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A pharmaceutical magazine

SHADOW CULTIVATE

SUMMER ISSUE

2022-23



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Dr. Rajiv Jash

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Koushik Maparu and Pradipta Bera



SUN
PHARMA



**Sanaka
Educational
Trust's Group of
Institutions**



PREFACE

We are delighted to present the inaugural volume of Shadow Cultivate, a vibrant and multifaceted academic magazine published under the aegis of Sanaka Educational Trust's Group of Institutions, and curated under the insightful leadership of Chief Editor Dr. Rajiv Jash. This publication is more than a compilation of articles and artworks—it is a collective journey of thought, creativity, inquiry, and expression that brings together scientific intellect, literary soul, and civic consciousness into a single cohesive platform. The vision behind Shadow Cultivate stems from the desire to break disciplinary silos and to encourage students, scholars, artists, and educators from all streams to participate in an open dialogue that both reflects and shapes the academic spirit of our time. This magazine is not just a reflection of our institutional excellence but a mirror of our students' voices—of their curiosity, concerns, creativity, and courage. This issue is thoughtfully divided into three major sections: Scientific Advancements, Art & Literature, and Current Affairs. Each segment opens a window into a different realm of human understanding while remaining rooted in the larger ethos of education, inquiry, and cultural expression. The Scientific Advancements section covers emerging and impactful areas such as modern drug delivery techniques, drug discovery and many more. These articles, meticulously researched and articulated, reflect the scientific temperament of the young contributors and provide valuable insights into fields that are shaping our future. In Art & Literature, we have curated a soulful selection of poems, paintings, short stories, and reflective pieces—both in English and regional languages—that reflect the emotional, cultural, and spiritual landscape of today's youth. Whether it is the empowering image of the divine feminine in visual art, the moving poetry that explores love, identity, or nature, or prose pieces that narrate stories of pain, escape, hope, and resilience, these entries reveal the depths of student thought and artistic potential. This section brings sharp focus to the political, social, and cultural conversations that matter that empower young minds to look beyond the classroom and engage meaningfully with the world around them. This magazine is the result of months of hard work, collaboration, and unwavering enthusiasm. We express our heartfelt gratitude to all the student authors, artists, editorial team members, and faculty mentors who have contributed their time, talent, and passion to bring this issue to life. Each submission was carefully reviewed and thoughtfully presented, ensuring a high standard of academic and creative quality throughout. We would also like to thank the Sanaka Educational Trust's Group of Institutions for their constant encouragement and support. Under the dynamic guidance of Dr. Rajiv Jash, this magazine has found its rhythm and voice—elevating the collective spirit of our institution and enriching its intellectual culture. As you turn these pages, we invite you to engage—not just as a reader but as a fellow cultivator of ideas. We hope that Shadow Cultivate Vol. 2 inspires critical thought, stirs your imagination, and awakens a deeper connection to the world we live in. May this be the beginning of an ongoing dialogue between disciplines, languages, generations, and minds.

Let this be not just a magazine, but a movement of minds—a shared space where science meets poetry, art meets activism, and thought meets transformation.

The Editorial Team

Shadow Cultivate Vol. 2

Sanaka Educational Trust's Group of Institutions



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DIRECTOR'S NOTE

It is with great pride and pleasure that I extend my warmest regards through this special note as we unveil Shadow Cultivate, an intellectual and creative endeavour initiated under the banner of Sanaka Educational Trust's Group of Institutions. More than just a magazine, Shadow Cultivate stands as a dynamic forum that captures the academic, artistic, and innovative expressions of our students and faculty. It bridges disciplines, ideas, and imaginations—where science meets art, and thought meets action. This edition reflects the diversity and depth of our institution, with contributions spanning scientific advancements, literary works, socio-political commentaries, and current affairs. At the heart of this vibrant collective is the Department of Pharmacy, a pillar of academic excellence within our institution. The articles and research insights from this department illustrate not just the intellectual potential of our students, but also their readiness to address the challenges of modern healthcare with integrity, innovation, and empathy. Pharmacy as a profession is rapidly evolving in the 21st century. It is no longer limited to dispensing medicine; it has expanded into areas such as drug discovery, nanotechnology, pharmacovigilance, regenerative medicine, and personalized therapeutics. Our Department of Pharmacy recognizes this shift and is committed to preparing students for this broader, interdisciplinary future. The work showcased in this magazine—on topics like green chemistry, nanotechnology in neurology, sustainable drug design, and smart drug delivery systems—demonstrates a forward-thinking mindset. It is especially heartening to see students not only engaging in rigorous scientific inquiry but also reflecting on the ethical and environmental dimensions of their work. This balance of scientific rigor and social responsibility is what we aim to in still through our academic programs. Shadow Cultivate also serves as a mirror to the cultural and emotional richness of our campus. Poems, paintings, and prose featured in this volume remind us that science and art are not opposites but allies in the pursuit of truth and beauty. The inclusion of multilingual literary expressions and artwork ensures that every student voice—regardless of discipline or background—is heard and celebrated. As Director, I believe that this spirit of openness, diversity, and interdisciplinary dialogue is essential to nurturing the next generation of responsible global citizens. I congratulate all contributors, editors, and coordinators who have worked tirelessly to bring this vision to life. Your dedication is visible in every page and every word. May this magazine continue to grow as a testament to the values we cherish—excellence in education, innovation in research, and compassion in service. I urge all readers—students, faculty, and visitors—to engage deeply with this volume, and to carry forward the ideas and inspirations it offers. Let us cultivate not only knowledge, but also the wisdom to use it for the betterment of humanity



FROM THE PRINCIPAL'S DESK



It is with great pride and a profound sense of purpose that I, on behalf of the Department of Pharmacy, Sanaka Educational Trust's Group of Institutions, share this message to honor Shadow Cultivate—a magazine that truly embodies the harmony of academics, culture, and intellect within our institution. This publication has served as a vibrant platform for diverse voices and ideas, creating a meaningful bridge between science and the humanities—an ideal our department deeply upholds and nurtures.

