
Explore the essence of life itself through the lens of biology
QUINTESSENCE
THE CYNOSURE OF LIFE
IV
EDITION
2023-24
Where Science Meets Life, Miracles Happen

Life Sciences a dynamic field in the world of science, encompasses the study of living organisms, their structure, function, evolution, and interactions with the environment. This interdisciplinary domain integrates knowledge from Biology, Chemistry, Physics, and Mathematics to explore fundamental questions about life at various levels, from molecules to ecosystems. It begins with foundational subjects such as cell biology, genetics, and biochemistry, providing a strong understanding of the building blocks of life and the mechanisms that govern biological processes.

As students of Life Sciences, we delve into various specialized areas that offer insights into the diversity of life forms, their adaptations, and how they respond to internal and external stimuli. We learn about the intricate workings of cells, organs, and systems, as well as the principles underlying genetics, disease mechanisms, and ecological interactions. Our practicals focus on imparting hands-on experience to students in laboratory techniques, data analysis, and scientific communication and imparts the skills needed for research and professional endeavours in the field.

One of the defining features of studying Life Sciences is its relevance to real-world challenges and applications. Through classroom discussions, we explore how biological knowledge contributes to advancements in medicine, agriculture, biotechnology, environmental conservation, and beyond. Our learned professors enlighten us with the information about the cutting-edge research, emerging technologies, and ethical considerations, preparing us to address global issues such as infectious diseases, climate change, biodiversity loss, and sustainable development. Through fieldwork, internships and collaborations with experts, our students gain a holistic perspective on the complexities and interconnectedness of life on Earth.

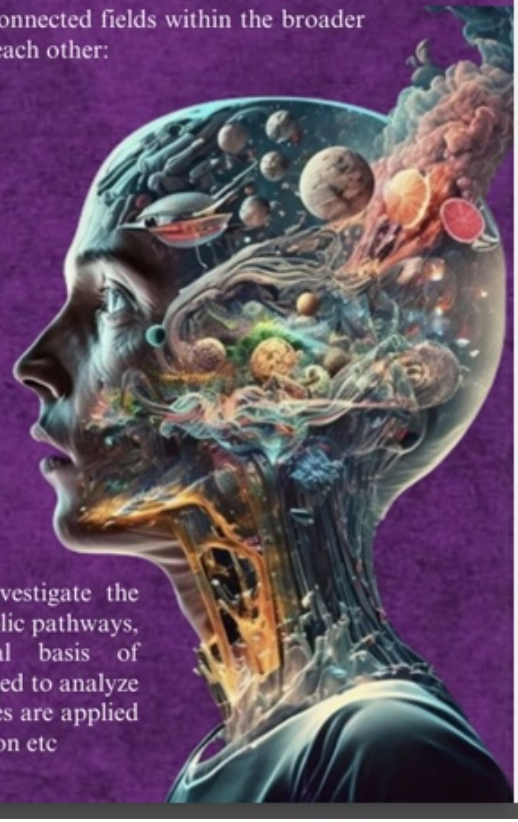
Overall, the course of Life Sciences offers a comprehensive exploration of life in all its forms, from the molecular mechanisms within cells to the ecosystems that sustain biodiversity. It fosters critical thinking, problem-solving skills, and a deep appreciation for the wonders of the natural world. Whether pursuing careers in academia, healthcare, industry, or environmental conservation, students in Life Sciences contribute to advancing knowledge, improving human health, and promoting the well-being of our planet.

Botany, **chemistry**, and **zoology** are three interconnected fields within the broader realm of life sciences. Here's how they relate to each other:

1.**Botany and Chemistry:** Botanists and biochemists investigate the chemical compounds produced by plants, such as pigments, toxins, essential oils, and medicinal compounds. Chemistry plays a crucial role in understanding processes like photosynthesis, respiration, and the synthesis of plant hormones.

2.**Botany and Zoology:** While botany primarily deals with the study of plants, including their structure, physiology, ecology, and evolution, zoology focuses on animals.However, there are areas where the two fields overlap, such as in the study of plant-animal interactions, including pollination, herbivory, seed dispersal, and symbiotic relationships.

3.**Chemistry and Zoology:** Zoologists may investigate the chemical composition of animal tissues, metabolic pathways, hormone regulation, and the biochemical basis of behavior.Analytical chemistry techniques are used to analyze biological samples, while biochemistry principles are applied to understand processes like digestion, respiration etc



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From

PRINCIPAL'S DESK

As we embark on the fourth edition of "Quintessence," our distinctive life science magazine that seamlessly integrates the realms of botany, zoology, and chemistry. With that, our exploration of neuroscience unfolds with an air of excitement and anticipation.

Within the intricate folds of the brain lie the secrets of consciousness, cognition, and the essence of what makes us human. Through the lens of neuroscience, we delve deeper into the complexities of the mind and unravel the mysteries that define our existence.

This edition serves as a beacon of insight, shedding light on the latest discoveries, breakthroughs, and innovations in the field of neuroscience. From the study of neural circuits to the exploration of brain disorders, each article offers a glimpse into the forefront of neuroscientific research and its profound implications for understanding the human experience.

PROF. VAJALA RAVI

"Neuroscience is by far the most exciting branch of science because the brain is the most fascinating object in the universe."
— Stanley B. Prusiner

I would like to extend my heartfelt gratitude to our life science committee, faculty and the editorial team whose creativity, expertise, and hard work have been instrumental in bringing this edition to fruition. May it inspire you to continue exploring, questioning, and uncovering the mysteries that lie within, for the pursuit of knowledge knows no bounds.

TIC'S MESSAGE

PROF. SANJAY KUMAR

It is my pleasure to introduce the fourth edition of "Quintessence," our esteemed life science magazine, dedicated to the captivating field of neuroscience for the session 2023-2024. I am deeply grateful for the enthusiasm and dedication of our students and faculty, whose dedication and passion have led to the culmination of this magazine.

Neuroscience, with its profound exploration of the brain and nervous system, continues to intrigue and inspire both scientists and enthusiasts alike. In this edition, you will find various aspects of neuroscience, from the molecular mechanisms underlying neuronal function to the implications of brain disorders on human behaviour and cognition.

I would also like to extend my gratitude to our Principal, Prof. Vajala Ravi for his continuous support and encouragement of our academic endeavours. His leadership and guidance have been instrumental in shaping the educational landscape of our college, allowing initiatives like "Quintessence" to flourish.

As you explore the pages of this magazine, I invite you to embark on a journey of discovery into the wonders of the brain. May the insights shared within these pages spark curiosity, foster understanding, and inspire further exploration into the complexities of neuroscience. I hope this magazine serves as a testament to the remarkable achievements of our life science community.

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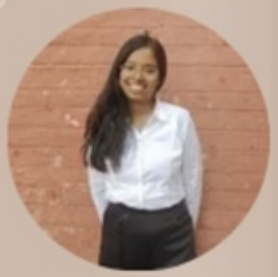

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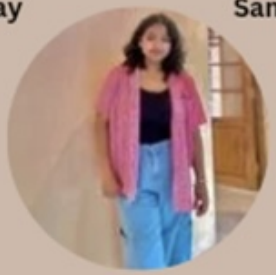

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Prakriti

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Message From Creative Head

Dear Readers,

Welcome to the world of QUINTESSENCE! As the Creative Head, I'm thrilled to share with you the magic of creativity.

Here at QUINTESSENCE, we explore ability to generate new ideas, concepts, or solutions that are original, valuable, and often innovative. It involves thinking divergently, breaking away from conventional patterns, and combining existing elements in novel ways to produce something unique.

The power of creativity lies in its ability to drive innovation, solve complex problems, and inspire change. It enables individuals to approach challenges from fresh perspectives, leading to breakthroughs in various fields such as technology, art, science, and business. Additionally, creativity fosters personal growth, self-expression, and emotional well-being, making it a fundamental aspect of human experience and progress.

Our magazine, while emphasizing aspects of creativity also fosters the coming the together of people who share the same essence of creativity, innovative, and inspiration. We invite you to join us on this journey, participate in our events, initiatives, and discussion. We welcome you to be an indispensable part of this creative outlet we have designed. Thankyou for being with us.

*_"Creativity doesn't wait for that perfect moment. It fashions its own perfect moments out of ordinary ones." – Bruce Garrabrandt_*

Warmest Regards

Naina Goel
Creative Head

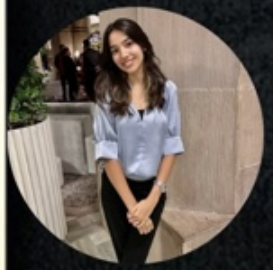
Message From Editors

Anusha

To all my dear readers, It is with great pleasure and excitement that I welcome you to the Fourth edition of our magazine "Quintessence-the Cynosure of Life". As the Editor in Chief, I am honored to present a collection of articles, insights, and perspectives that embody the essence of our publication.

Neurosceience, at its core, explores the very essence of what makes us human – our thoughts, emotions, behaviors, and consciousness. In this edition, you will find a diverse array of topics ranging from the latest advancements in neuroscience to thought-provoking discussions on societal trends and technological innovations. Our team has put forth their utmost effort to ensure that this magazine is both entertaining and informative for our readers. I trust that this magazine will spark curiosity, raise questions, and stimulate your minds regarding this subject.

Your feedback, comments, and ideas are invaluable to us. We welcome your thoughts on the content presented and eagerly anticipate the discussions and insights that will emerge from this shared experience.



Tarannum Chowdhary

As I pen these words, my heart swells with pride and emotion at the thought of presenting to you the fourth edition of "Quintessence," our cherished life science magazine, with a focus on the enthralling realm of neuroscience. It is with a profound sense of gratitude and humility that I embark on this journey of sharing knowledge, inspiration, and discovery with each and every one of you.

In this edition, we have poured our hearts and souls into illuminating the wonders of the brain, offering insights that both astonish and inspire.

To our dedicated team of writers, researchers, designers I extend my deepest appreciation. Your unwavering commitment to excellence and your boundless enthusiasm for science have breathed life into the pages of this magazine.

As you embark on this voyage of discovery through the pages of "Quintessence," I hope you will be moved, inspired, and uplifted by the beauty and complexity of the human brain.

Preface!!

Welcome to the latest edition of our Adhibhutq Magazine "Quintessence- the Cynosure of Life!

In this issue, we delve deep into the intricate workings of the human brain, exploring cutting-edge research, breakthroughs in neurobiology, and the fascinating realms of cognition, emotion, memory, and beyond.

Our team bring you engaging articles, insightful case studies, and thought-provoking discussions, shedding light on the complexities of neural networks, the impact of neuroplasticity, and the latest advancements in neuroimaging techniques.

Whether you're a seasoned neuroscientist, an aspiring researcher, or simply curious about the mysteries of the mind, this magazine is your gateway to the captivating world of neuroscience.

Join us on this journey of discovery as we unravel the secrets of the brain and its profound influence on our lives.

Happy reading!

AN INTRODUCTION TO
NEUROSCIENCE

Neuroscience, the interdisciplinary study of the nervous system, holds the key to unlocking the mysteries of the human brain and understanding the complexities of the mind. At its core, neuroscience seeks to unravel the intricate web of neurons, synapses, and circuits that underlie every aspect of human cognition, behavior, and emotion.

From the molecular mechanisms of neuronal communication to the macroscopic organization of brain regions, neuroscience encompasses a vast array of disciplines, including biology, psychology, physics, and computer science. By integrating knowledge from these diverse fields, neuroscientists strive to answer fundamental questions about how the brain functions, develops, and responds to the world around us.

Through cutting-edge research techniques such as functional magnetic resonance imaging (fMRI), electrophysiology, and molecular genetics, neuroscientists are uncovering new insights into brain function and dysfunction. This knowledge not only enhances our understanding of neurological disorders such as Alzheimer's disease, Parkinson's disease, and schizophrenia but also sheds light on the neural basis of consciousness, memory, and decision-making.

Welcome to the fascinating realm of neuroscience—a journey of discovery that knows no bounds

"Any man could, if he were so inclined, be the sculptor of his own brain."
— Santiago Ramony Cajal

EVOLUTION OF BRAIN

EXPLORING THE WONDERS OF BRAIN EVOLUTION THROUGH THE EVOLUTIONARY LADDER OF KINGDOM ANIMALIA

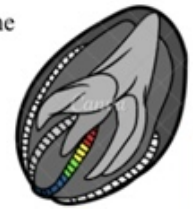
This amazing journey of brain evolution takes us through the diverse realms of the animal kingdom, revealing the adaptations that have shaped life on our planet. From the most basic organisms to the complexity found in humans, the story of brain evolution unfolds in distinct levels.

Porifera

Sponges, the earliest members of the animal kingdom. They lack a true nervous system, and thus, rely on a decentralized network of cells for basic sensory and motor functions.

Cnidarians

Moving on to Cnidarians, a basic nerve net allowing coordination of movements and responses to stimuli is observed. However, their less complex nervous system reflects their place in the evolutionary timeline.



Ctenophores

Ctenophores, or comb jellies, presents an interesting addition to our exploration. They possess a simple nervous system, with nerve nets and statocysts for basic sensory functions.

Flatworms

They may be flat, but their ability to regenerate is truly amazing! Flatworms have a more centralized nervous system with ladder-like nerve cords and ganglia showcasing cephalization. This rudimentary brain allows for more coordinated movements and basic behavioral responses.

Aschelminthes

Aschelminthes, or roundworms, introduce a level of complexity with a longitudinal nerve cord and ganglia, a step towards centralized nervous systems seen in more advanced organisms.

Annelids

Annelids, including earthworms and leeches, boast a more developed central nervous system with a brain composed of a pair of ganglia. This brain coordinates sensory input and controls complex behaviors.

