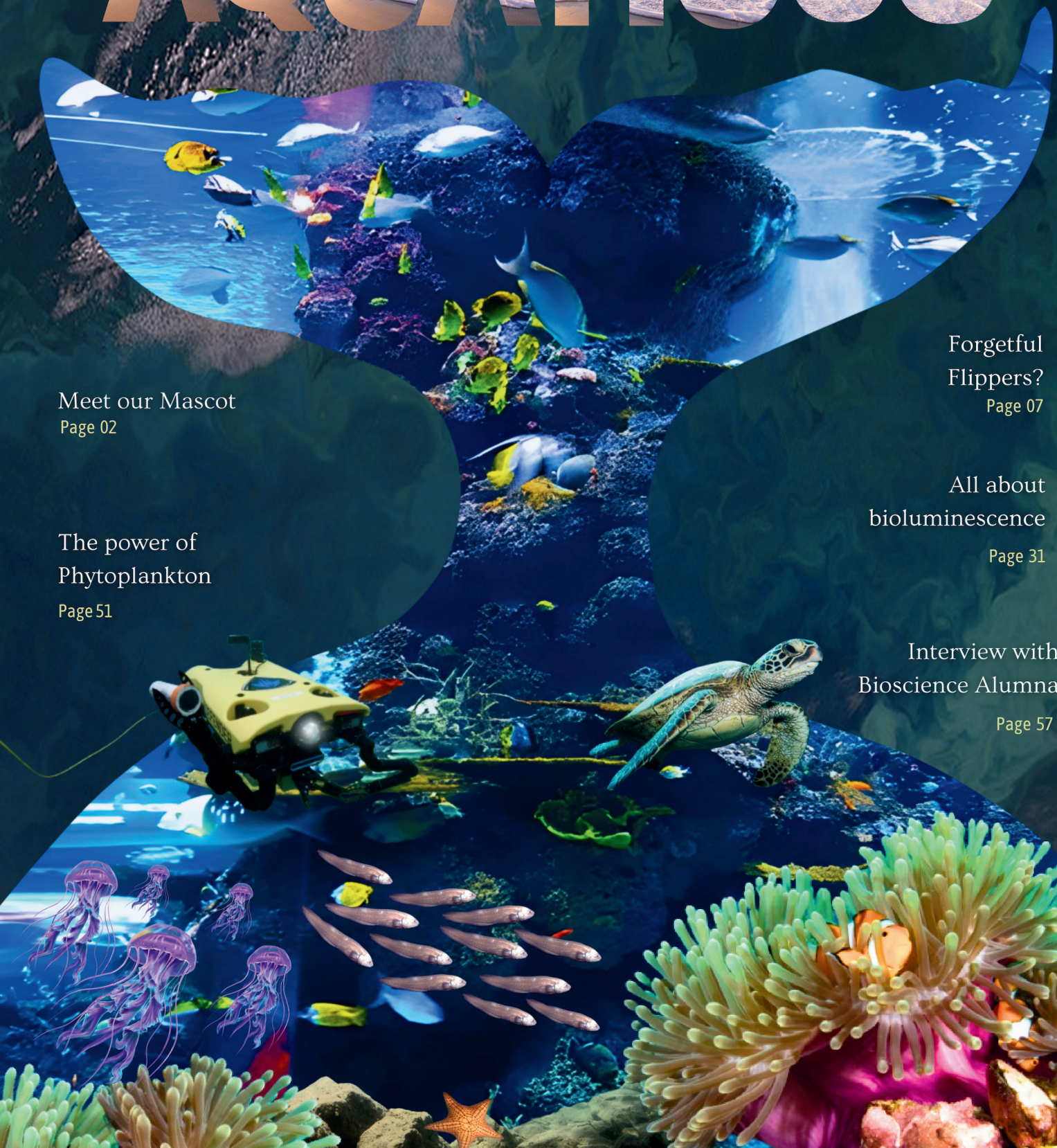
Department of Biological Sciences
Sri Venkateswara College

VERDURE

Seventh Edition, 2024

AQUATICUS



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Page 02

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KNOW OUR DEPARTMENT

Conceived by the visionary Prof. Kambadur Murlidhar, the undergraduate program in Biological Sciences has achieved significant milestones since its inception in 2005. The course framework was meticulously designed to encompass the entirety of biology, offering a thorough exploration of the living world. Its primary goal is to foster an interdisciplinary approach across the various branches of science. Sri Venkateswara College, University of Delhi, stands as the exclusive institution offering this undergraduate course, setting it apart and contributing significantly to its remarkable growth. This is underscored by the notable achievements of its alumni, who are actively involved in scientific research globally.

The course's scope is expansive, aiming to equip students with diverse skill sets that enable them to appreciate the intricate world of living organisms. The multidimensional nature of the curriculum ensures a comprehensive understanding of biology, integrating various subjects within the parent science disciplines.

In 2017, the Biological Science Society, Chrysalis, was established, owing its progress to the immense support of former principals Dr. A. S Reddy and Dr. P. Hemalatha Reddy, Prof. C. Sheela Reddy alongside the current principal Prof. K. Chandramani, dedicated teachers, and the student body. Chrysalis strives to encapsulate the department's ideas and aspirations, metamorphosing into a platform for intellectual exchange and creative expression.

Verdure, the annual magazine of the Biological Science Department, serves as a conduit for students to share their intellectual and artistic perspectives on crucial topics and explore various facets creatively. In its 8th edition, the magazine stands as a culmination point for the designed coursework and a testament to the diligence of the team involved in its development. Warm appreciation and esteemed admiration are extended to all patrons of the magazine, with sincere gratitude expressed to faculty members and the core team for their active participation, contributing to the resounding success of this year's issue.

KNOW THE FRONT COVER

The cover of the magazine presents a captivating and enigmatic depiction of the vast and mysterious depths of the ocean. The image serves as a breathtaking visual representation of the diverse and wondrous array of life forms and organisms that inhabit the oceanic ecosystem. The artwork invites the reader to immerse themselves in the unparalleled beauty of the oceanic world, which remains largely unexplored and undiscovered by humans.

The mesmerizing panorama on the cover showcases the vibrant and colorful schools of fish, intricately patterned corals, and other fascinating marine species that inhabit the depths of the ocean. The theme of oceanography goes beyond the portrayal of the diverse marine life, as it highlights the recent advancements in technology and scientific methods that have revolutionized the way we explore, study, and monitor the oceans. These advancements have enabled us to delve deeper into the oceanic world and uncover the mysteries hidden beneath its surface.

The cover art captures the essence of the ocean, with its vastness and complexity, conveying the sheer awe-inspiring beauty of the underwater world. It is an excellent representation of the book's overarching theme of oceanography - which explores the vast oceanic world and the recent technological advancements that have enabled humans to study and monitor it more effectively.

From the Principal's Desk



శ్రీ వేంకటేశ్వర కళాశాల

श्री वेंकटेश्वर महाविद्यालय

Sri Venkateswara College

(दिल्ली विश्वविद्यालय) (University of Delhi)

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"We need to respect the oceans and take care of them as if our lives depended on it. Because they do."

Sylvia Earle

Biological Sciences, a unique multidisciplinary course in our college, has been very creative in organising activities for the benefit of students. I take immense pride in congratulating the students of Biological Sciences for bringing out the 7th edition of their Annual Magazine, "Verdure", which is a platform to share different facets of science. This years' publications **Aquaticus,** encompasses a diverse pool of contents like in-depth profiles of oceanographers to thought-provoking analyses of sustainable fishing practices, each article serves as a testament to the importance of preserving our marine heritage for future generations.

The cumulative efforts of the hard-working students and equally devoted faculty have borne fruit in the form of this insightful magazine. I take this opportunity to sincerely appreciate the sheer dedication and perseverance of the faculty and the students involved in successfully releasing the magazine. I wish the students good luck in their future endeavours.

Happy Reading!!

Ag. Principal

Prof. K. Chandramani Singh

FROM THE COORDINATOR



PROF. DR. VARTIKA MATHUR

It brings me immense joy to introduce this year's edition of 'Verdure', our Biological Sciences magazine, skillfully crafted by the talented editors from our undergraduate community and teaching faculty. This year, our magazine delves into the theme 'Oceanography', where the tides of curiosity meet the shores of knowledge. In the pages that follow, the readers will find a treasure of articles, essays, and artworks that explore the depths of oceanography. I extend my heartfelt gratitude to all the contributors who have shared their expertise and insights.

I encourage the readers to immerse themselves in the pages of our magazine, symbolizing the intellectual currents that flow through this extraordinary and unique Bsc (H) Biological Sciences course. To my esteemed colleagues, I would like to express my heartfelt appreciation for your dedication in bridging the disciplines. Your incredible collaborative effort has not only enriched the academic experience but has also provided our students with a truly comprehensive understanding of biological sciences. Thank you for your unwavering commitment to academic excellence. I extend my sincere appreciation to our former college Principal, Prof. C. Sheela Reddy, and our current Principal, Prof. K. Chandramani Singh, for steadfastly supporting and fostering the growth of our interdisciplinary course, laying the foundation for a transformative educational experience for our students. Finally, I express my gratitude to our dedicated team of editors, whose creativity and hard work have brought this magazine to life, and to all faculty advisors and mentors for their guidance and support throughout this process.

FROM THE CONVENORS

Verdure' the Biological Science Magazine proudly presents its seventh edition this year. Every year when the journey of the magazine starts from its seed stage, we put in a lot of thought to picking up a theme which will not just help to educate and inform people about the latest developments and breakthroughs in oceanography BUT also stimulate important discussions and debates. The **seventh edition** themed AQUATICUS delves into the depths of the ocean.

"The ocean stirs the heart, inspires the imagination, and brings eternal joy to the soul." - Wyland

In keeping with the spirit of the theme of the magazine, we are extremely glad that our diligent student 'Verdure' team has worked tirelessly to bring forth the current issue. The magazine is a compilation showcasing the innovative and creative skills of our dear Biological Sciences students. We hope the magazine will provide valuable insights and information to researchers, academics, and enthusiasts who are interested in this fascinating field and sincerely hope that you enjoy the hard work and effort that has gone into putting together this piece of work.

Have a great reading experience!!

Dr. Aditi Kothari Chhajer, Department of Botany
Dr. P. Jayaraj, Department of Zoology
Dr. Siddhartha Taritla, Department of Biochemistry



Dr. Aditi Kothari Chhajer



Dr. Sidhartha Taritla



Dr. Perumal Jayaraj

FROM THE
Editor in chiefs



DEVYANSHI VINOD

There's something truly captivating about the ocean, isn't there? Its vast expanse seems to stretch out infinitely, beckoning us to explore its depths. Like a magazine, the ocean covers stories of life, beauty, and mystery beneath its waves, each page turning with the tides, revealing the secrets of the deep. We're constantly amazed by the ocean's ability to surprise us with new discoveries, every day bringing something new to light.

In this edition of Verdure, we're thrilled to bring you an in-depth look at the ocean like never before. I had the privilege of working at a magazine for two years, first as an editor, and then as the editor-in-chief. The experience was both challenging and rewarding.

I won't lie, the work was tiring, and there were many late nights spent working on layouts and designs. However, seeing the final product made it all worth it. It was amazing to see a blank page in Canva turn into a beautiful magazine with stunning graphics and compelling articles.

I also have to give a shoutout to my cat, Kurro, who kept me company during those long nights as i disturbed his sleep. Last but not least, I want to thank everyone who helped me grow and believed in me. I hope you enjoy reading this magazine as much as we enjoyed making it. Every article, every graphic, and every word was crafted with care and passion.

"As the waves whisper tales of the deep, let us sail into the sunset of understanding, where the symphony of oceanography harmonizes with the heartbeat of our blue planet."

FROM THE *Editor in chiefs*

Knowledge is an unending adventure at the edge of uncertainty.
Jacob Bronowski

One of the many ways that these words from one of the greatest scientists of all time have influenced my life is the decision I took to major in something equally amazing to biological science at Sri Venkateswara College. I am grateful for the long-lasting impacts it has had on me, such as the excellent training and the friendly surroundings.

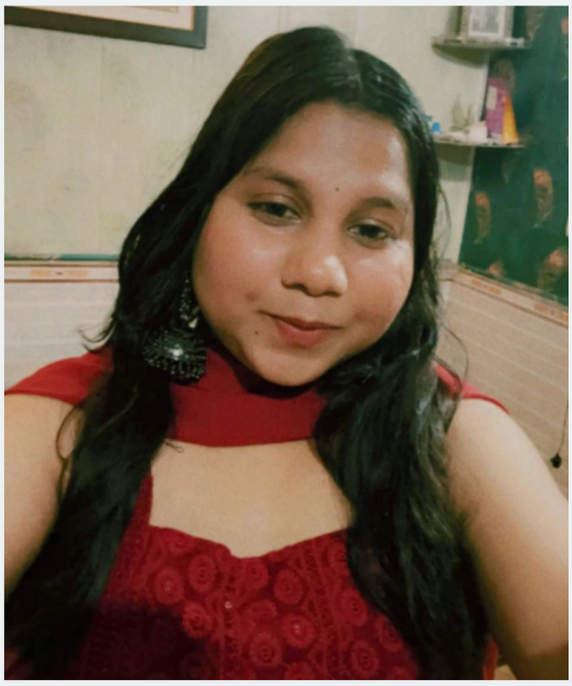
Another smart move I took was to become the chief editor of Verdure, the annual journal of the department of biological science. It has given me the opportunity to investigate new topics, such coherent research and team building .

This correspondence is an attempt to suggest an interesting oceanography topic for Verdure"23 Magazine. From marine life and ecosystems to climate patterns and oceanic currents, oceanography—the study of the ocean and its phenomena—offers a wide range of intriguing subjects for investigation.

We cordially invite you to voyage with us as Verdure Magazine readers and discover the intricacies and beauty of the ocean. Let's endeavor to ensure that the oceans on our planet support a thriving biodiversity for future generations while also honoring their richness today.

The team dedication to quality was unwavering throughout, from late-night edits to brainstorming sessions, thanks to your combined efforts that we were able to create such a beautiful magazine. I am privileged to have worked with such a gifted group of people, and your enthusiasm for the work you do is evident in every part of the magazine.

I appreciate your constant help, your creative suggestions, and your never-ending commitment to helping Verdure Magazine become the greatest it can be. I am immensely proud of all that we have managed to do together.



KAJAL CHAUHAN

FROM THE

Editors and Creative Head

Dive into the 7th edition of Verdure, where we ride the waves of "Oceanography." Imagine flipping through the pages as a journey across the ocean's mysteries. As one of your editors, it's been a joy to bring you stories about marine wonders, new findings, and the amazing life beneath the waves. Each piece is a tiny adventure, and I hope our magazine sparks your curiosity about the vast and incredible world of the ocean. Happy reading, don't forget to put your snorkel on!

Sudha Archak
EDITOR (2023 - 2024)





The ocean is an undiscovered territory for many and through the pages of our magazine, we aim to delve deep in the realms of beautiful world beneath us. Students of biological sciences bring you insightful articles and captivating visuals that help us uncover the intricacies of the waves and the world around it.
This beautiful magazine couldn't have been made without the unwavering support of our teachers and we are utterly grateful for their encouragement throughout.

Together, let's embark on a voyage of discovery and celebrate the wonders of the ocean.
Happy Reading!

Mehak Hira
EDITOR (2023-2024)

We all know that water is an essential component for building life on Earth. Almost every living function occurs in the dependence of water as a medium present in all living beings. This year in Verdure we wanted to explore something that's been mostly overlooked and untraversed like the 'depths of the ocean'. Thus the theme 'oceanography'. From the formation of the very first life to the adverse effects due to the negligence of complex beings, everything revolves around ocean. Unlike landmass, oceans are vast and most of it is yet to be discovered and explored. Hence, by compiling this magazine, our effort is to showcase the significant researches up-to-date in this upcoming field. We hope that you have an insightful read as you go through the magazine. So buckle your seat belts, let's dive deep into the ocean!



Hema Harini
EDITOR (2023 - 2024)



Our magazine seeks to explore the mysterious depths of the ocean, a realm largely unknown to many. Through the contributions of biological sciences students, we present engaging articles and stunning visuals that unravel the complexities of the underwater world. The creation of this magazine was made possible by the steadfast support of our teachers, for which we are sincerely thankful.

Join us on a journey of exploration and let's revel in the marvels of the ocean.

Bon Voyage!

Rahul Verma
CREATIVE HEAD (2023-2024)

FROM THE PRESIDENT

Chrysalis



LAVANYA TYAGI

Joining the Deptartment of Biological Science three years back exposed me to a myriad of concepts, and I truly came to love it all. I got a chance to become a part of this vibrant group of people, who came together with their one common interest: Science. Now, as a part of the Departmental society Chrysalis, I get to celebrate this world of science and knowledge even more. Being a part of this community over these years has only made it feel so personal for me, and I am honoured to have been able to serve it in this small manner.

I wish to thank all of our teachers for their invaluable guidance, and the efforts they take everyday to make us students a proficient professional for the future.

I extend my warmest congratulations to Verdure on the release of seventh addition of our annual magazine. The team's efforts to bring together knowledge in this enjoyable and captivating form are truly appreciated.

Wishing everybody a happy reading experience!

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HOW CAN BUSINESSES ADDRESS CONCERNS OF MARINE POLLUTION AND SUPPORT IN MARINE CONSERVATION EFFORTS

AT

Koshika '24

with Reela Mishra
on 12th March, 2024

Reela has 17 years of experience in the field of sustainability and ESG consulting, with specialization in ESG risk and impact assessments, development of ESG strategies, roadmaps, frameworks and management systems for corporate clients, transaction advisory and due diligence support for investors and borrowers, implementation of action plans and management plans at organizational level, ESG performance monitoring, compliance assessments and audits. She has industry experience of working with clients across sectors - finance/ banking, power, renewables, infrastructure, roads/ highways, manufacturing, healthcare, real estate, oil and gas, building/construction, ports/ harbor, waste etc. She handles multiple projects funded by multilateral and bilateral funding agencies as well as private equity investors. She is well versed in thorough application of international sustainability standards of IFC, World Bank, ADB, AIIB, DFC, NDB and benchmarks such as GRI, SASB, UNSDG, UNPRI etc. Reela holds consulting experience across India, Bangladesh, Nepal and Sri Lanka.

Let's talk to



REELA MISHRA

Designation: Director, Risk Advisory, Deloitte India

Topic of talk: How can businesses address concerns of marine pollution and support in marine conservation efforts

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TEAM VERDURE



TEAM CHRYSALIS



MEET THE MASCOT

Lumina



Born from the depths of the ocean, Lumina is a bioluminescent jellyfish. She can emit bright flashes of light to startle her predators and escape. Cool, isn't that? We're elated to announce that she'll be our host for this year's edition of Verdure.

Here you see her going through our magazine, choosing articles where she'll be making her appearances. Follow her on this journey as she gives you, the readers, fun facts, scientific info and sometimes, her own thoughts and opinions!



Contribution to Ocean Technology



1900

Edward Samuel Ritchie, an American scientist and inventor, produced the liquid compass, that helped advance water technology.

1902

German inventor Hermann Anschütz-Kaempfe patented the gyrocompass

1908

Canadian engineer Reginald Fessenden created the first practical sonar device

1910

Elmer Ambrose Sperry, an American inventor, invented the gyroscopic stabilizer

1911

The International Ice Patrol (IIP) was established as a significant advancement in ocean technology.

1912

Marconi Type 14H radio transmitter, often known as the "SOS" distress signal transmitter, was a significant ocean technology

1913

Reginald Fessenden, a Canadian physicist and inventor, invented the first effective depth sounder

1920

Colin Archer, a Norwegian engineer and scientist, invented the first echo sounder.

1922

Otis Barton and William Beebe, an American engineer and marine biologist, introduced the Bathysphere

1930

The SONAR (Sound Navigation And Ranging) device was invented

1932

Jacques Cousteau and Émile Gagnan invented the Aqua-Lung

1935

Dr. Henry Stommel and Dr. Walter Munk invented the bathythermograph.

1936

The HOSANNA (Honeywell Sounding And Navigation Apparatus) sonar device was developed,

1946

Christian Doppler invented the Acoustic Doppler Effect

1947

The "Radiosonde," developed was a significant advancement in ocean technology.

1951

The Oceanographic Data Acquisition System (ODAS) was developed.

1952

Multibeam sonar, a bathymetric map-making tool, was introduced

1953

Sir Alister Hardy invented the Continuous Plankton Recorder (CPR)

1955

The Nansen bottle was introduced

1958

Swiss scientists Auguste Piccard and his son Jacques Piccard developed the Bathyscaphe Trieste

1965

Robert F. Furgason, an American engineer, invented the Remotely Operated Vehicle (ROV)

1969

Development of the Global Positioning System (GPS).

1973

The Autonomous Underwater Vehicle (AUV) was developed

1975

Development of the Continuous Plankton Recorder (CPR) survey system

1978

The Argo float system was invented

1980

The Acoustic Doppler Current Profiler (ADCP), developed

1982

The Continuous Underway Fish-Egg Sampler (CUFES), invented

1985

The SeaWiFS (Sea-Viewing Wide Field-of-View Sensor) satellite sensor was developed

1987

The Conductivity, Temperature, and Depth (CTD) profiler was invented

1992

The SeaMARC series of underwater mapping systems was developed

1997

The Ocean Observatories Initiative (OOI) was established

1999

Creation of the Autonomous Underwater Vehicle (AUV) known as "Gavia

Around the year 2000

Autonomous underwater vehicles (AUVs) became popular and advanced

2001

SeaWiFS (Sea-viewing Wide Field-of-view Sensor) satellite was launched.

2003

High-resolution multibeam sonar devices were developed.

2005

The deployment of the first generation of gliders.

2006

(WECs) were developed which harness the power of ocean waves and transform it into electricity.

2008

Marine hydrokinetic (MHK) devices were developed to harness tidal and ocean currents to create power

2010

The Saildrone, was developed
Saildrones are unmanned surface vehicles (USVs)

2013

Boyan Slat's Ocean Cleanup project, marked a significant advancement in ocean technology.

2018

The Oceanbird, marked a significant advancement in maritime technology.

2020

General Electric (GE) developed the Haliade-X offshore wind turbine , marking a significant improvement in maritime technology.

FINISH



MYTHOLOGY AND MYSTICAL DEPTHS OF THE OCEAN

Princi Jaiswal, TBS

Mythology has long been intertwined with the awe-inspiring expanse of the ocean, holding tales of gods and creatures that dwell within its mystical depths. From the ancient Greek sea god Poseidon to the majestic sea serpents of Norse folklore, the ocean has been a rich source of inspiration and wonder for mythological stories across cultures.

The ocean, with its boundless waves and unfathomable abyss, has been depicted as both a force of creation and a realm of primordial chaos in mythological narratives. In Greek mythology, the ocean was personified by the powerful god Poseidon, who ruled over the seas and commanded its tempestuous forces. Tales of his wrath and benevolence have been woven into epic sagas, shaping the myths and legends of ancient Greece.

The ocean's mysterious depths have also birthed myths of enigmatic creatures, from the seductive mermaids of folklore to the monstrous leviathans of ancient texts. These mythical beings have captured the imagination of storytellers and artists, becoming iconic symbols of the ocean's captivating allure and untamed power.

Across different mythologies, the ocean serves as a metaphor for the unknown and the subconscious, reflecting humanity's profound fascination with the depths of the sea and the enigmas it holds. Stories of sunken cities, sea monsters, and legendary treasures hidden beneath the waves continue to captivate our imaginations, echoing the primal connection between mythology and the ocean's boundless majesty.

In contemporary culture, the ocean's mythological resonance persists through literature, art, and popular media, drawing inspiration from ancient myths while creating new narratives that reflect our evolving relationship with the sea. From fantasy novels that reimagine the ocean as a realm of magic to cinematic epics that weave modern-day mythology into tales of maritime adventure, the timeless allure of oceanic mythology continues to shape our collective storytelling traditions.

As we delve into the depths of mythology and the ocean, we uncover a trove of timeless tales that transcend cultural boundaries and resonate with the universal human experience. Through these myths, we explore the profound relationship between humanity and the vast, untamed expanse of the ocean, finding echoes of our deepest fears, desires, and aspirations in the ever-shifting tides of mythological storytelling.

In conclusion, the mythology of the ocean transcends time and culture, weaving a tapestry of timeless stories that speak to the primal forces of creation, destruction, and eternal mysteries that lie within the waters that have captivated humanity since time immemorial. As we gaze upon the boundless horizon of the ocean, we are reminded of the enduring power of myth and the timeless allure of the vast, enigmatic sea.



Forgetful Flippers!

