles, voznigm and somethon also corre-



-Tanisha Nowrin UG sem4 The human-animal relationship dates back to 15,000 years ago and has been evolved since then. Be it a beneficial relationship or a relationship that conveys love every human is in contact with animals in one way or another.

ZOONOTIC DISEASES

This relationship paves a way for diseases to reach humans or animals and such a disease is called a zoonotic disease. The term "zoonotic disease" refers to a disease or infection that can be transmitted from humans to animals or from animals to humans. About 60% of pathogens are zoonotic in origin and includes a variety of fungi, bacteria, parasites and other pathogens.

RABIES: A ZOONOTIC DISEASE Tista Das, UG Sem 6. Department of Zoology, Barasat Govt. College

Rabies, also called hydrophobia or lyssa, is a zoonotiz viral disease of the CNS (Central Nervous System) that is usually spread manage domestic estimate (it is a constrained in the constraint) of the constraints of the constraints (the dogs, cats etc) and wild exemivations animals by a fate or sensite. All warm-blooded animats, including humans, ore affected to ratics infection. Rhobbovirus is present in the solivory glunds of rubbi animatis and is disableved in solivor; the bite of the infected animal introduces the views into the fresh wound.

Sleeping Sickness

Meghna Day, UG tem 6, Dept. of Zoology

In the year 1943, David Ourby discovered a parasite in the blood of a fireg. Then in 1952 Funde found a woma like hody as the blood of a lawregean person suffering from sleeping sectors a Carebia. That was when we sectored that 2 particles, as welly, Tryprocessors more generations. and Termenopeum braves readentmax are responsible for the momenta diseases "African Trypures massis, we commody known as "Elepting cirkness". The detries in transmitted by kiesing ing, which set as a vactor. When before by this testes fly the sector transmittent a salary index with metacyclic trypemanigote, the infective stops of approximat, to the blood tentels of the potients.

Zonnic disease, mean transmission of confapous pathogen from animatis so humans lody Pulanosis is a zonnice instrumi anterium disease massi by the obligate intracellular organism. Gibioradia garanagartak is also fasori as jugono fenes. Rush dae punkteria partoses, iteras codetoos, and bulgerague constandy utifieted by the partogen. It is traumitted from context with infered blads, and context a wide-rangeng systems of distance and sur-



Zoonotic Psittacosis

WAY FORWARD IN COMBATING TRICHINELLOSIS IN INDIA



Zoonatic disease means a disease that passes from Zonnihi diverse mitona a disesse that posse tran-aminda to lumias. There are may zonoric disesses, but we will disease about TRICHD IELLOSIS, that is caused by remarked worms, Trichmella sparala, 11 accurs due to regestion of row, improperly cooled method formatic pigs and wild bear.



TOXOPLASMOSIS IN INDIA

Basusri Dandapat, SEM IV, Department of Zoology, Barasat Govt. College One fortunate day, for the betterment of the world, the first Rabies vaccine was administered by Louis Pasteur, a French biologist, on July 66 1885. Since then, World Zoonoses Day was initiated to educate and aware people all about the zoonotic diseases and their effect on the animal world.



Aboancess Programme Seminar on Awareness of Vector Borne Disease

Academic seminar on the research methodology related to field and laboratory research, extension and outreach programs on the occasion of the Awareness of Vector borne diseases like Dengu and preventive measures has been successfully organized by Post Graduate Dept. of Zoology, Barasat Govt. College supported by IQAC on 22.08.2023.

Professor Arindam Bhattacharyya, Immunology Laboratory, Department of Zoology, University of Calcutta & **Dr. Moytrey Chatterjee**, Block epidemiologist, Fulia BPHC, Santipur, Nadia, Department of Health and Family Welfare, GOWB were the speakers of the day.

The main goal of the seminar was to educate and aware people about signs, symptoms, and risk factors of Dengu and it's preventive measures.



Anaponess Programme Seminar Organized by Department of Zoology



Awareness Programme Seminar on Awareness on Cancer, Thalassemia & Heart Attack

Seminar on Awareness for Prevention of Cancer & Thalassemia and First Aid Protocol in Sudden Heart Attack (CPR) has been successfully organized by Post Graduate Department of Zoology, Barasat Govt. College, in association with Barasat Atmajan on 8.12.2023.

We all were spellbound by the lecture of Dr. Shankar Kumar Nath, Ex Senior Oncologist, Calcutta Medical College and R.G. Kar Medical College. He emphasised on the Role of hormones, occupation, diet, tobacco in cancer. Shri Malay Mukhopadhyay demonstrated heart attack (CPR) and Sri Susanta DattaGupta, working president of Atmajan gave mesmerizing lecture on Thalassemia.