Arthropods

Arthropods exhibit one of the most diverse and complex nervous systems among invertebrates. Their brains show considerable cephalization, thus, enabling a wide range of activities, including learning, memory, and complex social interactions.

Molluscs

Molluscs show a diverse array of nervous system architectures. Cephalopods, like octopuses and squid, have large brains with well-defined lobes and a high degree of cephalization, rivaling that of some vertebrates. This advanced nervous system enables complex problem-solving abilities.

EVOLUTION OF BRAIN

-Deepanshu Pandey, IInd Year Life Sciences

Echinoderms

Echinoderms exhibit a decentralized nervous system with a nerve ring and radial nerves. Though distinct from other invertebrates, their neural adaptations support advanced behaviors such as coordinated movement and response to environmental cues.

Hemichordates

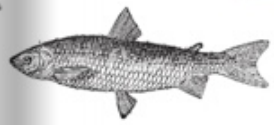
They may be lesser-known, but they're no less intriguing! They provide a bridge between invertebrates and chordates, displaying a dorsal nerve cord and pharyngeal gill slits. Their neural features contribute to our understanding of the evolutionary path leading to more complex vertebrate nervous systems.

Chordates

Where creatures have backbones and big dreams! The journey within chordates begins with Urochordates, or sea squirts, represent early chordates with a simple nervous system. As sessile adults, their nervous system simplifies, retaining basic sensory and motor functions.

Cephalo-chordates

Cephalochordates, like lancelets, show a more advanced nervous system with a dorsal nerve cord and rudimentary brain, setting the stage for further neural complexity in vertebrates.



Jawless Fish

From Jawless Fish, Basic structural features emerge, reflecting an increased reliance on sensory information. In sharks, Distinct regions specialize in sensory processing and motor coordination, adapting to an aquatic lifestyle whereas bony fishes show higher-order sensory processing, sophisticated behaviors, and buoyancy control.

Amphibians and reptiles

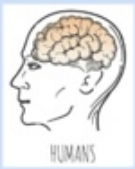
A leap in cognitive complexity supports advanced sensory processing, spatial reasoning, and problem-solving.

Birds

They show amazing cognitive abilities and brain adaptations, particularly in species like parrots and crows. Their brains exhibit sophisticated neural circuitry, enabling tool use, vocal mimicry, and problem-solving.

Mammals

At the highest peak of this evolutionary journey, humans possess the most complex and highly developed brains. Our brains exhibit unparalleled cognitive capabilities, including language, abstract reasoning, and self-consciousness.



CONCLUSION

The story of how brains have changed over time is amazing. It shows how different and flexible life on Earth can be and teaches us a lot about how living things have adapted to survive and do well in a world that's always changing.

Sensory Organs

SENSE AND SENSATIONS :

Our body's sensory organs help us perceive the world and make decisions. Sensory placodes are specialized ectoderm regions in the vertebrate head that contribute to sense organs and cranial ganglia, first described by Von Kupffer in 1891.

EYES: Sense of Sight

The eye is a complex sensory organ with 256 unique characteristics, responsible for 80% of learning. It can process over 50 images per millisecond. The cornea bends light, the iris acts like a camera shutter, and the lens focuses light on the retina. Rod and cone-shaped cells in the retina help create colorful vision. Eye impairments include cataracts, macular degeneration, retinitis pigmentosa, glaucoma, infections, and diabetic retinopathy.

TONGUE: Sense of Taste

The tongue contains taste buds with taste hairs and sensory cells that detect flavors. It can perceive sweet, bitter, salty, sour, and umami tastes. The tongue regenerates cells daily, aiding in quick healing from burns. Additionally, spice is identified as a pain signal, not a taste.

NOSE: Sense of Smell

Humans have over 400 smelling receptors in their nasal cavity, similar to dogs. The olfactory system helps differentiate odors and affects taste. Olfactory cells detect chemicals, sending nerve impulses to the brain for interpretation. Conditions like schizophrenia or brain injury can cause loss of smell (Anosmia).

EAR: Sense of hearing

The ear is a complex organ with external, middle, and inner parts. Sound waves travel through the external ear, vibrate the eardrum and bones in the middle ear, and stimulate the organ of Corti in the inner ear to convert vibrations into electrical impulses for the brain. Ears also contribute to balance. In India, around 63 million people, mainly the elderly, experience hearing loss due to factors like ageing and medical conditions.

SKIN: Sense of touch

The skin, the largest sensory organ, plays a vital role in defense and touch sensation. Specialized neurons transmit touch sensations like pressure, pain, and temperature to the brain, influencing emotions and decision-making. Aging can impact skin sensitivity, leading to reduced touch sensation.

—Suhani Singh
(Ist year Life Science)

Unraveling Motor Circuit Assembly: Insights from Neuronal Stem Cells

Diving into the captivating world of brain pathway construction is like embarking on a thrilling adventure. From the birth of nerve cells to the intricate web of functional circuits, it's a mesmerizing journey. Discover how stem cells take the spotlight in shaping these pathways, bridging the gap between nerve cell types and the molecular magic that ensures our brain circuits run smoothly.

Neuronal Stem Cells in the Motor System

In the magical realm of brain ballet, a cosmic saga of motor circuit birth takes center stage. Imagine a mystical gathering of brainy builders crafting new neurons that defy mere mortal limitations. Recent tales introduce a captivating twist - the concept of temporal squads shaping the motor circuit masterpiece. These squads, emerging together from a single brainy source, hold the secret to sculpting motor circuits' very core. Led by the beat of temporal rhythm maestros, they choreograph the brainy blueprint, molding their size and picking their synaptic buddies. While ancient scrolls sung praises of diverse neurons, a new legend unfolds, revealing the molecular magic that shapes early brain building.

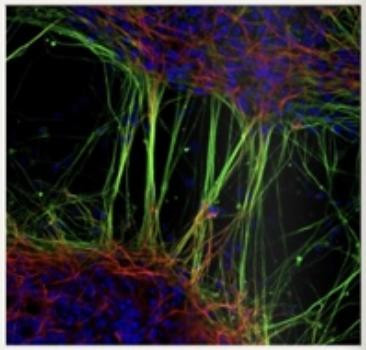


Fig: Neuron deriving from neural stem cell

Notch Signaling: A Regulator of Motor Circuit Assembly

Notch signaling is like the mysterious maestro orchestrating the assembly of motor circuits, shaping the unique identities of neurons and handpicking who gets in the exclusive motor circuit club. This fancy signaling dance starts early in development, influencing neuron types and deciding who joins the cool motor circuit gang. The complex world of Notch signaling in motor circuit formation is begging for more detective work.

Hox Genes and Anterior–Posterior Motor Circuit Diversity

Repeated motor circuits in the spinal cord are like a puzzle along a magical highway, each piece playing a unique role. Enter Hox genes, the maestros behind this circuit orchestra, ensuring each segment dances to its own tune. Despite sharing the same neural stem cell playground, these genes help sculpt a diverse cast of circuits, each specialized in choreographing different moves and sensations. It's like a genetic ballet where every gene has its own pirouette!

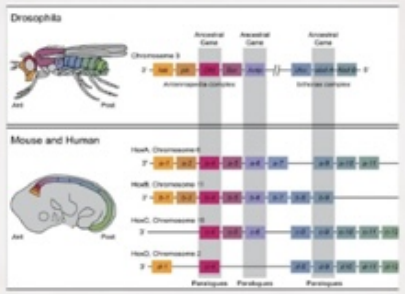


Fig : Hox Genes

Motor Circuits: Unique Features and Challenges

Motor circuits are the rockstars of the brain world! They're like the multitaskers of the central nervous system, juggling movement and processing a bunch of sensory info all at once. These circuits are on a mission to sense touch, heat, light, and keep us on the move. But watch out! If these circuits go haywire, it could lead to wacky perceptions and wonky movements.

In conclusion, we continue to explore the connections between neuronal stem cells and mature circuit features leadning to new frontiers in developmental neurobiology with potential implications for fields ranging from robotics to medicine.

— Deepanshu Pandey
(IInd Year Life Science)

The Intricate Dance of Appetite

The human body is like a superhero, always balancing thirst and hunger signals to match its surroundings. Dive into this article to uncover the secrets of these mysterious cravings and how our body embarks on the epic quest for food and drink!

Thirst Regulation: The Eloquent Cry for Hydration

As quoted by Johnson (2019), "Thirst is the body's sonnet to the elixir of life."

The Hypothalamus, the wise conductor of our body's thirst symphony, reads the signals of osmolarity and plasma volume like a cosmic maestro. In the enchanting chronicles penned by DE Leib and other brainy minds, we uncover the mysterious ballet of deep-brain calcium movements and the enigmatic Subfornical Organ (SFO), painting a vivid picture where thirst is tamed before harmony is restored, highlighting the art of anticipation. The tempting allure of icy waters whispers of an ancient rite of mouth-cooling, a divine elixir to quench not just the body but the soul's thirst too.

A Symphony of Body Regulation

Hunger Regulation: The Gastronomic Ballet

The hunger game is all about the energy dance within our bodies, balancing what goes in and what gets burned up. Back in the 1940s, Hetherington spilled the beans about the hypothalamus being the hunger HQ. Fast forward to today, we've got Ghrelin revving up our appetite while Leptin plays the fullness maestro. It's a tug-of-war between these two hormones to keep our weight and cravings in check. But wait, there's more! Jones and Brown shook things up by diving into the pleasure side of eating, revealing how neurotransmitters like serotonin and dopamine fuel our foodie emotions and reward centers, making us crave more than just a full belly.

In conclusion, the regulation of thirst and hunger emerges as a captivating narrative woven into the fabric of human survival. From the molecular ballet within our cells to the sensory system that guides our choices, understanding these regulatory mechanisms offers a profound glimpse into the intricacies of human physiology.

— Anam Akhtar
(Ist year Life science)

Exploring the Human Brain

Ever wonder why we're able to comprehend things around us or how we're able to remember a small detail from our childhood or maybe why it's imperative to learn certain lessons or things? The answer to these questions lies with science. Everything around us happens for a reason or rather a scientific reason when it comes to aspects pertaining to consciousness, memory, learning, feeling, and sleep.

Consciousness in layman terms refers to, "everything we experience" and while it holds certain truth to it, the above definition cannot fully comprehend the term. Even today, it's not easy for scientists or philosophers to give a proper definition. According to a Journal Article published in Oxford Academic, consciousness is defined as, "a subjective, first-person phenomenon, and science is an objective, third-person endeavor." This relation has led to a search for 'Neural Correlates of Consciousness'. Neuroscience has furnished evidence that neurons are fundamental to consciousness; at the fine and gross scale, aspects of our conscious experience depend on specific patterns of neural activity – in some way, the connectivity of neurons computes the features of our experience. For example, if you were to hurt your spinal cord, you would be paralyzed in the legs, arms and torso, unable to control your bowel and bladder. However, you would still be able to experience, that is you would still be able to see, feel, hear as well as remember things. The neuroscience premise here is that the brain functions as a prediction machine. And it is always making predictions about what is out there and calibrating these predictions with sensory signals. So, we don't deduce the world from sensory signals. We actively create it, yet our active creations are connected to the world in helpful ways.

When we learn something, our memory processing relies on forming connections between neurons in the brain. With around 100 billion neurons in the human brain, synapses play a vital role in connecting neurons. The strength of these connections depends on exposure to stimuli – more exposure leads to stronger connections. This process explains how we learn and remember new information.

A fairly common question asked in the field of neuroscience is, "Do our brains stop working when we sleep?" The answer is actually a big NO!

Certain findings have found that while sleep is important to our brain functions, it doesn't mean that the brain doesn't work just because the body is asleep. Studies according to an article published on the website National Institute of Neurological Disorders and Stroke, suggest that, "sleep plays a housekeeping role that removes toxins in our brains that build up when we're awake. The hypothalamus is made up of nerve cells that function as control centres for sleep. The brain stem, located near the base of the brain, connects with the hypothalamus and regulates the transition between consciousness and sleep. The pineal gland, positioned between the brain's two hemispheres, gets signals from the Suprachiasmatic Nucleus, the natural pacemaker of our body, increasing the production of the hormone melatonin, which helps us fall asleep after the lights go off.

A very interesting fact behind the science of sleep and memory is that when learning occurs prior to sleep, the learnt information benefits from consolidation during. Meaning that you're bound to remember your syllabus more if you're learnt it before sleeping!

Dr. Robert Levenson once defined emotions as "short-lived psychological-physiological phenomena that represent efficient modes of adaptation to changing environmental demands." The brain works through emotions in a sequence of phases. First, incoming information must be evaluated and given an emotional value. This process is typically quite rapid and may occur outside of our conscious awareness. Nonetheless, our first emotional reaction is influenced by a variety of individual biases and contextual factors. We may then recognise and experience the feeling. Depending on the social environment, we may need to moderate how that feeling is expressed. For example, there are moments when we want to vent our fury or contempt but must remain calm instead.

The human body is a complex network of nerves, actions, emotions and so much that scientists to this day continue pondering over why we are the way we are and what makes us this way.