Susmita Verma, SBS

According to the book, Encyclopedia of Marine Mammals by J.G.M. Thewissen, the brains of aquatic animals share the same features as those of other mammals. In mammals, the layers of grey and white matter develop a complex six-layered structure called the neocortex. They exhibit a well-developed hippocampus and amygdala which aids in their better adaptation.

Now one might ask, "If marine mammals show brain features like those of humans, is it possible that they might be experiencing similar brain problems as well?"

Recent research tells us that the brains of dolphins and whales (cetaceans) are protected from pressure exerted during swimming, by a mysterious network of blood vessels. The branched network of blood vessels communicates with sensory neurons in the peripheral nervous system and regulates their proliferation and differentiation.

Despite this remarkable mechanism of the vascular system, some species of dolphins are expected to develop neuropathological conditions. A study in odontocetes (toothed whales) suggests that the brains of three distinct species of dolphins show biomarkers for human Alzheimer's disease.

Alzheimer's in humans is a progressive neurodegenerative disease that slowly destroys memory and thinking skills. It is associated with extracellular waxy translucent amyloid protein deposition by neurons. This involves the amyloid-beta peptide, a 42-amino acid protein that is derived from a larger transmembrane protein called amyloid-beta precursor protein (APP). The primary cause of Alzheimer's disease is associated with the deposition of these amyloid fibers. Intracellular (in neurons) aggregation of a protein called 'tau' is also seen in people with AD-like pathology.

In a research association between the University of Glasgow, the Universities of St Andrew and Edinburgh, and the Moredun Research Institute, the brains of 22 different odontocetes were studied. The research resulted in two conclusions by researchers from different institutes.

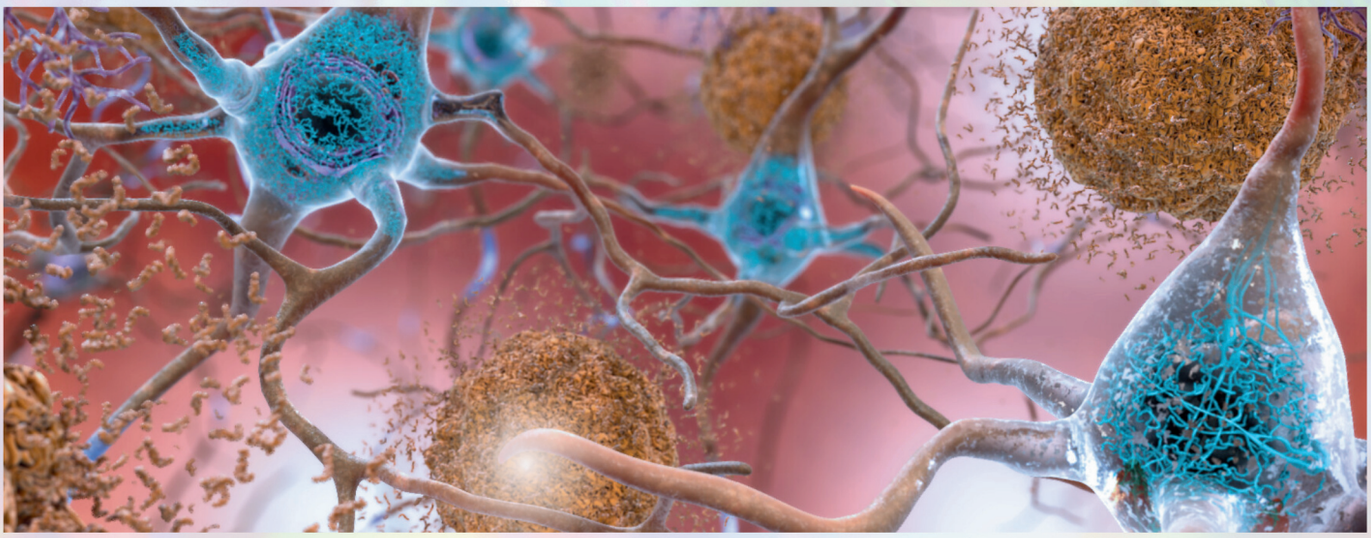


Fig. Beta-amyloid protein forms plaques (brown), disrupting neurons. Tau protein tangles (blue) in neurons disrupt cell communication. Both impair brain function, defining Alzheimer's disease.

Professor Frank Gunn-Moore from the University of St Andrews, who helped with the research, shared, "I've always wondered: do only people get dementia? Our discoveries suggest that dementia-like issues might not be exclusive to humans after all."

“The brain problems in stranded odontocetes are like those in people with Alzheimer's, and it’s tempting to think these animals might have memory issues” shared the lead researcher, Dr Mark Dagleish from the University of Glasgow.

The paper published in the European Journal of Neuroscience included five species -Risso’s dolphins, long-finned pilot whales, white-beaked dolphins, harbor porpoises, and bottlenose dolphins. Among these stranded species, four exhibited the accumulation of hyper-phosphorylated “tau” proteins and glial cells which leads to the formation of amyloid-beta plaques, the clumping of a protein found in the brains of people with Alzheimer’s disease.

Researchers suggest that the discovery supports the ‘sick leader’ theory i.e., when a group leader gets confused or lost because of cognitive decline, even healthy animals could end up in very shallow water because they follow the leader. Understanding the molecular basis becomes essential in this context.

What is hyper-phosphorylation and how does it lead to the accumulation of ‘tau’?

Tau is a phosphorylated protein particularly found in nerve cells and helps to stabilize the internal neuro-connections of the brain. The different phosphorylation sites of tau can be identified by mass spectrophotometry in combination with Edman sequencing, which indicates that there are around ten sites for phosphorylation in normal brain tau. However, in tauopathy brains, more than forty sites have been found, so far, indicating hyperphosphorylation i.e., complete saturation of phosphorylation sites. The reason is an imbalance in kinase and phosphatase activity which leads to aggregation of unbound tau proteins in AD-like pathology.

How does the aggregation of tau proteins lead to impaired memory?

Oligomers are the smaller forms of tau that are found in spaces between neurons which are converted to fibrils. Due to the protein misfolding, there is an increase in the formation of these fibrils. This disturbs the balance of brain cells by interfering with their communication which eventually leads to impaired memory.

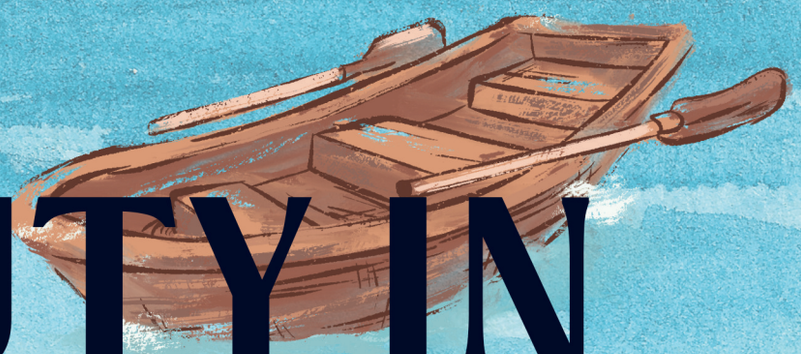
Based on the research in three distinct species of odontocetes— a long-finned pilot whale, a white-beaked dolphin, and a bottlenose dolphin, there was simultaneous presence of amyloid beta plaques, intraneuronal buildup of hyperphosphorylated tau, neuropil threads, and neuritic plaques. Microglia (immune cells of the brain) and astrocytes-subtype of glial cells were found, as expected, in all analyzed brain samples, but there were variations in cell morphology and numbers among individual species Therefore, it is expected that these species of dolphins might be experiencing similar cognitive deficits as those observed in humans with clinical

Alzheimer's disease.

Although humans are morphologically, physiologically, and genetically more like non-human primates, the study of Alzheimer's in odontocetes may be more accurate as non-human primates do not spontaneously develop AD. A significant level of similarity to AD-like pathology in humans is observed in the three studied species of odontocetes due to the presence of amyloid plaques (Aps). However further studies on the neuropathology of odontocetes could provide a deep insight into the pathogenesis, underlying mechanisms, and treatment of Alzheimer's disease.

Dolphins can recognize themselves in the mirror, meaning they're somewhat self-aware and understand their bodies and identities!





BEAUTY IN DEPTHS

Shivangi, TBS

In the depths of the ocean, where the darkness reigns
Lies a beauty so profound, it's like a painter's refrain
The coral reefs, they dance, in shades of blue and green
A world so vibrant, it's like a dream, unseen

The schools of fish, they dart and play
Their scales shimmering, in the sun's ray
Their movements graceful, like a ballet troupe
A symphony of life, in the ocean's depths

The sea turtles, they glide, with gentle ease
Their shells a armor, in the seas breeze
Their faces wise, with ancient secrets told
A story of the sea, in their eyes so old

The kelp forests, they sway, in the current's flow
Their fronds like tentacles, in the ocean's glow
A world of wonder, in each strand so fine
A beauty so great, it's like a work of art divine

The ocean's depths, they hold, a world so grand
A beauty so profound, it's like a sacred land
A place of mystery, where life thrives and grows
A beauty of the ocean, in its depths, it glows

Cryopreservation in Marine Genetics

Lavanya Tyagi, TBS

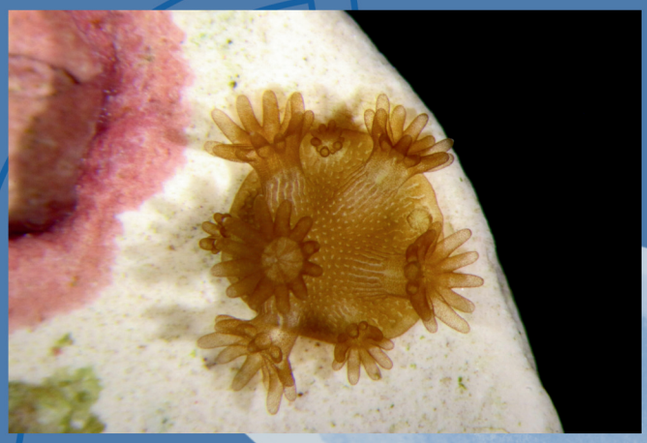
The technique of cryopreservation has brought about a revolutionary change in the field of marine genetics, providing researchers with a tool to store genetic material at ultra-low temperatures. This process involves freezing living cells or tissues at extremely low temperatures, usually in liquid nitrogen, to halt all biological processes and maintain the genetic material intact. The application of this technique has proven to be instrumental in preserving the genetic diversity of marine species and has opened up new avenues for research and conservation efforts. With the ability to store genetic material for an extended period, researchers can now carry out further studies on marine species genetics, contributing to a better understanding of their evolution and aiding in the development of conservation strategies.

The field of cryopreservation has a rich history that dates back to the early 20th century when researchers began to experiment with the freezing of biological materials. Cryopreservation in marine genetics gained momentum in the latter half of the century due to the advancements in technology that made it possible to store genetic material for extended periods without compromising its integrity. The contributions of key figures in the field, such as Dr Kazuo Yamazaki, renowned for his work in sperm cryopreservation, and Dr. Kazuo Inaba, a pioneering figure in the marine genetics field, have been instrumental in advancing the study of cryopreservation in marine genetics.



Fig. Cryobanking of Fish and Shellfish Egg, Embryos and Larvae

The impact of cryopreservation on marine genetics has been extensive. One of its significant advantages is the preservation of genetic diversity in marine species, including those that are endangered or face extinction. By preserving genetic material from a broad range of species, researchers have been able to establish genetic banks that can be used for breeding programs, reintroduction efforts, and molecular studies. Cryopreservation has also facilitated the exchange of genetic material between research institutions, enabling collaborative efforts to study marine biodiversity and develop conservation strategies.



Coral cryopreservation basis of survival

Numerous influential figures have made significant contributions to the field of cryopreservation in marine genetics. Dr. Mary Hagedorn, a renowned marine biotechnologist, has been a vocal proponent of the use of cryopreservation in conservation efforts, particularly in preserving coral reefs. Dr. Robert Feller, a distinguished molecular biologist specializing in marine genetics, has conducted pioneering research on cryopreserving fish embryos, highlighting the technique's potential for aquaculture and fisheries management. These individuals, among many others, have played a vital role in advancing the field of cryopreservation in marine genetics, paving the way for future discoveries and innovations.

Despite the manifold advantages offered by cryopreservation in marine genetics, this technique is not without its challenges and limitations. One of the most significant drawbacks is the potential for genetic damage or cell death during the freezing and thawing process. Although advances in cryopreservation technology have mitigated some of these risks, there is still a need for further research to enhance the efficiency and effectiveness of the process. Furthermore, the cost of maintaining cryopreservation facilities and conducting research in this field can be exorbitant, thereby restricting the accessibility of the technique to smaller research institutions and conservation organizations.

The future of cryopreservation in marine genetics appears to be a promising prospect. Recent developments in cryopreservation techniques, such as vitrification and cryoprotectant solutions, have led to the preservation of a wider range of genetic material with higher success rates. This new capability opens up new possibilities for studying and conserving marine biodiversity, as well as developing novel biotechnological applications. As researchers continue to explore new avenues for collaboration and innovation and push the boundaries of cryopreservation technology, the field of marine genetics is poised to undergo significant advancements in the coming years.

In conclusion, cryopreservation in marine genetics has had a profound impact on the field of marine biology, conservation, and biotechnology. From its historical roots to its current applications, this technique has played a crucial role in preserving genetic diversity, advancing scientific knowledge, and supporting conservation efforts. While there are challenges and limitations to be addressed, the future of cryopreservation in marine genetics looks promising, with opportunities for further research, collaboration, and innovation. By continuing to explore the potential of this technique and harnessing its benefits for the study and conservation of marine species, researchers can make meaningful contributions to our understanding of the marine environment and the preservation of its biodiversity.

Cryopreservation techniques are increasingly being applied in aquaculture to improve breeding programs and increase the efficiency of production. Preserving genetic material allows for the selection and propagation of desirable traits, such as disease resistance, growth rate, and tolerance to environmental conditions.



CORAL REEFS

Ananaya Bansal, FBS

What are corals and coral reefs

Corals are invertebrates that are part of the Cnidaria, a vast group of vibrant and interesting organisms.. Other animals in this group that you may have seen on the beach include jelly fish and sea anemones. Their distinguishing characteristics are a simple stomach with a single mouth opening surrounded by stinging tentacles. Every coral animal is referred to as a polyp, and the majority of them reside in "colonies" made up of thousands of genetically similar polyps. Through a process known as budding, the original polyp essentially creates duplicates of itself to form the colony..

There are two types of coral: "hard coral" and "soft coral." While soft corals resemble underwater vegetation, hard corals closely resemble rocks. Spiracles are internal structural supports found in soft corals. Hard coral, sometimes referred to as "reef building" corals, stony coral, or Scleractinian coral, is known to have about 800 species. It produces a structure that resembles a skeleton and is composed of calcium carbonate. Soft corals, which include sea whips, sea feathers, and sea fans, produce fleshy rinds for protection and wood-like cores for support instead of the calcareous skeleton found in rocks. In order to build a harder structure for development and defense, hard corals take large amounts of calcium from the surrounding waters. As a result, millions of small polyps come together to form massive carbonate structures that form coral reefs, which serve as the foundation and home for millions of other species.The dead skeletons of hard corals becoming anchoring points for new corals, both hard and soft.

Coral polyps have developed an association with tiny single-celled plants, known as zooxanthellae. Inside the tissues of each polyp live these microscopic, single-celled algae, sharing space, gas exchange and nutrients to survive.

Symbiotic relationship with zooxanthellae provides the coral energy through the algae's photosynthesis The majority of the host's nutritional needs, but not all of them, can be met by the algal partners at normal temperature and radiation levels. Heterotrophy, which uses tentacle capture, is necessary to sufficiently deliver essential nutrients, particularly nitrogen and phosphorus.

Threats to coral reefs

The two biggest concerns facing coral reef ecosystems worldwide are rising ocean temperatures and shifting ocean chemistry. Seawater temperatures rise in tandem with atmospheric temperatures. Corals are stressed as a result of this warming because they lose the algae that provide the sustenance they require. Coral bleaching is the term for the situation where coral loses its pigmentation due to the removal of algae, which exposes the white calcium carbonate structure beneath the polyps. Coral colonies may perish from severe or protracted bleaching, or they may become more susceptible to other dangers like infectious diseases. GCBE's have been recognized in 1998, 2010, 2014-2017. in 1998 the mass bleaching event occurred in the Indian Ocean region and was due to the rising of sea temperatures by 2 °C and due to the strong El Niño event

Coral bleaching

The ocean's pH, which indicates how basic or acidic the water is, decreases as carbon dioxide dissolves in it, making the water more acidic. Ocean water's acidity has increased by 30% in the last 200 years alone—a rate greater than any known shift in ocean chemistry during the previous 50 million years. The foundation of a coral's skeleton, calcium carbonate, can only form when the pH of the water falls within a certain range. Corals find it more challenging to form their calcium carbonate skeletons in the more acidic saltwater.

Furthermore, acidification has the potential to disintegrate the reefs' preexisting skeletons if it grows severe enough. Scientists predict that by 2085 ocean conditions will become too acidic for corals around the globe to begin to dissolve.This is already a reality for one reef in Hawaii

Reef ecosystems are also disturbed by overfishing and over harvesting of corals. Reefs can be damaged by divers and boat anchors if caution is not exercised. Coral reefs may potentially be threatened by invasive species. The population of lionfish, which are indigenous to the Indo-Pacific region, is rapidly expanding in the Atlantic Ocean. Due to their abundance and potential to compete with native coral reef creatures, the fish could have a significant negative influence on coral reef ecosystems

Corals are now recognized to be harmed by the chemicals in sunscreen, which is used to prevent sunburns. Particularly in locations where swimming and diving are common, even a tiny quantity that washes off swimmers' skin might harm the reef. A coral will identify a chemical such as oxybenzone as being alien to it. Corals link a sugar to the oxybenzone in an attempt to eliminate the chemical, but this act actually turns it into a sun magnifier. The reformed substance now intensifies UV radiation from the sun and successfully bakes the symbiotic algae, bleaching the corals

Now biotechnology can help us protect reefs Coral Cultivation

The two main goals of coral cultivation are the restoration of damaged reefs and the supply of young corals for the aquarium sector. Certain environmental molecular signal molecules control the processes of reproduction and larval metamorphosis in many invertebrates. These processes have been successfully used for control in the aquaculture of finfish and shellfish for many years; recent studies have shown that corals have similar pathways. A factor in the environment must be recognized by molecules for broadcast spawning, fertilization, planktonic activity and larval settling, and metamorphosis to occur.

The mechanisms governing the simultaneous spawning of several colonies of different species of stony coral have remained a mystery until quite recently. Estrogens appear to function as bioregulators of both gametogenesis and this process, according to research by Tarrant and colleagues (1999).

The identification of two estrogens—estrone and estradiol-17 beta—and the development of low-cost mimics of these compounds will be helpful for controlling these processes in aquaculture.

Deep Reef Corals

Recent investigations of populations of corals on deeper reef (70-95 m) slopes in the Caribbean suggest that these relatively disturbance-free communities may provide additional insights into the mechanisms that maintain healthy reefs. Additionally, particularly in times of high stress in shallower parts of the reef, they may be sources of larvae for natural replenishment of recruits.

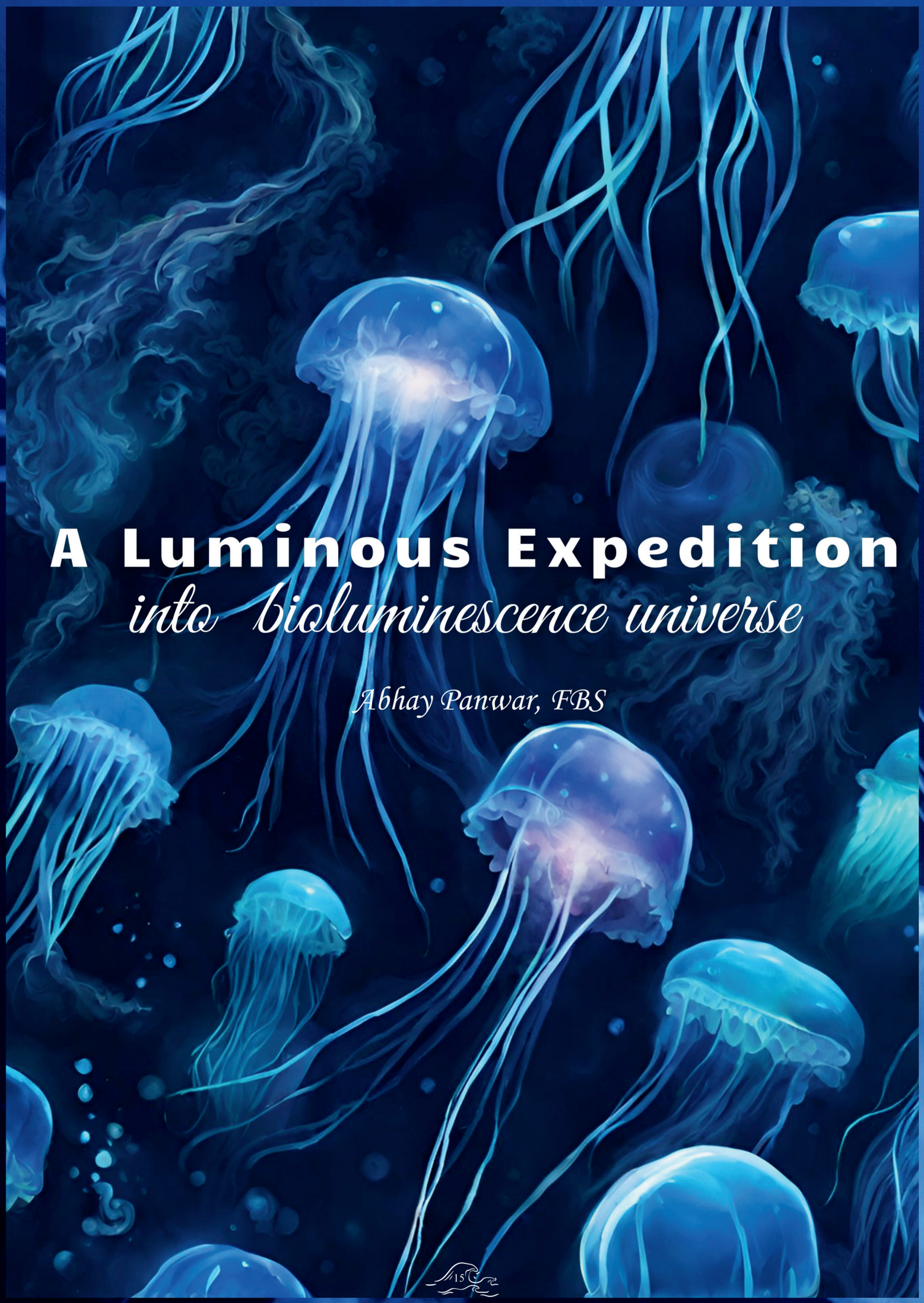
Biorock

A novel technique known as biorock is being used by scientists to aid in the preservation and restoration of coral. Biorock is a technological device that uses steel to conduct low-voltage direct electricity. The minerals in the ocean may then react with this energy, causing solid limestone to form on the structure. It operates on the same principles as electrolysis, in which an unexpected chemical reaction is sparked by an electric current. Technology of this kind is being employed to protect coral reefs. This is due to the fact that this kind of technology can expedite the typical coral growth processes. Additionally, biorocks have benefited fish and lobster populations—particularly the young ones that take refuge in the structures.

3D Printing coral reefs

Scientists are having a difficult time coming up with creative and practical solutions to save coral reefs because their numbers are dropping quickly. 3D printing is one of the novel ways they are achieving this. Human organs are among the many objects that are now often constructed using 3D printing. Reef segments that are partially 3D printed can have missing coral replaced. These so-called "fake" reefs are believed to be more resistant to environmental changes and less susceptible to climate change. In an attempt to restore natural reefs, scientists are employing 3D printing technology to help them build artificial reefs that closely resemble the texture and structure of the original reefs. There are currently experimental 3D printed reefs in use in the Persian Gulf, Mediterranean, Caribbean, and Australia.

If they are successful, not only will it provide fish with fresh habitat, but it will also enable young coral polyps to adhere to one another and grow into new reefs



A Luminous Expedition

into bioluminescence universe

Abhay Panwar, FBS

Human curiosity has been piqued by bioluminescence, the fascinating natural phenomena wherein living things create light, for ages. A remarkable journey of discovery and intrigue is revealed by the history of bioluminescence, from ancient philosophers to contemporary scientists. Together, we will explore scientific advancements, the possibilities of deep-sea life, and new research that sheds light on this amazing natural phenomenon as we set out on a brilliant voyage through time.