In House Poster Competition on the occasion of World Cancer Day

Dept of Zoology, Barasat Govt. College celebrated World Cancer Day 2024 by making poster competition on 06.02.2024

The main goal was to educate people about its signs, symptoms, and risk factors. It also served as a reminder for everyone to make healthy lifestyle choices that can help to prevent cancer. Talk Cancer, has consistently high impact for participants by increasing their knowledge of cancer risk factors.

Teachers who served as judges for this poster competition related to cancer awareness from Dept. of Botany and Dept. of Geography are thankfully acknowledged.













ONE-DAY SEMINAR ON WORLD WILDLIFE DAY & WORLD ENVIRONMENT DAY

Speaker Dr. Bulganin Mitra, Former Scientist C Organized by Dept. of Zoology, BCG & IQAC, BGC on 18.6.2024



Parent-Teacher Meeting held on 3.10.2023





Dept. of Zoology, Barasat Govt. College Celebrated World Cancer Day 2024 by making Poster Competition on 06.02.2024







Gender Sensitization Programme

The Department of Zoology and Botany jointly organized an interactive session with students on gender sensitization in collaboration with ICC and gender sensitization committee on 21st June, 2024. Dr. Paramita Bhattacharya, Faculty of Post Graduate Department of Bengali, Barasat Government College was the guest speaker of the program. The objective of the program was to promote awareness about gender equality and encourage and foster a respectful and safe campus environment. Students enthusiastically participated in the program.





Visit to IISER-K on "National Science Day"

Indian Institute of Science Education and Research Kolkata (IISER KOLKATA) cordially invited the students of Barasat Government College, on 28.02.2024 to Institute Open Day on the occassion of National Science Day.

15 Science Hons students from Department of Zoology, Botany, Physics, Mathematics and Chemistry have visited the Institute along with two of Science faculty members Dr. Prasanta Paul and Dr. Nisith Ch Das.



Sayan Halder of Sem (VI), Safina Alam of Sem (IV) and Ishika Sardar of Sem (I) represented Zoology department of BGC. All of the student participants were very happy to visit different laboratories of IISER.

Laboratory Visit to Institute of Health Science, Presidency University Newtown, Kolkata on 24.05.2024

The Zoology Department at Barasat Govt. College organised a laboratory visit programme for Parasitology & Immunology special students (total no. 14) with **Dr. lvy Kundu**, **Dr. Srikanta Guria**, **Dr. Somaditya Dey** on **24th May**, **2024** at Institute of Health Science, Presidency University in Newtown. We got a warm welcome from **Dr. Debanjan Mukherjee**, Assistant Professor of Institute of Health Science. He spent a lot of time with us and help us to know various types of instruments which are present in his laboratory. He explained the purposes of the tools and equipment used in the institute.





A Short Report on Visit to Apiculture Centre (Madhuban) at Rahana, Amdanga, North 24 Parganas, West Bengal

Post Graduate Sem IV students (Special paper: Entamology & Ecology and Environmental Biology, Number of students:10) of PG Dept of Zoology, Barasat Govt College visited an **Apiculture Centre (Madhuban) at Rahana**, **Amdanga, North 24 parganas, West Bengal** on 25.1.2024 along with the teachers Dr Sumana Saha and Smt. Indrani Banerjee. Our main purpose for this visit was to give the practical knowledge about bee keeping techniques. All the staffs of Madhuban supported a lot. After a brief introductory session, they arranged a field visit programme to manage apiaries, bees and collection of honey and identification of different bees and hives. Demonstration was given to the students on the uses of different bee's products (honey, beeswax, propolis, royal jelly and bee venom). It will impart awareness and new learnings to our students. They also explained about the role of bees in pollination and thus, in recent times, beekeeping has become a highly professional activity. It was a really fruitful and highly informative visit to know about this.



A Short Report on Visit to Sewage Treatment Plant at Bantala, Manpur, West Bengal

Post Graduate Sem III students (Special paper: Ecology and environmental biology & Entamology, Number of students:10) of Zoology visited Sewage treatment plant at Bantala, Manpur,West Bengal 700150 on 05.12.2023 along with the teacher Smt. Indrani Banerjee. Our main purpose for this visit was to give the practical knowledge about water treatment plant process. By this visit students can be familiar with industrial environment and get knowledge of different units of waste water treatment plant. Also acquired knowledge about how components of sewage plant are constructed, so it is very much convenient to see all the practical and components in real time work environment.





(Backlog 2022-23)

The Department of Zoology, Barasat Govt. College organized educational excursion for CBCS Sem 5 and Sem 3 Under Graduate students to Murti, Gorumara National Park, Chapramari (Dooars) and adjoining areas (West Bengal), North Bengal Wild Animal Park (Bengal Safari), Salugara and and adjoining areas (West Bengal) from 09.11.2022 to 13.11.2022.