— Urshita Sharma
(IIIrd year Life Science)

A Dive into its Intricacies

NEUROTRANSMITTERS AND ENVIRONMENTAL CONDITIONS

Influence of Environment on Neurotransmission

Neurotransmitters are chemical messengers that transmit signals from nerve cells to target cells, such as other nerve cells, muscles, or glands. They are part of the nervous system, which consists of the central nervous system (CNS) and the peripheral nervous system (PNS) and play a crucial role in regulating various bodily functions, such as heart rate, appetite, mood, sleep, learning, and memory. Environmental conditions are the physical and biological factors that affect the living organisms and their interactions such as temperature, humidity, light, air quality, noise, pollution, pathogens, and toxins. Environmental conditions can have significant impacts on the health and well-being of humans and other animals, as well as on the functioning of ecosystems and biodiversity. The relationship between neurotransmitters and environmental conditions is complex and dynamic. They can influence the production, release, uptake, and degradation of neurotransmitters, as well as the sensitivity and activity of their receptors. Conversely, neurotransmitters can modulate the responses and adaptations of organisms to environmental conditions, as well as their perception and cognition of the environment. This article reviews some of the effects of environmental conditions on neurotransmitters and their implications for human health and behaviour

Effects of Environmental Conditions on Neurotransmitters

Environmental conditions can affect neurotransmitters in various ways, depending on the type, duration, intensity, and frequency of the exposure, as well as on the individual characteristics and genetic factors of the organism. Some of the effects of environmental conditions on neurotransmitters are:

• *Temperature*: Temperature is a key factor that influences the activity and stability of neurotransmitters and their enzymes. High or low temperatures can alter the synthesis, release, and degradation of neurotransmitters, as well as the binding and signalling of their receptors. While high temperatures can promote dopamine, serotonin and norepinephrine release, low temperature is responsible for high secretion of acetylcholine leading to various responses by body such as lethargy in winter seasons.

• *Light*: Light is a major regulator of the circadian rhythm i.e., the biological clock that controls the daily cycles of physiological and behavioural processes. Dim light affects the secretion of melatonin, a hormone that is derived from serotonin and regulates sleep and wakefulness. It also controls the release of other neurotransmitters, such as dopamine, norepinephrine, and glutamate, which are involved in mood, alertness, and cognition.

• *Air quality*: Air quality refers to the concentration of pollutants and allergens in the air, such as particulate matter, ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, and pollen. Poor air quality can have negative effects on the respiratory system, the cardiovascular system, and the nervous system, affecting the levels and functions of neurotransmitters, such as serotonin, dopamine, glutamate, and histamine, which are involved in inflammation, mood, cognition, and allergic reactions.

• *Noise*: Noise is a form of sound that is unwanted, unpleasant, or harmful. Noise can have adverse effects on the auditory system, the cardiovascular system, and the nervous system. Tampering the levels of dopamine, serotonin, norepinephrine, and cortisol, noise can cause elicitation of stress response, anxiety, aggression and in severe cases, depression and impaired memory in individuals.

• *Pollution*: a notorious challenge faced by our generation not only effects the health and survival of living organisms but also the levels and functions of neurotransmitters, such as dopamine, serotonin, acetylcholine, and glutamate, which are involved in neurodegeneration, mood, cognition, and motor control.

Implications of Environmental Conditions on Human Health and Behavior

The effects of environmental conditions on neurotransmitters can have significant implications for human health and behaviour. Some of the implications are:

• Neurodegenerative diseases: Neurodegenerative diseases are disorders that involve the progressive loss of neurons and their functions in the brain. Neurodegenerative diseases are associated with abnormal levels and functions of neurotransmitters, such as acetylcholine, dopamine, glutamate, and serotonin, which are involved in memory, movement, and mood. Environmental conditions, such as temperature, light, air quality, noise, and pollution, can influence the risk, onset, progression, and severity of neurodegenerative diseases, by affecting the production, release, uptake, and degradation of neurotransmitters, as well as the sensitivity and activity of their receptors. For example, exposure to high temperatures can increase the risk of Alzheimer's disease, by enhancing the aggregation of amyloid-beta, a protein that forms toxic plaques in the brain, while exposure to bright light can delay the onset of Parkinson's disease, by stimulating the production of dopamine, a neurotransmitter that is deficient in the disease.

• Mood disorders: Mood disorders are disorders that involve persistent or recurrent disturbances in mood, such as depression, bipolar disorder, and anxiety disorder. Mood disorders are associated with abnormal regulation and receptivity of neurotransmitters serotonin, dopamine, norepinephrine, and gamma-aminobutyric acid (GABA), which are involved in emotion, motivation, and reward. For instance, exposure to low temperatures can increase the risk of depression, by reducing the levels of serotonin and dopamine in the brain.

• Cognitive performance: Cognitive performance refers to the ability to process information, such as attention, memory, learning, reasoning, and problem-solving and is dependent on acetylcholine, dopamine, norepinephrine, and glutamate which are responsible for arousal, focus, encoding, and retrieval. Environment can disrupt the balance of these chemicals in body like in case of exposure to moderate temperatures, enhancement of the cognitive performance is observed due to optimization of balance of acetylcholine and dopamine in the brain, while exposure to extreme temperatures can impair the cognitive performance, by disrupting the balance of these neurotransmitters and causing thermal stress.

Thus, understanding the relationship between neurotransmitters and environmental conditions can help to prevent, diagnose, and treat various neurological and psychiatric disorders, as well as to improve the quality of life and well-being of individuals and populations.

Ankush Malhan, IInd Year Life Science

WHAT GUT IS YOUR FEELING...

Anushka Singh, IInd year Life Sciences

""Instinct is a marvellous thing. It can neither be explained nor ignored."

This famous quote from Agatha Christie's "The Mysterious Affair at Styles" resonates with people across the globe, and as it turns out, the quote holds a profound truth. This mystifying thing we often call it as instinct, inner voice, or gut feeling, goes by many names, and it's an experience shared by everyone. These feelings manifest in various ways – when you're nervous about something, your stomach might feel heavy, and when you're in love, you might experience those butterflies in your stomach. These sensations are not mere coincidences; they are manifestations of a truth: your stomach houses a "second brain" that serves as the source of these feelings.

This second brain is an integral part of the Enteric Nervous System (ENS), a complex network comprising more than 100 million nerve cells which lines up the gastrointestinal tract. The ENS is responsible for determining the movement of Gastro Intestinal Tract, regulation of gastric acid, change in blood flow, releasing of gut hormones and interaction of immune system.
It operates as a parallel processing center, often independently from the central nervous system in our heads. This parallel operation between the central nervous system (CNS) and the ENS is made possible through the sharing of approximately 30 neurotransmitters. These two systems frequently communicate via the 10th cranial nerve, known as the Vagus nerve, which extends from the medulla through the neck and reaches deep into our bodies. The intricate dance between the CNS and the ENS provides insights into the complex and profound connection between our mental and physical states.

The ENS is made up of two main layers known as Myentric ganglia which is present around the upper oesophagus to the internal anal sphincter and is made of motor neurons. The main function of this ganglia is to control peristalsis. The second type is submucosal ganglia which present in the small and large intestine and is made up of afferent neurons. Its main function is to detect the chemical stimuli from the ingestion and muscle movement. It even controls absorption and secretions in the digestive systems.

Our understanding of this "second brain" is opening new doors to comprehend the deep connections between our gut and our emotions. Many researches have shown clear evidence that the microbiome of our gut clearly affect the state of our mind. These bacteria are the key player in the gut brain connection. The 100 trillion microbes that make up our GI tract their playground is critical to health. Gut bacteria regulate digestion and metabolism. They extract and make vitamins and other nutrients from food that you eat. They program the body's immune system. They build and maintain the gut wall, which protects the body from outside invaders.

Gut bacteria also produce many neurochemicals that the brain utilizes to regulate basic processes as well as mental processes such as learning, memory and mood. For example, gut bacteria manufacture about 95 percent of the body's supply of serotonin, which influences both mood and GI activity. A two-way link between the bacteria in our gut and our brain has been observed, known as the gut-brain axis and involves various factors. While the details of how our metabolism, immune system, and nervous system interact with the gut's diverse microorganisms can be quite meticulous, it's clear that these interactions play a role in our wellbeing and the development of diseases. For instance, experiments involving animals raised in a sterile environment (germ-free animals), animals given antibiotics, the use of beneficial bacteria (probiotics), or studies where specific microbes are introduced into the gut (monocolonization), and even fecal transplants, have demonstrated that altering the gut's microbial makeup can lead to changes in behavior and overall health.

In simpler terms, the gut-brain connection is vital, and when the balance of gut bacteria is disrupted, it can impact how we feel and behave.

THE SCIENCE OF FOOD PSYCHIATRY

When we think about nourishing our bodies, we often focus on the physical effects – stronger muscles, better digestion, or shinier hair. ***But have you ever considered the impact of what you eat on your brain?*** Enter the fascinating world of food psychiatry, a field that examines how different foods and chemicals, commonly found in our diet and medications, influence our mental well-being. Let's take a bite into the science behind the effects of food and drugs on our brains.

The Brain-Gut Connection:

We've all experienced that "*gut feeling*" – those butterflies in our stomach when something doesn't feel right. Science has now shown a strong connection between the gut and the brain, known as the gut-brain axis. The food we consume has a profound effect on this connection.

1. **Serotonin: The Happy Neurotransmitter:**
Serotonin, a neurotransmitter that plays a vital role in mood regulation, is produced in the gut. Dietary components, especially tryptophan-rich foods like turkey and dairy products, can increase serotonin levels. This is why a warm glass of milk or a turkey dinner might make you feel content and relaxed.

2. **Omega-3 Fatty Acids: Brain's Best Friend:**
Foods rich in omega-3 fatty acids, such as fatty fish (salmon, mackerel, and sardines), walnuts, and flaxseeds, have been associated with reduced risk of depression and improved cognitive function. These fatty acids are essential for maintaining brain health and reducing inflammation.

Omega 3's and Grandma's wisdom

Remember the wisdom of your grandmother, who always insisted on fish being brain food? She might not have known about omega-3 fatty acids, but her advice was spot-on. In regions where fatty fish is a dietary staple, cognitive decline and depression rates are notably lower.

The Chemical Culprits:

Our diets also contain substances that can affect our brain chemistry. For example, caffeine in your morning coffee a well-known stimulant that enhances alertness and concentration.

Coffee and the Creative Spark:
The morning ritual of sipping coffee isn't just about caffeine; it's also about creativity. Some of the world's greatest artists, writers, and thinkers, like Beethoven and Balzac, were known for their coffee consumption. It's as if the brew ignites their creative spark, helping them produce masterpieces.

Sugar Highs and Lows:
The sugar rollercoaster is real. Excessive sugar intake, often found in processed foods and sugary drinks, can lead to fluctuations in blood sugar levels, causing mood swings and irritability. It's no wonder you might feel a little cranky after that sugary snack.However consuming sugar every once in a while after a tough day like a piece of rich, dark chocolate is like an instant mood-lifter. That's because chocolate contains compounds that can stimulate the release of endorphins, your brain's natural feel-good chemicals.

The Dark Side of the Midnight Snack:
Imagine a late-night craving for sugary snacks. You indulge in a bowl of ice cream, and as the sugar rush hits, you feel momentarily euphoric. But a few hours later, you're wide awake, and the sudden mood swing leaves you feeling irritable. It's like a rollercoaster ride from joy to grumpiness.

The MSG Dilemma:
Ever experienced that nagging headache or general discomfort after indulging in your favorite Chinese takeout? It might not just be the fortune cookie's prophecy. It could be the MSG (monosodium glutamate), a flavor enhancer, lurking in your meal. Your taste buds are delighted, but your head may not be.Artificial food additives, such as monosodium glutamate (MSG) and aspartame, have been linked to symptoms like headaches and mood disturbances in some individuals.

The concept of food psychiatry is a reminder that the brain and the gut are more connected than we think. What we eat not only fuels our bodies but also has a significant impact on our mental health. By making mindful choices about our diet, we have the potential to nourish both our bodies and our minds, making us feel happier, more focused, and ready to take on the world – ***one delicious bite at a time.***

Anam Akhtar Ist year Life Science

UNRAVELLING THE SYMPHONY OF THE MIND:

A ROLLERCOASTER RIDE THROUGH DIFFERENT BRAIN WAVES

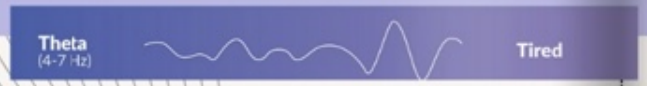
Have you ever wondered what's happening inside your brain as you navigate the complex maze of life? Well, buckle up, fellow brainiacs, because we're about to take a thrilling journey through the intriguing world of electrical rhythms, known as brain waves, are like the beats and melodies of our mental soundtrack.

DELTA WAVES: THE SLUMBER SONATA

Our adventure begins in the realm of delta waves, the slowest and most tranquil members of the brain wave family. When you're lost in the realms of dreams during deep sleep, delta waves take centre stage. It's the brain's way of ensuring you get a restful night's sleep, rejuvenating your mind for the adventures of the next day.

THETA WAVES: THE DREAMY WALTZ

Ever found yourself in that whimsical state between wakefulness and slumber, where dreams intertwine with reality? Cue the theta waves! These dreamy oscillations play a pivotal role during REM (Rapid Eye Movement) sleep, contributing to the fantastical landscapes of our dreamscapes. Astonishingly, these waves also play a major role in creative insights! It turns out that those "Aha!" moments, when brilliant ideas seemingly pop out of nowhere, often have a theta wave accompaniment.



ALPHA WAVES: THE CHILL LOUNGE GROOVE

When you're in a relaxed state, perhaps enjoying a lazy Sunday afternoon or practising mindfulness, alpha waves hold the fort. They're the chill lounge groove, enhancing creativity and promoting a zen-like state.

BETA WAVES: THE ENERGISING POWER SURGE

Need a burst of energy to tackle that demanding to-do list? Enter the high-energy beats of beta waves. These rapid-fire oscillations kick in when you're engaged in focused activities, problem-solving, or facing the exhilaration of a challenging task. It's the brain's power surge for peak performance.