Natural organisms use the light-producing phenomena known as bioluminescence for defense, prey, or communication. The process by which bioluminescence produces light is based on a biological reaction wherein an enzyme, such as luciferase, oxidizes a substrate, such as luciferin. Bioluminescence measurements do not require incident radiation, in contrast to fluorescence. In essence, the signal shines against a dark background, providing superior sensitivity to fluorescence in situations when phototoxicity occurs and throughout the sampling process. Furthermore, fluorescence presents significant challenges for in vivo imaging when it comes to scattering and absorbing excitation photons. While in vivo fluorescence endoscopy can yield excellent spatiotemporal resolution, it is frequently an invasive operation requiring a high degree of skill. Contrarily, bioluminescence gets beyond the majority of these problems and is a great option for achieving noninvasive imaging in living creatures. Furthermore, because of spectral overlaps, optogenetic instruments—which are extensively employed to modify or regulate biological systems—do not always work well with standard fluorescent probes. In this setting, bioluminescence has developed into an extensively researched field, and biomedical researchers have used bioluminescent reporters for a variety of purposes, such as gene regulation.

The voyage started more than two millennia ago when the Greeks and Romans recorded the features of bright creatures. As early as 350 B.C., Aristotle identified bioluminescence when he compared lightning to shimmering water. The glowing slime of jellyfish was recorded by Pliny the Elder in 50 A.D., who claimed that rubbing it on a stick could illuminate the path like a torch. Centuries of investigation into the secrets of bioluminescence were made possible by these prehistoric findings.

Prominent scientists and thinkers investigated the mysteries of bioluminescence as the scientific revolution progressed. René Descartes and Robert Hooke postulated hypotheses on the vibratory motion of light and its relationship to the agitation of saltwater during the 17th century. In 1671, Jacques Rohault provided insights by providing explanations In 1671, Jacques Rohault provided explanations for the sea's glimmering during periods of extreme agitation, citing the release of salt particles into the atmosphere. As theories developed, Robert Boyle conjectured in 1680 that those cosmical laws would affect the generation of bioluminescent phenomena.

An explosion of scientific inquiry and discovery took place in the 18th century, yielding important new understandings of bioluminescence. In 1667, Robert Boyle recorded that luminescence required air, opening the door for further investigation. The discoveries made on oxygen by Priestley, Lavoisier, and Scheel improved our knowledge of how air composition and bioluminescence are related. The 18th century saw two significant discoveries: first, that light generation is not limited to living things; and second, that luminescence observed in maritime environments was linked to creatures.

Scientific expeditions that helped to better understand bioluminescence during the 19th century included the H.M.S. Challenger trip in 1873. The essential elements of the bioluminescent reaction, luciferin, and luciferase, were discovered by Raphael Dubois at the end of the century through his innovative work with bioluminescent clams.
A well-known scientist of the 20th century, E. Newton Harvey devoted his career to studying the luciferin-luciferase system in a variety of luminescent animals. The first luciferin was identified in 1956, and the calcium-activated photoprotein aequorin was found in the following decades. A class of small-molecule substrates known as luciferins releases light energy when it reacts with oxygen in the presence of the enzyme luciferase. The 20th century established the foundation for bioluminescence research in the current age. The discovery and development of green fluorescent protein (GFP) in the 20th century led to the awarding of the 2008 Nobel Prize in Chemistry, laying the foundation for the current era of bioluminescence research.

Numerous fields have found useful uses for bioluminescence. In the past, people employed fireflies and glowing mushrooms to provide light in dark mines and impenetrable forests. These days, water toxicity is monitored using Aliivibrio fischeri's bioluminescence, which offers early warning signs of contamination. While bioluminescent creatures helped monitor the final German U-boat during World War I, the phenomena known as "Angel's Glow" illustrated the bioluminescence's defensive qualities during the American Civil War.

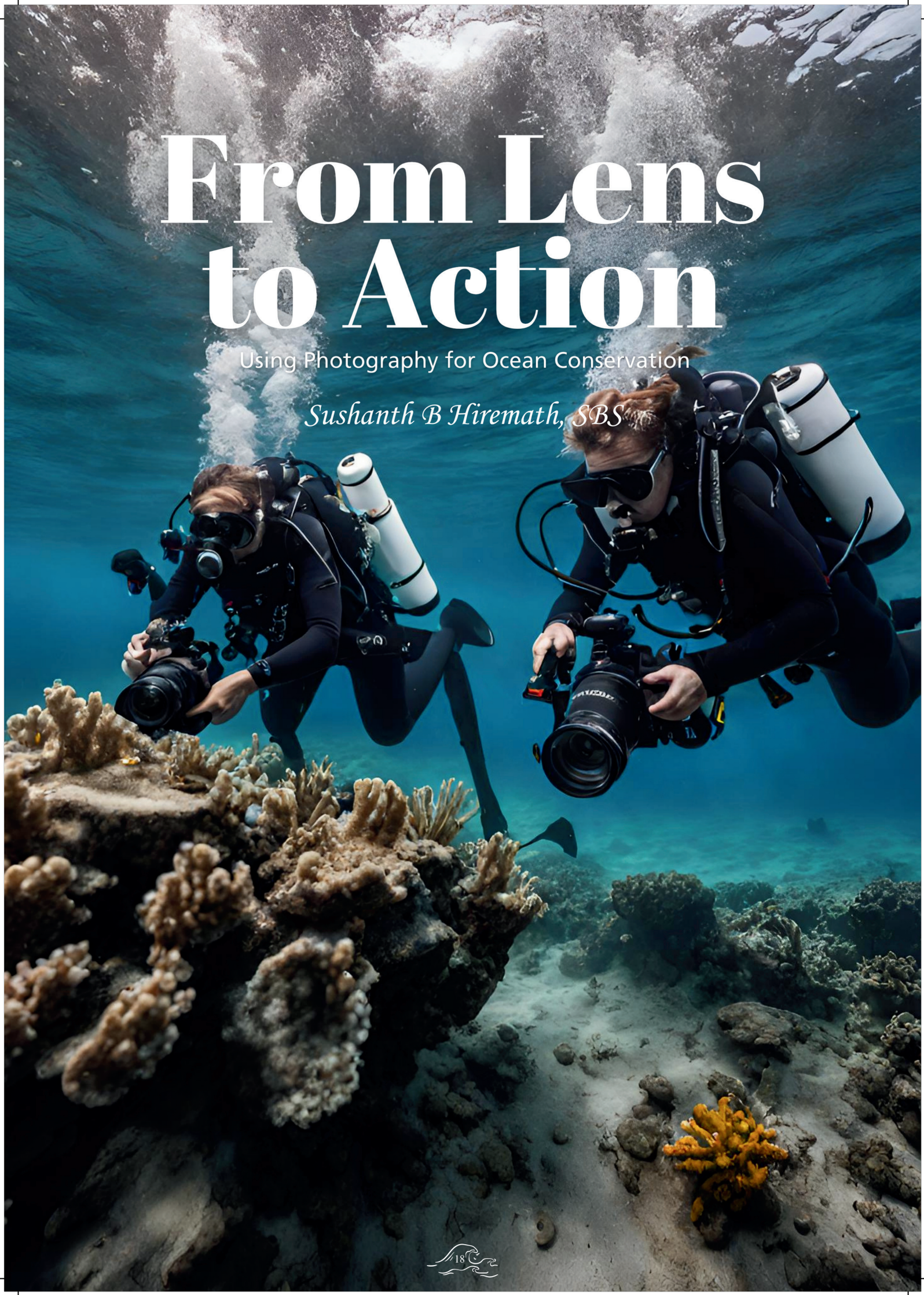
Recent discoveries:
The mysteries of bioluminescence have been further revealed by recent research. The molecular signaling pathways that allow the Vibrio fischeri bacterium to infiltrate the light organ of Hawaiian bobtail squids have been clarified by researchers at Penn State. The tight coordination between bacteria and host organisms is demonstrated by this mutualistic interaction.
Another innovation came from Brazilian researchers at the Federal University of São Carlos, who created a unique luciferin-luciferase system that emits far red light. With three times the brightness of natural luciferin and luciferase, this system has enormous potential for bioluminescence imaging in mammalian tissues, which could transform medical research and diagnostics.

Bioluminescence and the deep sea:
There are many bioluminescent marvels hidden in the ocean's depths. Because they are accustomed to living in complete darkness, deep-sea animals use bioluminescence for concealment, communication, and hunting. The captivating exhibits of the variety and versatility of bioluminescence in the deep water are exemplified by the captivating light shows found there, such as the glowing lure of anglerfish and the shimmering trails of creatures.

Where do humans make use of bioluminescence?
Using Bioluminescence for Medical Imaging: The application of bioluminescence in medical imaging has been the subject of recent research. Using bioluminescent proteins as markers to monitor and investigate biological processes is a novel development. This novel method enables the non-invasive, real-time monitoring of biological activity within living things. It is inspired by naturally occurring luciferases. Using bioluminescence to track the environment: More and more bioindicators are being used to monitor the environment using bioluminescent organisms. Because these species are sensitive to environmental changes like temperature, pollution, or nutrient levels, they are useful tools for evaluating ecosystem health. Recent research has developed biosensors that identify environmental toxins by using bioluminescent bacteria and algae. This provides a quick and affordable way to check the quality of the water.Deep-sea bioluminescence exploration: Researchers are still fascinated by the ocean's depths, and new developments in deep-sea exploration technologies have revealed previously unknown bioluminescent species. Specialized cameras on board robotic submarines have recorded images of hitherto unidentified critters putting on captivating light shows. These findings provide insight into biodiversity and adaptability.

Bioluminescent materials for sustainable lighting: Using bioluminescent proteins, researchers hope to provide sustainable lighting options. Scientists hope to develop bioluminescent paints or coatings that could take the place of conventional lighting sources by integrating these proteins into materials. This environmentally friendly method could be used in urban planning to minimize light pollution and cut down
on energy use.

Bioluminescence in Agriculture
The use of bioluminescence in agriculture has been the subject of recent research. The prospect of genetically modifying plants to display bioluminescence to produce organic markers of plant stress and health is being investigated by researchers. This could completely change agricultural monitoring practices by enabling early disease or environmental stressor detection. As our luminous voyage through the history of bioluminescence draws to an end, we are amazed by the centuries of learning and the most recent discoveries that keep unlocking the mysteries of this amazing natural phenomenon. A future where the glow of deep-sea organisms and the brilliance of engineered luciferin-luciferase systems will further enrich our understanding of the luminous mysteries that lie beneath the surface of our oceans and within the cells of living organisms is what bioluminescence promises to bring. This fascination with bioluminescence has persisted from ancient philosophers to modern researchers. The brilliant adventure goes on, illuminating the path for upcoming generations to investigate and decipher the fascinating realm of bioluminescence.



From Lens to Action

Using Photography for Ocean Conservation

Sushanth B Hiremath, SBS

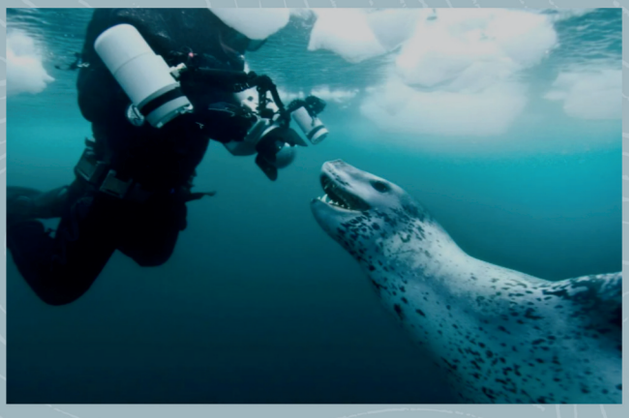
Photography has long been recognized as a powerful tool for storytelling. In recent years, it has emerged as a crucial asset in the fight to conserve our oceans and marine environments.

Through the lens of a camera, photographers capture the beauty, diversity, and fragile nature of the underwater world, inspiring action and raising awareness about the urgent need to protect our seas. Documenting the unseen underwater world does the job of spotlighting the true beauty that is being destroyed with unsustainable habits.

Photography has the unique ability to transcend language barriers and evoke emotions in ways that words alone cannot. By capturing compelling images of marine life, ecosystems, and human interactions with the ocean, photographers can effectively communicate the importance of ocean conservation to a global audience. Stunning photographs of Coral reefs, Sea turtles, Whales, Manta rays and other marine creatures serve as powerful ambassador species of the oceans.This lets photographers bridge the gap between two worlds.

Visual cues are one of the best ways to convey messages as masses interpret messages better through visual experience.

Pressing environmental issues facing our oceans, such as plastic pollution, overfishing, climate change, and habitat destruction can be changed with photography as the spark to a huge fire. Through visually captivating images, photographers shine a spotlight on these challenges and problems which make us take action.



From viral social media campaigns to exhibitions in art galleries and museums, photographs serve as a catalyst to the change.With increasing urbanization of the world, many people miss the opportunity of firsthand experience of the royal hidden gem.



Photography bridging this gap brings the beauty and power of marine environments into our palm.Through captivating underwater photographs, photographers transport viewers beneath the waves, allowing them to explore coral reefs, kelp forests, and other underwater seascapes. By fostering a deeper connection with the ocean, photography inspires individuals to become advocates for its protection.

Using Photography for Scientific Research and Conservation

Photography is not only a tool for raising awareness but is also a valuable resource for scientific research and conservation efforts.During the study of after effects of the Whaling period, Photographs of the whales was one of the best scientific ways to count and understand the population dynamics.Whales just like humans with birthmarks have tail markings making it good for unique identification.

This happened because photographers collaborate with researchers and conservation organizations documenting threatened species, monitor marine protected areas, and gather data on environmental trends.

The collaborative work of fields of Filmmaking and Photography with Environmental Conservation is like the best sandwiches that's out there.

The beauty captures of the whole ecosystem from phytoplanktons to huge 200 ton, 30mts whales helps us create many marine reserves where actual declining keystone species can slowly recover.



Cameras are utilized to document water conservation projects, environmental restoration efforts, and community initiatives aimed at protecting water resources. These images and videos are valuable for raising public awareness, engaging stakeholders, and promoting sustainable water management practices.



Conclusion:

In an era of unprecedented environmental change, the need for effective conservation action has never been greater.The appreciation, conservation and the respect we show to nature always boomerangs with interests.The Positive feeling of both Awe and Greatness is brought about in a human through photography especially of the deep blue oceans.

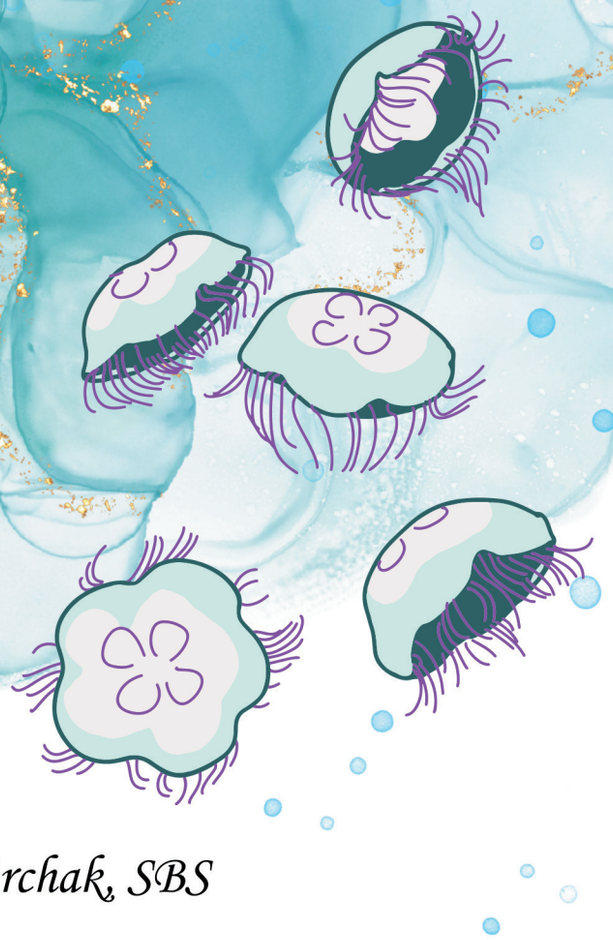
The perfect integration of sophisticated photography gear into the knowledge of the subject's behavioral pattern creates great and mesmerizing feelings ‘Aka’ photos.

Storytellers and photographers can create ripples in the world's basic belief and this makes it the right tool to bring about the right perspective of conservation of marine life.

The pristine ocean is where life started and it is where it will end.Hence we don't get any right to change and harm it.Humans are not in any sense the only species who are capable of thriving, instead are only a part of the great act of harmony.



8 OCEAN RIDDLES WITH NO ANSWERS YET



Sudha Archak, SBS

The ocean feels like another world within our own. We don't know the kind or number of many of its creatures; their behaviours and adaptations continue to be puzzling. We still lack a map of this world's actual contours. The surface of Mars is likely more familiar to us than the seafloor.

I mean, how could one not be excited about it? It makes perfect sense that people are so fervently enthusiastic about space travel. But because it's here, on the same planet as ours, the ocean is just as fascinating!
Here are eight ocean mysteries scientists still can't fully explain:

1 The Ocean Floor

Seventy percent of the Earth's surface is covered by the ocean, yet 95 percent of it remains unexplored by us. Truth is, scientists 'have' been able to map the entire ocean floor—but due to incredibly poor resolution, we can only visualize features larger than three miles. Seabed 2030 is an ongoing scientific project that aims to bring the ocean floor into greater focus, so we can better understand what's really down there. For now, we can just marvel at the most amazing deep-sea sights in the world.

2 The Milky Sea Phenomenon

Sailors have been describing a strange "milky" cast to the sea as far as the eye can see, for hundreds of years, but scientists have been never been able to explain it—or know for sure if it was real. In 2006, researchers were able to capture a satellite image of a milky sea, and many years later, experiments discovered that the glow was likely from bioluminescent bacteria that attract fish so they can be eaten and live in their guts. But how or why the bacteria gather in such huge numbers that they can be seen from space, scientists still aren't sure. Additionally, their glow is continuous, in contrast to the more commonly seen dinoflagellate organisms that emit brief flashes of light.

3 The Purple Orb

On the ocean floor off the coast of California, in 2016, researchers from Ocean Exploration Trust (started by oceanographer and Titanic discoverer Robert Ballard), discovered an odd purple blob on the exploration vessel Nautilus.

The scientists, stumped as to what it might be, called it Blobus purpilis and joked that it was either a spider egg sac or a "tiny momma octopus", before engaging in combat with a crab to get the specimen! It has an odd, captivating jellyfish-like appearance. Although investigation on the orb's nature is still ongoing, a new species of velutinid—a kind of snail—is one theory that has been put forth.

4 Blue Whales

These enigmatic giants of the sea are the largest animal to live on Earth—ever. But partly due to the whaling trade hunting them nearly to extinction, and their slow reproduction, there just aren't many of them out there to look at. As a result very less is known about these elusive creatures, including how long they live, when they become sexually mature or how they reproduce. The animals' shyness also makes them difficult to observe. In 2017, a video of never-seen-before blue whale behavior off Sri Lanka caused controversy among experts as to if or not the rolling and racing caught on camera was a mating ritual.

5 The Bloop Sound

A mysterious "bloop" sound was recorded in the South Pacific in 1997. It was like nothing that had ever been heard before; very loud, with a low frequency and an unusual pattern that made some think it was a newly discovered creature lurking in the depths. (It didn't help that the sound came from near the location of HP Lovecraft's imaginary sunken city of R'yleh, where a creature called Cthulhu is imprisoned.)
Researchers continued to search for the origin of the noise for years, until in 2005 they announced it had been an "icequake," which happens when icebergs break off of glaciers. Although this reasoning has been generally accepted, some conspiracy theorists still feel the explanation is a little flimsy.

6 "Immortal" Jellyfish

Could a little jelly be holding the secret to curing cancer? Tinier than a pinky nail, this sea creature has the ability to revert back to a polyp stage when threatened with starvation or injury, earning it the nickname "immortal jellyfish" for how it outsmarts death. The species had been known for about a hundred years, but it wasn't until the 1990s that this incredible phenomenon was discovered. Scientists still are unsure exactly how its cells are able to regress and regrow, but the immortal jellyfish could have the potential for fighting diseases like cancer in humans.

7 Giant Oarfish

Could these be ancient sea monsters? The longest bony fish on Earth, this snake-like animal can grow up to 56 feet and have a weight of 600 pounds. But since they inhabit depths of roughly 3,300 feet, very little is known about these creatures (rarely seen alive). Two dead oarfish were found on California shores in 2013, making scientists wonder if sinister forces were at work to beach the normally deep-sea animals, since they have been rumored to wash up before earthquakes. But instead the incident turned out to be a boon for scientists to be able to examine the specimens—since they don't even know how many species of the fish exist, DNA samples may help researchers figure that out.

8 The Abyss

Scientists are traveling to the real-life abyss, the area between 13,000 and 20,000 feet under the surface, to discover new marine life. A recent expedition near Australia found hundreds of new species, as well as less-known creatures like the "faceless fish" that hasn't been seen here since 1873. Other rare specimens the scientists collected were the spiny king crab, the monkey brittle star, the smooth-head Blobfish (yep, that's its real name), and the deep-sea lizard fish. Who knows what else is down there? We certainly don't—and we don't have the explanations for these unsolved mysteries about planet Earth, either.

EXPLORING ENZYMES: FROM DEEP SEA TO BIOTECH LABS

Kanupriya Mahaur, TBS

Deep-sea enzymes refer to specialized proteins produced by organisms that inhabit extreme conditions in the ocean's depths. These enzymes offer unique properties that make them valuable for numerous industrial and biotechnological applications. The potential of harnessing deep-sea enzymes for industries such as pharmaceuticals, biofuels, and bioremediation is currently being explored by researchers. The exceptional properties of these enzymes make them highly desirable for their potential applications in the biotechnology industry.

The investigation of enzymes found in the deep sea has been a subject of interest since the mid-20th century, when scientists began to delve into the depths of the ocean.



Fig : New deep-sea enzyme breaks down PET plastic

The discovery of the Challenger Deep, the deepest known point in the ocean, in 1961, stimulated curiosity in the unique life forms that exist in such extreme environments. Scientists discovered that organisms dwelling at great depths had adapted to the harsh conditions of high pressure, low temperatures, and a lack of light by producing specialized enzymes with remarkable properties.

Dr. George Wells Beadle, a renowned geneticist and Nobel laureate, is credited with pioneering research on deep-sea enzymes. His work laid the groundwork for further exploration of these enzymes' potential for industrial and biotechnological applications. Since then, significant advancements have been made in comprehending the diversity and functionality of deep-sea enzymes, resulting in their widespread use across various industries.

Deep-sea enzymes are a unique class of biological catalysts that exhibit remarkable properties such as high stability, activity, and specificity, even under extreme conditions. This feature makes them particularly attractive for applications in diverse fields, including pharmaceuticals, food processing, and bioremediation. Additionally, these enzymes can catalyze various reactions, including the hydrolysis of complex polymers, which makes them ideal for use in the production of biofuels and other renewable energy sources.

In conclusion, Dr. Beadle's pioneering research on deep-sea enzymes has opened up new avenues for exploring their potential applications in diverse industries. Subsequent studies have contributed to a better understanding of their properties and functionality, making them an attractive option for various industrial and biotechnological applications.

The field of harnessing deep-sea enzymes for industrial and biotechnological applications has been significantly advanced by the contributions of several key figures. Dr. J. Craig Venter, a distinguished biologist and entrepreneur, played a pivotal role in the discovery and characterization of novel deep-sea enzymes. Dr. Cindy Lee Van Dover, a prominent marine biologist and oceanographer, has conducted extensive research on deep-sea ecosystems and their enzymatic activity. Van Dover's studies have yielded valuable insights into the diversity and function of deep-sea enzymes, highlighting their potential for biotechnological applications.