The students were accompanied and guided by Dr. Ivy Kundu, Associate Professor of Zoology, Dr. Enamul Haque, Assistant Professor of Zoology, Dr. Srikanta Guria, Assistant Professor of Zoology and Smt. Indrani Banerjee, SACT 2, Dept. of Zoology.

This excursion provided students with invaluable experience. Activities like Quadrat sampling, pitfall sampling, hemolymph extraction from local insects were done along with safaris, animal spotting etc.





UG Excursion (2023-24)

An educational excursion was organised with CBCS Sem 5 Under Graduate students (number = 20) of Department of Zoology to visit Jaldapara, Buxa and Jayanti (Dooars) and adjoining areas (West Bengal) accompanying with 3 Teachers (Dr. Jayati Ghosh, Dr. Enamul Haque, Dr. Srikanta Guria) as part and parcel of UG CBCS syllabus from 29. 11. 2023 to 04.12.2023.





PG Excursion (2023-24)

As part of the course curriculum in M.Sc. Zoology, an academic excursion was organized from 21.02.2024 to 26.2.2024 for final year of students of Barasat Government College to Tadoba Tiger Reserve, Maharashtra. A total of 24 students accompanied and guided by three faculty members Dr.SumanaSaha, Associate Professor & HOD, Dr. Ivy Kundu, Associate Professor and Smt. Indrani Banerjee participated in the tour. Students had a thrilling experience in jungle safari while travelling along and collecting insects & spiders from their natural habitats by pitfalls traps, quadrat & random sampling methods. The miraculously preserved biodiversity of these national parks have enriched their knowledge on flora and fauna within habitats.









Anushka Ghosh and **Rajat Paul**, M.Sc. Sem II students (2023-25) participated in a Seminar "GREEN BIO-MERGE 2024", 1st International Conference on Enhancing Health through Environment Biotechnology and Entrepreneurship (Hybrid Mode) during February 22-24, 2024, organised by Department of Biotechnology, BRAINWARE UNIVERSITY, Kolkata and presented their poster on A REVIEW STUDY ON BIOREMEDIATION OF ENVIRONMENTAL POLLUTANTS, demonstrating their expertise and enriching the discourse in the respective field.


Report on visiting Sree Chaitanya College for Poster

A group of students from Post Graduate Department of Zoology, Barasat Government College visited in a National Conference entitled "Modern Approached in Biological Sciences" on 10th October 2023 organised by Department of Zoology, Sree Chaitanya College, Habra, North 24 Parganas to participate in a poster presentation event focusing on modern approaches in biological sciences. Primary objectives of this visit is to present original research or review paper on modern approaches in biological sciences, to engage in academic discussions and receive feedback from experts in the field, to foster collaborations and networking opportunities with students and faculty from other colleges, to enhance the presentation and communication skills of our students. This event provided an excellent platform for our students to showcase their research, exchange knowledge, and network with peers from different institutions. As an outcome students gained valuable insights into current research trends and methodologies, constructive feedback from experts helped students refine their research projects, participation in the event enhanced the students' presentation, communication, and critical thinking skills, this visit provided ample opportunities for our students to build professional networks, which could lead to future research collaborations and career opportunities. Several students received awards and certificates for their outstanding poster presentations, bringing recognition to Barasat Government College.







Rahit Ali, M.Sc. Sem III student (Session 2022-24) participated in a One Day National Seminar on "Chemistry in Biology" on 19.12.2023 organized by the Department of Chemistry, Shri Shikshayatan College in collaboration with the Indian Photobiology Society (celebrating Diamond Jubilee 1964-2023)



GPS Hap Camer





Seminar Participation

The One-Day National Level Satellite Symposium was held on 22nd March 2024 at Ramkrishna Mission Vidyamandira, Belur Math, Howrah, West Bengal organized by Department of Zoology (UG + PG), Asutosh College, Kolkata in collaboration with the Department of Zoology, Ramakrishna Mission Vidyamandira, Belur, Howrah.

The visit to Ramkrishna Mission Vidyamandira for the poster presentation on the integration of remote sensing, GIS, and AI in expanding research horizons within biological sciences proved to be an enlightening and enriching experience. The event provided a platform for teachers, scholars, researchers, and students alike to delve into the innovative intersections of technology and biological sciences.

The presentation sparked engaging discussions among attendees, fostering a collaborative exchange of ideas and insights. Participants expressed keen interest in the practical applications of remote sensing, GIS, and AI within biological sciences and shared valuable perspectives on potential research directions and interdisciplinary collaborations.

The poster presentation focused on the transformative role of remote sensing, GIS, and AI in revolutionizing various facets of biological research. It highlighted how these technologies have paved the way for novel methodologies and insights, consequently opening new research avenues. The event served as a catalyst for interdisciplinary dialogue and knowledge exchange, reaffirming the pivotal role of innovation in driving scientific progress within the biological sciences domain.