GAMMA WAVES: THE MIND'S COSMIC SYMPHONY

When your brain is firing on all cylinders, solving complex problems, or experiencing heightened states of consciousness, gamma waves are in action. They're the mind's cosmic symphony, orchestrating the integration of information across different brain regions.

-Anam Akhtar Ist year Life sciences

JOIN THE BRAINWAVE SYMPHONY!

As we conclude our rollercoaster ride through the diverse landscapes of brain waves, remember – your brain is the ultimate DJ, spinning an ever-changing playlist of electrical rhythms. Whether you're peacefully dreaming in delta, waltzing through the realms of theta, or rocking out with gamma, each brain wave plays a crucial role in the grand symphony of your mind.

So, the next time you find yourself lost in thought, take a moment to appreciate the intricate beats and melodies, for within the dance of brain waves lies the fascinating machinery of your extraordinary mind. Keep grooving, fellow intellects – the concert within is always in session!

iMPACTs oF LoNELiNEss AND Social iNTERACTioNs oN Us

Suhani Singh, Ist year Life Sciences

Have you ever felt the sudden emotion when you see a group of people talking and enjoying their time which made you feel somewhat lonely. We all have faced this at least once in our life. But have you ever wondered why we feel lonely? Loneliness is distress due to perceived discrepancy between desired and existing social relationships and is associated with higher rates of cardiovascular disorders, dementia, anxiety, depression, suicidal ideation and 30% greater mortality.

Okay-Okay! we got some idea about what is loneliness but how does it affect our brain? Perceived loneliness in humans is associated with higher tonic vascular resistance, blood pressure and hypothalamic pituitary adrenocortical activation, and lower inflammatory control, immunity, and sleep salubrity. When lonely individuals view unpleasant pictures of people versus objects, they show higher activation of the visual cortex and lower activation of temporo-parietal junction. Moreover, these individuals show increased activation of the ventral striatum to pleasant objects than pleasant people, while non lonely individuals display the reverse patterns.

Numerous researches have been conducted over the years to understand differences in brain activity of lonely people vs socially active ones. One of such was when a team of researchers examined the magnetic resonance imaging (MRI) data, genetics and psychological selfassessments of approximately 40,000 middle-aged and older adults who volunteered to have their information included in the UK Biobank: an open-access database available to health scientists around the world. The research yielded significant insights about the brain patterns which were centred on what is called the default network: a set of brain regions involved in inner thoughts such as reminiscing, future planning, imagining and thinking about others. Researchers found the default networks of lonely people were more strongly wired together and surprisingly, their grey matter volume in these regions was greater. Loneliness also correlated with differences in the fornix: a bundle of nerve fibres that carries signals from the hippocampus to the default network. In lonely people, the structure of this fibre tract was better preserved. In 2023, Elisa C. Baek and her co-workers conducted a neuroimaging survey among 70 individuals belonging to two different residential communities to analyse the similarities in their neural responses and personalities. While nonlonely people were more or less similar neurologically speaking, individuals with high levels of loneliness, regardless of how many friends they had, were more likely to have unique brain responses. "Our results suggest that lonely individuals process the world in a way that is dissimilar to their peers and to each other," Ms. Baek write in their published paper, "which may contribute to the reduced sense of being understood that often accompanies loneliness." Loneliness was also linked to lower similarities in regions involved in the brain's reward system.

Now as we know how does loneliness affect the brain, let's understand the effect of social interactions and synchrony. The coordination of behaviour between two or more individuals– behavioural social synchrony (called hereafter "social synchrony" and implying some pattern of behaviour coordination) is a fundamental aspect of social life. Social synchrony is an evolutionary-ancient mechanism that binds members into a social group; rodents and primates, exhibit behavioural mimicking, a precursor of human social synchrony, and in both, familiarity with conspecific bolsters behavioural matching. Across mammalian species, social synchrony is learned within the mother-infant bond through processes of bio-behavioural synchrony, the coupling of parent and infant's physiology and behaviour during moments of social contact, and, thus, attachment contexts provide the arena for the experience and encoding of synchrony. Interactions between parents and infants carry significant effects on the maturation of physiological systems that support inclination towards building of social life. For instance, during episodes of social synchrony in the gaze and affect modalities there is also a coupling of parent and infant's heart rhythms, and coordinated release of oxytocin, suggesting how social synchrony provides a foundation for the awakening of biological synchronization between attachment partners. Its been discovered that social interactions not only brainwave activity in regions associated with reward, empathy, and understanding social cues but also stimulate gamma waves linked to higher cognitive functions, while negative or stressful social experiences may trigger patterns associated with anxiety or distress.

To conclude this topic, we understood how loneliness and social interactions affect the brain and how differently it stimulates the brain waves. Loneliness on one hand is more than just a feeling of isolation; it's a complex emotional state with profound effects on mental, emotional, and even physical health. While social interactions dynamically shape brainwave activity, highlighting their impact on cognitive and emotional processing

POEM BY KESHAVEE ANAND, 1 ST YEAR LIFE SCIENCES

हां, वो ज़रा मुस्कुरा रही थी
पर आंखें उसकी कुछ और बतला रही थीं
हां, वो खिलखिला रही थी
मगर आंसू आंखों से छलका रही थी
हां, वो खुश नज़र आ रही थी
कुछ तो बात मगर अंदर ही अंदर उसे रुला रही थी
हां, वो खिलखिला रही थी
मगर कुछ तो बात उसे रुला रही थी

वो ज़रा बड़बड़ाता सा नज़र आ रहा था
मगर दिल में कुछ वो छुपा रहा था
हां, वो खुशी में घूमता समझ आ रहा था
मगर अंदर ही अंदर कुछ तो उसे खा रहा था
हां, वो भी मुस्कुरा रहा था
मगर फिर भी गुमसुम सा नज़र आ रहा था

हां, मुस्कुराते चेहरे वो देखे थे
मगर उन आंखों की नमी भी नज़र आ रही थी
हां, वो खुश थे
मगर कुछ तो बात उन्हें अंदर ही अंदर रुला रही थी
मगर कुछ तो बात उन्हें अंदर ही अंदर यूं खा रही थी

उस मुस्कुराहट के पीछे छिपे उस दर्द को देखा था
जब फोन की बंद खिड़की से बाहर मैनें देखा था

हां, उसको कभी डर कर, कभी सोचते-सोचते,
कभी ज़्यादा तो कभी कम खाते देखा था
कभी आधी रात को जागते,
कभी खुली आंखों से दिन में सोते देखा था।

उस मुस्कुराहट के पीछे छिपे उस दर्द को देखा था
जब फोन की बंद खिड़की से बाहर मैनें देखा था।

MENTAL HEALTH break

Physical, Mental and Emotional well-being together forms a healthy life but in today's fast paced world, maintaining such healthy life with physical as well as mental and emotional health is not possible, maybe it is not easy but denying the fact completely is just one example of how we might lose it.

As said by *Frederick Langbridge*

> Two men look out through the same bars: one sees mud- and one sees stars.

One can either worn off oneself by denying simple facts and positivity around them or they can simply workout the problems and face the challenges thrown at them by life.

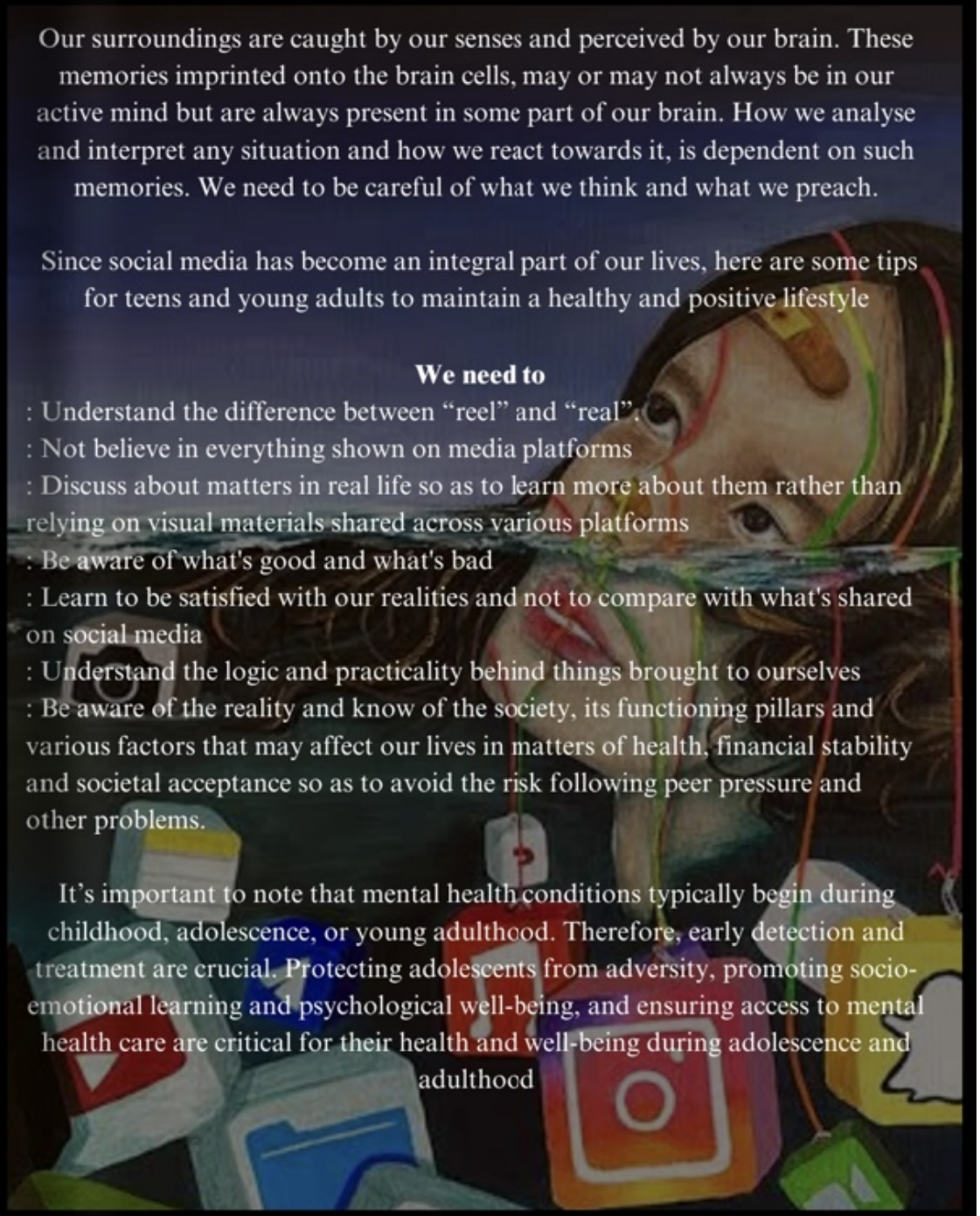
Our surroundings are caught by our senses and perceived by our brain. These memories imprinted onto the brain cells, may or may not always be in our active mind but are always present in some part of our brain. How we analyse and interpret any situation and how we react towards it, is dependent on such memories. We need to be careful of what we think and what we preach.

Since social media has become an integral part of our lives, here are some tips for teens and young adults to maintain a healthy and positive lifestyle

We need to

: Understand the difference between "reel" and "real".
: Not believe in everything shown on media platforms
: Discuss about matters in real life so as to learn more about them rather than relying on visual materials shared across various platforms
: Be aware of what's good and what's bad
: Learn to be satisfied with our realities and not to compare with what's shared on social media
: Understand the logic and practicality behind things brought to ourselves
: Be aware of the reality and know of the society, its functioning pillars and various factors that may affect our lives in matters of health, financial stability and societal acceptance so as to avoid the risk following peer pressure and other problems.

It's important to note that mental health conditions typically begin during childhood, adolescence, or young adulthood. Therefore, early detection and treatment are crucial. Protecting adolescents from adversity, promoting socio-emotional learning and psychological well-being, and ensuring access to mental health care are critical for their health and well-being during adolescence and adulthood



-Keshavee Anand, Ist year Life Science

NEUROPLASTICITY

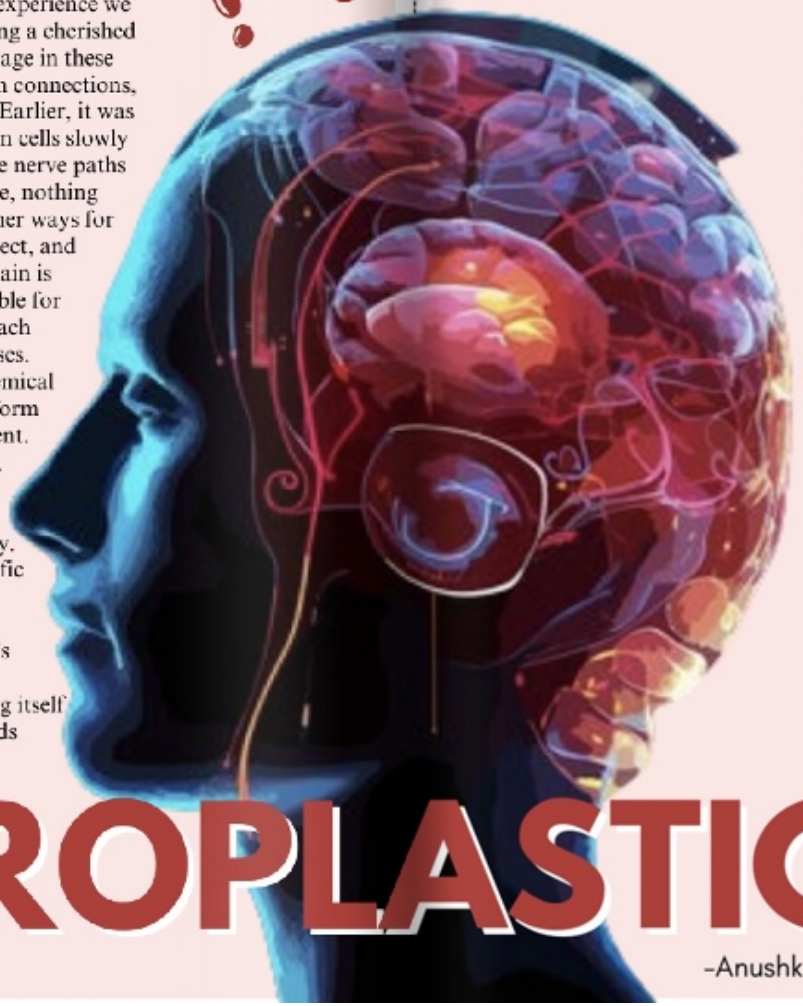
What is neuroplasticity?