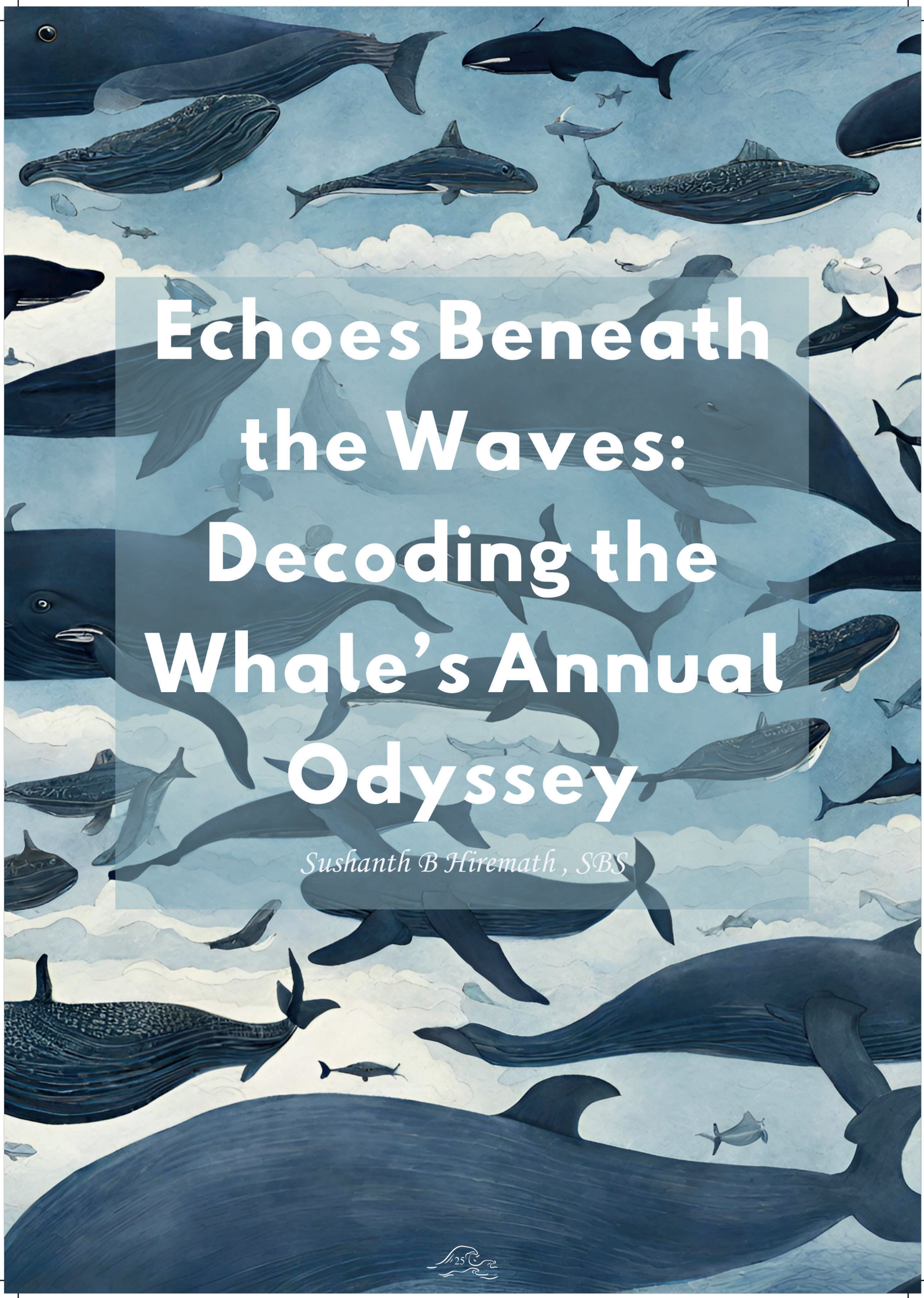
The utilization of deep-sea enzymes in industrial and biotechnological contexts has had a profound impact on numerous sectors. In the pharmaceutical industry, deep-sea enzymes are employed for the generation of biologically active compounds intended for the treatment of diseases such as Alzheimer's, cancer, and infectious diseases.

The biofuel industry has seen a significant contribution from deep-sea enzymes in the production of biofuels from renewable sources such as seaweed and algae. In the domain of bioremediation, deep-sea enzymes are utilized to degrade pollutants and contaminants in soil and water, facilitating the mitigation of environmental disasters and industrial waste sites.

Dr. Peter Golyshin is a renowned authority in the field of deep-sea enzymes and their potential applications in biotechnology. His research has been focused on the exploration of microbial diversity in deep-sea environments and the enzymes synthesized by these microorganisms. Dr. Karen Lloyd, a distinguished microbiologist and oceanographer, has made significant contributions to the field of deep-sea enzymes by studying their role in biogeochemical cycles. Their combined efforts have shed light on the enormous potential of deep-sea enzymes for biotechnological applications across various industries, including pharmaceuticals, agriculture, and environmental remediation.

The future of harnessing deep-sea enzymes for industrial and biotechnological applications is promising, with ongoing research on new discoveries and innovations. Researchers are exploring various methods for discovering and producing deep-sea enzymes, including metagenomic approaches that allow for the identification of enzymes from uncultured microorganisms. With the use of advanced technologies such as next-generation sequencing and bioinformatics, scientists are able to expedite the discovery and characterization of deep-sea enzymes with beneficial properties.

Over the course of the next few years, the field of deep-sea enzyme technology is poised to undergo a major transformation through advancements in enzyme engineering and protein design. This transformative shift will enable the creation of bespoke enzymes that are tailored to specific industrial applications. Through the application of synthetic biology and genetic engineering, deep-sea enzymes can be modified and optimized in order to enhance their catalytic efficiency, stability, and substrate specificity. The potential impact of these engineered enzymes is significant, as they have the capacity to revolutionize a wide array of industries, including healthcare, agriculture, energy, and environmental remediation.



Echoes Beneath the Waves: Decoding the Whale's Annual Odyssey

Sushanth B Hiremath , SBS

Voicebox of the whales are a great evolutionary piece in the puzzle that has been clouding our understanding to the music of depths. But recently 3 scientists studied carcasses of 3 species of whales near Denmark and unraveled the secret behind the greatest orchestra of the ocean.
Whales are a huge pivot point in the marine ecosystems. These 200 ton massive beasts communicate through long distance signals.

Whale migration, a majestic phenomenon covering vast oceanic distances, is a testament to the remarkable navigational abilities and social dynamics of these marine royal families. The core of this annual journey is the intricate and complex system of communication that they rely upon. Through vocalizations generated from the U shaped Voice box and slight touch of body language, whales navigate, find mates, and maintain social bonds within their pods.
The work done here on these mysticetes like Sei, Common minke and Humpback show the systematic stepwise evolutionary aspect of voice generation biological tools i.e.Voice Box. The comparative study of terrestrial mammals' voice box and marine mammal's gave out this conclusion.

"The whale's voice box differs significantly from that of terrestrial mammals, reflecting the challenges and opportunities presented by their underwater habitat. Unlike land mammals, whales lack vocal cords, the vibrating bands of tissue responsible for producing sounds in humans and many other animals. Instead, whales produce sounds using structures known as phonic lips, located within their larynx" stated in the paper.

"Sound is absolutely crucial for their survival, because it's the only way they can find each other to mate in the ocean," briefed Prof Coen Elemans from University of Denmark.
But this whole system is being disrupted by anthropogenic interventions.The rise in shipping traffic has led to increased noise pollution in whale habitats.The roar of ship engines and the ping of sonar systems cover or intervene the subtle sounds of whale calls, impairing their navigation and communication.

In the swiftly moving process of whale recovery [after the whaling occurrences, these little starter dominos cascade one top of the other creating massive ripple effects. Because of worldwide change makers and marine nature's adaptability rate, whale recovery is proceeding at a good clip and should not be disturbed.
A major problem in whales is that they misinterpret information from the signals of other whales and mess up their migration patterns. They also face heightened stress levels and potential health impacts. If whales could adjust to change and communicate at newer frequencies, this issue may be handled; however, their anatomy prevents this from happening.
Recent advancements in space technologies can be helpful to map and help scientists study the migratory routes ,which can be avoided by common heavy loaded ships.
Mitigating the impacts of human intervention on whale migration routes require collaborative efforts of scientists, policymakers, and industry stakeholders internationally. Measures such as speed restrictions, rerouting of shipping lanes, and research and development into quieter ship designs offer promising solutions. However, sustained and determined research like this always helps to know and resolve issues.
The disturbance caused by ships reverberates throughout the marine ecosystem, affecting not just whales but the entire community and marine ecosystems.
Furthermore, the degradation of delicate and endangered habitats, such as coral reefs, seagrass meadows, and mangrove forests, due to anchor damage, sedimentation, and pollution from ships, undermines the resilience of marine ecosystems and compromises their ability to support diverse and thriving populations of marine life.
Ultimately, by acknowledging the interaction between humans and the marine environment taking proactive steps to minimize our ecological footprint, we can work towards ensuring a sustainable future for our oceans.

I would also like to include an interesting fact here regarding the elephant in the room i.e., marine biology, biophysics and computational modeling which are perfectly combined together in this paper in perfect harmony. These recent findings and the methods used for it serve as an excellent source of motivation for Biological Science students.

DRUGS FROM THE DEPTH

Devyanshi, TBS

The discovery of potential pharmaceuticals sourced from the ocean floor has emerged as a promising area in the realm of drug discovery. Deep-sea sediments, with their exceptional biodiversity and chemical composition, have attracted the attention of researchers. This essay aims to discuss the historical significance of pharmaceutical research in the ocean, highlight significant figures in the field, analyze the far-reaching impact of these discoveries, and explore the exciting possibilities for future developments.

Throughout history, the ocean has captivated the imagination of scientists and explorers, sparking curiosity and inspiring countless discoveries. The medicinal properties of various sea creatures and plants were even believed in by many ancient civilizations, who used them in traditional healing practices. However, it wasn't until the 20th century that the pharmaceutical industry began to explore the untapped potential of the ocean floor. Today, scientists continue to uncover new and exciting ways in which the ocean and its inhabitants can benefit humanity, from developing new medicines to finding sustainable sources of food and energy.

Dr. William Fenical, a renowned marine natural products chemist, has established himself as a leading figure in the realm of pharmaceuticals sourced from the ocean floor. His pioneering research has been instrumental in the discovery of numerous important medications, including the highly effective anticancer drug cytarabine. This medication has been a life-saving treatment for patients suffering from leukaemia and lymphoma. Dr. Fenical's groundbreaking work has revealed the remarkable potential of deep-sea sediments as a source of novel compounds with profound therapeutic properties. His contributions to the field have opened up new avenues of exploration and have helped pave the way for the development of advanced pharmaceutical treatments for a wide range of diseases.

The pharmaceutical industry has made remarkable strides in recent years with the help of deep-sea sediment research. The ocean floor holds an incredible amount of biodiversity that scientists have been able to tap into to uncover a vast array of bioactive compounds. These incredible discoveries have the potential to treat a variety of diseases. For instance, research has revealed that compounds isolated from marine organisms possess properties such as antibacterial, antiviral, and anticancer properties, which could revolutionize the pharmaceutical industry. The implications of these discoveries are enormous, as they could vastly improve the quality of life for patients worldwide.

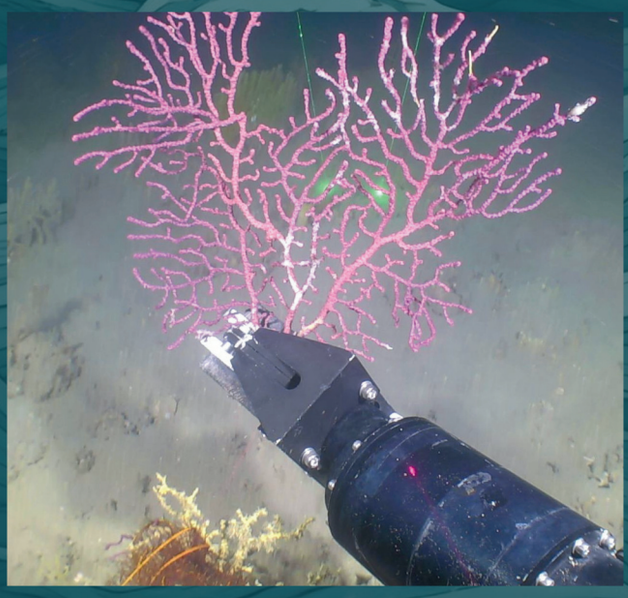


fig : Finding new drugs from deep sea

The prospects of pharmaceutical research in deep-sea sediments are indeed bright, with immense potential in discovering new and effective medications. However, this research is not devoid of challenges and limitations. One of the most prominent hurdles is the arduous task of accessing deep-sea sediments, which are situated at depths of up to several thousand meters.

This presents logistical difficulties for scientists and necessitates the use of specialized equipment and expertise. Furthermore, the process of extracting and purifying compounds from marine organisms can be both time-consuming and financially draining, thereby making the development of new medications a long-drawn-out and expensive undertaking.

Despite the numerous obstacles that come with it, the potential of pharmaceutical research in deep-sea sediments is promising. The advent of new and advanced technologies, such as remotely operated vehicles and deep-sea submersibles, has made it possible for scientists to explore and gather samples from the ocean floor, which was once a challenging and risky endeavour. This breakthrough has opened up a world of possibilities for drug discovery, which could lead to the creation of groundbreaking medications capable of saving countless lives.

In recent years, there has been growing interest in the potential of deep-sea sediments as a source of novel pharmaceuticals. Renowned figures in the field, such as Dr William Fenical, have made significant contributions to this area of research, highlighting the abundance of untapped biodiversity on the ocean floor. Despite the challenges associated with this type of research, advances in technology and the increasing focus on marine biodiversity are driving progress forward. As a result, the future of pharmaceutical research in the ocean holds great promise for the development of new and innovative medications that have the potential to greatly improve human health.

WORD MAZE

Let's explore the ocean of words

Rahul Verma, SBS

C	M	O	B	V	T	R	K	L	Y	G	O	Y	A	N
L	U	T	C	R	D	Q	S	R	U	U	C	G	D	N
I	O	R	E	L	N	V	T	L	Y	P	E	O	J	A
Z	W	N	R	F	L	E	F	G	H	L	A	L	S	K
J	C	P	V	E	M	O	O	M	H	N	N	O	U	F
H	X	I	T	Y	N	L	T	J	C	I	O	I	B	P
O	D	T	H	L	O	T	D	A	A	N	G	B	M	A
O	N	T	C	N	X	C	O	R	A	L	R	E	E	F
R	A	S	A	V	O	R	V	I	N	J	A	N	R	F
B	I	E	J	E	S	M	U	U	J	B	P	I	S	A
X	C	D	M	Q	N	D	R	I	F	T	H	R	I	K
O	L	W	G	R	A	N	O	S	I	U	Y	A	B	W
H	N	K	G	E	M	R	B	D	G	X	J	M	L	K
Z	R	P	H	X	S	B	F	C	K	U	L	I	E	D
V	I	Y	F	O	S	T	G	U	Q	T	S	G	Y	G

HINTS

01 The study of underwater depth of lake or ocean floors.

02 The movement of water in the ocean caused by wind.

03 A natural underwater elevation of the earth's surface.

04 The study of ocean currents.

05 A large area of sea that is partly surrounded by land.

06 A device used to determine the depth of water or to detect and locate underwater objects.

07 A feature of the ocean floor formed by the accumulation of coral skeletons.

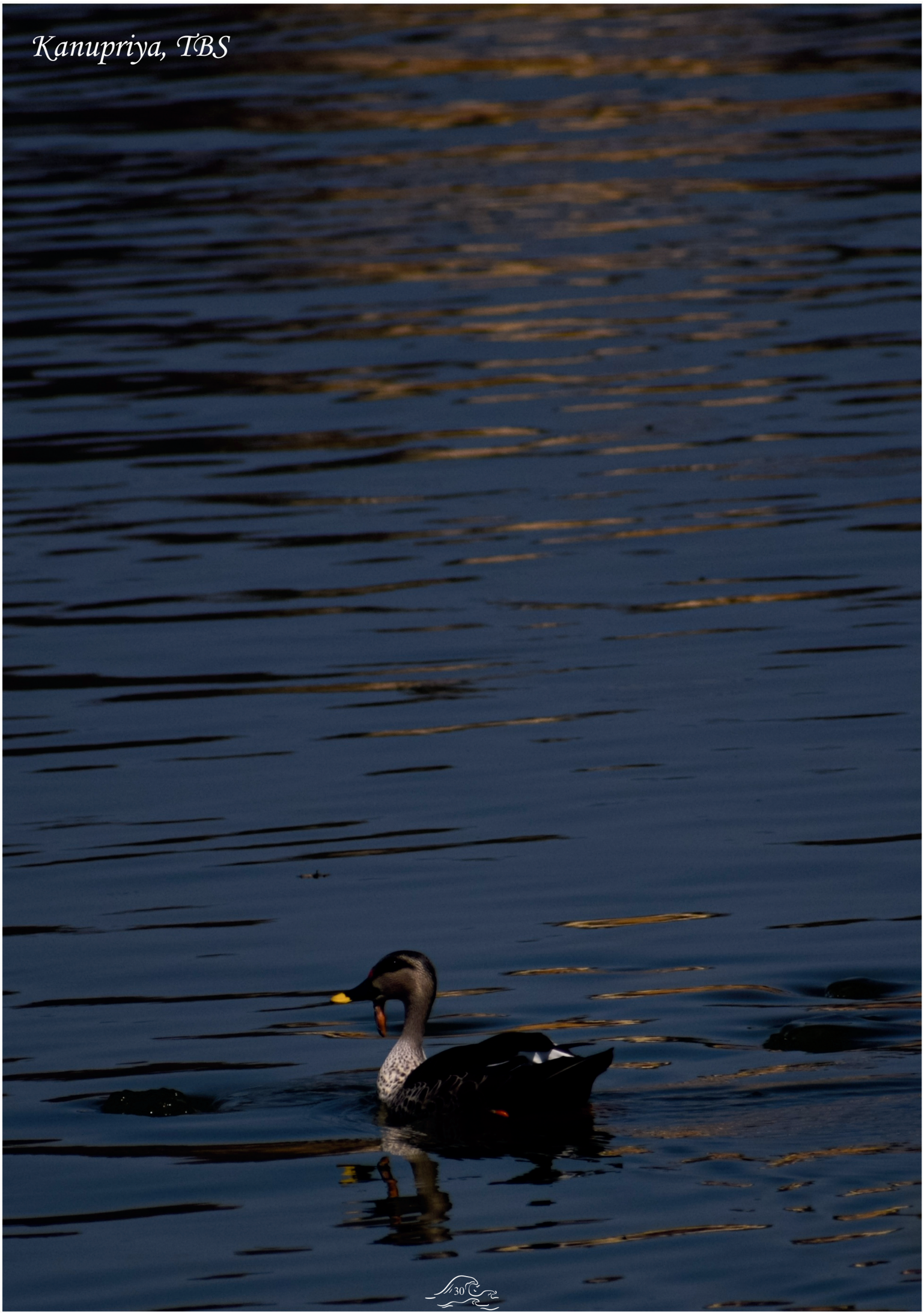
08 The study of marine life.

09 A marine ecosystem characterised by coral reefs.

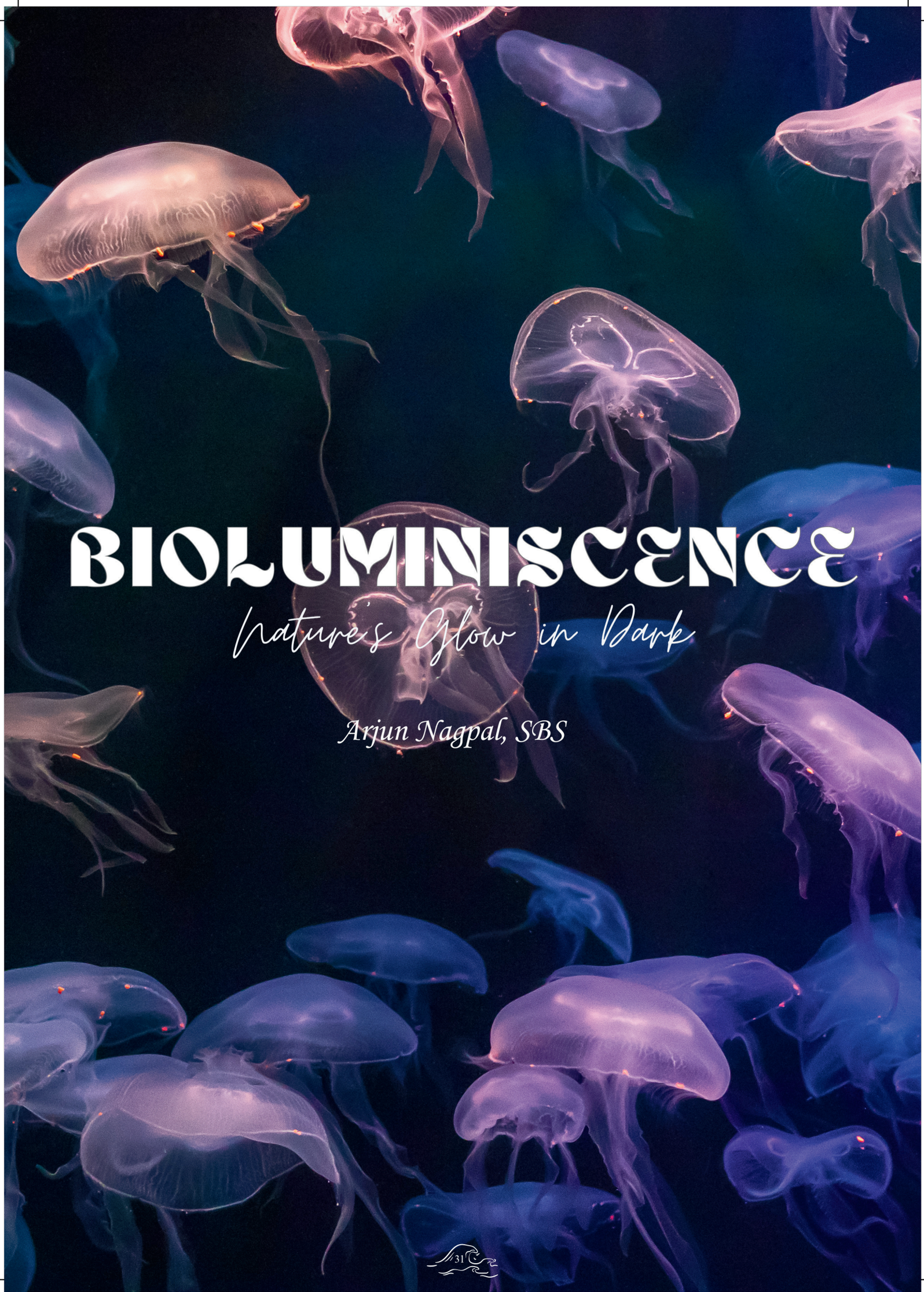
10 A large, natural stream of water flowing in a particular direction through the ocean.

11 A device used to explore the ocean floor.

12 A deep valley in the ocean floor.



Kanupriya, TBS



BIOLUMINISCENCE

Nature's Glow in Dark

Arjun Nagpal, SBS

Also Known as "nature's own light show," bioluminescence is a fascinating phenomenon that may be seen in a wide range of animals, such as some types of fungi, insects, jellyfish, and deep-sea life. One kind of chemiluminescence is this. Although bioluminescence has an obvious aesthetic appeal, scientists are fascinated by it because of its prospective uses as well as its practical roles in nature.

Mechanism : How the organisms glow

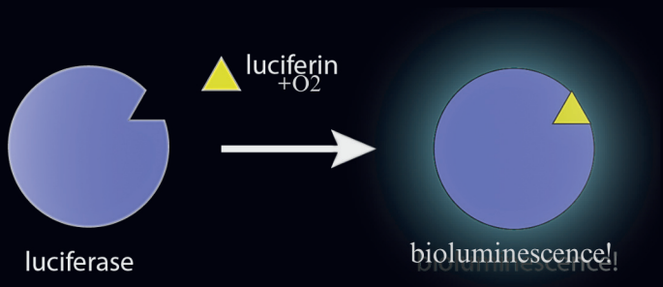


FIG : how bioluminescence works

Two special substances are needed for the chemical reaction that produces bioluminescence: luciferin and either luciferase or photoprotein. Actually, the substance that emits light is called luciferin. The substrate in a chemical process is luciferin. The bioluminescent hue (yellow in fireflies, greenish in lanternfish) is a result of the arrangement of luciferin molecules. Certain bioluminescent organisms are self-sufficient in the synthesis of luciferin. For example, dinoflagellates exhibit bluish-green bioluminescence. Certain creatures that glow in the dark do not produce luciferin. Rather, they take it in through symbiotic relationships or as food through other creatures. For example, certain types of midshipman fish get their luciferin from the "seed shrimp" they eat.

Luciferin and luciferase are involved in the majority of bioluminescent reactions. However, luciferase is not necessary for all reactions. A substance known as a photoprotein is involved in these processes.

"Green fluorescent protein" (GFP) is the name of the photoprotein found in crystal jelly.