It is noteworthy that our faculty member, *Dr. Sumana Saha, Head of the Department (Zoology, Barasat Govt. College)* served as one of the judges during the event, bringing forth an added layer of expertise and perspective to the evaluation process. Her insights and feedback further enriched the discourse, contributing to the overall success of the event.

NAME OF PARTICIPANTS FROM BARASAT GOVT. COLLEGE IN POSTER PRESENTATION

SI. No.	Name of the Participant	Semester (UG/PG)
1.<	SoumikChowdhury	2021-23 (PG)
2.	AishiChowdhury	IV-PG
3.	Rahit Ali	IV-PG
4.	RijuJati	IV- PG
5.	SamyaChakraborty	IV- PG
6.	ShatavisaSardar	IV-PG
7.	ShrabantiSaha	IV-PG
8.	AnushkaGhosh	II- PG
9.	AninditaChakraborty	II- PG
10.	Tista Das	II- PG
11.	Debabrata Das	II- PG







M.Sc. Certificate Distribution Ceremony















University Toppers

We are very glad to inform you that three of our B.Sc. Zoology Hons. (2020-23) Students, Basusri Dandapat, Meghna Das and Anushka Ghosh has secured 1st, 2nd and 8th rank at the WBSU examination 2023 respectively. They are currently pursuing M.Sc. (Zoology) at WBSU, Lady Brabourne and Barasat Government College respectively.



RANK CERTIFICATE

This is to certify that BASUSRI DANDAPAT. bearing Registration No. 1062021400500 of Session 2020-2023 & Zoll No. 623210101482 obtained B. Sc. Honours in Zoology of this University in the year 2023 and secured Top Rank with 90.00% marks among all the passed out candidates in the subject in that year.

In-Charge of the Office of the Controller of Examinations West Bengal State University Registrar (Officiating) West Bengal State University

Date: 13ª March, 2024 Flace: Barasat



RANK CERTIFICATE

This is to certify that ANUSHKA GHOSH. bearing Registration No. 1062021400507 of Session 2020-2023 & Roll No. 623210101456 obtained B. Sc. Honours in Zoology of this University in the year 2023 and secured Eighth Rank with 87.45% marks among all the passed out candidates in the subject in that year.

Les In-Charge of the Office of the Controller of Examinations West Bengal State Universit

Date: 12* April, 2024



VB5U/CDE/Rank/2047/2024

RANK CERTIFICATE

This is to certify that MEGHNA DAS. bearing Registration No. 1062021400516 of Session 2020-2025 & Roll No. 625210101486 obtained B.Sc. Honours in Joology of this University in the year 2023 and secured Second Rank with 89.40% marks among all the passed out candidates in the subject in that year.

In-Charge of the Office of the Controller of Examinations West Bengal State University (F) Ita Registrar (Officiating) West Bengal State University

Parte of August, 2022 Parte Dariasat

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r (Officiating)

Award Winner

On 23rd March 2024, Basusri Dandapat (UG Batch:2020-2023) received the Best Academic Performance Award (Highest Scorer in B.Sc (Honours Examination) at the Award distribution ceremony by Barasat Government College Alumni Association (BGCAA).



Aldrienements

IASc-INSA-NASI Summer Fellowship (June-July, 2023) in favour of **Dr. Ankita Mondal** (B.Sc. Sem IV, Zoology Hons. [Batch 2021-24]) for working at the lab of Dr. Arpita Konar, IHS, Presidency University, Kolkata



Summer Research Fellewship Programme Certificate

Theo a to certify that Me Ankius Mondal worked on a project entitled "Investigating the impact of early life traumatic stress on opgenetic factors in brain regions" during June - July 2028 as a Summer Research Follow under the supervision of Dr Arpita Konar, Desidency University, Halkata. The Summer Research Followship Degram is jointly sponsored by SASe (Bengalaru), SNSA (New Delki) and NAST (Dragagraj).

Lace: Congaluru Date: 32-09-2023

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CONTRACTOR OF SCIENCES, C. V. RAMAN AVENUE, POST BOX No. 8005, RAMAN RESEARCH INSTITUTE CAMPUS, SADASHIVANAGAR P.O., REDMI 9 POWER I STIMUT BENGALURU 560 080, INDIA



Aishi Chowdhury of M.Sc. Sem IV student (Batch 2022-24) participated in Poster competition on the occasion of the International Women's Day under Theme : Imagine a Gender Equal World on 4th March, 2024 organised by NSS unit, Barasat Government College in collaboration with SWAYAM (a recognised NGO) and awarded 1st Position.







Puja Das, UG Sem VI (CBCS) Zoology Hons. student awarded first in Singing Competition during Students Week Celebration 2023 & 2024 organized by Barasat Government College







Sriparna Pakira, Ex-PG student (2020-22) completed the course of "Diploma in Information Technology" and awarded "Certificate of Achievement".