Julius Caesar's quote, *"Experience is the teacher of all things,"* is an inspiration for a million of people around the globe. Just as we learn and grow by experiencing various situations, our brains continually adapt and rewire themselves through a process called experience-dependent plasticity or neuroplasticity. The word "Experience-dependent plasticity" is mainly made of two words where 'Experience' means direct observation of or participation in events as a basis of knowledge and 'Plasticity' is the ability of any structure to change in response to any external stimuli. Therefore, the Experience dependent plasticity is the changes that occur in brain due to a person's life experiences and changes.

The Relationship Between Life Experiences and Brain Changes!

Our brain as a versatile and ever-adapting toolbox. Every experience we encounter—whether it's learning a new skill or even recalling a cherished memory—triggers an activity in your brain. When you engage in these experiences, specific neurons in your brain fire up and form connections, creating neural pathways that represent these experiences. Earlier, it was thought that the brain was a not a regenerative organ, brain cells slowly die as we age. As Ramón y Cajal said, "in adult centers, the nerve paths are something fixed, ended, immutable. Everything may die, nothing may be regenerated." This research found that thereare other ways for brain cells to die, other ways for them to adapt and reconnect, and perhaps even ways for them to regrow or replenish. Our brain is made of a network of numerous neurons which is responsible for communication with the body. The information between each neuron is exchanged through connections known as synapses. These synapses can transfer the information in form of chemical signals or electric signals. These neurons can modify and form new synaptic connections which results in brain development. The more you engage in a particular activity or experience, the stronger these neural connections become. Conversely, if you neglect certain skills or experiences, the corresponding neural pathways might weaken or fade away. For example, when individuals learn a new language, specific regions of the brain responsible for that skill's execution undergo structural and functional changes. Neural circuits become more refined and specialized, optimizing the brain's ability to perform the learned task more effectively and proficiently. his adaptation is the brain's way of fine- tuning itself to be more efficient and effective in response to the demands of your life.

Over time, these connections become more efficient, making it easier for you to perform it. One of the fundamental mechanisms underlying experiencedependent plasticity is Hebbian learning, famously summarized as "cells that fire together, wire together."When neurons are repeatedly activated together, their synaptic connections strengthen, leading to a more efficient transmission of signals between them. This strengthening of connections facilitates faster and more effective neural communication, contrib- uting to the acquisition of skills, memory formation, and learning processes. Moreover, the brain's ability to rewire itself extends beyond skill acquisition; it plays a critical role in recovery after brain injuries. The critical period of development of experience-dependent plasticity in early childhood. During this period, the brain displays heightened plasticity, shaping its architecture and neural circuits in response to various experiences. Early experiences profoundly influence neural development, setting the stage for future learning and adaptation. The extent of plasticity may diminish with age, the brain's ability to adapt and learn persists, emphasizing the lifelong importance of experiences in shaping brain function.The critical period of development of experience-dependent plasticity in early childhood. During this period, the brain displays heightened plasticity, shaping its architecture and neural circuits in response to various experiences.



"The brain is like a fantastic architect, always remodeling its thought pathways."

Enhance your Neuroplasticity:

- Activities that challenge your brain
- Learn a lanuage
- Solve puzzles
- Master an instrument
- Delve into creative pursuits
- Do regular reading
- Quslity sleep
- Physical excercise

-Anushka Singh, IInd year Life Sciences

CASE STUDY

LIFE OF JODY

Background:

Rasmussen's encephalitis (RE) is a very rare degenerative brain disorder that involves long-term worsening inflammation (encephalitis) of one hemisphere (half) of the brain and disrupts its electrical activity. Another name for it is Rasmussen syndrome. This inflammation leads to frequent seizures (epilepsy) and progressive and permanent brain damage.

Clinical Case:

A 3-year-old female child started getting epileptic seizures 6 weeks after she turned 3. She could not use her left arm and left leg. The medicines assigned did not work and the seizures became life-threatening. The parents of the child brought her to paediatric neurologist Dr.Eileen Vining. Upon checkup, it was found that all her seizures were originating from the right hemisphere of her brain and the doctors knew that virtually nothing else could produce the symptoms shown by a young child like her other than Rasmussen encephalitis. Small Electrical explosions were flaring up in her right hemisphere. Seizures became almost constant and she lost complete control of her left side because the right hemisphere controls the left side and vice-versa. Pathologic features are lymphocytes surrounding round cells and diffused proliferation of microglia.

Hemispherectomy was recommended by the doctor which is a radical surgical procedure where the diseased half of the brain is completely removed, partially removed and fully disconnected or just disconnected from the normal hemisphere. This is one of the most successful operations at stopping seizures in carefully selected patients. It was performed by paediatric neurosurgeon Dr.Benjamin Carson.

Result:

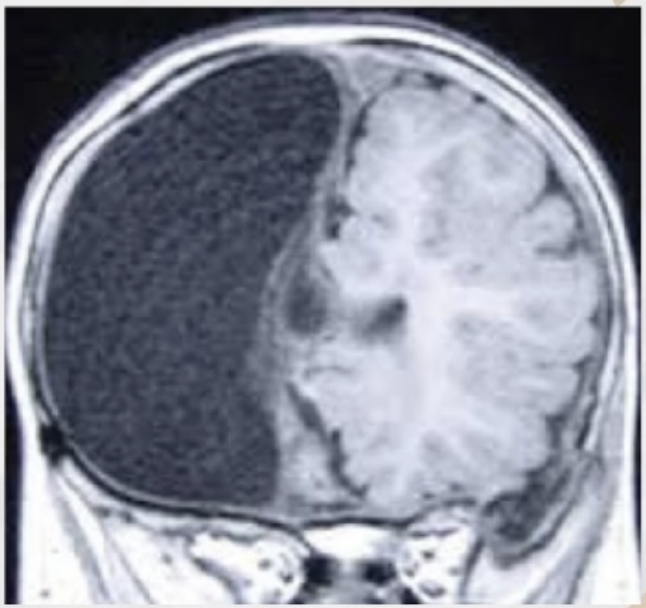
After a successful operation, the right hemisphere of the brain of the patient was removed. It was filled with cerebral spinal fluid. The left hemisphere took over the functions of the right side of the brain and within ten days of being discharged, the patient was able to walk.

Young Jody

Conclusions:

The patient was diagnosed with Rasmussen encephalitis, due to which she had to undergo a radical surgery of hemispherectomy, in which the right hemisphere of her brain was removed. Yet, due to the amazing phenomena of neuroplasticity, which the ability of the brain to make new neural connections within itself, the left side of the brain was able to take over the functions of the now removed right side as well.

MRI Scan of Jody's brain



-'Samaira Wadhwa, 1st year Life Science

WHEN THE SENSES MERGE

SYNESTHESIA

Synesthesia is a fascinating phenomenon that has captured the imagination of scientists and artist alike for centuries. It's a unique sensory experience where stimulation is one sensory or cognitive pathway leads involuntary and extraordinary experiencesin another. Synesthetes might associate numbers with colors, feel textures when hearing sounds, or even perceive a distinct taste when reading words. This intermingling of senses can be both captivating and bewildering. This remarkable blending of the senses challenges our understanding of perception and cognition. Recent research has delved into neurological underpinnings of synesthesia. Functional MRI (fMRI) studies have revealed that brains of synesthetes exhibit distinct patterns of activity during synesthetic experiences. For example, when a synesthete hears a musical note, brain regions responsible for both auditory and visual processing light up simultaneously.

The Science Behind Synesthesia

While the exact mechanisms of synesthesia remains a topic of ongoing research, three main theories have gained prominence:

1. **Cross-Activation Theory:** This theory suggests that synesthesia arises from increased connectivity between neighbouring regions of the brain that are typically responsible for distinct senses or decreased rate of "neural pruning" during fetal stage. Neural pruning is the process of elimination of unnecessary synapnes by decay of neurons. In an enhanced connection between the auditory and visual regions could lead to sound-color synesthesia.

2. **Disinhibition Theory:** According to this theory, there is no difference in the brain of synesthetes and non-synesthetes during early stages of life. It is due to a lack of inhibition between sensory regions or, in simpler terms, the normal dampening of signals between unrelated senses is diminished in synesthetes, allowing for cross-sensory perceptions.

3. **The stochastic resonance model:** This model has been found to be more acceptable than previous two theories due to its belief that small changes in the level of neural noise in sensory systems can lead to supra-threshold activation in synesthetes.

Types of Synesthesia

Synesthesia comes in various forms, with some of the most common types including:

1. **Grapheme-Color Synesthesia:** This is perhaps one of the most well-known forms. Synesthetes might perceive letters and numbers as having distinct colors.

2. **Sound-Color Synesthesia:** Some individuals experience colors in response to different sounds or musical notes, effectively "seeing" the music.

3. **Lexical-Gustatory Synesthesia:** Words can evoke specific tastes for those with this form of synesthesia. For example, the word "apple" might taste like a combination of sweet and tart flavors.

4. **Spatial-Sequence Synesthesia:** This type involves seeing numbers, days of the week, or months of the year as arranged in specific spatial patterns. For example, someone might visualize numbers extending from left to right or forming a spiral.

The Prevalence of Synesthesia

Synesthesia is more common than once believed. It is estimated that approximately 1 in 2,000 people have some form of synesthesia. While many synesthetes don't even realize they have this condition until they discover that their sensory perceptions are unique, others have vivid and conscious experiences of synesthetic associations. This unique sensory experiences have influenced art, music, and literature. Some of the world's most celebrated artists, including Wassily Kandinsky and Vladimir Nabokov, claimed to be synesthstes. Kandinsky's abstract paintings are thought to reflect his synesthetic experiences, where colors and shapes were closely tied to his emotional responses to music.

As we explore the complex world of synesthetic experiences, we are reminded that our perception of reality is far more flexible and intricate than we often realize. In the colorful and multi-sensory world of synesthetes, we find a beautiful reminder of the boundless potential of the human mind. Despite significant advances in our understanding of synesthesia, many questions remain.

Are synesthetic experiences learned or innate? What causes the various forms of synesthesia? How does the brain distinguish between the "real" sensory input and the synesthetic one? These intriguing questions continue to captivate researchers in the field.

Article by Deepanshu Pandey, IInd year Life Science

(FIRST SONG: RADIOHEAD: KARMA POLICE SECOND SONG: LIFE ON MARS: ART BY MELISSA MCCRACKEN)