The Department of Pharmacy has always been dedicated to shaping students into holistic professionals—individuals who possess not only technical expertise but also ethical values, social awareness, and cultural sensitivity. In this light, Shadow Cultivate stands as a perfect reflection of the multidisciplinary nature of modern pharmacy education. The insightful contributions of our students in this edition highlight their engagement with contemporary global challenges and their participation in an evolving academic environment. Their ability to merge scientific reasoning with creative expression—through poetry, prose, and art—is truly inspiring and reaffirms our belief that scientific excellence must coexist with emotional intelligence and creativity.

As the head of the department, it fills me with pride to witness our students evolving into future pharmacists, well-prepared to meet the complex and ever-changing demands of healthcare, technology, and patient-centric innovation. At Sanaka Educational Trust's Group of Institutions, we remain committed to fostering a learning ecosystem that extends beyond classrooms and laboratories. With state-of-the-art facilities, committed faculty, and a student-centered philosophy, we strive to ensure our learners are not only employable but also research-driven and socially responsible.

The enthusiasm and initiative shown by our students in contributing to Shadow Cultivate stand as strong evidence of this culture of academic freedom and encouragement. I extend heartfelt appreciation to the editorial board, faculty mentors, and every contributor whose efforts made this publication possible. Their collaboration truly represents the spirit of unity and shared purpose that defines our department and institution.

CONTENT

Chapter	Sl. no.	Content	Page no.
Scientific advancements	1	<i>Cell Cycle Specific Therapies for Triple-Negative Breast Cancer (TNBC)</i>	1–2
	2	<i>Click Chemistry in Triazole Synthesis</i>	3–4
	3	<i>Development of Liposomal Dosage Form in Alzheimer's Treatment</i>	5–6
	4	<i>3D Printing of Personalized Medicines</i>	7
	5	<i>CRISPR-Cas9 in Gene Editing Therapies</i>	8–9
	6	<i>Monoclonal Antibodies in Targeted Therapy</i>	10–11
	7	<i>Neuropharmacology of Depression and Anxiety</i>	12–13
Art & Literature	8	<i>Lakshmi Roopam (Painting)</i>	14
		<i>Sulakshana (Painting)</i>	14
	9	<i>Song of a Running Train (Poem)</i>	15
		<i>Kalbaishakhi (Poem)</i>	16
		<i>A Rainy Eve (Prose)</i>	16–17
		<i>The Boy Who Chased Everything</i>	17–18
		<i>শেষ পাতার রহস্য (Mystery Story)</i>	18–19
Current affairs	10	<i>Political Unrest in Pakistan: Assassination Attempt on Imran Khan</i>	20–21
	11	<i>Shifting Frontlines and Internal Chaos: Ukraine's Counteroffensive, Russia's Resurgence, and the Wagner Rebellion</i>	22–23
	12	<i>Tragedy in Peshawar: The Devastating Mosque Bombing of January 30, 2023</i>	24–25
	13	<i>Dancing Lights over Ladakh: April 2023's G4 Geomagnetic Storm and the Rare Low-Latitude Aurora</i>	26–27
	14	<i>Honoring Tribal Legacy: PM Modi Declares Mangarh Dham a National Monument</i>	28–29
	15	<i>Revolutionizing Indian Agriculture: Launch of IFFCO's Nano-DAP Fertilizer by Home Minister Amit Shah</i>	30–31

1

**Scientific
Advancements****Cell Cycle Specific
Therapies for
Triple-Negative
Breast Cancer
(TNBC)***Shaheen Noori, Soumendu Mondal*

Triple-negative breast cancer (TNBC) is a highly aggressive and heterogeneous subtype of breast cancer characterized by the absence of estrogen receptor (ER), progesterone receptor (PR), and human epidermal growth factor receptor 2 (HER2) expression. Due to this lack of receptor targets, TNBC patients do not benefit from endocrine or HER2-targeted therapies, leaving chemotherapy as the main systemic treatment. However, high rates of recurrence, metastasis, and chemoresistance necessitate the development of more precise and effective strategies. One such promising approach is the development of cell cycle-specific therapies, which aim to disrupt the unregulated proliferation of TNBC cells by targeting key regulatory checkpoints of the cell cycle. The cell cycle comprises four distinct phases—G1, S, G2, and M—each

regulated by a complex interplay of cyclins, cyclin-dependent kinases (CDKs), and CDK inhibitors. TNBC often exhibits dysregulation of these pathways, particularly the loss of tumor suppressors such as p53 and RB, overexpression of cyclin E1, and increased activity of CDKs, especially CDK2 and CDK4/6. This presents an opportunity to exploit such vulnerabilities through therapeutic intervention. CDK4/6 inhibitors such as palbociclib, ribociclib, and abemaciclib have shown success in hormone receptor-positive breast cancer, and recent trials are exploring their effectiveness in subsets of TNBC, especially in those retaining RB function. Furthermore, cell cycle inhibitors targeting the G2/M checkpoint, such as Wee1 inhibitors (e.g., adavosertib), are gaining traction in TNBC with defective G1/S regulation. Wee1 inhibition forces cells with DNA damage to prematurely enter mitosis, leading to mitotic catastrophe and cell death. Similarly, Chk1 and ATR inhibitors disrupt DNA damage checkpoints and are particularly effective in TNBC cells harboring BRCA1/2 mutations or defects in homologous recombination repair. Another approach is targeting the S-phase with antimetabolites such as gemcitabine and 5-fluorouracil, which inhibit DNA synthesis. Additionally, microtubule-targeting agents like taxanes and vinca alkaloids act during mitosis, causing mitotic arrest and apoptosis. These agents are already used in standard chemotherapy but are now being revisited in combination with molecularly targeted cell cycle drugs to enhance specificity and reduce resistance. Moreover, preclinical studies and early-phase clinical trials are evaluating combination therapies that simultaneously

target multiple phases of the cell cycle or integrate immune checkpoint inhibitors and PARP inhibitors with cell cycle drugs to potentiate their effect. Biomarker-driven therapy, using genomic and proteomic profiling to identify TNBC subtypes and associated cell cycle defects, further enhances the precision of such treatments. Despite encouraging preclinical data, clinical translation remains challenging due to the heterogeneity of TNBC and compensatory survival pathways that allow cells to bypass inhibition. Therefore, the future of cell cycle-specific therapies in TNBC lies in the strategic integration of multiple pathway inhibitors, careful patient selection based on molecular profiling, and dynamic monitoring of treatment response. This precision-oncology approach holds the potential to transform the treatment landscape for TNBC and improve outcomes for patients suffering from this challenging disease.