Prize Distribution Ceremony of Poster Competition held on 6th Feb. 2024 on the occasion of World Cancer Day in the Department of Zoology



Teachers Achievements

This is great pleasure & proud moment too that our respected HOD madam **Dr. Sumana Saha** received Certificate of excellence for her great achievements in the research field of Entomology and completion of her 175 research publications, during the event of National Conference at Sree Chaitanya College, Habra on 10.10.2023.



Oral paper presentation (jointly authored with Rahit Ali (M.Sc. Sem III student) by **Dr. Srianta Guria** at Adamas University in BioNext 2023: 3rd International Conference on Translational Research towards attaining "Good Health & Well Being". organized by School of Life Science and Biotechnology, Adamas University in collaboration with The Society of Biological Chemists (I), Kolkata Chapter & Microbiologists Society, India (MBSI) on 4-6 October 2023.



Oral paper presentation by **Dr. Srikanta Guria** jointly authored with Rahit Ali (M.Sc. Sem IV student) in "Green Bio-Merge2024: International Conference On: Enhancing Health Through Environment, Biotechnology and Entrepreneurship" at BrainwareUniversity campus, Kolkata, dt.February 22 to 24, 2024.



Best poster presentation award conferred to **Dr. Srikanta Guria** for poster presentation at National Seminar 2023 On "Chemistry in Biology" organized by The Department of Chemistry, ShriShikshayatan College in collaboration with Indian Photobiology Society, on 19th Dec. 2023.



Dr. Somaditya Dey, Assistant Professor in Zoology has received Long Term ICMR-DHR International Fellowship for Young Indian Bio-medical Scientists 2022-23 to act as International Visiting Fellow (Indian Council of Medical Research, Govt. of India) under the supervision of Dr. Shaden Kamhawi, at Laboratory of Malaria and Vector Research, National Institutes of Allergy and Infectious Diseases, National Institutes of Health, Rockville, USA, 15th March, 2023-14th March, 2024.



Participation of Students and Faculties of Zoology Department in Lab Visits of School Students Organized by Science Club, Barasat Govt. College on 12 October 2023





















Visit to Zoology Laboratories by School Students on 18 December, 2023

In connection with Comprehensive approach for vertical integration among Hub and Spoke Colleges and schools for Higher Education through cluster approach, students of five schools visited the college on 18/12/2023 from 12.30 PM onwards for **CAREER COUNSELLING SESSIONS AND VISIT TO LABORATORIES AND LIBRARY**. This has been scheduled from HED and DM, North 24 Parganas and co-ordinated through HM, P.C. Sarkar High School, Barasat.

In this context following faculty members acted as Nodal Officers of corresponding Departmental Lab visits.



The following pictures were the interaction of teachers of Zoology with school students























Zoology Faculty Exchange Program 2022-23 as per MoU



Dr. Aniruddha Mitra, Assistant Professor of Zoology, Sarojini Naidu College for Women delivered a talk on "Hymenopterans - why they matter and what can we learn from them?" at Dept. of Zoology, Barasat Govt. College on 18.05.2023.



Dr. Amlan Ganguly, Assistant Professor in Zoology, Government College of Education (CTE), Banipur delivered a talk on "Individual Pro Environmental behaviour in respect some Variables", at Dept. of Zoology, Barasat Govt. College on 19.06.2023.



Dr. Pabitra Saha, Assistant Professor of Zoology of PR Thakur Govt. College, delivered a talk on "Insecticide susceptibility status of major Dengue Vector" at Dept. of Zoology, Barasat Govt. College on 10.01.2023.



Dr. Priyankar Sanphui, Assistant Professor of Dept. of Zoology, Sree Chaitanya College took classes at Barasat Govt. College on "Cause and consequence of human wildlife conflict & our rescue operations, with respect to local ophiofauna: a conservational initiative" on 12.06.2023.



Dr. Enamul Haque, Assistant Professor of Zoology, Barasat Govt. College took classes at Sarojini Naidu College for Women on the topic, "Antimicrobial Resistance(AMR)-A Silent Pandemic" on 19.05.2023.



Dr. Srikanta Guria, Assistant Professor of Zoology, Barasat Govt. College took classes at PR Thakur Govt. College on the topic "Effect of Environmental Pollution on Immune Cells" on 04.01.2023.