Significance of bioluminescence

1. Living in dimly lit areas, like the ocean's depths
2. Attraction of prey; certain fish species, for instance, use light to entice their prey.
3. Defence against predators: Some squid species, for instance, release bioluminescent fluid to ward off potential attackers.
4. Attracting partners throughout the breeding season; this is typical for some worm and crustacean species.

Some bioluminescent organisms

1.Dinoflagellates

Dinoflagellates are a form of unicellular algae commonly referred to as fire algae. They can be found in freshwater and marine habitats. Because they generate chemical compounds that react to produce light, certain dinoflagellates are able to produce bioluminescence. Contact with other living things, objects, or the motion of a wave's surface can all cause bioluminescence. Certain dinoflagellates may also show bioluminescence in response to temperature drops. Dinoflagellates elude potential predators by displaying bioluminescence. The water takes on a lovely blue colour when these little creatures light up.

2. Jellyfish

Blue or green light can be emitted by jellyfish. Bioluminescence is largely used by a variety of species for defence. Usually, touch triggers the light emission, which is meant to frighten away potential predators. Comb jellies have been known to exude luminescent ink, which distracts predators and allows the comb jelly to escape.

3. Anglerfish

Anglerfish are unusual-looking deep-sea fish with sharp teeth. The females have a flesh bulb that protrudes from their dorsal spine and includes photophores, which are glands or structures that produce light. This appendage, which hangs over the animal's mouth, mimics a fishing rod and lure. The anglerfish's big, wide mouth draws in prey from the surrounding dark aquatic environment as the luminous bulb illuminates. In addition, the lure is used to draw in male anglerfish. Anglerfish exhibit bioluminescence as a result of the presence of bioluminescent bacteria. These microorganisms live inside the blazing lightbulb and generate the chemicals needed to release light. Within this mutualistic symbiotic association, the bacteria obtain both shelter and an environment in which to flourish.



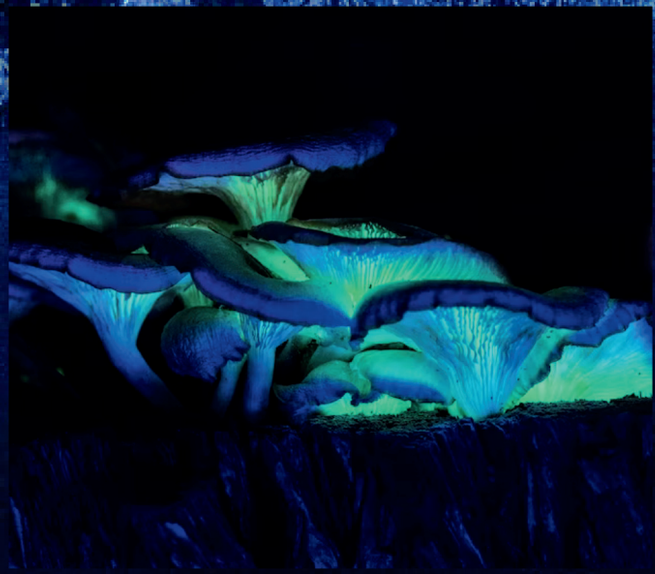


4. Fireflies

Fireflies are winged beetles with light-producing organs in the abdomen. The chemical luciferin reacts with ATP, calcium, oxygen, and the bioluminescent enzyme luciferase inside the light organ to produce light. Fireflies' bioluminescence has multiple uses. Its main purpose in adulthood is to draw mates and entice prey. Members of the same species can be recognised by their flashing light patterns, which also help to differentiate male and female firefly. Because firefly larvae contain repulsive poisonous compounds, their blazing light warns predators not to consume them.

5. Fungi

Bioluminescent fungi shine green when illuminated. An estimated 70 or more species of fungi are known to be bioluminescent. According to scientists, fungi that shine, like mushrooms, do so to draw in insects. The mushrooms attract insects, who then crawl around on them, gathering spores. As the insect departs from the mushroom and moves to new areas, the spores are dispersed. When the sun sets, the temperature drops, causing the fungi to glow and become visible to insects in the dark. Fungi start to glow in the dark, making them clearly noticeable to insects.



6. Squid

Numerous kinds of bioluminescent squid inhabit the deep waters of the ocean. These cephalopods have photophores all over their body, which produce light. The squid may now emit blue or green light along its entire length thanks to this. When squid migrate to the water's surface at night, they use bioluminescence to entice prey. Counter-illumination, a form of defence, is another application for bioluminescence. In order to evade predators who usually hunt by exploiting variations in light to detect prey, squids emit light.

Application of bioluminescence in research

The fascinating natural phenomenon known as bioluminescence has grown beyond its aesthetic value to become a key topic in scientific study. Researchers can use the luminous qualities of some organisms, which are produced by biochemical reactions, to create effective non-invasive imaging and biological process monitoring tools.

ATP sensing

ATP is the energy currency of living cells and can be found in almost every bacterial and eukaryotic cell. A range of assays for ATP detection with varying detection limit levels for ATP have been developed using the firefly luciferase and D-luciferin system, given that Mg-ATP is an essential co-factor in the process of firefly bioluminescence. The distribution methods and preparations of luciferase reagents for ATP detection differ among suppliers and are tailored to suit individual systems. A well-balanced mixture of enzymes, co-factors, buffers, and extractants make up each reagent system.

Disease therapy using bioluminescent light

In photodynamic treatment, the light emitted by bioluminescence has been utilised as a regulated and confined light source to excite photosensitizers. Utilising photosensitizer molecules, photodynamic therapy produces reactive oxygen species (ROS) radicals, such as singlet oxygen, which can degrade protein and tissue when exposed to light. When treating infections or cancers, for example, where cell death is necessary as a therapeutic approach, this cytotoxicity may be helpful.

Imaging using Bioluminescence

Molecular imaging, which use either fluorescent or bioluminescent reporters, is one of the most sensitive known optical imaging techniques. It also employs the most straightforward and economical procedure. The use of fluorescent dye molecules or genetically encoded fluorescent proteins and their derivatives for fluorescence imaging has made a significant contribution to the field of cell biology. These tools offer an effective way of imaging a wide range of materials, from individual molecules to entire organisms. Unfortunately, this technique is not suitable for long-term and quantitative imaging because fluorescent reporters require exogenous illumination in order to emit light. These reasons include: (1) the fluorescent reporter is bleached by repetitive illumination; (2) repetitive exogenous light illumination causes phototoxic damage to cells (3) Light-sensitive tissue, like the retina, experiences physiologic disruption from external lighting. On the other hand, external light illumination is not necessary for bioluminescence imaging that employs luciferase reporters, as the luminescence reaction is quantitative and has a very low background. This imaging technique is very helpful for quantitative and longitudinal imaging.

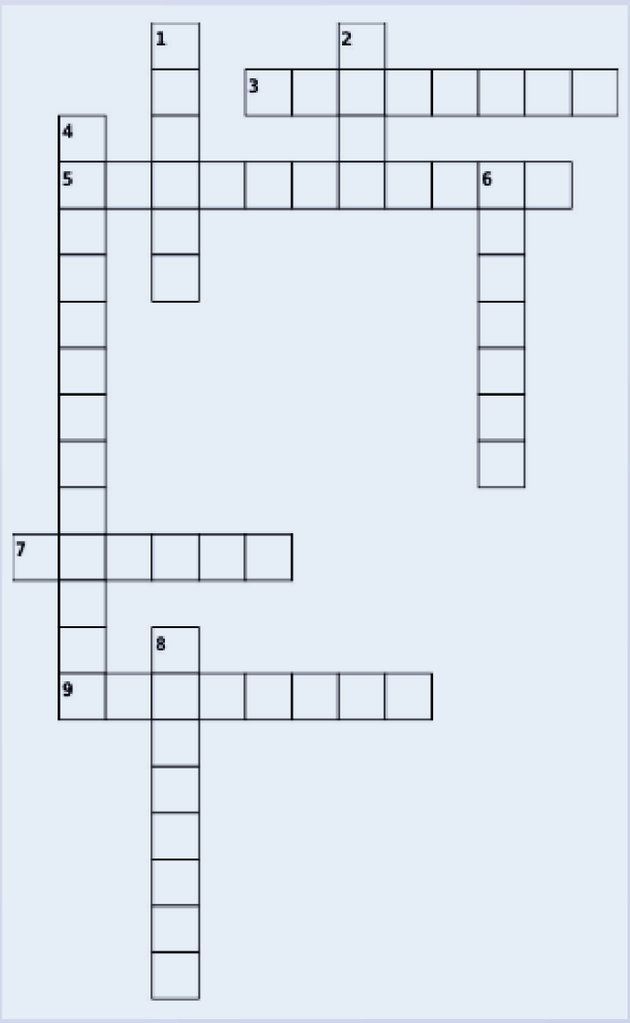


Which of the following chemicals is commonly involved in the bioluminescent reaction?

- A. Chlorophyll
- B. Hemoglobin
- C. Luciferin
- D. Insulin

Crossword

Megha, TBS



Across

3. Are a diverse group of organisms that live in the water column of large bodies of water and that cannot swim against a current.

5. Shelf underwater landmass which extends from a continent

7. Aquatic animals that are able to swim and move independently of water current

9. A mountain rising from the ocean seafloor that does not reach to the water's surface

Down

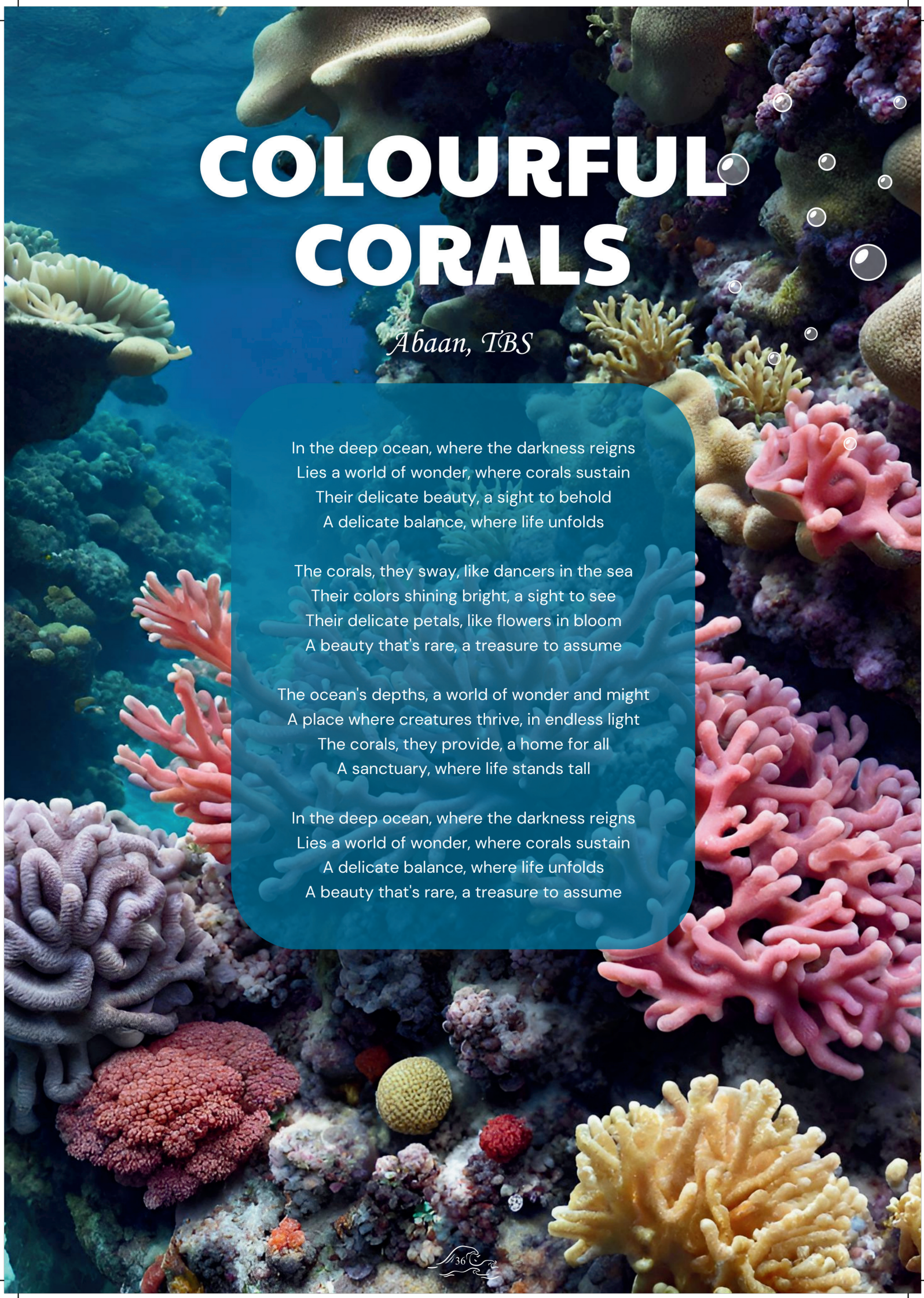
1. A long, narrow, deep depression in the ocean floor, typically one running parallel to a plate boundary and marking a subduction zone.

2. The ocean that transmits energy from one place to another

4. Directed movement of seawater generated by forces acting upon this mean flow

6. Consists of muds and silts, and is often crosscut by submarine canyons.

8. Measure of all the salts dissolved in water



COLOURFUL CORALS

Abaan, TBS

In the deep ocean, where the darkness reigns
Lies a world of wonder, where corals sustain
Their delicate beauty, a sight to behold
A delicate balance, where life unfolds

The corals, they sway, like dancers in the sea
Their colors shining bright, a sight to see
Their delicate petals, like flowers in bloom
A beauty that's rare, a treasure to assume

The ocean's depths, a world of wonder and might
A place where creatures thrive, in endless light
The corals, they provide, a home for all
A sanctuary, where life stands tall

In the deep ocean, where the darkness reigns
Lies a world of wonder, where corals sustain
A delicate balance, where life unfolds
A beauty that's rare, a treasure to assume

Microbial Symbiosis in Deep-Sea Ecosystems

Chetna, TBS



The study of microbial symbiosis in deep-sea ecosystems has been a subject of significant scientific interest for many years. This essay aims to delve into the historical background, key figures, and the impact of microbial symbiosis in deep-sea ecosystems. In addition, this essay will identify and analyze influential individuals who have contributed to this field, discuss various perspectives, and provide a well-reasoned analysis of the positive and negative aspects of microbial symbiosis in deep-sea ecosystems. Finally, this essay will consider potential future developments related to this topic.

Deep-sea ecosystems are considered to be some of the most extreme and inhospitable environments on the planet, characterized by high pressures, low temperatures, and a lack of sunlight. Despite these challenging conditions, they are bustling with life, including a diverse range of microbial organisms. Microbial symbiosis, which refers to a close and often mutually beneficial relationship between different species of microorganisms, is a crucial factor in the functioning of these ecosystems.

The examination of microbial symbiosis in deep-sea ecosystems has its origins in the 1970s and 1980s when researchers embarked on an exploration of microbial communities inhabiting deep-sea hydrothermal vents. These vents are subaquatic geysers that emit hot, mineral-laden fluids into the frigid, lightless depths of the ocean, creating exceptional habitats for a diverse range of organisms.

Scientists discovered that many of these organisms depend on symbiotic relationships with microbes to survive in these harsh environments. Dr. Colleen Cavanaugh, a marine biologist and professor at Harvard University, is a seminal figure in the field of microbial symbiosis in deep-sea ecosystems. Her pioneering research on the symbiotic relationships between microbes and deep-sea animals has been instrumental in advancing our understanding of the critical role of microbial symbiosis in these environments. Dr. Cavanaugh's work has unveiled the significance of symbiotic relationships in nutrient cycling, energy production, and adaption to extreme conditions in deep-sea ecosystems. Her findings provide unique insights into the intricate interdependence between different organisms and their environment, helping us to unravel some of the mysteries of the deep-sea biome.

Dr. Margaret McFall-Ngai, a professor at the University of Hawaii, is a prominent figure in the study of microbial symbiosis in deep-sea ecosystems. Her research delves into the intricate interactions between microbes and host organisms in challenging deep-sea environments, with a particular emphasis on mutualistic symbiosis. Dr. McFall-Ngai's work has yielded invaluable insights into the mechanisms that enable microbial symbionts to assist their host organisms in surviving and thriving in the deep sea. Her research is highly regarded in the scientific community and has contributed significantly to our understanding of microbial ecology in deep-sea environments.

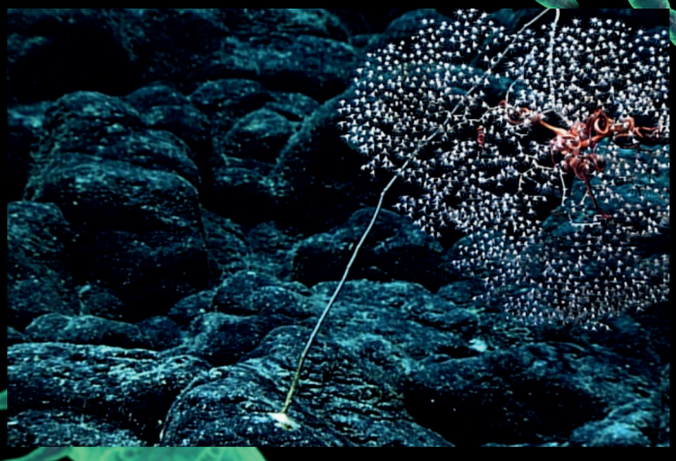
The influence of microbial symbiosis on deep-sea ecosystems is considerable and widespread. The symbiotic associations between microbes and host organisms play a critical role in nutrient cycling, energy production, and overall ecosystem functioning in deep-sea environments. The extreme conditions of the deep ocean make it challenging for many deep-sea organisms to survive, and without these symbiotic relationships, their survival would be jeopardized. Therefore, understanding and investigating these symbiotic relationships can provide valuable insight into the functioning of deep-sea ecosystems and the role of microbial communities in these environments.

Microbial symbiosis in deep-sea ecosystems can, from a positive perspective, make a significant contribution to biodiversity, ecosystem resilience, and adaptation to environmental change. The symbiotic relationships between host organisms and microbes enable these organisms to thrive in otherwise inhospitable conditions, resulting in the creation of complex and dynamic ecosystems that support a diverse range of life forms. These symbiotic relationships could play a crucial role in maintaining the stability of deep-sea ecosystems, which are often susceptible to environmental disturbances. Thus, a better understanding of these relationships would provide valuable insights into the functioning of these unique ecosystems and their potential to support life in extreme environments.

Microbial symbiosis in deep-sea ecosystems has been widely studied and has shown several positive aspects. However, it is important to consider the negative impacts that can arise from imbalanced symbiotic relationships. Parasitic microbes, for instance, are known to exploit their host organisms, leading to their weakening and causing significant harm to the overall ecosystem. Therefore, it is imperative to understand the mechanisms of microbial interactions in deep-sea ecosystems to mitigate any adverse effects that may arise.

Researchers are increasingly utilizing advanced technologies, including metagenomics, transcriptomics, and proteomics, to delve deeper into the potential future developments related to microbial symbiosis in deep-sea ecosystems. The application of these technologies is enabling scientists to study microbial communities in greater detail, and consequently unravel the intricacies of microbial symbiosis and its significance in deep-sea ecosystems.

The role of microbial symbiosis in deep-sea ecosystems is of critical importance, as it greatly influences nutrient cycling, energy production, and the overall function of these ecosystems. The contributions of eminent researchers such as Dr. Colleen Cavanaugh and Dr. Margaret McFall-Ngai have significantly advanced our understanding of microbial symbiosis in deep-sea environments. While there exist both positive and negative aspects to consider, the study of microbial symbiosis in deep-sea ecosystems continues to evolve with the development of new technologies and research approaches. The future of this field holds great promise for advancing our knowledge of how microbial symbiosis shapes and sustains life in the enigmatic depths of the ocean.



A Metallogorgia coral delicately perched on a small boulder, with its brittle star symbiont sprawled out amongst its polyps. Courtesy of NOAA.

What role do microbial symbionts play in coral reefs?
A. They compete with corals for space and resources
B. They provide corals with essential nutrients through photosynthesis
C. They feed on coral tissue, causing coral bleaching
D. They produce toxins that harm coral larvae



Antifreeze Proteins in Arctic Fishes

-Mayank, TBS

Antifreeze proteins identified in Arctic fishes have been a subject of great interest in the scientific community for several decades. The remarkable ability of these proteins to aid these organisms in surviving in extremely cold temperatures has fascinated scientists. These proteins perform a crucial role in preventing ice formation in the blood and tissues of these organisms. This mechanism, in turn, enables them to thrive in icy waters where most other species would be unable to survive. The study of these proteins and their functions could have significant implications for fields such as biotechnology and medicine.

The discovery of antifreeze proteins in Arctic fishes dates back to the 1960s when scientists first observed that these organisms could survive in subzero temperatures without succumbing to freezing. This observation sparked extensive research into the mechanisms underlying this remarkable ability, which eventually led to the identification of antifreeze proteins. These proteins function by binding to ice crystals and impeding their growth, effectively preventing the formation of large ice masses that could be fatal to the organism. The discovery of antifreeze proteins holds significant implications for the fields of biotechnology, medicine, and environmental science, as it provides a novel mechanism for combating frost damage in crops, preserving organs for transplantation, and mitigating the effects of climate change on Arctic ecosystems.

Dr. Arthur L. DeVries, a distinguished biochemist, has played a pivotal role in the study of antifreeze proteins found in Arctic fishes. In the 1970s, Dr. DeVries conducted pioneering research on these proteins, which led to the discovery that Antarctic notothenioid fishes produce significant quantities of antifreeze glycoproteins in their blood. This unique adaptation enables these fishes to survive in the icy waters of the Southern Ocean. Dr. DeVries' seminal work laid the groundwork for further research into the biochemical and molecular properties of these proteins.

Dr. Cheng Chi Lee, a notable biologist, has made significant contributions to our comprehension of antifreeze proteins' action at the molecular level. Lee's research has illuminated the structural characteristics of antifreeze proteins and their interactions with ice crystals, providing valuable insights into the mechanisms by which these proteins prevent freezing in Arctic fishes.

The Arctic fish's antifreeze proteins present potential applications in various industries, such as cryopreservation, food storage, and medical technology. By comprehending the mechanism of antifreeze proteins, scientists can develop novel approaches to preserve biological samples, ameliorate the quality of frozen food products, and enhance the efficacy of medical treatments that require cold storage. Understanding the antifreeze proteins' properties and functions can lead to the creation of innovative techniques for improving the aforementioned industries.

The utilization of antifreeze proteins for commercial purposes presents a potential dilemma regarding the ethical implications of exploiting natural resources and the potential environmental consequences of harvesting these proteins from Arctic organisms. In addition, the introduction of antifreeze proteins into novel environments could result in unforeseeable outcomes, including alterations to local ecosystems and disruptions to natural evolutionary processes. These concerns highlight the need for careful consideration and assessment of the ethical and environmental consequences of employing antifreeze proteins in commercial applications.

Recent developments in genetic engineering and biotechnology have shown promising potential for the creation of synthetic antifreeze proteins. These proteins could offer a more cost-effective and efficient alternative to natural sources while being applicable in various fields. The practical applications of these synthetic proteins range from enhancing the quality of frozen foods to improving the safety and effectiveness of medical procedures that require cold storage.

The development of synthetic antifreeze proteins is a significant breakthrough in biotechnology. Utilizing these proteins could bring about various benefits, including cost-effectiveness, increased efficiency, and reduced environmental impactFurthermore, the synthetic proteins could be engineered to have improved features, such as higher thermal stability and wider temperature ranges.

These synthetic antifreeze proteins have enormous potential for use in the food industry, where they could enhance food quality and reduce waste. Additionally, the medical industry could benefit from the use of synthetic proteins in cold storage for various medical procedures, including organ transplants and blood transfusions.

In conclusion, the development of synthetic antifreeze proteins has shown significant potential for various applications in the biotechnology industry. The use of these proteins could bring about significant advancements in fields such as food and medicine while being cost-effective and efficient. Nonetheless, further research and development are required before their implementation in practical applications.

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DID YOU KNOW?!?

Antifreeze proteins have shown promise in biomedical applications, such as improving the preservation of organs for transplant and developing ice-resistant tissues for cryosurgery.

Ocean Acoustics

-Megha, TBS

In the vast expanse of the world's oceans, sound plays a crucial role in communication, navigation, and understanding the underwater environment. Ocean acoustics, the study of sound in the ocean, has emerged as a vital field with applications ranging from marine biology to national defence.

Sound travels approximately four times faster in water than in air, making the ocean an excellent medium for acoustic communication. Oceanographers study various aspects of sound propagation, including its speed, directionality, and attenuation over distance. Marine biologists use acoustic techniques to track the movements of marine mammals, such as whales and dolphins, and study their behaviour.