2

Scientific Advancements

Click Chemistry in Triazole Synthesis

Suman Nayak, Somnath Dey

Click chemistry has revolutionized the field of organic synthesis by offering a modular, efficient, and high-yielding strategy for constructing complex molecules. Introduced by K. Barry Sharpless in 2001, click chemistry refers to a set of highly selective, bioorthogonal reactions that are fast, simple to perform, and produce minimal byproducts. One of the most celebrated reactions in this category is the copper(I)-catalyzed azide–alkyne cycloaddition (CuAAC), which enables the regioselective formation of 1,2,3-triazoles—a class of five-membered nitrogen-containing heterocycles with significant applications in medicinal chemistry, materials science, and chemical biology. The CuAAC reaction involves the reaction between a terminal alkyne and an organic azide, catalyzed by a copper(I) source, typically yielding 1,4-disubstituted 1,2,3-triazoles with excellent regioselectivity and yields under mild conditions. This reaction is tolerant of a wide range of functional groups, solvents,

and temperatures, making it a powerful tool for triazole synthesis. Triazoles produced through click chemistry possess high thermal and chemical stability, and their unique electronic and hydrogen bonding properties contribute to their use in drug development as enzyme inhibitors, antifungal agents, anticancer compounds, and antiviral drugs. Additionally, triazoles act as bioisosteres of amides and other functional groups, enhancing the pharmacokinetic properties of candidate molecules. In bioconjugation, click chemistry is widely used to label biomolecules like proteins, nucleic acids, and lipids with fluorophores or other tags without interfering with biological processes, owing to the bioorthogonality of the azide and alkyne groups. Beyond the CuAAC reaction, metal-free variants such as the strain-promoted azide–alkyne cycloaddition (SPAAC) have been developed for use in living systems where copper toxicity is a concern. SPAAC utilizes strained cyclooctynes to react with azides without the need for metal catalysts, broadening the applicability of click chemistry in biomedical and in vivo research. Triazole synthesis via click chemistry has also found application in polymer chemistry, facilitating the formation of block copolymers and dendrimers with controlled architectures. Furthermore, in materials science, triazole-based ligands are being used in the design of metal-organic frameworks (MOFs) and supramolecular assemblies. The versatility and predictability of triazole formation through click chemistry make it a cornerstone in the design of smart materials and drug delivery systems. In medicinal chemistry, structure–activity relationship (SAR) studies frequently

utilize triazole scaffolds to fine-tune binding interactions with biological targets. Moreover, click chemistry is enabling high-throughput synthesis and screening of compound libraries for drug discovery. The robustness, regioselectivity, and orthogonality of click chemistry reactions ensure reproducibility and scalability, making them highly attractive for industrial applications as well. As click chemistry continues to evolve, the development of newer catalysts, greener reaction conditions, and alternative cycloaddition strategies (e.g., ruthenium-catalyzed reactions for 1,5-disubstituted triazoles) expands the synthetic potential of this approach. In conclusion, click chemistry has emerged as a powerful, efficient, and versatile tool in triazole synthesis, with profound implications across diverse scientific fields, driving innovation in drug development, biomolecular labeling, and material design.

3

Scientific Advancements

Development of Liposomal Dosage Form in Alzheimer's Treatment

Neha Pramanik, Romit Bhattacharjee

The development of liposomal dosage forms has emerged as a promising strategy in the treatment of Alzheimer's disease (AD), a progressive neurodegenerative disorder characterized by memory loss, cognitive decline, and the accumulation of amyloid-beta plaques and tau protein tangles in the brain. One of the major challenges in Alzheimer's therapy is the efficient delivery of therapeutic agents across the blood-brain barrier (BBB), a highly selective membrane that restricts the entry of most drugs into the central nervous system (CNS). Liposomes, which are spherical vesicles composed of one or more phospholipid bilayers encapsulating an aqueous core, offer a unique advantage by enhancing drug solubility, stability, and permeability. They can encapsulate both hydrophilic and lipophilic drugs and protect them from enzymatic degradation,

thus increasing the half-life and bioavailability of therapeutic molecules. In Alzheimer's treatment, liposomal formulations have been employed to deliver a wide range of drugs including acetylcholinesterase inhibitors (like donepezil), antioxidants (such as curcumin), anti-inflammatory agents, and even gene therapy molecules like siRNA. These formulations can be surface-modified with targeting ligands, such as antibodies, peptides, or transferrin, to facilitate receptor-mediated transport across the BBB and improve site-specific drug delivery to neuronal tissues. Moreover, the controlled release properties of liposomes enable sustained drug delivery, reducing dosing frequency and minimizing systemic side effects. Several studies have demonstrated that liposomal donepezil improves drug uptake in the brain and enhances cognitive function more effectively than conventional oral formulations. Curcumin-loaded liposomes have shown promise in reducing oxidative stress and amyloid plaque burden in animal models. Similarly, liposomes functionalized with ApoE-derived peptides have been designed to mimic natural transport pathways and increase uptake by neurons affected in Alzheimer's disease. Additionally, liposomes are being explored for the co-delivery of multiple drugs or combination therapies, aiming to address the multifactorial nature of AD pathology. The use of stealth liposomes coated with polyethylene glycol (PEG) further enhances circulation time and reduces immune clearance. Despite these advancements, challenges remain in large-scale production, long-term stability, and the complexity of brain targeting. Regulatory hurdles and clinical translation

also require thorough pharmacokinetic and toxicological evaluations. Nonetheless, advances in nanotechnology and bioengineering are continuously improving liposome design with responsive or stimuli-triggered systems that release drugs in response to pH, enzymes, or redox conditions found in diseased brain tissues. As our understanding of Alzheimer's pathophysiology evolves, the integration of diagnostic agents into liposomal carriers also opens avenues for theranostic applications—simultaneous diagnosis and therapy. Overall, the development of liposomal dosage forms represents a significant leap forward in overcoming the limitations of conventional therapies in Alzheimer's disease. By enabling targeted, sustained, and efficient delivery of therapeutic agents across the BBB, liposomal systems hold the potential to improve patient outcomes, delay disease progression, and ultimately offer new hope in the management of this debilitating disorder.