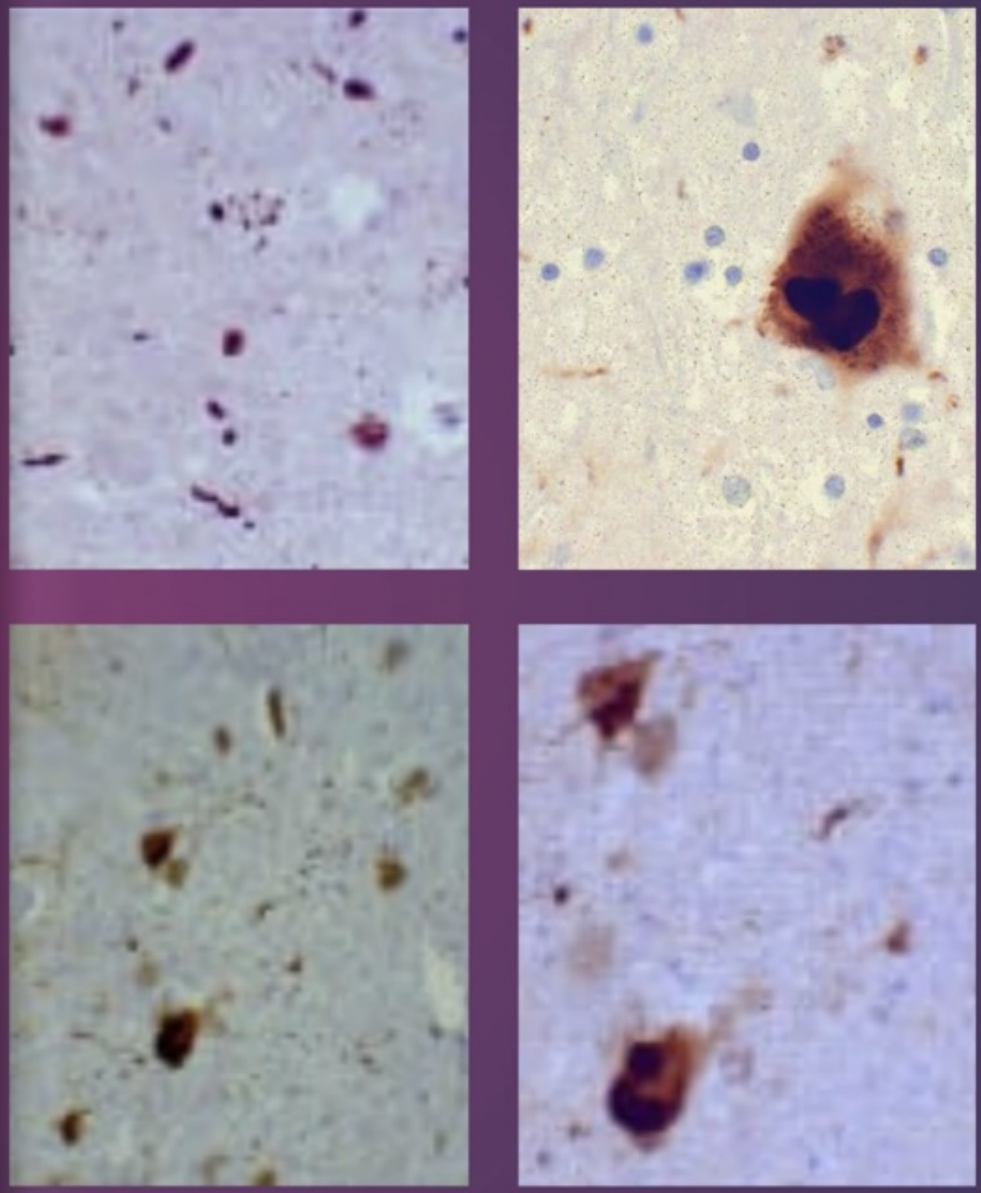
NEURODEGENERATION

Neurodegeneration, in broad terms, means degradation of neurons but in reality, only progressive loss of a certain set of neurons come under this category such as Alzheimer's, Parkinson's, etc. Degeneration of neurons due to accidents, traumas or exposure to neurotoxins are not taken into account. The earliest recorded brain disorder i.e., Epilepsy, a life-long condition characterized by recurring seizures in patients, is a neurocutaneous disorder, though similar symptoms can be observed in patients of Alzheimer's thus, it's very hard to diagnose a certain neural disorder unlike common cold or stomach-aches.

Most of the neurodegenerative diseases have been associated with ageing due to cumulative effect of metabolic and neurobiological defects that develop within an individual over a period of time. Through extensive research in recent decades, scientists have been able to identify certain factors and pathways responsible for these diseases.

Monoamine oxidase or MAO, a family of enzymes that catalyze oxidation of monoamines, are found in mitochondrial membrane of cells. In humans, MAO-A and MAO-B isoforms are responsible for regulation of various neurotransmitters and thereby, are one of the main causes of neurodegeneration alongside abnormal protein aggregation such as tau and Aβ4 proteins, oxidative stress and inflammations. MAO isoforms show differential affinities to different neurochemicals except Dopamine and Tyramine. While MAO-A majorly acts on Serotonin, Melatonin, Epinephrine and Nor-epinephrine, MAO-B oxidizes Phenylethylamine and Benzylamine. Certain tissues such as placenta and fibroblasts mainly express MAO-A enzymes whereas Platelets and lymphocytes only synthesize MAO-B. In recent times, Platelets have become a promising candidate to understand the working of MAO-B enzymes. While the poor activity of MAO-A and MAO-B can lead to severe aggression, suicidal behavior, alcohol addiction, bipolar disorder and poor impulse control, their over-expression can cause to Alzheimer's, Parkinson's disease (PD) and Schizophrenia which are characterized by lapse of memory, poor motor responses and disorganized thinking respectively. Besides PD, Multiple system Atrophy, Dementia with Lewy bodies (LBD), Parkinsonism and Parkinson-plus syndromes have been reported, all of which have similar symptoms and are hard to distinguish in earlier stages.

Our next set of neurodegenerative diseases, Multiple Sclerosis (MS) and Amyotrophic Lateral Sclerosis (ALS) target neural coverings of CNS and motor neurons respectively. Multiple sclerosis is an autoimmune disease divided into 4 categories depending on number of relapses and rate of progression during the patient's lifetime. Demyelination of axons leads to delayed signal conduction and damaged neurons. Loss of vision, weakening of muscles and poor sensory and motor coordination are some of the effects of this disease. MS is diagnosed by the characteristic lesions found in CNS via MRI. Amyotrophic Lateral Sclerosis or Lou-Gehrig Disease can be categorized into different subtypes based on part of motor neuron and body effected.



(Lewy bodies: seen in Parkinson's disease)

The distinctive feature of this disease is presence of Bunina bodies within cytoplasm of neurons and doesn't have any particular method for diagnosis except for identification of symptoms like stiffness and twitching of muscles. Stephen Hawking, the renowned Theoretical Physicist, was diagnosed with ALS at the age of 21 and lived through it for more than 50 years.

Huntington chorea, a rare genetically dominant disease that generally manifests itself in people at the age of 30s to 40s and unaffected by natural selection, is the only disease that can not affect an individual unless it "runs in their family". All the other diseases we have discussed maybe caused due to genetic, environmental or lifestyle- related reasons. Pathophysiology of this disease suggests defect in Kynurenine Monooxygenase pathway for catabolism of Tryptophan in mammals. 'Chorea', a term used for jerky, random movements is the Hallmark sign of this disease. Patients of HC are able to survive for an average of 10 to 30 years after the onset of symptoms. Similarly, Batten's disease is an autosomal recessive disorder linked to 20 genes whose alleles express itself in children of 5 to 10 years of age. The patients have a very short life expectancy but it may vary depending on type of variations found in them.

What if a disorder was caused when proteins "passed on" their "misfoldedness" to normal proteins? Prion diseases or Encephalopathy is the class of transferable and fatal neurodegenerative disorders among humans and animals. All prion diseases are caused by PrP or prion proteins. In humans, Creutzfeldt–Jakob disease (CJD), fatal familial insomnia (FFI), Gerstmann–Sträussler–Scheinker syndrome (GSS) and Kuru have been identified as prion diseases. Prion aggregates are stable and can't be eliminated by disinfection or boiling. So far, only intraspecific transfer (via grafting, cannibalism) has been observed and not interspecific transfer but CJD in humans is hypothesized to have been caused by a prion that is responsible for Bovine spongiform encephalopathy (BSE) due to consumption of infected meat. In 2015, it was found that plants can also act as vectors for prion transport. PrP are assumed to cause rampant growth of Amyloid fibrils in brain. These diseases show non-specific symptoms and thus, are hard to diagnose.

So far, we have come across diseases that primarily cause neurodegeneration but what if there was a disease where neuronal damage was one of the many side effects? Yes! Diabetic neuropathy exists. Diabetes Mellitus is an endocrine disease caused due to insufficient production of Insulin by pancreas leading to increase in blood glucose level in body. Neuropathy is presumed to be caused due to various factors such as constriction of blood vessels, abnormal bonding of excess of glucose with proteins, etc. Diabetic neuropathy can have various neuropathic conditions such as Mononeuropathy, Radiculopathy, Diabetic peripheral neuropathy, etc. Loss of balance and defects in limb functioning are few main signs of the disease.

We have covered some of the major neurodegenerative diseases that exist in today's world. Unfortunately, no "absolute cure" exists for any of these disorders but over the last few decades, multiple medications and therapies have been developed to help the patients regain control of their lives.

by Anusha K; IIIrd year Life Science

"And of course, the brain is not responsible for any of the sensations at all. The correct view is that the seat and source of sensation is the region of the heart.".

~ Aristotle

Neurobiology has burst onto the scene, mingling with physics, math, chemistry, and even a sprinkle of psychology and biology, despite ancient beliefs that our thoughts and desires originated from the heart, as mentioned in texts from the Egyptians, Romans, Greeks, and the Bible! Way back when, Greek thinkers like Alcmaeon and Hippocrates kickstarted brain exploration, paving the way for today's mind-blowing neuroscience. Let's dive into this brainy journey through the ages!

• Neurophysics

Neurophysics is like using physics to explore how the brain works. It involves studying the brain's structure and properties, like its electrical signals and fluid dynamics, to understand how it functions and diagnose diseases. Jibu and Yasue even found connections between quantum mechanics and consciousness! Plus, we've learned that the brain's chemical reactions are influenced by electromagnetic fields. And it's not just theory – we're diving into ion channels, neuron signals, brain waves, and neural recordings to uncover the brain's mysteries!

• Neurogenomics

Neurogenomics studies how genetic sequences relate to the development of neural systems in organisms and their evolutionary significance. It's heavily influenced by the Human Genome Project, which revealed genetic makeup across species and helps trace similarities and differences in neural coding. For instance, bee genetics helps understand DNA links to behavior like altruism. This field is vital for treating psychiatric diseases, as neural disorders depend on both molecular complexities and genetic makeup.

INTERDISCIPLINARY NATURE OF NEUROSCIENCE

• Neuronanotechnology

Neuronanotechnology is about using nanoparticles in neural systems to enhance recording and diagnostic methods. Inspired by Richard Feynman's 1959 concept of nanotechnology, researchers have developed metal, polymer, DNA, RNA, protein, and lipid-based nanodevices. These nanoparticles can potentially have self-sustaining molecular properties and repair capabilities, leading to advanced imaging, visualization, and healing techniques in neuro-engineering.

• Computational neuroscience

Computational neuroscience harnesses computational techniques to simplify complex neural pathways into models and analyze vast datasets quickly. It enables high-resolution imaging like Spatial transcriptomics for detailed brain mapping. Using mathematical equations and statistical methods, it generates patterns to understand new phenomena and aids in AI development. Since 1986, AI has been utilized for logical processing systems like Parallel Distributed Processing (PDP), which later expanded to study human intelligence and behavior. Techniques like Reinforcement Learning (RL) and Deep-Q Network (DQN) enhance data processing and presentation for improved understanding.

• Neuroscience and psychology

Neuroscience and psychology intersect to explore the brain's complexities and human behavior. While psychology, sociology, and anthropology examine cultural influences on personality and behavior, neuroscience uncovers how different brain regions contribute. Psychological disorders often stem from disrupted neural mechanisms, highlighting the interdependence of these fields. Neural development and neuroplasticity are crucial in child psychology, aiding learning and understanding. Recent research suggests gut microbiota could contribute to autism spectrum disorders. Neuropsychology emerges as a bridge, studying psychology through the lens of nervous systems.

— Anusha K
(IIIrd Year Life Science)

THE MORAL DILEMMA

H.M. CASE (LOBOTOMY)

HUMAN history is riddled with instances where the quest for scientific advancement has led to ethical problems and irreversible consequences. In this intricate tapestry, certain narratives stand as stark reminders of the complex interplay between scientific advancement and ethical dilemmas. The story of H.M. with the controversial practices of lobotomy and psychosurgery serves as a reminder of the consequences of anthropogenic interventions in the field of neuroscience. These are perfect examples unveiling the perils of brain manipulation in the pursuit of understanding.

In the mid-20th century, lobotomy emerged as a widely practised procedure for treating various psychiatric disorders. Lobotomy is a neurosurgical procedure that involves severing connections in the brain's prefrontal cortex. Putting it simply, a lobotomy is a surgical procedure where certain parts of the brain are cut or disconnected, typically in the frontal lobe area. The oncoming of lobotomy promised to revolutionise the treatment of psychiatric disorders by manipulating neural pathways. While initially hailed as a breakthrough in psychiatric treatment, lobotomy eventually fell out of favour due to ethical concerns and advancements in medical understanding and technology. One of the primary reasons for the discontinuation of lobotomy was its significant ethical implications. The procedure often resulted in severe and irreversible side effects, including personality changes, cognitive impairment, and in some cases, death. Patients subjected to lobotomy frequently experienced a loss of autonomy and quality of life, raising serious questions about the ethicality of the practice. It was argued that the benefits of lobotomy were outweighed by its potential harms, leading to growing public outrage and condemnation within the medical community.

BLUNDERS OF PSYCHOSURGERY

Psychosurgery also known as neurosurgery for mental disorders (NMD), is a surgical procedure that involves altering or removing specific areas of the brain in an attempt to treat severe mental illnesses that have not responded to other forms of therapy.Psychosurgery is considered a last resort and is typically reserved for cases where other treatments, such as medication and psychotherapy, have failed to provide relief.Psychosurgery and lobotomy are related concepts within the realm of neurosurgery, but there are important differences between the two.

It is a broader term that encompasses various surgical procedures aimed at treating severe mental disorders by altering or modulating specific areas of the brain. While lobotomy is a historical example of psychosurgery, modern psychosurgical techniques are more refined and targeted, often involving precise interventions such as deep brain stimulation (DBS) or cingulotomy. These procedures are typically reserved for severe and treatment-resistant cases of conditions like obsessive-compulsive disorder (OCD), major depression, and severe anxiety.

BRAIN MANIPULATION

Modern brain manipulation techniques are promising for treating a wide range of neurological and psychiatric disorders. DBS has been approved for conditions such as Parkinson's disease, essential tremor, and treatment-resistant depression, offering relief to patients who have failed to respond to conventional therapies.

Transcranial magnetic stimulation or TMS, a technique to induce electric fields which further promotes the flow of electric current in neurons of body, shows potential in treating depression, anxiety, and chronic pain, with fewer side effects compared to traditional medications.

Optogenetics, although primarily used in animal research, has the potential to revolutionize our understanding of brain function and inform novel treatments for neurological disorders.

While modern brain manipulation techniques offer hope, they also raise ethical questions regarding safety, autonomy, and societal implications. In navigating the ethical landscape of brain manipulation techniques, it is essential to balance the pursuit of scientific progress with respect for individual rights and well-being.