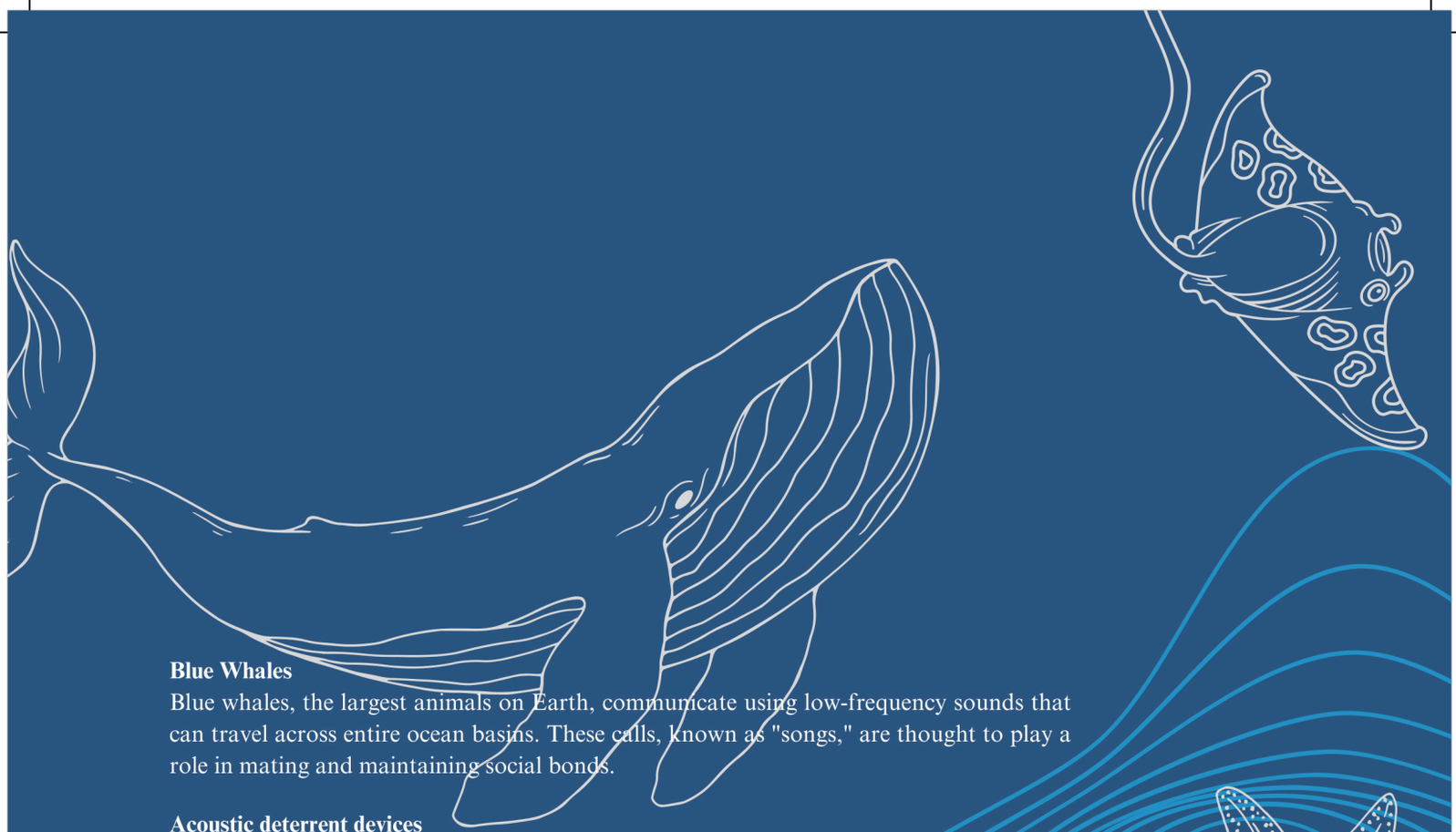
Monitoring underwater soundscapes can reveal important information about the health of marine ecosystems. Changes in ambient noise levels may indicate human activities such as shipping, construction, or seismic exploration, which can impact marine life.

SONAR, an acronym for Sound Navigation and Ranging, is a critical technology in ocean acoustics. It uses sound waves to map the seafloor, detect underwater objects, and navigate submarines and ships. Sonar systems, including multibeam and sidescan sonar, provide detailed images of the ocean floor.
Ocean acoustics have long been of interest to the military for submarine detection and communication. Sonar systems are used for detecting and tracking submarines, underwater mines, and other potential threats.

Therefore, Ocean acoustics is a dynamic and multidisciplinary field with far-reaching implications for science, industry, and society. By unravelling the mysteries of underwater soundscapes, researchers are gaining insights into the hidden world beneath the waves and advancing our understanding of the ocean environment. As technology continues to evolve, ocean acoustics will remain at the forefront of marine science, unlocking new opportunities for exploration, conservation, and discovery.

Challenges and Future Directions:

Despite its many applications, ocean acoustics faces challenges such as background noise from human activities, environmental variability, and limited data availability in remote regions. Addressing these challenges requires interdisciplinary collaboration, advanced technology development, and innovative research approaches. Future directions in ocean acoustics include enhancing acoustic monitoring networks, improving modeling techniques, and exploring emerging applications in fields such as marine renewable energy and climate change research.



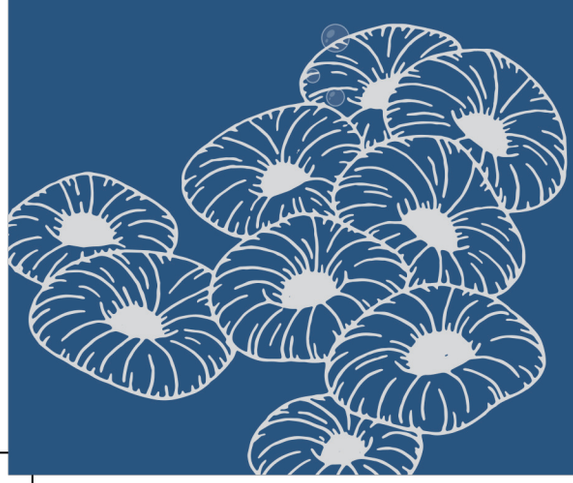
Blue Whales
Blue whales, the largest animals on Earth, communicate using low-frequency sounds that can travel across entire ocean basins. These calls, known as "songs," are thought to play a role in mating and maintaining social bonds.

Acoustic deterrent devices
Acoustic deterrent devices (ADDs) emit loud sounds underwater to deter marine mammals from approaching fishing gear or aquaculture facilities. These devices help reduce accidental entanglements and interactions between marine mammals and human activities.

Global Listening Arrays
Global networks of underwater listening devices, known as hydrophone arrays, are used to monitor and study ocean soundscapes on a global scale. These arrays provide valuable data for scientific research, conservation efforts, and ocean management initiatives.

Deep-Sea Soundscapes
The deep ocean is not as silent as one might imagine. It is filled with a variety of sounds, including the calls of marine mammals, the crackling of icebergs, the rumble of underwater volcanoes, and even the sound of earthquakes.

Underwater Communication
Marine animals, such as dolphins and some species of fish, use sound to communicate, navigate, and locate prey in the vast ocean environment. They produce and perceive sounds at frequencies that are often beyond the range of human hearing.





Different marine species use various sounds for communication, including clicks, whistles, grunts, and even songs. These sounds serve purposes such as attracting mates, establishing territory, and warning of danger.

Into the Dark: Towards the Next Generation of Antibiotics

Durani Sikha Kakoty, FBS

According to WHO, antimicrobial resistance is one of the top 3 threats to human health. The emergence and diffusion of antibiotic resistance stands as one of the most urgent health concerns of our day, alongside the rise of various infectious diseases. Antibiotics are one of the most intriguing compounds, particularly for applications in biotechnology and pharmaceuticals. They kill bacteria or prevent them from reproducing and spreading. Numerous factors, such as modifications to membrane permeability, an increase in drug efflux pumps (which remove toxic substances from inside the cell), the antibiotic's enzymatic modification or inactivation, target site modification, alternative metabolic pathways, and the formation of biofilms (attachment to the surface of an object by secreting a gel-like substance), can cause antimicrobial or antibiotic resistance in microorganisms.

Antimicrobial resistance occurs when microorganisms change as they are exposed to antimicrobial drugs. Genetic mutations and the horizontal gene transfer (HGT) mechanism are the two main ways through which microorganisms adapt to antimicrobial medications.

The majority of antibiotics that are presently on the market come from semi-synthetic products of fermentation or terrestrial organisms. Most of our therapeutically essential antibiotics, including macrolides, tetracyclines, and penicillins, were discovered by studying the secondary metabolites that terrestrial microorganisms create. However, the same microbial species, after being repeatedly cultivated, in recent years, have given dim results. This raises a question among scientists, "Where will the next generation of antibiotics come from?"

It may be possible to find substances with antibiotic action by isolating bacteria from unexplored habitats. The ocean, for example! The deep-sea environment is a unique and less explored habitat, a valuable source of natural products.

Such great biodiversity leads one to believe that the deep sea represents the upcoming frontier in the search for exploitable biology. The term "deep-sea environment" is still vaguely defined. While the deep sea is typically defined at a depth of ≤1000 m, older designations imply that it is deeper than 200 m. The primary barrier to deep-sea life research has always been the difficulty of accessing the ocean floor.

The deep-sea microorganisms, because of their adaptation to this extreme environment, have the potential to produce fresh secondary metabolites with various biological activities. Among them, antimicrobial compounds have impressive biological activity against various kinds of fungi and bacteria that are resistant to drugs, making marine natural products an extremely desirable resource in the hunt for new antimicrobial medicines. However, due to obvious technical challenges, one of the parts of microbiology that have received the least investigations is the ‘sediments beneath the deep ocean’. And so, the research and development in this matter is not keeping pace with the rising drug resistance.

In recent years, however, the deep ocean settings have become more accessible via the use of Remotely Operated Vehicles (ROV) and submersibles, along with enhanced acoustic gadgets, which led to the discovery of biological activity in that zone.

The deep sea's characteristics, which make it a harsh environment, include (i) pressure: increases by one atmosphere for every 10m increase in water depth, (ii) temperature: generally drops with increasing depth reaching values around 2°C on the abyssal plain;

(iii) oxygen concentration in the bottom waters: can be much less than that of the surrounding region, or even zero and (iv) light intensity: declines exponentially with depth in the water column because incident photons are absorbed or scattered, and total darkness prevails below 250 m deep.

Due to intense stress in the deep sea, microorganisms that thrived in these harsh environments acquired particular survival techniques. While most of them are piezo-tolerant (tolerate high-pressure conditions) and piezophilic (grow better under high-pressure conditions), the cultivation of these strains is limited by inadequate instrumentation. Their modifications in primary/secondary metabolic pathways and gene regulation, yielding new natural products, are an indicator of their adaptability to biochemical and physiological processes. According to marine pharmacology reports, in the last 50 years, over 30,000 marine natural products have been found and approximately 2% of those have been isolated from deep-sea organisms.

Deep-sea microbe isolation and culture began in the late 1950s when true pioneers in the subject, Zobell and Morita, succeeded in creating titanium chambers for bacteria that could withstand pressures of up to 100 MPa. They were only able to isolate piezo-tolerant strains. It took until 1979 before Yayanos et al. isolated Spirillum CNPT-3 from an amphipod captured in the trenches of the Philippines using a pressure-retaining trap to get the first obligate piezophilic strains.

Cultivation of hyperthermophilic and piezophilic bacteria inhabiting deep-sea hydrothermal vents turned out to be considerably more challenging, as major strains are mostly chemolithoautotrophs (bacteria capable of using inorganic, rather than organic, molecules for their fueling reactions). A new isolation technique later introduced by Takai et al. led to the isolation of piezophilic hyperthermophilic methanogenic strains.

Although the discovery of novel biological resources (microorganisms and/or their genetic material) is inherently linked to the discovery of novel antibiotics, the success of biodiscovery campaigns to find antimicrobials, and more broadly, bioactive compounds, from these extreme ecosystems, is still hindered by numerous obstacles. Innovations aimed at maximizing the exploitation of deep-sea microorganisms are essential to improve the current situation.



METAGENOMICS:

There have been advancements in the cultivation of deep-sea microbes, yet it's a challenge to grow most of these bacteria in a lab setting. This implies that we have a limited ability to collect antibiotics from deep-sea microbes using traditional techniques. Advancements in DNA amplification, sequencing, and analysis have yielded effective tools to surmount those limitations.

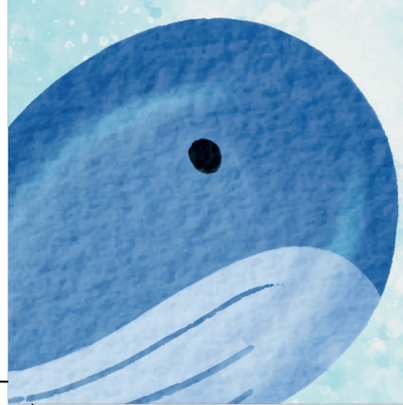
A technology that does not require cultivation, metagenomics, holds great promise for investigating and harnessing adverse conditions. In recent years, there's also been exploration of metagenomics' potential for the discovery of natural compounds.

The study of whole nucleotide sequences that have been extracted and examined from every creature in a bulk sample—usually microbes—is known as metagenomics. It is a popular tool for studying a particular microbial population. Fujita et al. successfully cloned and expressed a biosynthetic gene cluster from a metagenomics library taken from sediments in the East China Sea (1000 m below sea level) by using a functional method. They produced a library of over 60,000 clones with an average insert size of roughly 35 kbp in E. coli. The synthesis of metal-binding compounds was then checked in this library using an assay for chrome Azurol metal-ion indicator. This allowed for the detection of a clone that produced Bisucaberin, a bioactive siderophore. According to the gene cluster study, it most likely originated from an uncultured bacterium. This metagenomics approach's major limitation has to do with recombinant expression. Deep-sea-derived gene clusters are frequently not expressed in systems based on recombinant synthesis in Escherichia coli. Therefore, designing expression platforms based on piezophile microbes may be important for raising metagenomics' success rate.

However, the metagenomic sequence-based approach is becoming easier to use and more effective for drug discovery due to the ongoing improvement of sequencing technology and bioinformatics tools. The ongoing decline in the cost of sequencing metagenomic samples and genomes has made large-scale research possible.

The focus on microbial communities in the search for new naturally occurring bioactive chemicals from deep-sea habitats has been made possible by technological advancements throughout the past 10 years. According to recent reports, natural chemicals originating from deep-sea microorganisms may offer an original channel for the generation of therapeutics against several human diseases, including infections and cancer. If the biotechnology sector and academic institutions work together, they could accelerate the interest in natural product drug discovery that has only grown over the past 10 years. Though some are nearing clinical trials, the commercialization of natural goods and compounds obtained from deep marine resources is still in its early stages. For this reason, recording microorganisms found in deep-sea habitats is essential to the discovery of new drug alternatives for the treatment of human ailments in the future.

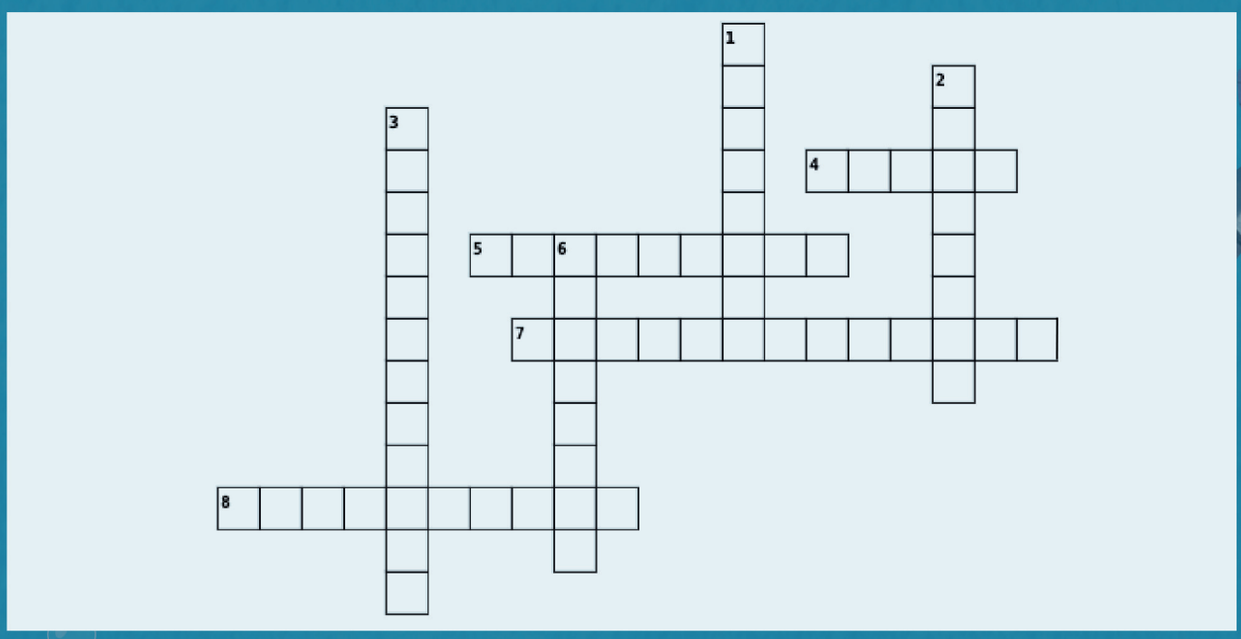
Which of the following techniques is commonly used in marine metagenomics?
a) PCR (Polymerase Chain Reaction) b) Electrophoresis c) Microarray analysis d) Next-generation sequencing





Crossword

Muskan, TBS



Across

4. Device used to measure ocean depth
5. The deepest part of the ocean
7. Study of marine life in its natural habitat
8. The zone of the ocean where photosynthesis can occur

Down

1. A region of the ocean where two oceanic plates are moving apart
2. Tiny organisms at the base of the marine food chain
3. The study of ocean currents and their effects on climate
6. A region of the ocean with extremely low oxygen levels

Marine Biotechnology and Its Applications in Drug Discovery

Kritika, FBS

Marine biotechnology is also referred to as "blue biotechnology". It helps to access biological compounds and provides novel uses for them, by exploring and harnessing marine materials. It is the use of biological resources from the ocean for industrial, medical or environmental purposes. Due to the ecologically and environmentally diverse sea environment, the planet's most chemically varied ecosystem, marine biotechnology, has been recently known to produce an increasing number of key medicinal goods, industrial and environmental tools and applications for varied research analysis.

Marine Biotechnology Drugs Against Various Diseases

- Marine Drugs as Anti-cancer Agents.
- Marine Drugs for Cardiovascular Diseases.
- Marine Drugs for Diabetes.
- Marine Drugs for Malaria.

Marine Drugs as Anti-cancer Agents

Cancer remains one of the major issues for public health systems worldwide. The usual forms of cancer treatment include surgery, radiotherapy and chemotherapy. Currently, cancer chemotherapy is facing a remarkable revolution with the introduction of an increasing number of target-oriented drugs,increasing treatment efficacy, reducing side effects and improving the quality of life of patients.
Seven marine-based pharmaceuticals have been approved for marketing, 23 compounds are in clinicaltrials and over one thousand compounds isolated from marine organisms are undergoing preclinical studies.

It should be noted that among those marine organism-derived compounds in clinical use, four are used in the treatment of cancer: cytarabine (Cytosar), trabectedin (Yondelis), Eribulin mesylate(Halaven) and the conjugated antibody brentuximab vedotin (Acentris).

- Cytarabine is widely used in the treatment of various types of leukemia, such as acute lymphocytic leukemia, acute myelogenous leukemia, chronic myelogenous leukemia, and non-Hodgkin's lymphoma.

Trabectedin this was the first marine natural molecule approved for clinical use in cancer chemotherapy and was the first drug in 20 years to be validated for the treatment of soft tissue sarcoma.

- Eribulin used to treat advanced metastatic breast cancer, and it became the second line of treatment for liposarcoma therapy.

Marine Drugs for Cardiovascular Diseases

Brentuximab vedotin (Adcetris) – Targeted cytotoxic drugs - extracts obtained from the gastropod mollusk *Dolabella auricularia*, which is found in the Indian Ocean, stood out for their pronouncedanticancer activity.

The marine-derived compound such as omega-3 acid ethyl esters, xyloketal B, asperlin, and saringosterol showed promising results in several CVDs. The present review focuses on marine-derived compounds' cardioprotective potential for hypertension, ischemic heart disease, myocardial infarction, and atherosclerosis.

Marine Drugs for Diabetes

The marine world has evolved as a remarkable source of antidiabetic agents and hence provided a new dimension in this book chapter. The marine-derived bioactives are obtained from diverse marinesources like brown algae (5%), red algae (4%), sponges (31%), green algae (1%), mollusca (6%),microorganisms (15%), ascidians (6%), and coral (24%).

Brown algae

• *Pelvetia*

Pelvetia represents the genus of marine macroalgae that has four species 70% methanolic extract of *Pelvetia babingtonii* produced a potent inhibitory action against the enzyme α-glucosidase thatreduced the blood glucose level by 75%.

• *Ecklonia*

E. stolonifera were also found to be active in suppressing the enhanced blood glucose level by 60%and lipid metabolism by 50% in KK-Ay diabetic rat models.

• *Laminaria japonica*

Laminaria japonica is a marine foodstuff whose rhizoid was used traditionally in China for treating DM Bioactive compound butyl-isobutyl-phthalate was isolated from *L. japonica* and in vivo studiesindicated that it can lower the blood glucose level at a dose of 300 mg/kg and hence produce the hypoglycemic effect.

• *Sargassum cristaefolium* Agardh

The extracts of *Sargassum cristaefolium Agardh* were found to be rich in bioactive compounds like fucoxanthin and polyphenols that not only exhibited inhibitory potential toward two enzymes αamylase and α-glucosidase but also had the potential to stimulate the secretion of insulin.

Green Algae

• Chlorophyta

Ulva lactuca L. is one of the commonest green macroalgae that have a high concentration of polysaccharides and could potentially lower the blood glucose level by inhibiting the major enzymes that play a contributory role in the digestion of starch and their digestion in the small intestine and plasma.

Corals

Insulin isolated from the dogfish *S. canicula* resembled that of the human insulin with a nearly equivalent receptor binding capacity and could significantly lower the blood glucose level.

These are just some examples of marine drugs for diabetes.

Marine drugs for Malaria

Marine-derived antimalarials from sponges

• Manzamine A
• Fascaplysin and homofascaplysin A
• Cymbastela hooperi
• Kalihinane diterpenoids
  • Marine-derived antimalarials from bacteria
• *Cyanobacteria*
• Marine actinomycetes
• Mollemycin A was extracted from Streptomyces sp.
• cyclomarin A derived from Streptomyces sp.
• Marine cyanobacterium Lyngbya Majuscula,

Marine-derived antimalarials from diverse biota

• Fijian red macroalga Callophycus serratus has been shown to contain novel brominated macrocyclic meroditerpenes which were antimalarial in vitro.
• Dolostatin 10 and dolostatin 15 (potential anticancer agents) are two marine peptides derived from sea hare Dolabella auricularia and their synthetic derivatives-auristatins, have been investigated for their antimalarial activities.

SURVIVAL IN THE DEPTHS

Aashleshaa Mishra, SBS



Just when I begin to believe that I have seen everything in life, our beautiful planet comes up with yet another creation that amazes me to no extent. Often, the thought of being a human can fill you up with the arrogance of being the most supreme on this planet. But is it really so? I don't think so. There are a myriad of creatures inhabiting this splendid space we call '**Earth**'.

The Earth is approximately 71% water. There are so many water bodies present on its surface such as rivers, lakes, ponds, seas, oceans, reservoirs, estuaries, streams and so forth. So much time has been devoted to studying the plethora of species that are found on land and are all around us. But what about the magnificent oceans? Do you think they have been explored enough? It is believed that an estimated **80% of the world's oceans are still unmapped**; one can only imagine how much of it still remains unexplored! Some researchers have also stated that it's easier to travel to the space than taking a plunge to the dark abyss of the ocean. Isn't that incredulous? The question that arises from all these facts is why is it so difficult to scout the gigantic water bodies, after all?