4

Scientific Advancements

3D Printing of Personalized Medicines

Chiranjit Mahato, Robina Khatun

3D printing, also known as additive manufacturing, is rapidly transforming the pharmaceutical landscape by enabling the creation of personalized medicines tailored to the unique needs of individual patients. Unlike conventional manufacturing, where drugs are mass-produced in standard doses and forms, 3D printing allows precise control over drug composition, dose, release profile, and even geometry. This technology involves layer-by-layer deposition of pharmaceutical materials using computer-aided design (CAD) models to fabricate complex drug delivery systems. It holds particular promise in areas such as pediatric and geriatric medicine, where personalized dosing and ease of administration are crucial. The first FDA-approved 3D printed drug, Spritam® (levetiracetam), marked a milestone in 2015 by demonstrating how rapidly disintegrating tablets with high drug loads could be created for epilepsy patients. Various 3D printing techniques—such as fused deposition modeling (FDM), inkjet

printing, selective laser sintering (SLS), and stereolithography—are being explored to fabricate oral tablets, transdermal patches, implants, and even polypills that combine multiple medications with distinct release profiles in a single unit. This approach not only improves medication adherence but also minimizes drug interactions and optimizes therapeutic efficacy. Moreover, 3D printing facilitates on-demand manufacturing in hospitals and pharmacies, reducing wastage and ensuring real-time customization. For instance, pharmacogenomic data can be integrated to tailor drug dosage based on the patient's genetic profile, advancing the field of personalized medicine. Additionally, complex drug delivery systems like time-delayed or pH-responsive tablets are more easily achieved using 3D techniques than traditional methods. Despite its potential, challenges remain, including regulatory hurdles, standardization of printable pharmaceutical inks (printlets), stability of drugs during the printing process, and large-scale adoption in clinical settings. As research continues and the technology matures, 3D printing is expected to revolutionize how medicines are prescribed, produced, and consumed—ushering in a new era of patient-centric healthcare

5

Scientific Advancements

CRISPR-Cas9 in Gene Editing Therapies

Subhankhi Mukherjee, Subhadas Chatterjee

CRISPR-Cas9 has revolutionized the field of gene editing, offering unprecedented precision, efficiency, and simplicity in modifying genetic material, and is now at the forefront of gene therapy innovations. Derived from a naturally occurring defense mechanism in bacteria, the CRISPR-Cas9 system enables scientists to cut DNA at specific locations and modify, delete, or replace genetic sequences. This programmable tool consists of two main components: the Cas9 nuclease enzyme that acts as molecular scissors, and a guide RNA (gRNA) that directs Cas9 to the targeted DNA sequence. Its specificity allows for targeted gene corrections, making it a powerful technology for treating a variety of genetic disorders. In therapeutic applications, CRISPR-Cas9 is being explored to correct mutations responsible for monogenic diseases such as sickle cell anemia, beta-thalassemia, Duchenne muscular dystrophy, and cystic fibrosis. For instance, in 2019, a landmark clinical trial showed that CRISPR-Cas9

editing of hematopoietic stem cells to correct the faulty HBB gene in sickle cell disease patients resulted in the production of healthy red blood cells and the elimination of disease symptoms. Similarly, clinical trials are underway to treat Leber's congenital amaurosis, a form of inherited blindness, by directly editing retinal cells in vivo. Beyond monogenic diseases, CRISPR-Cas9 holds promise in oncology by engineering T cells to recognize and destroy cancer cells, improving the effectiveness of immunotherapies. It is also being studied for applications in HIV treatment, where the integrated viral genome can potentially be excised from infected cells. Furthermore, CRISPR-Cas9 has opened the door to developing treatments for complex diseases by enabling genome-wide screening to identify novel drug targets. Despite its enormous potential, challenges remain in ensuring the safety and ethical use of CRISPR-based therapies. One major concern is off-target effects, where unintended genetic modifications may occur, potentially leading to harmful mutations or cancer. Advances in next-generation CRISPR tools—such as base editing and prime editing—aim to reduce these risks by enabling more precise and predictable edits without introducing double-strand breaks. Another key hurdle is the delivery of the CRISPR system into target cells, which researchers are addressing using viral vectors, lipid nanoparticles, and other nanocarriers. Ethical issues surrounding germline editing—where changes could be passed on to future generations—have also prompted global debate and regulatory scrutiny. Nonetheless, the therapeutic use of CRISPR in somatic cells (non-heritable

modifications) is advancing steadily, with several clinical trials showing promising results and the potential for regulatory approvals in the near future. As research progresses and safety profiles improve, CRISPR-Cas9-based gene therapies are poised to shift the paradigm from treating symptoms to curing genetic diseases at their root cause. This transformative technology, once considered science fiction, is now becoming a central pillar in the future of personalized medicine and targeted therapeutics, with the potential to impact millions of lives across a spectrum of currently untreatable genetic conditions.

6 *Scientific Advancements*

Monoclonal Antibodies in Targeted Therapy

MD Nasiruddin Khan, Shailesh Gupta

Monoclonal antibodies (mAbs) have emerged as a cornerstone in targeted therapy, revolutionizing the treatment of various diseases, particularly cancer, autoimmune disorders, and infectious diseases. These lab-engineered molecules are designed to mimic the immune system's natural ability to identify and neutralize specific antigens, offering a highly specific therapeutic approach compared to conventional treatments. The concept involves creating identical antibody molecules that bind exclusively to a single epitope on a target antigen, thereby allowing selective intervention at the molecular level. In oncology, monoclonal antibodies have dramatically improved outcomes by targeting tumor-associated antigens with precision, leading to direct cancer cell destruction, inhibition of tumor growth, or immune system activation against malignant cells. For instance, trastuzumab targets the HER2 receptor in breast cancer, rituximab binds to CD20 on B cells in non-Hodgkin's