"The brain is the organ of destiny. It holds within its humming mechanism secrets that will determine the future of the human race." - ~Wilder Penfield

-Tarannum Chowdhary, IIIrd year Life Scienc

CASE STUDY: H.M CASE

INTRODUCTION

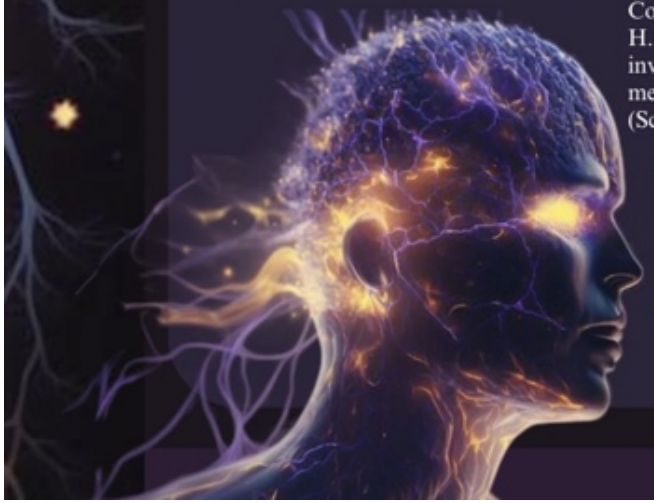
Memory is our most prized human treasure. It defines our sense of self and our ability to navigate the world. But among us there was someone who suffered through a loss: loss of memories or loss of making memories.
In one famous quote, he somberly described his state as ***"like waking from a dream…. every day is alone in itself".*** Yes we're talking about the famous H.M.case. It is one of the most famous and important case studies in psychology, especially in cognitive psychology. It was the source of groundbreaking new knowledge on the role of the hippocampus in memory.

BRIEF BACKGROUND

Henry Molaison was born in Manchester, Connecticut, and experienced intractable epilepsy that has sometimes been attributed to a bicycle accident at the age of nine. He had minor or partial seizures for many years, and then major or tonic-clonic seizures following his 16th birthday. He worked for a time on an assembly line but, by the age of 27, he had become so incapacitated by his seizures, despite high doses of anticonvulsant medication, that he could not work nor lead a normal life.
And so, H.M. agreed to undergo a radical surgery that would involve removing a part of his brain called the hippocampus — the region believed to be the source of his epileptic seizures. For epilepsy patients, brain resection surgery refers to removing small portions of brain tissue responsible for causing seizures. Although resection is still a surgical procedure used today to treat epilepsy, the use of lasers and detailed brain scans help ensure valuable brain regions are not impacted.

SURGICAL PROCEDURE

Neurosurgeon William Beecher Scoville performed H.M.'s surgery in Hartford, Connecticut, in August 1953 when H.M. was 27 years old. The surgery involved what was called a "partial medial temporal lobe resection" (Scoville & Milner, 1957).



NAME: Henry Gustav Molaison
BORN: 26 February,1926
DIED: 2 December,2008

In this resection, Scoville removed 8 cm of brain tissue from the hippocampus — a seahorse-shaped structure located deep in the temporal lobe. Further research conducted after this removal showed Scoville also probably destroyed the brain structures known as the "uncus" (theorised to play a role in the sense of smell and forming new memories) and the "amygdala" (theorised to play a crucial role in controlling our emotional responses such as fear and sadness). As previously mentioned, the removal surgery partially reduced H.M.'s seizures; however, he also lost the ability to form new memories.

HM's AMNESIA

H. M.'s apparent amnesia after waking from surgery presented in multiple forms. For starters, H.M. suffered from retrograde amnesia for the 11-year period prior to his surgery. Retrograde describes amnesia, where you can't recall memories that were formed before the event that caused the amnesia. Important to note, current research theorises that H.M.'s retrograde amnesia was not actually caused by the loss of his hippocampus, but rather from a combination of antiepileptic drugs and frequent seizures prior to his surgery.
In contrast, H.M.'s inability to form new memories after his operation, known as anterograde amnesia, was the result of the loss of the hippocampus. This meant that H.M. could not learn new words, facts, or faces after his surgery, and he would even forget who he was talking to the moment he walked away.
However, H.M. could perform tasks, and he could even perform those tasks easier after practice. This important finding represented a major scientific discovery when it comes to memory and the hippocampus. The memory that H.M. was missing in his life included the recall of facts, life events, and other experiences.

CONTRIBUTION IN NEUROSCIENCE

H. M.'s case study represents a historical time period for neuroscience in which most brain research and findings were the result of brain dissections, lesioning certain sections, and seeing how different experimental procedures impacted different patients. Therefore, it is paramount we recognize the contribution of patients like H.M., who underwent these dangerous operations in the mid-twentieth century and then went on to allow researchers to study them for the rest of their lives.
Even after his death, H.M. donated his brain to science. Researchers then took his unique brain, froze it, and then in a 53-hour procedure, sliced it into 2,401 slices which were then individually photographed and digitised as a three-dimensional map. Through this map, H.M.'s brain could be preserved for posterity. As neuroscience researcher Suzanne Corkin once said it best, "H.M. was a pleasant, engaging, docile man with a keen sense of humour, who knew he had a poor memory but accepted his fate.

-Suhani Singh, Ist year Life Sciences

UNDERSTANDING NEUROSCIENCE IN-DEPTH!

The brain is one of the most complex organs in the human body, composed of a diverse array of cell types that form intricate anatomical structures and functional circuits. To understand how the brain works, it is essential to map the molecular identities and spatial organization of the different cell types in the brain, as well as their interactions and connectivity. However, conventional transcriptomic methods, such as single-cell RNA sequencing (scRNA-seq), require the dissociation of cells from their native tissue, resulting in a loss of spatial information. Moreover, some cell types, such as neurons, are difficult to isolate and process without inducing stress, cell death, or aggregation. Therefore, there is a need for technologies that can measure the transcriptome of cells or tissues while preserving their spatial context. This is the goal of spatial transcriptomics (ST), a set of methods that enable the simultaneous mapping of cell types and their locations in intact tissue sections.

Methods

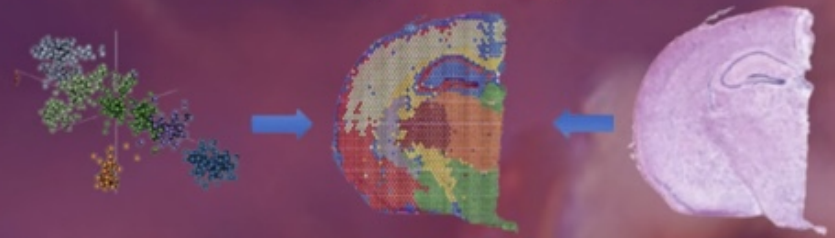
ST methods can be broadly classified into two categories: imaging-based and sequencing-based. Imaging-based methods use fluorescence or other types of microscopy methods to visualize the expression of specific genes or transcripts in tissue sections. These methods can provide high-resolution spatial information, but are limited by the number of genes or transcripts that can be detected simultaneously, as well as by the availability and specificity of probes or antibodies. Sequencing-based methods use various strategies to capture and barcode the transcripts from discrete regions or cells in tissue sections, and then sequence them to obtain their identities and abundances. These methods can provide unbiased and comprehensive transcriptomic information, but are limited by the resolution and throughput of the capture and sequencing steps. Some examples of imaging-based methods are:

Fluorescence in situ hybridization (FISH): A technique that uses fluorescent probes to hybridize to specific RNA molecules in fixed tissue sections, and then detects them by fluorescence microscopy. Though FISH can provide high spatial resolution, it fails to employ multiple probes and cancelling of background signals.

Multiplexed error-robust FISH (MERFISH): this complex computational procedure involves combinatorial and high accuracy systems to mark and detect numerous RNA molecules in preserved tissue samples by repeating multiple FISH cycles and imaging techniques.

Spatially resolved transcript amplicon readout mapping (STARmap): an approach to create and detect labelled amplicons of several hundreds of genes in tissue samples by using hydrogel-tissue hybridisation and in-situ amplification followed my sequential rounds of FISH and imaging techniques

10x Visium spatial Transcriptomics



Single cell gene expression **Spatially Resolved Gene Expression** **Tissue Section**

Some examples of sequencing-based methods :

Spatial transcriptomics (ST): this method uses a series of oligonucleotide probes to collect and barcode the transcripts of RNA from the given sample by using a standard RNA-seq.ST can yield an unbiased and diversified data but has limited resolution.

Slide seq : This method is used for transferring RNA from tissue samples to a surface having barcoded DNA beads at specific positions to identify its position in distinct regions in the sample.

Visium spatial gene expression: A commercial platform developed by 10x Genomics that uses an array of oligonucleotide capture probes printed on a glass slide to capture and barcode the transcripts from discrete regions of a tissue section, and then sequences them by droplet-based RNA-seq.

Applications

ST methods have been applied to various biological contexts, such as embryo development, immune-cell responses to antigens, and different types of cancers. In neuroscience, ST methods have several advantages. Firstly, they remove the need for tissue dissociation of delicate neurons. Secondly, they preserve the spatial context of cells, which is crucial for understanding the functional organization and connectivity of the brain. Thirdly, they enable the integration of transcriptomic data with other types of spatial data, such as histology, anatomy, or activity. Some examples of applications of ST methods in neuroscience are:

- **Mapping the cell-type composition and spatial organization of the mouse and human cerebral cortex. These studies used ST and Visium to profile the transcriptomes of thousands of regions in the cortex, and identified distinct cell types and subtypes, as well as their laminar and regional distributions. They also integrated the spatial transcriptomic data with anatomical and functional data to reveal the molecular and cellular basis of cortical organization and function.**
- **Mapping the cell-type composition and spatial organization of the mouse and human hypothalamus. These studies used ST and Visium to profile the transcriptomes of thousands of regions in the hypothalamus, and identified diverse cell types and subtypes, as well as their spatial patterns and interactions. They also integrated the spatial transcriptomic data with physiological and behavioral data to reveal the molecular and cellular basis of hypothalamic regulation of homeostasis and behavior .**
- **Mapping the cell-type composition and spatial organization of the mouse and human retina. These studies used MERFISH and STARmap to profile the transcriptomes of thousands of cells in the retina, and identified various cell types and subtypes, as well as their spatial arrangements and connectivity. They also integrated the spatial transcriptomic data with morphological and functional data to reveal the molecular and cellular basis of retinal structure and function.**

Therefore, ST methods are powerful tools for studying the complexity and diversity of the brain at the molecular and cellular level, while preserving the spatial context and organization of the tissue. ST methods can provide unprecedented insights into the functional atlases of the brain, and can facilitate the discovery of novel cell types, subtypes, and states, as well as their interactions and connectivity. ST methods are expected to advance our understanding of the brain in health and disease, and to open new avenues for diagnosis and therapy.

Ankush Malhan; IInd year Life Science

FEMALE NEUROSCIENTISTS

Anam Akhtar, Ist year Life Sciences

In the realm of Science, Technology, Engineering, and Mathematics (STEM), strides have been made in recent decades to foster inclusivity and diversity and the stories of those who have shattered barriers and achieved excellence serve as beacons of inspiration, lighting the way for others and underscoring the potential for change. Let's know about some of the Famous Neuroscientists who has changed our perspective of the subject.

Maria Mikhailovna Manasseina (1843–1903)

She is considered an expert neuroscientist in the field of physiological chemistry and a pioneer in somnology (the study of sleep or sleep science) and biochemistry. Her most distinguished contribution in the field of neuroscience was her research on sleep deprivation. She was one of the first scientists to state that while we sleep the brain is active

Augustine Marie Cecile Mugnier Vogt (1875 –1962)

Augustine Marie Cécile Mugnier Vogt, better known as Cécile Vogt-Mugnier, was a French neurologist. She and her husband, Oskar Vogt, are known for their extensive cytoarchitectonic studies on the brain. The Vogts were attempting to precisely locate the regions in the cerebral cortex that correlate with specific brain functions. They pursued advanced neuropathological research, publishing their findings on both cyto- and myelo-architecture in the central nervous system and on the functional anatomy of the basal ganglia.

Brenda Milner (July 1918-present)

Born as Brenda Langford on July 15, 1918, [illegible] Canadian neuropsychologist has made significant contributions to the field of clinical neuropsychology including the study of memory and cognition. Her work with patient H.M. revolutionized our understanding of how brain structures govern different learning, memory, and speech functions. As of 2020, she holds more than 25 honorary degrees and she continued to work in her nineties.

T.S. Kanaka (1932 – 2018)

T. S. Kanaka, also known as Thanjavur Santhanakrishna Kanaka or Tanjore Santhana Krishna Kanaka, was Asia's first female neurosurgeon and one of the world's first few female neurosurgeons. She was the first neurosurgeon in India to perform chronic electrode implants in the brain, deep brain stimulation as early as in 1975 and pioneered functional neurosurgery in the 1960s and 1970s.

MIND-BLOWING BOOKS & MOVIES

Let 's walk through some of the greatest works in human history dealing with the beauty and terrors of Neuroscience.

ANIMAL FARM Are the fables as simple as we believe them to be? George Orwell certainly proves otherwise! Revolutionary at best and oppressive at worst! The pull of power, corruption and the 'animal need' for equality, no theme remains untouched! Humans are the worst animals to walk on this Earth, or are they?

1984 Mind is the safe haven of ideas, or is it? The 'thought-police' saves the state from swaying away from 'useless thoughts' of freedom and rebellion because the government knows best. Total power in the hands of one administration could change a lot of things…

THE MANCHURIAN CANDIDATE Sergeant Shaw returns from the Korean War as a hero but the propaganda of politics has him in the grips. The war might just be over but the killings aren't. The darkness of the shining fame might just take him under, consciously or unconsciously.