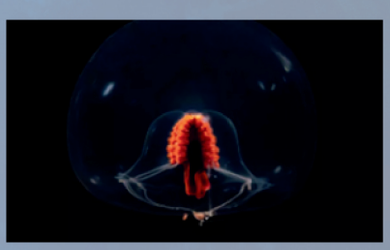
Physics presents the main obstacles to ocean exploration. The water exhibits zero visibility, extremely frigid temperatures, and crushing pressures at vast depths, according to **Dr. Gene Carl Feldman**, an oceanographer at NASA's Goddard Space Flight Centre. He stated that diving to the Mariana Trench's bottom, which is almost seven miles below the surface, would involve pressure that is more than a thousand times higher than that at the surface. "That's like having fifty jumbo jets' worth of weight pressing down on your body."

How is it then the organisms living in the oceans survive the harsh conditions and make their existence possible?

In order to endure in the deep, dark seas, species have evolved physical responses to pressure, light, temperature, and starvation. These responses result in peculiar physical traits that endear an organism to onlookers. Marine life responds to pressure in different ways. The majority of deep-sea fish have undergone significant internal adaptation from species on the surface. Surface level, or epipelagic fish, have a structure called a gas bladder used to maintain buoyancy. The bladder can be compressed to lower itself or filled with gas to rise to the ocean's surface. Deep water fish, however, are incapable of doing this because the pressure would rupture their gas bladders, killing them. All marine life found in the deep sea is compressed to resist the extreme pressures there.

This results in muscles that are more flexible and "watery" than bones, and muscles that can withstand pressure longer than those of any land organism. The absence of light and frigid temperatures are two more obstacles that deep water marine species have surmounted. It is completely dark below because light barely reaches a depth of 200 metres. Certain creatures use a chemical process called **bioluminescence**, which results in the emission of light with a green or blue wavelength, to create light in order to see. Marine life often uses this light for two purposes: observing their surroundings and making their way through the deep darkness. or for going hunting.

Since many creatures that live in the dark are drawn to light, light serves as a bait for prey, which the predator eventually kills when it gets close enough. Using their long antenna with a "light bulb" hanging off, lantern fish are a well-known example of this type of hunting.



The deep-sea snow globe jelly's red stomach aids in its concealment by masking any bioluminescent prey it could devour.



The Gossamer worm (Tomopteris sp.) is one of the few deep-sea species that make yellow light.

Deep sea organisms are similarly impacted by cold temperatures since light cannot reach the depths of the ocean. Slowing down or stopping metabolisms and utilizing that energy to create heat is one way to solve the problem. Certain species can readily withstand freezing temperatures because they lack the ability to regulate their body temperature, i.e., they are cold-blooded or poikilotherms. Because food is limited, it is essential for organisms to store energy. This is accomplished by decreasing mobility and slowing down metabolic activity. Within the deep ocean, a large number of organisms primarily consume organic waste known as detritus from higher-order organisms. As energy is needed to power muscles for movement, an organism's energy efficiency increases with decreased mobility.

Small movements have been achieved by a multitude of marine organisms. The majority of marine life in the deep sea is referred to as drifting, meaning that they move to different areas in quest of food while letting the ocean's current carry them in a single direction. This conserves a massive amount of energy. With their long, flexible jaws, the larger organisms—which are not drifters—can easily consume any adjacent food.

Surreal, isn't it? After reading and researching about all these organisms, one is just compelled to think about how we humans even have the audacity to call ourselves the greatest when there are so many magical creatures out there surviving in the toughest of environments.

Giant Isopod is a very interesting deep sea creature which can grow up to 16 inches in size! This colossal crustacean slowly roams the seafloor, feeding on dead animals. It is found in deep cold waters and can withstand depths of over 7,000 feet!



The power of phytoplankton

Hema Harini, SBS

The ocean is teeming with organisms so small you can't see them, including populations of microorganisms called phytoplankton. Despite their microscopic size, they play a crucial role to help drive the global carbon cycle. The recent research on this topic makes us wonder if we could use this knowledge to restore a balanced carbon cycle.

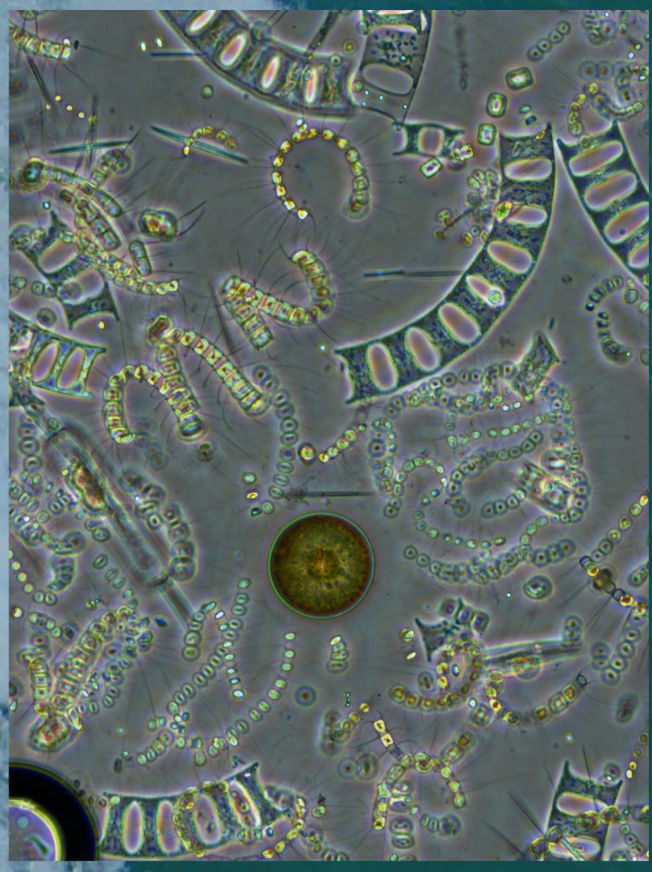
Our microscopic friend - phytoplankton, is made of two main groups: photosynthetic cyanobacteria and the single-celled algae drifting in the top layers of the vast ocean. Their major role is to provide food for the oceanic creatures, either directly or indirectly. Much of the oxygen that permeates the atmosphere is emitted by them. Fossils of these organisms are now being used as fuel in the form of liquid carbon. The recent focus on phytoplankton is on their role in cycling carbon dioxide from the atmosphere to the biosphere, thereby controlling Earth's climate.

The earliest evidence for the importance of phytoplankton on a global scale was found in the 1930s. Researchers collected different samples of sea water across the world and then estimated the relative quantities of carbon, phosphorus, and nitrogen. They are regarded as the elements needed to construct essential cellular molecules in both phytoplankton and sea water. It was observed that these ratios were not vague but were rather definite. All the samples had a fixed 16:1 ratio of nitrogen to phosphorus atoms, which was the same ratio as in phytoplankton. It was after 20 years, it was proposed that phytoplankton not only reflected the chemical composition of the deep ocean but also created it. This was based on the idea that the phytoplankton and the organisms that consumed them died; these settled down in the ocean bed, where they were decomposed by microorganisms, thus releasing nitrogen and phosphorus, making the sea waters contain the same chemical composition as phytoplankton. It was discovered that in the 4.6 billion years of history of the planet Earth, it had no free oxygen for the first half of its history. It was only in the past 2.4 billion years that it started accumulating oxygen. The focal point is that the planet had no land plants to create oxygen; the whole of the oxygen production was solely dependent on the phytoplankton, which created the atmosphere rich with oxygen.

Phytoplankton provide organic material for oceanic creatures. This is done by consuming carbon dioxide that would otherwise dissolve in the ocean waters, making it more acidic. If this carbon dioxide is removed from the ocean waters, then most of it would have to diffuse in the air, which would disturb atmospheric levels of gases, thereby making them a crucial factor in maintaining the global carbon cycle. Through further research, it came to light that measuring the primary productivity of an ocean ecosystem would shed light on carbon cycles in the ocean. In oceanic food webs, phytoplankton forms the base. Therefore, the determination of the phytoplankton's productivity will also help indetermining the carbon dioxide uptake from the atmosphere. The results showed that the phytoplankton present across the world incorporate 45–50 billion metric tonnes of inorganic carbon into their cells.

Thus depicting the crucial role of phytoplankton in the conversion of carbon dioxide into plant and animal tissue. Although the photosynthetic biomass of phytoplankton on Earth is less than one percent, they contribute almost half of the world's total net primary production. Hence, they are an important component in modifying the planet's carbon cycle.

The organic matter absorbed by the phytoplankton faces two different conditions, considering the fact that they do not possess roots, trunks, or leaves. In the first condition, the phytoplankton present in the top 100 metres of the ocean is consumed by the heterotrophs, animals, and several microbes present in that layer. This is a carbon dioxide-releasing process, and the released carbon dioxide is again consumed by the other phytoplankton along with the sun's energy and used for their growth. In this method, the carbon dioxide levels in the top layer of the ocean are in a steady state, and no gas is pumped into the deep ocean. Whereas in the second condition, the dead phytoplankton, along with other organic wastes of oceanic creatures, sinks in the ocean bed, where microbes break them down and convert them into their chemical components. Since the lower waters of the ocean rarely mix with the upper waters, the carbon content is stored in deep waters, with the upper layer acting as a biological pump, sending carbon dioxide to the ocean bed.



There are over 200,000 species of of these tiny marine plants that use sunlight and nutrients to grow and reproduce at the ocean's surface.

The carbon-based fuels that we have been using for over a century now are from fossilised phytoplankton, which took millions of years for its formation. Recent anthropogenic activities combined with the extinguishing of fossil fuels have increased atmospheric carbon dioxide levels to 390 parts per million, which is almost 40% higher than the pre-industrialization era. This global warming has led to the slowdown of the phytoplankton-driven pump. Further studies have shown that the upper layers of the ocean have gotten warmer, which makes them less dense and devoid of nutrients that are usually obtained by mixing them with the cold and nutrient rich waters below. This in turn is affecting phytoplankton growth, resulting in slower levels of carbon fixation, altering ecosystems, and leaving more carbon dioxide in the atmosphere.

While further research is being conducted about microbes playing such a huge role in maintaining the biogeochemical cycles, there are also practical ambiguities on how long phytoplankton can keep clearing the mess that humans have created through global warming and how this knowledge about phytoplankton can further be used to protect our planet. Ultimately the microbes will keep on sustaining and help maintain the biogeochemical cycles, as they have for billions of years. Understanding them better will help the mankind survive as well.

GENETIC ENGINEERING IN DEEP SEA ORGANISMS:

A new area in synthetic biology

Aditi Gaur, FBS

How may genetic engineering be used to improve deep-sea organisms for their survival and adaptation?

Through stem cell research, genetic engineering has the potential to help deep-sea organisms survive and adapt. Stem cells could be cloned and sub-pooled for genetic experimentation to test different traits in a single coral. This would enable scientists to establish which traits are favorable for survival and adaptation in the deep sea environment. Furthermore, industrial-scale production of coral larvae could use stem cells from newly created breeds. Such an approach would allow scaling up efforts to restore large sections of coral reefs destroyed by environmental factors like climate change and ocean acidification. The production of genetically engineered coral larvae with traits that enhance their survival in harsh conditions could help rebuild reef ecosystems and increase the resilience of deep-sea organisms. These developments in genetic engineering could have a major impact on the preservation of deep-sea biodiversity as well as fostering sustainable marine resource management.

What are the potential biotechnological applications of genetically modified deep-sea organisms?

The possible biotechnological uses for genetically modified deep-sea organisms are numerous and varied. Deep sea thermophiles, halophiles, and psychrophiles can produce new thermostable, pH-stable, cold-active enzymes with notable industrial importance. For instance, some of these enzymes including Thermolysin (Deep Sea thermophilic protease) and Pre-Taq Protease are used in generating dipeptides or cleaning up DNA before PCR amplification. Bacillus sp. JM7 Keratinase Ker02562 isolated from the deep sea is important in detergents as it is stable at high temperatures and alkaline conditions.

The lipolytic nature of Halophilic enzymes from the deep sea offers opportunities for the production of biodiesel, polyunsaturated fatty acids, and food. Halophilic amylases from deep-sea bacteria can be used to treat wastewater with high salt concentrations and starch residues. Again, novel β-agarases that are thermostable, pH stable, and endolytic on agar degradation for potential biotechnological applications in food have been produced by genetically modified deep-sea organisms. Cold active cellulose-degrading enzymes like glucosidases

How does genetics help our knowledge of deep-sea ecosystems and biodiversity?

A major contribution of genetic engineering to the comprehension of deep-sea ecosystems and biodiversity is its use in biotechnology. Genomic advances have introduced possibilities for conservation frameworks that promote sustainable ocean ecosystems, and genomics could be an innovative strategy to supplement and underpin ocean conservation. We can deploy genomic tools as part of strategies to conserve biodiversity, fight diseases, or offer synthetic substitutes. While its application in wild ecosystems is still low, there are prospects that it might enhance our understanding of deep-sea ecosystems and biodiversity. For example, genetic engineering could bring about new ways of addressing threats to ocean health. One way this could be used is by creating organisms that are capable of breaking down pollutants in the sea, or organisms that can adapt to changes in their environment. These genetically modified organisms would provide valuable information on how deep-sea ecosystems operate as well as suggestions on how they should be protected. Thus if we continue to unfold all its aspects, genetic engineering may significantly redefine our grasp on deep-sea ecosystems as well as biodiversity.

IMPACT OF CLIMATE CHANGE ON FISHES

Kajal Chauhan, TBS

The world's seas, which cover huge areas and are home to amazing biodiversity, are facing unprecedented challenges as a result of climate change. Fish, among many other marine species affected, are important indicators of the health of marine ecosystems. Climate change has led to obvious shifts in fish habitats. Rising ocean temperatures force many species to migrate poleward or to deeper, cooler waters in quest of more favorable environments. This disruption in distribution can cause ecological imbalances, since predators and prey may no longer cohabit peacefully, impacting the structure and function of marine ecosystems. As atmospheric CO2 levels grow, the ocean absorbs a large amount, leading to acidification. This poses a serious hazard to fish, particularly species that rely on calcium carbonate structures like shells and skeletons. Impaired calcification can impede growth, survival, and reproductive success, threatening fish populations' resilience. Climate change can interrupt fish life cycles by altering ocean chemistry and temperature. Water temperature changes can cause alterations in spawning seasons, influencing the timing and success of reproduction. Furthermore, variations in ocean pH can disrupt larval growth and survival, potentially resulting to population losses and reduced genetic diversity Fish species rely on important environments such as coral reefs, mangroves, and seagrass beds for shelter, food, and nursery regions. However, these essential ecosystems are threatened by climate change-related phenomena such as coral bleaching, sea level rise, and coastal erosion. The loss and degradation of these habitats deprives fish of important supplies, making them more vulnerable to other stressors. Climate change has far-reaching effects on fisheries and coastal communities worldwide, not only ecological concerns. Declining fish supplies, changing distribution patterns, and habitat destruction endanger the livelihoods and food security of millions of people throughout the world who rely on fishing for nutrition and profit. Furthermore, climate change-exacerbated socioeconomic inequities intensify the issues that vulnerable people face.

Climate change's impact on fish is a harsh reminder of the connection of human activities and ocean health. Urgent and coordinated action is required to address the core causes of climate change, reduce its effects on marine ecosystems, and strengthen fragile fish populations. We can work toward a more equitable and sustainable future for fish and the countless livelihoods they support by adopting sustainable practices, safeguarding important habitats, and increasing international cooperation. Let us act decisively to protect our oceanic guardians while also preserving the beauty and abundance of our oceans for future generations.

What is one way in which climate change affects the distribution of fish species?
a) By causing ocean currents to change b) By increasing freshwater availability
c) By reducing predator-prey interactions
d) By promoting migration to cooler waters



INTERVIEW

WITH BIOSCIENCE ALUMNA

INTERVIEW WITH ADITI SHARMA

Ms. Aditi Sharma an alumna of Sri Venkateshwara College's 2014-2017 B.Sc. Biological Science Batch, currently serves as an Associate Producer and Researcher at Riverbank Studios. With extensive experience in long-format productions and documentaries, she excels in crafting narratives that resonate with viewers and promote meaningful change. Her portfolio encompasses a diverse range of subjects, including but not limited to climate change, forests and ecosystems, and rivers.



SCAN THE LINK TO WATCH THE WHOLE INTERVIEW !!



Q A with Aditi Sharma



Q1| Your thesis was based on threat identification, microplastics assessment conservation of olive ridley turtles and project troubled waters focused on a Gangetic river dolphin. Could you explain the effects of climate change and pollution on aquatic life, and the potential risks and future threats posed to them based on your observations?

An Olive ridley female hatchling just a day old moves towards the sea and returns back after 16 years to lay eggs in the very same place she was once born. Isn't that amazing? Without any Google navigation how are these species able to come back to the same place? Crossing thousands of kilometres of tropical seas swimming against the waves... Olive Ridley arrive at the coast of Odisha.

This caught my attention and made me go to nesting grounds of Rushikulya to explore and to witness this spectacular and rather unique mass nesting event - arribada, which is indeed a homecoming for the.. turtles. Olive ridley turtles are the smallest and most abundant of all sea turtles found in the world, inhabiting warm waters of the Pacific, Atlantic and Indian oceans. These turtles, along with their cousin the Kemps ridley turtle, are best known for their unique mass nesting called Arribada, where thousands of females come

Situated on the east coast of India, Odisha serves three mass nesting sites to ridley turtles Gahirmatha, Devi and Rushikulya. However, when I visited the Odisha coast in 2019 for my dissertation thesis, there was no arribada. This was probably due to climate change and plastic pollution, which affected the nesting season. Though found in abundance, their numbers have been declining over the past few years, and the species is recognized as Vulnerable by the IUCN Red list.

Evolution of sea turtles on earth started 100 million years ago and since then they are known to adapt to marine ecosystems, fighting harsh climatic conditions and natural predators.

During my study I found out that microplastic content was higher in the turtle nesting line whereas macroplastic dominates in the high tide line. Microplastic found having higher specific heat capacity and larger surface area can hamper the sex ratios and hatching success. One major issue for sea turtles is that their sex is temperature-dependent. If the temperature is above a specific point, all the eggs will hatch as females. If it's lower, all the eggs will be males. The Gangetic River dolphin is another species affected by human activity. They are genetically blind adapting to the murky water of the Ganges, relying heavily on sonar echolocation for navigation. However, commercial vehicles in the river and sand dumping have disrupted their habitat, making it difficult for them to navigate. Smaller streams created by dumping sand can trap dolphins and their young, affecting their genetic pool and population.

To sum up all I can say is, Climate change is a heavy term, and its effects may not be evident until 20 to 25 years into the future. However, it is a significant issue that we must address. Earth can deal with the changes, but we must also do our part to help.

Q2| With your ongoing show on hotstar snake's SOS Goa's WILDEST What are some misconceptions or myths about snakes prevalent in the local community, and how do you address them through your rescue work?

Snakes are a topic which used to scare me a lot before I started working on a show about them. In Hindu mythology, we worship cobras as Lord Shiva is often depicted with one. I came across a lot of stories about snakes and it was really eye opening to find that most of these are just myths, that's been told over generations to create fear. There is a myth that cobras drink milk, which people often feed them during the festival of Naag Panchami. However, this is untrue as snakes are lactose intolerant and cannot digest milk. In reality, feeding them milk can harm them and even cause their death. Rat snakes are non venomous harmless snakes, but there are myths that rat snakes can sting with their tails, which is completely untrue. Then there is a myth about a snake called Whittaker's boa, people often perceive it as a two headed snake but actually the tail of this snake is as thick as its head which it uses as a defence when a predator tries to attack its head.

As I worked on the show, I learned that snakes are shy and delicate creatures that try to avoid humans whenever possible. I have come to love snakes, whether they are venomous or non-venomous, as they are fascinating creatures. Snakes SOS- Goa's wildest, had a positive impact on people's perception of snakes. It has helped to dispel myths about snakes and educate people about their behaviour. The show is in its fifth season, and we have shot almost 50 episodes. We often encounter people who are scared of snakes and their first response is to fanfic and sometimes even kill the snake. However, we have also met people who have watched the show and are now more aware about snakes and their behaviour. They can differentiate between venomous and non-venomous snakes and know how to behave when they spot a snake.
The primary goal of the show was to change people's mindset about snakes and to help them understand that snakes are not as scary as they seem. We have succeeded in this goal to a great extent. Children who were once scared of snakes are now curious about them and want to learn more. They know that not all snakes are venomous and that they can coexist with humans peacefully. In the show, we rescue snakes and educate people about their behaviour and habitat. We hope to continue this work and create more awareness about snakes and their importance in our ecosystem.

Q3| Two of your projects, "Rivers of Hope" and "Troubled Waters" both delve into the impacts of climate change on communities and ecosystems. What insights did you gain from these projects, and were there any surprising discoveries along the way?



Climate change stories are getting hard to tell without getting emotional. It takes great courage to face the consequences of something that you bear the least responsibility for. In these islands, where the river is supreme, people watch their homes and livelihoods being shaped by the rising tides. 'Rivers of Hope' tells stories from Bangladesh's vulnerable families facing climate shifts: floods and cyclones in a water-rich land. In the Bay of Bengal, where cyclones strike more frequently, fishermen rely on the 1090 helpline for vital cyclone and flood forecasts. These calls inform their decisions, ensuring a safe return home.
Bangladesh is known as a water country. With over fifteen international rivers flowing through it, the country is among the most disaster-prone in the world. The film highlights Jalil, Krishna, and Rasheeda's struggles, offering hope through timely information to build climate resilience and save lives.

In Kurigram, we observed where rivers provide their livelihood, Krishna, his wife, and young son Bipen have endured the heartache of their home being washed away not once, not twice, but a staggering 14 times, a relentless cycle of floods and erosion that left them with aching hearts and empty hands.
Jalil's story is a testament to the strength of the human spirit. Despite facing the relentless floods that have washed away his farmland, he remains as calm as the serene waters he once fished. From the tender age of 12, he's been a nomad, moving his house with the changing seasons like clothes. Today, he works tirelessly in other people's fields, but he doesn't carry the burden in his heart. He believes it's Allah's wish, and his faith sustains him.

Rashida Begum, a symbol of unwavering strength in the face of countless cyclones. She married a widower, who tragically lost his family to the Sidr cyclone. Together, they have two daughters and one son. Rashida is single-handedly raising them, as her husband has lost his vision post the cyclone. Rashida's resilience shines through as she tells us about leaving her home during cyclones, only to return because she has nowhere else to go. Every day, she starts by tending to her cattle and watching her ducks play in the small pond in front of their house, a common sight in this village. Then, she sets out to fetch water and prepares meals for her family. She finds solace and strength in her faith, offering her prayers and is determined to make her daughter a doctor to serve people, inspired by the heroic doctors who save lives during floods and cyclones.

Despite annual cyclones, floods and devastating losses, these families persist with remarkable determination, aspiring to educate their children and help humanity. Their story is a testament to the indomitable human spirit and capacity for happiness. Truly inspiring.

Q4| How do you navigate the balance between scientific accuracy and captivating storytelling in your documentaries?

Not all documentaries strive to create social change and nor should they. But for those that do, understanding research approaches and tools – and identifying them appropriately in the beginning phases of a project, not only the final stages – is invaluable for capturing social impact. One of the most critical aspects to keep in mind is the fine line between stating facts and overstating them. The importance of maintaining a balance between these two cannot be overstated. While it is crucial to sensitise the audience to issues, one should avoid causing them to feel hopeless by presenting the information in a manner that instils a sense of hope and action.

In this field, scientific accuracy is paramount, and it is essential to reference available research papers and magazines to ensure that the information presented is reliable.

However, one should not solely rely on these sources to gauge the impact of a community's situation. In reality, one can only truly understand the impact of such issues by being physically present on the ground, engaging with the people and understanding their experiences and perspectives. To achieve this, it is essential to have a script in place before filming, which outlines the key facts and issues that need to be covered. However, it is equally important to be flexible and adaptable to the reality on the ground. This means that one should be willing to adjust the script as needed to ensure that it accurately reflects the situation.



As someone who came into filmmaking from a research background, I am committed to making research more accessible to people. Therefore, it is vital to ensure that the information presented is accurate and not misleading. If there is any doubt about the accuracy of a fact, it is better to wait until it can be verified rather than risk spreading misinformation. Documentaries and films have the power to shape public opinion and perception. Therefore, it is our responsibility to ensure that what we present is factual and unbiased.

Even the smallest detail can have a significant impact on how people perceive a particular issue, which is why it is imperative to conduct thorough research, verify the information, and fact-check the content before publishing it. For example, in a recent season of Roadies, a contestant was seen with an iguana and a ball python, which led many viewers to question its legality. Such instances showcase the power of media to influence generations. Therefore, it is our responsibility to ensure that the content we present is accurate, well-researched, and unbiased.



Q5| For students interested in pursuing a career similar to yours, what practical steps or opportunities would you recommend they pursue to gain relevant experience and skills in the field?