lymphoma, and cetuximab targets the epidermal growth factor receptor (EGFR) in colorectal cancer. These antibodies can work through several mechanisms: direct blocking of growth signals, triggering apoptosis, or recruiting immune effector functions such as antibody-dependent cellular cytotoxicity (ADCC) and complement-dependent cytotoxicity (CDC). Additionally, antibody-drug conjugates (ADCs) have been developed to deliver potent cytotoxic agents directly to cancer cells, sparing normal tissues. A notable example is ado-trastuzumab emtansine (T-DM1), an HER2-targeted ADC used in breast cancer treatment. Monoclonal antibodies are also playing a critical role in immunotherapy by modulating immune checkpoints. Drugs such as pembrolizumab and nivolumab block PD-1 receptors on T cells, preventing cancer-induced immune suppression and restoring immune activity. In autoimmune diseases like rheumatoid arthritis and multiple sclerosis, monoclonal antibodies such as adalimumab and natalizumab help suppress overactive immune responses by targeting cytokines or cell adhesion molecules. Infectious disease management has also seen breakthroughs, particularly with mAbs developed against SARS-CoV-2 during the COVID-19 pandemic, offering both therapeutic and prophylactic benefits. The specificity of mAbs minimizes off-target effects, resulting in better tolerability compared to traditional chemotherapy. However, their production is complex and costly, requiring sophisticated biotechnological processes involving mammalian cell cultures. Moreover, challenges such as immunogenicity, short half-life, and limited tissue penetration

persist. Efforts are underway to overcome these limitations through the development of humanized or fully human antibodies, bispecific antibodies that target two different antigens, and engineered antibody fragments with enhanced properties. Advancements in genetic and protein engineering, coupled with improved delivery systems, continue to refine the efficacy and safety of monoclonal antibody therapies. Regulatory approvals of biosimilars are also helping reduce costs and expand global access. As our understanding of disease biology deepens, monoclonal antibodies are expected to become even more sophisticated and personalized, tailored to individual patients' molecular profiles. In conclusion, monoclonal antibodies represent a paradigm shift in targeted therapy, offering high specificity, potent activity, and versatility across a wide range of diseases. Their integration into modern medicine marks a significant advancement toward precision therapeutics, improving both survival and quality of life for patients worldwide.

7

Scientific Advancements

Neuropharmacology of Depression and Anxiety

Debshikha Mahajan, Sanket Seksaria

The neuropharmacology of depression and anxiety explores how various neurotransmitters, receptors, and neural circuits contribute to these common and often debilitating mental health disorders, and how pharmacological agents can modulate these systems to restore emotional balance. Depression and anxiety share overlapping pathophysiological mechanisms, involving complex interactions between neurotransmitters such as serotonin (5-HT), norepinephrine (NE), dopamine (DA), gamma-aminobutyric acid (GABA), and glutamate. Traditionally, the monoamine hypothesis has served as a foundational model in understanding these disorders, proposing that deficits in serotonin, norepinephrine, and dopamine levels are central to their development. Consequently, most conventional antidepressants and anxiolytics aim to enhance monoaminergic transmission. Selective serotonin reuptake inhibitors (SSRIs) like fluoxetine and sertraline, serotonin-norepinephrine reuptake

inhibitors (SNRIs) such as venlafaxine, and tricyclic antidepressants (TCAs) are widely prescribed for both depression and anxiety, as they increase the availability of serotonin and/or norepinephrine in the synaptic cleft, thereby improving mood and reducing anxiety symptoms over time. However, these medications often take weeks to show therapeutic effects and may not be effective for all patients, highlighting the need for alternative approaches. Recent advances in neuropharmacology have uncovered the importance of the glutamatergic system in the pathogenesis of mood disorders. Ketamine, a non-competitive NMDA receptor antagonist, has shown rapid and sustained antidepressant effects in treatment-resistant depression by modulating glutamate signaling and enhancing synaptic plasticity. This has led to the development of novel glutamate-targeting agents and a paradigm shift away from the monoamine-centric view. Another major neurotransmitter involved in anxiety regulation is GABA, the brain's primary inhibitory neurotransmitter. Benzodiazepines, which potentiate the activity of GABA-A receptors, provide rapid relief from acute anxiety but carry risks of dependence, tolerance, and cognitive impairment with long-term use. Hence, research is focused on developing subtype-selective GABA modulators with fewer side effects. Neurosteroids like allopregnanolone, which modulate GABA-A receptors, are being explored for their rapid antidepressant and anxiolytic effects, as seen with brexanolone, approved for postpartum depression. Beyond neurotransmitters, dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis and elevated cortisol levels are commonly

observed in individuals with depression and anxiety, implicating neuroendocrine factors in their pathophysiology. Chronic stress alters brain structure and function, particularly in the hippocampus, amygdala, and prefrontal cortex, which regulate emotion and stress responses. Inflammatory cytokines have also been implicated, suggesting an immunological component to mood disorders. Consequently, anti-inflammatory agents and HPA axis modulators are under investigation as adjunctive treatments. Furthermore, the gut-brain axis and the role of the microbiome in neuropsychiatric health is a rapidly expanding area of research, offering new therapeutic targets. Modern neuropharmacology embraces a more holistic understanding of depression and anxiety, integrating genetic, epigenetic, and environmental influences with neurochemical imbalances. Personalized medicine approaches, including pharmacogenomics, aim to optimize treatment strategies based on individual biological profiles. As our understanding of brain function deepens, the future of treating depression and anxiety lies in multi-targeted, rapid-acting, and safer therapies that address both core symptoms and underlying neurobiological mechanisms

Art & Literature

8 Paintings



Lakshmi Roopam

~Pratyushi De

This image is a vibrant folk-art style (Pattachitra) painting of Goddess Lakshmi, depicted with four arms holding lotus flowers, symbolizing prosperity, purity, and abundance.

Sulakshana

~ Debanjana Mondal

This vibrant artwork portrays a stylized image of Lord Ganesha, blending traditional Indian folk motifs with rich colours and intricate patterns. The lotus, leaves, and divine symbols create a harmonious spiritual essence.



9 *Art & Literature*

Prose & Poetry

Song of a Running Train

~ Deep Sarkar, 4th year

Across the fields, through hills and rain,
Rolls the mighty running train.
Iron heartbeat on the track,
Never once does it look back.

Smoke and steam, a roaring sound,
Wheels that spin and shake the ground.
Windows frame a thousand scenes—
Rivers, trees, and village greens.