BRAVE NEW WORLD The future, though unpredictable, is sure to have a part of us right? But what If the connecting link, our genes, are only modified? Filled with advancements in reproductive technology, genetic engineering, and psychological manipulation while exploring the themes of consent, choices and emotions, all which make us human, this book has it all! How are we supposed to stay true to ourselves as two of our paths entwine?

A CLOCKWORK ORANGE What would you choose between free will and good behaviour? Alex, a teen a part of a vicious gang couldn't care less about other people's feelings and pain, but with his growing rate of crime, the government decides to step in and change Alex's immoral behaviour patterns but how far will they intervene?

STRANGER IN A STRANGE LAND If our capacity to understand knows no bounds then why do our perspectives and beliefs? The protagonist, Valentine Michael Smith, a human raised on Mars by Martians, explores and challenges the narrow ideas and societal norms of Earth.

MOVIES

SPLIT Are all humans multi-faceted? Kevin, a person suffering from dissociative personality disorder and has 23 personas, kidnaps 3 girls. Can they figure out the friendly alters, before the onset of the most dangerous and wild 24th persona?

FATAL ATTRACTION Is a one-night stand exactly what its name suggests? Dan Callagher, a married man, gets involved with another woman, Alex, he gets more than what he bargained for. Unable to see Dan with anyone but herself, Alex does everything within and beyond her means to break his family.

PSYCHO "Psycho" a term thrown around so casually these days, but the depiction of a terrifying deviation from "normal" may actually force you to see the reality. Norman Bates, who works at the Bates Motel, a shy motel proprietor, might just have many faces under that reserved manner.

SHUTTER ISLAND How do we distinguish between what's real and what's not? Teddy Daniels and Chuck Aule, two US marshals, are sent to an asylum on a remote island in order to investigate the disappearance of a patient, but Teddy might just loose himself to find someone else...

THE SHINING What can possibly cause one to turn against one's own family? Jack and his family move to an isolated hotel in the hope of curing Jack's writer's block. Yet, plagued with sinister spirits, the abandoned hotel might just contain many secrets.

TURNER & HOOCH Detective Turner leads an orderly life until it is disrupted by Hooch, the dog of his friend Amos Reed, who was recently murdered and the sole witness to a murder. Turner attempts to adjust to life with the big dog, resulting in everything he detests, household destruction and unwelcome chaos, will his life change forever?

SRI- VIPRA 2023-24

Sri Vipra-2023, a summer internship organized by Sri Venkateswara College, presented the students with a golden opportunity to get an in-depth knowledge about their classroom subjects and a Hands-on experience in their field of interest. The internship presented 63 diverse projects to students. About 369 students participated in these projects out of which, 45+ students belonged to Life Sciences. Congratulating all the students for successfully completing their projects.

S.No.	Mentor's Name	Project Name	Project Number	Student's Name
1.	Dr. Anju Kaiecker	Relationship between diet and disease	SVP-2311	Ananya Singh Ayushi Singhal Ruchi Biswas
2.	Dr. M.Prajna	Stress management with Traditional Systems of medicine	SVP-2315	Ashmit Chowdhury Kashish Grover Prathan Gupta
3.	Dr. Navneet Kumar	Health sensitization and awareness among people: A paradigm shift in their mental attitude in pre and post covid times	SVP-2316	Harsh Panwar
4.	Prof. Shukla Saluja Dr. Aditi Kothari	Micropropagation and Biotechnical aspects in Millets Improvement	SVP- 2317	Mohd. Sahil Nimmi Verma Dhruv Rathi

5.	Dr. Shikha Gulati	Green Nanobiopolymers for Environmental Remediation : Step twoards Sustainable future	SVP-2320	Yamini Moriya Kumud Joshi
6.	Dr. Pooja	Exploring the Anticancer Potential of Coumarin Heterocyclic Derivatives	SVP-2321	Punita
7.	Dr. Meena Bisht	Improving the activity and stability of enzymes in presence of green solvents	SVP-2322	Urshita Sharma Shivani Yadav Vratika Chandel Shikha Yadav
8.	Laishram Saya Devi	Natural Polysaccharide based Nanomaterials as potential candidates for sensing applications	SVP- 2323	Shivani Lodhi Anupam Shivangi Sharma
9.	Dr. Vinita Kapoor	QSAR Study of common drugs using software tools	SVP- 2324	K Anusha Nupur Joshi

10.	Chandra Shekhar Tekuri	Dye Sensitized Solar cells	SVP- 2330	Deepti Kharb Tanisha Sonkar
11.	Dr. Rekha Yadav Dr. Pamil Tayal	Effects of Drain Chemicals on garden soil and plants	SVP- 2331	Ritika Madankar Archana Kumari
12.	Dr. Perumal Jayraj Dr. Seema Sen	Evaluation of Eyelid Tumors and their Metastatic Potential using CAM Assay	SVP- 2332	Sandhya Yadav Shubham Kaintura Ananya Singh
13.	Prof. Anita Verma Dr. Rajendra Phartyal	Adulteration in Fruits and Vegetables	SVP- 2333	Samarth Vanshika Akanshi Anushree Haya Dilshad Itika Garg Deepti Rana
14.	Dr. Vartika Mathur	Microbial biochemical characterisation and bioactivity	SVP- 2334	Apeksha Singhal

15.	Dr. Sumit Raj	In silico screening and identification of potential inhibitors of Zika Virus protein NS5 by virtual screening	SVP-2336	Neha Mahour Lalita
16.	Dr. Obaiah Jamakala	Protective role of Curcuma longa extract supplementation in STZ induced diabetic rats	SVP- 2337	Adarsh Raj Chanchal Udania Megha Mahesh Aakanksha Chak
17.	Dr. Pooja Jain	Mapping the Publications on Sustainable fashion:A Bibliometric Analysis	SVP- 2349	Amartya Anand
18.	Dr. Sindhu Mani bag	Insolvency and Bankruptcy code- 2016: Its impact on the corporate sector of India	SVP- 2350	Sanchi Sibal
19.	Abhishek Malhotra	Comparative Analysis of the State Government budgets	SVP- 2351	Madhur Agarwal

President's Note

As the president of Adhibhuta - The Life Sciences Society, Thanksgiving holds a special significance for me and our society . It is a time to reflect on the achievements, challenges, and aspirations of our members and the members of life sciences society . In this reflection, I find profound gratitude for the dedication, passion, and innovation that characterize our collective pursuit of understanding .

At the heart of our society lies a deep commitment to work for the betterment of the society. we embrace the diversity of disciplines that collectively helps for overcoming challenges .It is through the tireless efforts that we push the boundaries of our potential and work till the extreme.

This is a message of acknowledgement and celebration of the remarkable achievements of our members. Whether it be coundcting seminars or organising our very own fest "Sci verse " , organising competitions or research on projects for our very own magazine,each contribution enriches our understanding for the team work and enhances the quality of work for the society . As a president, I am continually inspired by the ingenuity and dedication displayed by our society members , and I am grateful for the opportunity to lead such a dynamic society .

In expressing gratitude, I also extend my gratitude towards the teachers who guided us through all the challenges and enlightened us with the knowledge and experience they have .

In conclusion, as president of Adhibhuta - The Life Sciences Society, I am deeply grateful for the unwavering dedication and passion of our members, the support of our teachers and the boundless opportunities that lie ahead. Let us celebrate our achievements, acknowledge our efforts and reaffirm our commitment to advancing knowledge and improving life through the transformative power of the life sciences.

Batch'24

UDAIPUR

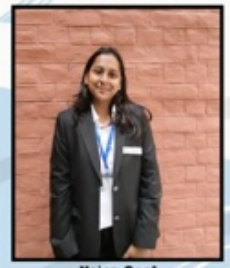
Pride of Life Sciences

Urshita Sharma
President - Empathise

Samarth
Logistics Head - FAA
Joint Sec. - Adhibhuta

Dhruv
Treasurer - Alaap

Ruchi Biswas
Gen Sec. - Brainiacs



Naina Goel
Vice President - Brainiacs
Creative and Technical Head - Adhibhuta

Sanchi Sibal
President - Brainiacs

Akanshi
Vice president - Student for development
General secretary - Gandhi study circle

Vanshika bhandari
PR HEAD - Empathise

Sagar Rautela
Stalls Head - FAA

Ayushi Singhal
Core coordinator - Brainiacs

Lalita
Vice President - Adhibhuta
Attendence Head - vimarsh

Shyam Jyoti
President - vimarsh

Madhur Agarwal
PR HEAD - NSS

Divya Sharma
Executive - Equal Opportunity Cell

Yamini Moriya
President - Conquistadors

Aryan Jaiswal
Events and Logistics head - MAC
PDI coordinator - Exordium

Saachi ahuja
UPSC coordinator - Exordium

Anushka singh
Graphics and Logistics Head
- Brainiacs

Adhibhuta

The Life Sciences Society

Core Members

Shashwat Vashisht
President

Lalita
Vice-President

Saachi Ahuja
General secretary

Samarth Pratap Singh
Joint secretary

Madhav Jee
Joint secretary

Extended core

Naina Goel

Harshit Sharma

Bhagwati Kanwar

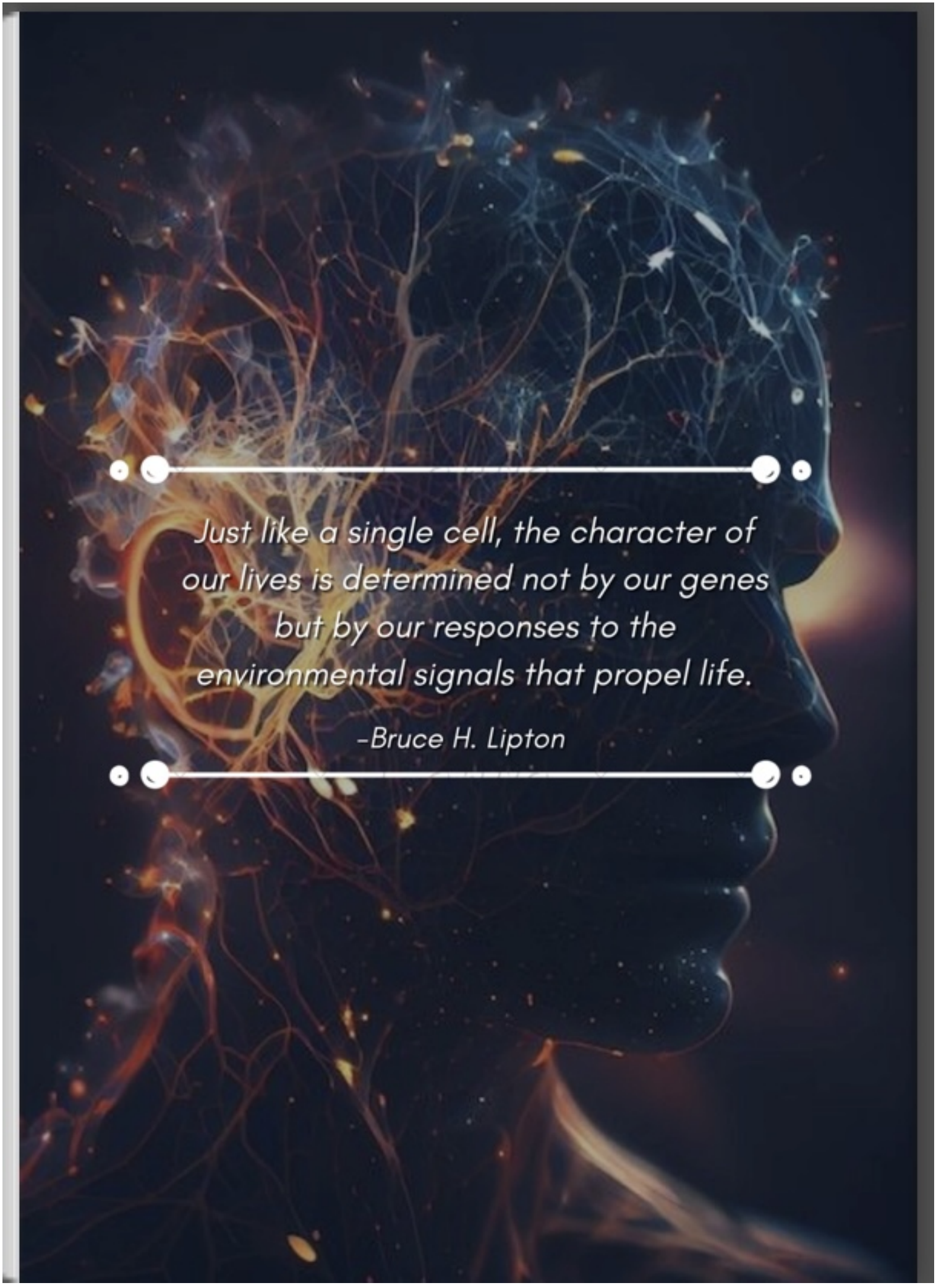
Tarannum

Anusha

Aryan Jaiswal

Ending Note

As we come to the end of this issue, we want to express our gratitude to our readers, contributors, and team members who make this magazine possible. Your support and enthusiasm drive us to continue delivering quality content that inspires, informs, and entertains. Let's look forward to the next issue with even more inspiring stories, insights and discoveries. Until then, stay curious, stay inspired, and keep exploring the world around you. Thank you for being a part of our journey. See you soon!


Just like a single cell, the character of our lives is determined not by our genes but by our responses to the environmental signals that propel life.
-Bruce H. Lipton