Wildlife filmmaking is a career that requires a lifelong commitment, with no easy or quick steps to success. Unannounced roadblocks can disrupt career plans, be it COVID, a sudden accident, family emergency, it could be anything.

Commitment, passion and desire to not give up on the work is the utmost thing. It is tiring when you have to go through sleepless nights, early call times, long shooting schedules, multiple edit cuts, this is the reality of it. But I enjoy it, and I LOVE IT! The most difficult time for me is the dry spell when I don't have any projects to work on. My journey into wildlife filmmaking began at Venkateshwara College in 2017, where my mentor and colleague, Mr. Mike Pandey, attended a conference. During my interaction with him, he remembered me, and later, while pursuing master's in environment management, I reached out to him expressing my desire to work with him. To my surprise, he accepted my application, and I began working with him. My passion for wildlife filmmaking started with the show "Earth Matters," which I used to watch as a child. Today, working in this field feels like a full circle. My experience has taught me to keep trying and never give up on my dreams, and sometimes, destiny plays a role in one's career path. For those interested in pursuing a career in wildlife filmmaking, I recommend watching numerous documentaries and studying the work of other professionals to determine what aspects you like and dislike. Making a documentary is not one person's job, it's a team effort. Deciding a niche for yourself is important, what role you would like to do while working on documentaries. Pick a role, be it a director, producer, editor, researcher or a cameraperson and start working in that direction. Enrol for a professional and if you want to follow what I did then write to people for
internships, learn for a couple of years in their guidance. Remember, keep dreaming, keep trying, keep failing, and you will eventually succeed. Also, don't forget to have fun :)

OU
DEPAR



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Societies

WE'RE A PART OF

01

Enactus

Mehak Hira, SBS
Project Head

Srijal Jain, SBS
Project Development Head

Rahul Verma, SBS
PR & Outreach Head

Members
Fatima, FBS
Aditi Gaur, FBS
Jeeya Arora, FBS
Mohd Tahoor, FBS
Kritika Chaturvedi, FBS

02

Fine Arts Association

Srijal Jain, SBS
Creative Head
Treasurer

Members
Fatima, FBS
Sanskriti Nawale, SBS
Aditi Pandey, SBS

03

Leonci Art Society

Hema Harini, SBS
Social Media Head

Members
Niharika, FBS
Mohd Tahoor, FBS
Kritika Chaturvedi, FBS

04

Youth India Foundation

Mehak Hira, SBS
General Secretary

Srijal Jain, SBS
HR Head

Members
Gargi Sajwan, TBS
Rahul Verma, SBS

05

Exordium

Members
Rounak Rathod, FBS
Dakshita Mishra, FBS
Megha Chandilla, TBS
Aman Ojha, TBS

06

English Debating Society

Members
Aditi Gaur, FBS
Jeeya Arora, FBS
Mohd Tahoor, FBS
Sanskriti Nawale

07

Petrichor

Members
Aditi Gaur, FBS
Srijani, FBS
Akangkha Choudhury, TBS

& Others

Women Development Cell
Gauravya Mohan, TBS
Jeevika Bhatt, TBS

Blue Chip
Shruti Mishra, SBS
Yash Tyagi, SBS

Conquiztadors
Mohd Abaan Kurikkal, TBS
Gauravya Mohan, TBS

Verbum
Ananya Bansal, FBS

Nritya
Reetika, TBS

Empathise
Aastha Tomar, FBS

Verbum
Ananya Bansal, FBS

Brainiacs
Manas Jaiswal, FBS

Cushy Book Club
Jeevika Bhatt, TBS

Ascend E-Cell
Rahul Verma, SBS
Research & Content Head

Effulgence Photography
Kritika Chaturvedi, FBS

Crescendo
Kritika Chaturvedi, FBS
Durani Sikha Kakoty, FBS

Competitions

OUR ACHIEVEMENTS

First Year

Aditi Gaur

Secured second position in IBTIDA - Anokhii: Project Presentation Competition organized by NSS of Gargi College

Second Year

Ayush Dev

Secured second position in ECOTILE Competition organized by Sri Venkateswara College

Final Year

Gargi Sajwan

Secured third position in G 20 Awareness Quiz Competition organized by National Cadet Corps (NCC) of Sri Venkateswara College

Mayank

Secured First position in Volleyball Tournament organized by National Cadet Corps (NCC) of Sri Venkateswara College

Kanupriya

Secured First position at the Darkoom photography competition organized by IRIS - PGDAV college

Internships

SHAPING CAREERS

Final Year

Akangkha Choudhury

University of California, Santa Cruz - Worked on bio logging data to study the accelerometry and dive profile of Northern Elephant Seals.

Indian Institute of Technology, Indore - Worked on bio diesel extraction and bioremediation of oil spills using micro-algae.

IISc - Worked on DNA barcoding of marine invertebrates to study the biodiversity as a part of Autonomous Reef Monitoring System (ARMS) in Andamans.

Anand Prajapati

National Institute of Plant and Genome Research - Worked on the cloning of NLP-9 gene and on the study of the effect on root development of plant in SN (sufficient nitrogen) and SN + salt (NaCl).

Devyanshi Vinod

Sri Vipra - To study the effects of curcuma longa extract on the stz induced diabetic rats.
Mentor : Dr.Jamakala Obaiah
(Department of Zoology)

Gargi Sajwan

Sri Vipra - Worked on Nano-BioPolymers usage in Oncogenic treatment.
Mentor : Dr.Shikha Gulati
(Department of Chemistry)

Gauravya Mohan

Wildlife Institute of India - Plant identification and cataloguing, tree phenology monitoring.

Kanupriya Mahaur

Sri Vipra - QSAR study of common drugs using software tools.
Mentor : Dr. Vinita Kapoor
(Department of Chemistry)

Kevika Goel

Sri Vipra - Worked on Evaluation of Eyelid Tumours and their Metastatic Potential using CAM assay.
Mentor : Dr. P. Jayaraj
(Department of Zoology)

Lavanya Tyagi

Sri Vipra - Worked on Identification and analysis of miRNA-137 targets in Cancer Research.
Mentor : Dr. Ravindra Varma
(Department of Biochemistry)

Megha Chandilla

Sri Vipra - Worked on Identification and analysis of miRNA-137 targets in Cancer Research.
Mentor : Dr. Ravindra Varma
(Department of Biochemistry)

Muskan Aggarwal

School of Life Sciences, JNU - Assisted in transformation of Candida albicans cells and cloning of genes of enzyme complex involved in final step of GPI anchor pathway.

Internships

SHAPING CAREERS

Shivangi

Sri Vipra - Worked on medicinal plants world wide and in india, their uses and maintenance using DNA barcoding.
Mentor : Dr. Amit Vashishtha, Dr. Neeti Mehla and Dr. Aditi Kothari Chhajer
(Department of Botany)

Shivani Yadav

Sri Vipra - Worked on Identification and analysis of miRNA-137 targets in Cancer Research.
Mentor : Dr. Ravindra Varma
(Department of Biochemistry)

Second Year

Ayush Dev Yadav

Insplore Consultants - Preparation of Excel sheet, docs and communication with customers.

Shruti Mishra

VCIS - PRO, Vice Chancellor Office, University of Delhi. Handling media optimization, sorting engagement, and management.

Sudha Archak

VCIS - Department of Botany, University of Delhi.
To observe and study the working of high end lab equipment, managing specimens in the museum's collection, preparation of posters to showcase specimens and highlight plant diseases.

Susmita Verma

VCIS - Department of Education and VC office, University of Delhi. To assist with inventory management, to organize merchandise and drafting. To scan documents and books for DU convocation.

Yash Tyagi

The Investor Corporation - Technical analysis of various stocks and indexes and trade in stock market as per the client requirements.

Kautilya Industries pvt ltd - Worked on industry reports and market assessment, market research, sales analysis and maintenance of database.

Sri Vipra - Worked on carbon literacy : a step closer to life.
Mentor : Dr. Pooja Gokhale Sinha
(Department of Botany)

First Year

Aditi Gaur

STEM today - Researcher at STEM today. To summarise research articles along with supplementary materials.

Girlhood Magazine - Writer at girlhood magazine. To write articles highlighting struggles and reality of women in the society and their achievement.

Caught in the lens

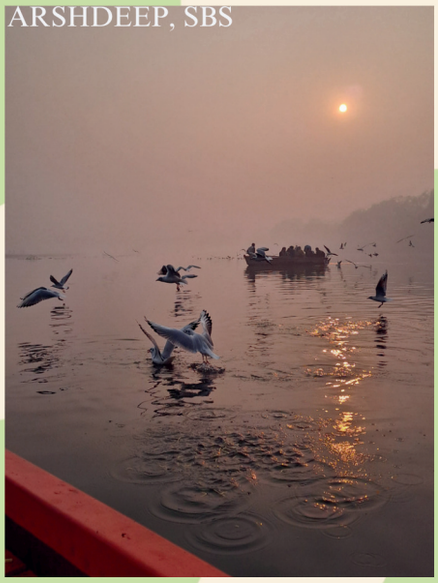
ALFIA SBS



SHWETA, FBS



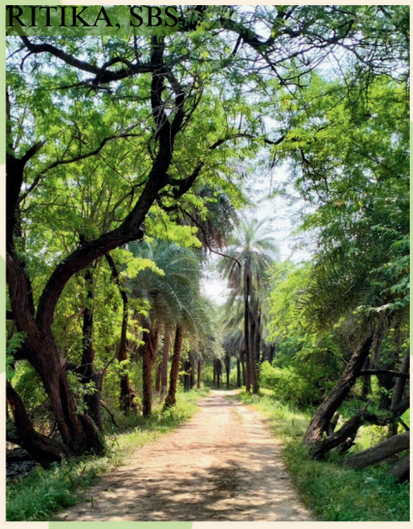
ARSHDEEP, SBS



KRITIKA, FBS



RITIKA, SBS



GARGI, TBS



SHIVANI, TBS



RITIKA, SBS



JON, TBS



KRITIKA, FBS



ALFIA SBS



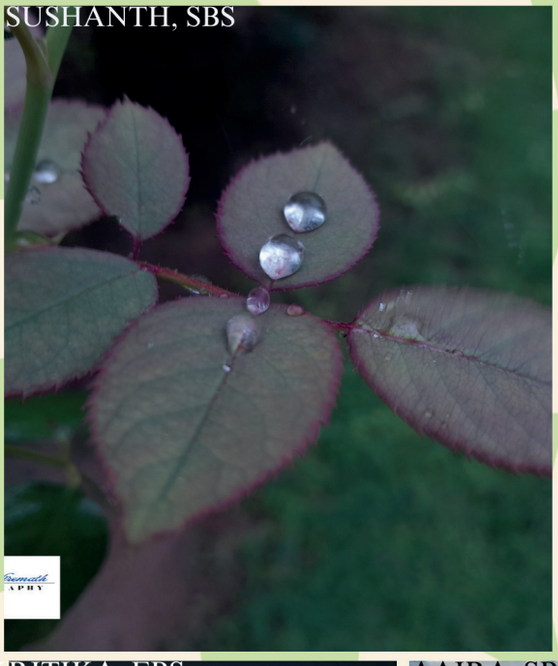
ANASH, FBS



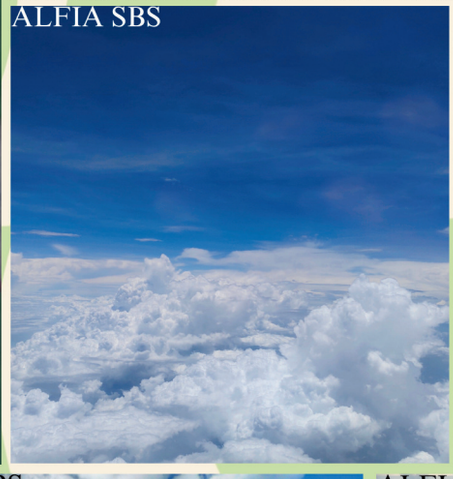
ARSHDEEP, SBS



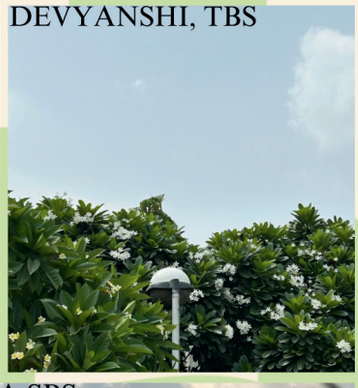
SUSHANTH, SBS



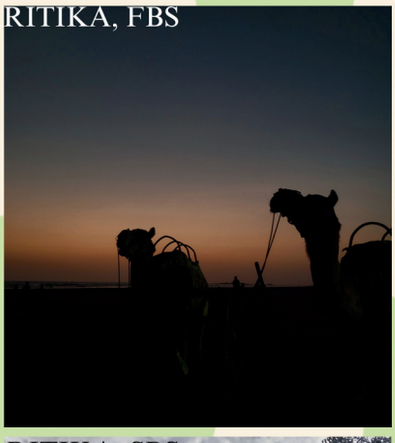
ALFIA SBS



DEVYANSHI, TBS



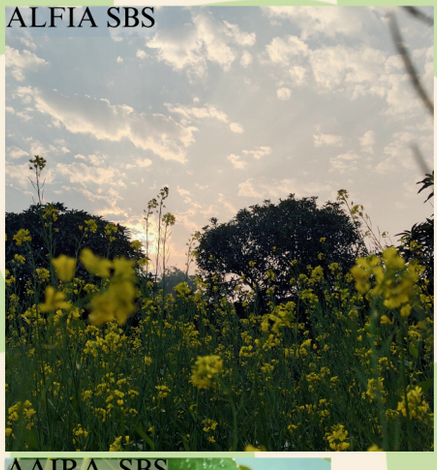
KRITIKA, FBS



AAIRA, SBS



ALFIA SBS



RITIKA, SBS



SUSHANTH, SBS



AAIRA, SBS



INSTITUTES OFFERING OCEANOGRAPHY



1. UNIVERSITY OF WASHINGTON - SEATTLE



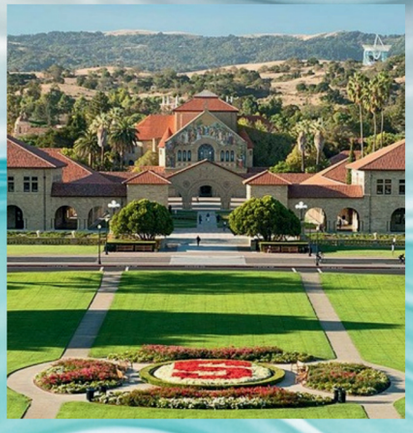
2. MASSACHUSETTS INSTITUTE OF TECHNOLOGY



3. UNIVERSITY OF TOKYO



4. UNIVERSITY OF CALIFORNIA - BERKELEY



5. STANFORD UNIVERSITY



6. ANDHRA UNIVERSITY



7. UNIVERSITY OF HYDERABAD



8. MANGLORE UNIVERSITY



9. ANNAMALAI UNIVERSITY

2023 WRAPPED

2023 WRAPPED
2023 WRAPPED
2023 WRAPPED
2023 WRAPPED
2023 WRAPPED


That
Summer


of
2023

Class of 2024



AMRIT

Always do the right thing no matter what others say. It is you, not them, who have to face the consequences.



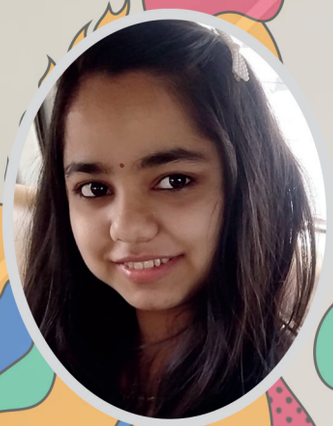
MRIDUL

みんなはいっしょにくににほこりなります。



MUSKAN

Don't let your fears stop you; conquer them, make them your wings and fly toward your goals.



SHIVANGI

Life is like a box of chocolate you never know what you gonna get



KEVIKA

It's either half glass full or half glass empty.



GARGI

life is like a ball which can move in multiple paths, become the wind that can give life the right direction , the right path



ANSHIKA

suno sabki karo apni



LAVANYA

Moshi Moshi



MEGHA

sab the mentally the sick ho gaye h



KANUPRIYA

I spent most of my classes fantasizing about the extra sleep I could've had , had i not turned up.



CHETNA

be happy



JON

If life becomes hard, Go harder because it doesn't like competition



AKANGHKA

i loved the stars too fondly to be fearful of the night.



GAURAVYA

they'll be alright. the sun rises eventually . and if not the rain falls lovingly.



JEEVIKA

free Palestine



PRINCI

inhe the psychiatrickts ki zaroorat h



MAYANK

yes my boy



DEVYANSHI

boy nahi bwoi



SHIVANI

it takes courage to grow up and become who you really are.



TANVI

Accept yourself, love yourself, and keep moving forward. If you want to fly, you have to give up what weighs you down.".



KAJAL

life is like a bicycle, to keep your balance, you must keep moving.



RAKSHA

Don't worry about failures , worry about the chances you miss when you don't even try.



ANKUR

need is just a way not a destination, those who know this will never be fulfilled.



MOHIT

One man can be a important ingredient to a team but one man can't make a team



SHUBHAM

"It's no fun if you don't try other options once you know they exist"



ANAND

You will face many defeats in life, but never let yourself be defeated



KAMRAN

The most difficult thing is the decision to act, the rest is merely tenacity



REETIKA

the little progress you've made today still matters.



ANKITA

The majority of your life is the direct result of your actions, behaviour and choices.



VENKAT

don't lose hope



KUNAL

"Be the love you never recieved "



AMAN

Life is not a problem to be solved, but a reality to be experienced.

OUR DEPA

Batch of 2024



Batch of 2026



.RTMENT

Batch of 2027



TEAM VERDURE




SAVE THE
OCEAN



KOSHIKA 2023

With the view of celebrating science and promoting insight, Chrysalis, the Biological Science Society organized its annual departmental fest, Koshika 23' on 23rd March 2023. The fest incorporated three major events, an inaugural lecture on the theme Science Beyond Borders: Exciting Opportunities by Dr. Renu Swarup, Former Secretary, DBT, Government of India, a Photography Competition and an Innovation Presentation Competition.



The event began with dedicating our warm prayers to God with the invocation ceremony, following which a heartfelt welcome to the guests, teachers and participants was extended. The event-in-charge, Dr. Meenakshi Kuhar gave an introduction to our honorary guest lecturer Dr. Renu Swarup. The event was held in an offline mode and was attended by more than 100 participants, including staff and students. Dr. Renu Swarup started by introducing how people have evolved in the field of science and have created immense changes and developments in our country and spoke about BIRAC, a non-profit organization in New Delhi, implementing mandates through activities like target funding. She motivated the students to step out of conventional fields and to be ready to take risks as entrepreneurs. She gave a comparative account of the resources and scope of research in India and Abroad, emphasizing the development seen in recent years in India. Quoting an example of how a PhD student approached her with an idea regarding entrepreneurship, she talked about how she later implemented it in one of the government schemes and also mentioned how various students went on to create biotech startups which are now mainly located in the states with the help of the funding that BIRAC was able to grant.

Dr. Swarup talked about various government-aided projects like Eyuva, Sitare, the Pandorum Technologies, the Biotechnology Ignition grant and the Startup India initiative which are helping students in pursuing their ideas. These projects provide young minds a headstart on their ideas; as quoted by Dr. Renu Swarup. The lecture was followed by a Q&A session, where the teachers and students asked several thoughtful questions regarding prospects, gaining practical wet-lab skills and DBT provisions for student internships. The end of this session was marked with a vote of thanks by Ms. Aparna and Ms. Mansi, student coordinators of Chrysalis, thanking the esteemed speaker, guests, faculty members and students for being a part of the maiden event.



After a short high tea break, the event was carried forward by Ms. Megha and Ms. Gargi, Student Coordinators of Chrysalis, who announced the top 7 best pictures from the Photography competition conducted on the theme "Nature's warmth", which were judged by Dr. Robin Suyesh and Dr. Ashish Thomas. The event in-charge, Dr. Meenakshi Kuhar and the judge of the competition, Dr. Robin Suyesh announced and awarded the top 2 winners of the competition. Following this, Ms. Prishita, student coordinator of Chrysalis, introduced the Innovation Presentation Competition on the theme "A Sustainable Campus". The competition was conducted by Ms. Lavanya, student coordinator of Chrysalis, wherein multiple teams of students were called upon to present their ideas about a sustainable campus through innovative presentations. After a long and thorough analysis of the presentations by the judges, Dr. Anju Kaicker and Dr. Pankaj, the top 2 winners of the competition were announced and awarded.

Winners of Competitions

PHOTOGRAPHY COMPETITION WINNERS



Priyanshu Shankar
BSc. (H) Botany
SECOND YEAR



Peehu Chouksey
B.c. (H) Biochemistry
FIRST YEAR





SUSTAINABLE CAMPUS WINNERS



Urvi Singh, Shreya Taluja
B.Sc. (H) Biochemistry
Third year



Shradha Jain, Hiral Rawal
B.Sc. (H) Biological Sciences
Third Year



EDITOR IN CHIEF
Devyanshi Vinod



EDITOR IN CHIEF
Kajal Chauhan

VERDURE 2024



EDITOR
Mehak Hira



EDITOR
Hema Harini

CORE TEAM



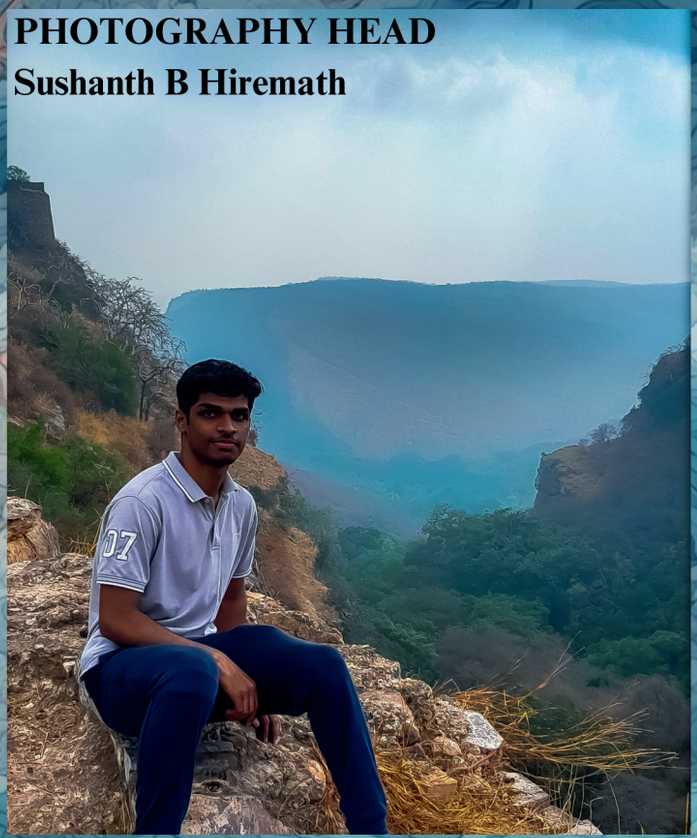
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MESSAGE FROM
the mascot



Hey there! It's me, Lumina, your friendly mascot! I just wanted to take a moment to say goodbye and thank you for joining me on this amazing journey of discovery. We've explored so many fascinating topics together, from mythology to science, and even the habitats of different creatures (including me!).

As we part ways, I encourage you to keep your curiosity alive and continue learning, just like we have during our journey through the depths and waves of the ocean. The ocean is full of possibilities, from the colorful coral reefs to the potential benefits of ocean-based drugs and biotech labs.

I hope you've had a great time reading this magazine, discovering new things, and maybe even solving some crosswords. Every year, we strive to make our content even more exciting and engaging. This time, it was my turn to capture your imagination. I hope you weren't bored and had fun.

On behalf of the entire team of Verdure, I want to thank each and every one of you for staying till the end. You've been an amazing reader, and we hope to see you again next year!

So, with a heavy heart, I bid you adieu. Keep exploring, keep learning, and keep smiling!

Warm regards,
Lumina

About the Back Cover

Devyanshi Vinod, TBS

In the depths of cerulean waves so vast,
Lies a mystery that's unsurpassed,
The ocean's gaze, a mirror of the eye,
Reflecting secrets that cannot lie.

The sea, like eyes, holds tales untold,
A world of wonder, ancient and bold,
In each wave, a glimpse of eternity,
A silent longing for infinity.

Just as eyes are windows to the soul,
The sea reveals stories, tales untold,
Both hold depths beyond compare,
Mysteries hidden, waiting there.

So as we gaze upon the sea,
Let's remember the eyes that see,
A connection deep, profound and true,
Between the ocean's depths and you.