Clickety-clack, a rhythmic beat,
Children waving from the street.
Vendors call with chai and bread,
While sleepy heads rest overhead.

Sunrise glints on metal skin,
Whispers where the day begins.
With every mile, a story born,
Of dreams departed, hopes reborn.

Strangers meet and stories blend,
Journeys start and sometimes end.
From crowded towns to mountains high,
The train moves on beneath the sky.

Oh running train, so bold and free,
A thread that weaves through history.
A moving world on tracks of steel—
Of time, of place, of life so real.

কালবৈশাখী

(Kalbaishakhi)

~ Arnab Dey 3rd year

আকাশ কালো, ছায়া ঘন,
দিগন্ত জুড়ে ঝড়ের রণ।
হঠাৎ হাওয়া, ছুটে আসে,
গাছের ডালে কাঁপন বাঁসে।
মেঘের গর্জন, বিদ্যুৎ চমক,
হৃদয় কাঁপে সেই ঝাঁকুনি চক।
ধুলো উড়ে, পাতরা নাচে,
মাটির গন্ধ বাতাসে বাঁচে।
কুয়ো ভাঙে, ছাউনি যায়,
শিশু কাঁদে মায়ের ছায়ায়।
বৃষ্টির ধারা ঝমঝম করে,
শীতল জলে মনটা ভরে।
ক্ষণিক পরে শান্তি নামে,
সবুজ ধরা স্নান পায় জামে।
কালবৈশাখী, তোরেই ডাকি,
তুই দিগন্তে প্রাণের ঝাঁকি।
ভয়ও আনে, শান্তিও ছড়ায়,
বাংলার প্রাণে জয়গান গায়।
তুই আসিস বারেবারে,
নতুন আশা, নতুন বারে।

A Rainy Eve

~ Prosun Ganguly, 4th year

It was a quiet evening in the small town of Chinsurah. The sky had turned a brooding shade of grey, and a gentle breeze carried the smell of wet earth even before the first raindrop fell. At exactly five o'clock, as if nature kept its own clock, the skies opened up and rain began to pour, drenching the narrow streets, the rusted tin roofs, and the bougainvillea vines clinging to old brick walls. Ananya sat by the window, a cup of steaming tea warming her palms. The rain pattered softly on the windowpane, and the world outside looked like a watercolor painting—soft, blurred, and peaceful. She always loved rainy evenings; they reminded her of childhood, of school holidays, of paper boats floating in puddles, and her grandmother's stories told over fried pakoras and laughter. Today, however, there was a touch of longing in the air. It had been three years since Ananya left Kolkata to work in Mumbai. She had returned just a week ago

to visit her parents, trying to find a sense of stillness in the familiar corners of home. The rain seemed to bring back every forgotten emotion — a sense of comfort, nostalgia, and something else she couldn't quite name. Down the street, someone ran for shelter, holding a bag over their head. Children splashed barefoot in the puddles, their laughter ringing through the air. A cycle bell rang, a dog barked, and the evening played out like an old film. Suddenly, the doorbell rang. Surprised, Ananya opened the door to find Arjun — her childhood friend, soaked to the bone, hair dripping, but smiling like sunshine.

“I heard you were home,” he said breathlessly. “Thought I’d catch you before the rain stopped.”

She laughed, pulling him inside. “Still reckless, I see.”

He shrugged. “Still love the rain.”

As they sat by the window, two cups of tea between them and the rain dancing outside, the silence spoke louder than words. It wasn't just the weather — it was the warmth of home, the return of old bonds, and the healing power of a simple rainy eve.

And somewhere between the thunder and the tea, Ananya realized — sometimes, home isn't just a place. It's a feeling that comes with the rain.

The Boy Who Chased Everything

~ Ishu Mishra, 3rd year

In a small village nestled between hills and fields, lived a boy named Rihan. From the moment he could speak, Rihan dreamed big — bigger than the boundaries of his modest home, bigger than the expectations of his parents, and even bigger than the stars that glimmered over his village at night. At ten, he wanted to be a cricketer. He would practice with a stick and rubber ball every evening. The very next year, he wanted to be a scientist — his books filled with hand-drawn rockets and wild equations. By thirteen, he declared he would become an artist, painting the walls of his house with colors borrowed from dreams. People laughed. “He wants everything,” they said. “A jack of all trades, master of none.”

But Rihan didn't care. Every new ambition lit up his eyes like Diwali lamps. He read tirelessly, practiced endlessly, and questioned constantly. His teachers admired his curiosity, though they sometimes shook their heads at his lack of focus.

At seventeen, he left for the city. He worked part-time jobs, studied under streetlights, and took odd classes — coding, acting, mechanics, even music. He failed often. He ran out of money, missed meals, and once spent a night on a railway bench. But he never stopped chasing.

Years passed. Rihan, now in his mid-twenties, hadn't yet “made it” in the traditional sense. He wasn't famous, nor rich, nor had he stuck to one thing. But his room was filled with little trophies, certificates, painted canvases, half-written books, and unfinished inventions. He had tutored kids, built apps, acted in short films, and even opened a small creative studio with a few friends.

One day, a journalist visited his studio, curious about this boy who had done so much yet claimed so little. “What do you truly want to become?” she asked.

Rihan smiled. “I want to become everything I can — not to impress the world, but to explore every corner of the person I am.”

She called him “The Boy Who Chased Everything” in her article.

And Rihan, reading it under the same starlit sky of his childhood, whispered to himself, “Not everything is meant to be mastered. Some things are just meant to be felt, tried, and loved.”

And in that moment, he knew — he had already achieved more than most ever dare to dream.

শেষ পাতার রহস্য

~ Jayanti Talukder, 3rd year

সন্ধ্যা নামছে কলকাতার কলেজ স্ট্রিটে। বইয়ের দোকানগুলোর ঝাঁপ নামছে ধীরে ধীরে। এমন সময় এসে হাজির হল প্রাইভেট ডিটেকটিভ অরিত্র বসু। হাতে একটা হলুদ খামের চিঠি, যার ওপরে লেখা— “দয়া করে আমাকে সাহায্য করুন, আমি আজ রাতে মারা যেতে পারি। — বিনয় ঘোষ”

অরিত্র অবাক। চিঠি এসেছে ঠিক এক ঘণ্টা আগে, অথচ পাঠানোর সময় লেখা ছিল গতকাল! তিনি দেরি করেননি। চিঠিতে দেওয়া ঠিকানা অনুসারে, কলেজ স্ট্রিটের এক পুরনো বইয়ের দোকানে পৌঁছে গেলেন— “সেকেন্ড হ্যান্ড পেপার হাউস।” দোকানটি প্রায় বন্ধ, কিন্তু আলো জ্বলছে। দরজা ঠেলেই অরিত্র ভেতরে ঢুকলেন।

“বিনয়বাবু আছেন?”