Dr. Srikanta Guria, Assistant Professor of Dept. of Zoology, Barasat Govt. College took classes at Sree Chaitanya College, Habra on the topic "Analysis of invertebrate immune cells (hemocytes) for assessing environmental pollution" on 09.06.2023





"Primitive inhabitants of Today's seashores" Chiton (Acanthochitona fascicularis - velvety mail shell) in the intertidal zone of Neil island, Andaman (Dr. Sumana Saha, Associate Professor & HOD)



"Symbols of prosperity and beauty" Explore the elegance of Brown Cowry Shells (Cypraea chinensis) in the intertidal zone of Neil island (Dr. Sumana Saha, Associate Professor & HOD)



"Boring Giant Clam" Jolly Bouy Island, Andaman & Nicobar Islands (Aishi Chowdhury, PG Sem-IV (2022-24), PG Dept. of Zoology, Barasat Govt. College)



"Crab being the Master of Disguise"- Fascinated by the Art of camouflage Neil Island, Andaman & Nicobar Islands (Aishi Chowdhury, PG Sem-IV (2022-24) PG Dept. of Zoology, Barasat Govt. College)



"Breakfast time Stork-billed kingfisher" (Pelargopsis capensis) predating on a fish (Soumya Das, Ex-PG Student (2018-20), PG Dept. of Zoology, Barasat Govt. College)



Lime butterfly (Papilio demoleus) feeding on nectar of Hibiscus flower (Soumya Das, Ex-PG Student (2018-20), PG Dept. of Zoology, Barasat Govt. College)



"The blue fairy" (Tamoghna Roy, Ex-PG Student (2016-18), PG Dept. of Zoology, Barasat Govt. College)



"Parenting" (Tamoghna Roy, Ex-PG Student (2016-18), PG Dept. of Zoology, Barasat Govt. College)






Science Club Organised Activity of Students of Department of

- Our students visited to IISER, Kolkata on National Science Day, 28.02.24. They were acquainted with cutting edge research facilities of the institute and interacted with young researchers and professors.
- Student of our Department participated in a Science Heritage Walk on 05.03.24 in and around Rajabazar-Maniktala Region.
- Our students made five posters on national and internationally important days.
- They made popular video on the occasion of National wildlife week: The voice for voiceless.
- Participated in Interactive Meet with High School students- acquaint school students to the various laboratory techniques and instruments available in the college laboratories so as to generate interest in science.
- Undergraduate and Postgraduate students wrote an article "Microplastics: an invisible enemy" in the second issue of the magazine QUANTOPEDIA



139

Students Academic Achievement & Progression

Batch	Name of Student	Academic Achievement
2012-14 PG student	Priya Prasad	Senior Research Fellow, pursuing PhD in ZSI
2012-14 PG student	Shubhajit Saha	Joined as Assistant Professor in Sundarban Hazi Desarat College South 24 Parganas in 2019, & joined as Assistant Professor, in Zoology Burdwan University in 2023
2012-14 PG student	Arpita Kundu	Joined as Forest Ranger under West Bengal Forest Service in 2021 posted at Jalpaiguri Division under Northern Circle
2013-15 PG student	Aritra Ghosh	Joined ZSI as Senior Zoological Assistant in 2022
2013-15 PG student	Samriddhi Sen	Qualified NET LS in 2019; GATE XL 2021 (AIR 2067), pursuing PhD in Sambalpur University, Orissa
2014-16 PG student	Deb Shankha Goswami	Joined as JRF in Wild life institute of India, Dehradun in 2018; Qualified GATE XL 2021 (AIR 2460)
2014-16 PG student	Anirban Chakraborty	Qualified NET UGC JRF, pursuing PhD in Dept. of Zoology, University of Calcutta
2014-16 PG student	Himadri Nath	Qualified NET JRF, CSIR-UGC and admitted in PhD program in IICB, Kolkata
2014-16 PG student	Shahina Parveen	Assistant Teacher; Qualified 22nd SET, 2020; Awarded DBT BET JRF Category I 2021
2014-16 PG student	Suparna Sadhukhan	Joined ZSI as Senior Zoological Assistant in 2022
2015-17 PG student	Jayita Ghosh	Assistant Primary Teacher, Indian Girl Primary School in 2020
2015-17 PG student	Antara Sarkar	Qualified NET UGC CSIR JRF (RANK 137); Joined as JRF in University of Calcutta
2015-17 PG student	Keyai Pramanick	Employed as Assistant Grade III Technical, Food Corporation of India on 8.10.2020 posted at Birbhum