কেউ উত্তর দিল না। দোকানটা ভেতরে বেশ অগোছালো। পুরনো বইয়ের গন্ধ, ছড়ানো খবরের কাগজ, আর মাঝে একটা কাঠের চেয়ারে বসে আছে এক নিথর দেহ— বিনয় ঘোষ, দোকানের মালিক।

অরিত্র এগিয়ে গিয়ে দেখলেন, লোকটি মারা গেছে। পুলিশের খবর দেওয়া হল, কিন্তু অরিত্র বুঝলেন—এটা নিছক আত্মহত্যা নয়।

চিঠি অনুযায়ী, কেউ তাকে হত্যার হুমকি দিচ্ছিল। কিন্তু কে? কেন?

অরিত্র চারপাশ খুঁজে দেখতে লাগলেন। হঠাৎ একটা পুরনো বইয়ের ভেতর থেকে পেলেন একটা ছেঁড়া পৃষ্ঠা। সেটার নিচে লেখা—

“শেষ পাতা সব বলে দেয়।”

এটা কীসের ইঙ্গিত?

তদন্তে জানা গেল, বিনয় ঘোষ একসময় রARE বই সংগ্রহ করতেন, এবং সম্প্রতি একটি দুস্প্রাপ্য বই পেয়েছিলেন- “নকশাল যুগের গোপন ডায়েরি” । এতে নাকি ৭০’ র দশকের এক রাজনৈতিক হত্যাকাণ্ডের তথ্য ছিল।

অরিত্র এবার দোকানের প্রতিটি বই খুঁজতে শুরু করলেন। হঠাৎ একটা মোটা বাংলা উপন্যাসের ভেতর গুঁজে রাখা পাতায় খুঁজে পেলেন সেই ডায়েরির শেষ পাতা।

তাতে লেখা-

“আমার মৃত্যু
পেছনে ওর হাত-বিমল মিত্র।”

বিমল মিত্র! নামটা পরিচিত। অরিত্র ভাবতে লাগলেন-এ তো কলেজের প্রাক্তন অধ্যাপক, ইতিহাসবিদ এবং বিনয় ঘোষের পুরনো বন্ধু।

পুলিশ ডাকা হল। বিমলবাবুকে জিজ্ঞাসাবাদে ধরা পড়ল সত্য। তিনি জানতেন, যদি সেই ডায়েরি প্রকাশ পায়, তবে তার রাজনৈতিক জীবন ধ্বংস হয়ে যাবে। তাই বন্ধুকে চিরতরে সরিয়ে দিতে দ্বিধা করেননি।

অরিত্র বসুর তীক্ষ্ণ পর্যবেক্ষণ আর শেষ পাতার সূত্রেই রহস্যের জট খুলে গেল।

অরিত্র চুপচাপ দোকান থেকে বেরিয়ে এলেন। বাইরের বাতাসে বইয়ের গন্ধ আর সন্ধ্যার আলো মিলেমিশে যেন বলছিল-
সত্য চাপা পড়ে না, যত পুরনোই হোক না কেন।

10

Current affairs

Political Unrest in Pakistan: Assassination Attempt on Imran Khan and Rise in Taliban Activities amidst Leadership Transition

Soham Dutta (3rd year)

On November 3, 2022, Pakistan was thrust into political turmoil when former Prime Minister Imran Khan narrowly escaped an assassination attempt during a public rally in Wazirabad, near Lahore. Khan, who was leading his “Haqeeqi Azadi March” (Real Freedom March) demanding early elections and denouncing what he called foreign intervention in domestic politics, was shot in the leg by a lone gunman while addressing his supporters atop a moving container. The attack injured several others and immediately heightened tensions across the nation. Khan's survival and swift media appearance post-attack

invigorated his supporters but also underscored the fragility of Pakistan's political landscape. His Pakistan Tehreek-e-Insaf (PTI) party termed the attack as an assassination attempt orchestrated by political rivals and sections of the establishment, further deepening civil-military discord. This incident occurred amidst a resurgence of violence by the Tehrik-i-Taliban Pakistan (TTP), also known as the Pakistani Taliban. Following the end of a shaky ceasefire agreement with the government, the TTP intensified its insurgent activities across the Khyber Pakhtunkhwa region and tribal districts. The group, emboldened by the Taliban's return to power in Afghanistan in August 2021, launched several deadly attacks on security forces, checkpoints, and police stations in late 2022 and early 2023. The security establishment struggled to contain this renewed threat, raising concerns about the spread of extremist influence in both urban and border areas. The increasing frequency and brutality of attacks created a climate of fear, especially in the northwest, destabilizing already vulnerable communities and highlighting the inadequacies of counterterrorism strategies. Amid these crises, Pakistan underwent a significant transition in military leadership. General Qamar Javed Bajwa, who had served as Chief of Army Staff since 2016 and played a dominant role in shaping Pakistan's civil-military dynamics, retired in late November 2022. He was succeeded by General Asim Munir, a former Inter-Services Intelligence (ISI) chief known for his integrity and experience in intelligence and operational command. General Munir assumed office at a time when the military was facing public criticism for alleged interference in politics, and his appointment was seen as

an opportunity to recalibrate the military's role and restore its credibility. However, Munir also inherited daunting challenges — managing the rise of the TTP, maintaining internal stability, and redefining the army's relationship with political stakeholders like Imran Khan. The convergence of these three events — the attempted assassination of a populist leader, the re-escalation of militant violence, and the appointment of a new army chief — painted a vivid picture of a Pakistan in flux. The nation stood at a critical juncture, where democratic aspirations, institutional reform, and national security concerns collided. While Khan's political momentum gained sympathy following the attack, the threat from extremist elements and uncertainty over the military's future role continued to cast a shadow on the country's stability. The months following these developments were expected to determine not just the fate of Imran Khan and his party but also the trajectory of Pakistan's democracy, civil-military relations, and fight against terrorism.