2015-17 PG student	Malay Dutta Chowdhury	Joined at Dept. of Agriculture, Directorate of Sericulture as Account Clerk Post in 2022
2015-17 PG student	Indrani Mondal	Joined as Mlti Tasing (Non-Technical) Staff (Group_C Non-Gazetted) in Archeologcal Survey of India in 2023
2016-18 PG student	Sonali Ghatak	Qualified SET, 2020, Joined as SACT-II in Behala College, 2020; Presently pursuing PhD. in Dept. of Zoology, WBSU
2016-18 PG student	Amartya Paul	Joined as JRF (Zoological Survey of India) in 2021, Qualified RET for enrollment of Ph.D. in 2022
2016-18 PG student	Ankur Banerjee	Qualified NET UGC JRF (RANK 74) 2019; Joined as JRF, Dept. of Zoology, WBSU in 2019
2016-18 PG student	Pritam Mandal	Qualified NET LS on 4.02.2021; Qualified GATE XL 2021 (AIR 4676); Joined as PhD Scholar in Dept. of Zoology, WBSU in 2021
2016-18 PG student	Sayanty Dasgupta	Qualified GATE XL in 2019, Qualified UGC NET LS on 4.02.2021
2016-18 PG student	Tanusri Das	Assistant Teacher in Holy Christ School, Kolkata from 2018-2021; Qualified GATE XL in 2020 (AIR 5998); Joined as JRF, Zoological Survey of India on 16.06.2021 & enrolled Ph.D. registration from Kalyani University (2021-22)
2016-18 PG student	Tamoghna Roy	Joined as Probationary Officer in Central Bank of India on 2023; at present Assistant Manager
2016-18 PG student	Soumita Roy	Joined as Lower Division Clerk, Directorate of Fisheries, Kolkata on 9.12.22
2016-18 PG student	Nandita Mondal	Selected as Supervisor in ICDS Project under Directorate of ICDS, GOWB
2016-19 UG student	Apluta Majumder	M.Sc. from Vellore Institute of Technology in Applied Microbiology, 2021; Joined Syngene in 2021, joined as Research Scientist, Wockhardt Ltd., Maharashtra in 2024
2016-19 UG student	Ayan Mandal	M.Sc. from Banaras Hindu University, 2021; Admitted to PhD program , IISER, Mohali

2016-19 UG student	Banhishikha Datta	Selected for M.Sc. in Punjab University, Joined in Bio MedCAS 2021-2022, Van Andel Institute Graduate School PhD program in Molecular & Cellular Biology
2016-19 UG student	Nitisha Kulia	Qualified June 2021 JRF NET on 24.03.22; GATE 2022, LIFE SC XL.
2016-19 UG student	Tathagata Bhowmik	Selected for Doctoral (Ph.D.) programme at the School of Arts and Sciences, Ahmedabad University for the Monsoon 2022-23 academic term (joined on 1.7.2022); Qualified LS (Joint CSIR-UGC) in 2024
2017-19 PG student	Sayan Dutta	Employed as Assistant Grade III Technical, Food Corporation of India, posted at Siliguri
2017-19 PG student	Suman Kumar Saha	Joined ZSI as Senior Zoological Assistant in 2022
2017-19 PG student	Koustav Bhattacharjee	Joined as Assistant Teacher, RKM Vidyapith, Deoghar, Jharkhand in 2019
2017-19 PG student	Subhra Prakash Mandal	VBD Technical Supervisor, Basirhat Health District
2017-19 PG student	Subhradip Pandit	Qualified UGC CSIR JRF NET on 4.02.2021, Joined as Project Assistant, Dept. of Zoology, Panchanan Barnma University, Coach Beher
2017-19 PG student	Priya Chatterjee	Worked as Project Assistant in CIFRI, Barrackpur, Kolkata; Admitted for Ph.D. Programme at Centre for Brain Research (CBR), IISC, Bangalore on 8.7.2022
2017-19 PG student	Susraba Chatterjee	Qualified GATE XL 2021 (AIR 3749); UGC CSIR NET on 4.02.2021 (AIR UGC 75); JRF in School of Tropical Medicine in Glyco Immunology Laboratory
2017-19 PG student	Pradipta Kumar Ghosh	JRF in Zoological Survey of India, Kolkata; Qualified UGC NET LS 2020-21, joined as JRF at Dept. of Zoology, Ramakrishna Mission Vivekananda College, Rahara
2017-19 PG student	Partha Das	Joined as Assistant Professor in Basic Science & Humanities Department for Biology in St. Marys Technical Campus, Kolkata affiliated to MAKAUT & WBSCTE in 2023



2017-19 PG student	Shami Akhtar	Enrolled for PhD (YP- II, under NICRA Project, ICAR, CIFRI, Barrakpore, on 20.9.2022)
2017-19 PG student	Nabajit Mondal	Qualified GATE XL 2020 (AIR 6794); Joined for Ph.D. Programme in Zoology at Netaji Subhas Open University , Kolkata, in academic year 21-22
2017-19 PG student	Arghya Biswas	Qualified GATE XL 2021 (AIR 2150)
2017-19 PG student	Shrubawati Sarkar	Qualified GATE XL 2022 (AIR 2810)
2017-19 PG student	Mayuri Dutta	Qualified Central Teacher Eligibility Test, 2022
2017-19 PG student	Mithun Sarkar	Qualified GATE XL 2023 (AIR 862); Joined as Block Epidemiologist, Phanshidewa Block, Primary Health Ventre, Under District Health & Family Welfare Samity, Siliguri SMP, Darjeeling on 16.08.23
2017-19 PG student	Tripti Mallick	Appointed as PGT Biology in Eklavya Model Residential School (EMRS), Kirimara, Odisha on 06.01.24
2017-20 UG student	Rebanta Roy	Qualified GATE XL 2022 (AIR 503); Qualified 23 rd rank in SET; Qualified BET 2023 & Awarded DBT-JRF in 9.6.2023; Qualified CSIR NET LS (2022-23) (RANK 62); pursuing research work for Ph.D. at Bose Institute, Kolkata
2017-20 UG student	Dhrubajyoti Bairagyo	Qualified CSIR NET JRF (2022-23) (RANK 69)
2017-20 UG student	Bidisha Ray	Qualified GATE XL 2022 (AIR 4562); Qualified Joint CSIR - UGC NET LS (2022 2023) (RANK- 33)
2017-20 UG student	Pritikana Mondal	Appointed as Assistant Workshop/Mech. in level 1 under Kancharapara Railway Workshop on 11.09.2023
2017-20 UG student	Tritap Sarkar	Completed Master of Science (Genetics) degree under Maulana Abul Kalam Azad University of Technology, West Bengal
2018-20 PG student	Koustuv Chakraborty	Qualified GATE XL 2022 (AIR 4562)



2018-20 PG student	Jibandeep Ghosh	Qualified 23rd SET 2022
2018-20 PG student	Soumyadip Mukherjee	Qualified JRF(NET)-UGC, 17.03.2022 (RANK-187); Joined as JRF, Dept. of Zoology, WBSU
2018-20 PG student	Avirup Ghosh	Qualified JRF (NET)-UGC, 17.03.2022 (RANK-109); Joined as JRF, Dept. of Zoology, Burdwan University
2018-20 PG student	Samim Hossain	Qualified LS (NET)-UGC, 17.03.2022 (RANK-20), enrolled Ph.D. at Presidency University in 2022
2018-20 PG student	Arup Das	Joined Department of Post, Gramin Dak Sevak on 20.7.2020
2018-20 PG student	Manashi Ash	Joined as GDS packer, Dept. of Post, India on 06.03.2020
2018-20 PG student	Kritika Chatterjee	Assistant Teacher at Central Model School, Barrackpore on 4.8.22
2018-20 PG student	Sushobhan Naskar	Cleared Ph.D. Entrance Exam 30.08.23 & pursuing Ph.D. at Dept. of Pharmacology, IPGME &R
2018-20 PG student	Ampita Bhadra	Awarded Joint CSIR-UGC NET JRF in 2024
2019-21 UG student	Rakesh Mondal	Joined ICICI Bank as Senior Officer on 21.2.24.
2019-21 PG student	Suman Kalyan Dinda	Qualified GATE XL 2021 (AIR 2783); Awarded BET (DBT-JRF) Category -I, 02.06.2022, Qualified CSIR- UGC LS (NET), 2022-23 (RANK 57); Enrollment in Ph.D. in Medical Biotechnology at Dept. of Biomedical Science and Technology, Ramakrishna Mission Vivekananda Educational and Research Institute, Narendrapur Campus, Kolkata on 26.12.2022
2019-21 PG student	Rumi Ghosh	Qualified SET 2023
2019-21 PG student	Ankita Mondal	Qualified GATE XL 2022 (AIR 3944)
2019-21 PG student	Shreya Biswas	Appointment to the post of Upper Division Clerk (UDC) In The E.S.I. Corporation, West Bengal & Sikkim Region on 22.11.22



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2019-21 PG student	Titas Das Gupta	Completed MBA from Adamas University on July 2023
2019-22 PG student	Arup Chanda	Qualified SET 2024; joined as Guest teacher at Habra Sree Chaitanya College, North 24 Parganas, West Bengal, Awarded Joint CSIR-UGC NET JRF in 2024
2019-22 UG student	Diptam Chowdhury	Qualified NIIT & Joined MBBS course at Bankura Medical College on 15.11.2022
2020-22 PG student	Pritam Chakraborty	Joined as Lecturer in Regent Institute of Science & Technology, Barrackpore, Kolkata in 2022
2020-22 PG student	Sriparna Pakira	Qualified Diploma in Information Technology (DIT) from National Board of Computer Education, GOI in 2022
2020-22 PG student	Jotishree Koley	Qualified the course - Diploma in Medical Laboratory Technology (DMLT) under State Medical Faculty of West Bengal in 2022
2021-23 PG student	Sahin Ali	Joined as employee in Bright Institute of Nursing, village Dadpur, Barasat Institute of Nursing, on 31.07.2023.
2021-24 UG student	Ankita Mondal	Successfully completed Summer Research Fellowship programme (June-July 2023) jointly sponsored by IASc-INSA-NASI for working at the lab. of Dr. Arpita Konar, IHS, Presidency University, Kolkata



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