11

Current affairs

Shifting Frontlines and Internal Chaos: Ukraine's Counteroffensive, Russia's Resurgence, and the Wagner Rebellion

Motiur Rahaman (3rd year)

In the evolving landscape of the Russia-Ukraine war, the period between late 2022 and mid-2023 marked a significant phase of territorial flux, strategic recalibration, and internal instability. Following a series of devastating setbacks for Russian forces in 2022, Ukraine launched a major counteroffensive, reclaiming substantial territory in the northeastern Kharkiv region and pushing forward in the southern Kherson oblast. These advances were hailed as major victories for Kyiv, signaling both tactical proficiency and

resilient morale bolstered by Western-supplied weapons, particularly HIMARS rocket systems, advanced drone warfare, and real-time battlefield intelligence from NATO allies. Ukrainian troops regained control of hundreds of settlements, including key logistics hubs, forcing Russia into defensive positions and exposing gaps in its command structure and troop readiness. However, as winter gave way to spring in 2023, Russia began to regroup and reassert its military initiative, most notably in the battle for Bakhmut, a strategically important city in the eastern Donetsk region. Although considered by some analysts to hold limited strategic value, Bakhmut became symbolically critical for both sides. Russian forces, heavily supported by the Wagner Group—a private military company led by Yevgeny Prigozhin—conducted relentless assaults on the city. After months of attritional warfare, Russia captured Bakhmut in May 2023, declaring it a key victory in the Donbas campaign. Ukrainian officials acknowledged the withdrawal but emphasized the city's destruction had weakened Russian forces more than it benefited them, turning Bakhmut into a costly triumph for Moscow. Amid these shifting battlefield dynamics, Russia was simultaneously grappling with deep internal strife. Discontent simmered within the ranks of the Wagner Group, whose leader Prigozhin openly criticized Russia's military leadership, especially Defense Minister Sergei Shoigu and Chief of the General Staff Valery Gerasimov. The breaking point came in June 2023, when Prigozhin launched a dramatic and short-lived armed rebellion, marching his forces towards Moscow in what appeared to be a coup attempt. The world watched in

astonishment as Wagner troops seized military facilities in Rostov-on-Don and advanced hundreds of kilometers with little resistance. However, just as swiftly, the mutiny was called off after a deal—reportedly brokered by Belarusian President Alexander Lukashenko—was reached, allowing Prigozhin and his men to stand down in exchange for amnesty and relocation to Belarus. This Wagner mutiny exposed severe cracks within Russia’s war apparatus, revealing vulnerabilities in command and control and raising questions about President Vladimir Putin’s grip on power. The rebellion momentarily paralyzed Russian command structures and deeply embarrassed the Kremlin, which had long projected strength and unity in its war narrative. While Putin survived the immediate crisis, the episode shook domestic confidence and emboldened international critics. Meanwhile, Ukraine viewed the chaos as validation of its strategy to wear down Russian resolve both on the battlefield and within its political hierarchy. Overall, the period from late 2022 to mid-2023 underscored the volatile and unpredictable nature of the war. Ukraine’s counteroffensive demonstrated its ability to reclaim lost ground, but Russia’s eventual recapture of Bakhmut and its internal fractures, symbolized by the Wagner mutiny, highlighted a conflict far from resolution—one where military momentum and political stability are constantly in flux.

12

Current affairs

Tragedy in Peshawar: The Devastating Mosque Bombing of January 30, 2023

Ankan Paul (3rd year)

On January 30, 2023, Pakistan witnessed one of its deadliest terror attacks in recent years when a suicide bombing inside a mosque in Peshawar killed over 100 people, the majority of them police officers. The explosion occurred during afternoon prayers at a high-security compound in the Police Lines area, a fortified zone that houses police headquarters and counterterrorism offices. The mosque was located within the premises of the compound, a place where security personnel gathered regularly, making it a deeply symbolic and tactical target for the attackers. The bombing was not only an act of extreme violence but also a direct strike at the heart of Pakistan's law enforcement apparatus.

The explosion reduced a large portion of the mosque's structure to rubble, trapping worshippers beneath the debris. Eyewitnesses described the moment of horror, with bodies scattered across the prayer hall and survivors scrambling to pull colleagues out from under collapsed walls. Rescue operations stretched for hours, and hospitals were overwhelmed with casualties. The scale of devastation was staggering, with more than 220 injured and over 100 confirmed dead—most of them uniformed police officers. The attack was a painful reminder of the persistent vulnerability of even the most secure sites in Pakistan to militant violence. Although no group immediately claimed responsibility, suspicion quickly turned toward the Tehrik-i-Taliban Pakistan (TTP), also known as the Pakistani Taliban. The TTP had previously carried out numerous attacks against Pakistan's security forces, and the scale and target of the Peshawar bombing bore the hallmarks of their operational tactics. While a TTP spokesperson initially denied involvement, later intelligence reports and investigations indicated the attack may have been orchestrated by a splinter faction or affiliates sympathetic to the group's ideology. The incident came just weeks after the TTP formally ended a ceasefire with the Pakistani government and resumed hostilities, emboldened by the Taliban's resurgence across the border in Afghanistan. The bombing shocked the nation and drew widespread condemnation from domestic leaders and the international community. Prime Minister Shehbaz Sharif called the attack “a national tragedy” and vowed stern action against those responsible. He visited the injured and declared a day of mourning, while top military and intelligence officials

convened urgent security meetings. However, critics pointed to long-standing failures in Pakistan's counterterrorism strategy, highlighting the emboldenment of extremist networks and the apparent intelligence lapses that allowed such an attack to occur in a secure zone. This Peshawar mosque bombing marked a dark chapter in Pakistan's fight against militancy, reigniting fears of a return to the wave of terror that plagued the country during the 2007–2014 period. It raised pressing questions about the efficacy of peace talks with militant groups, the porousness of Afghanistan–Pakistan borders, and the need for stronger internal security coordination. Beyond the immediate loss of life, the bombing dealt a heavy psychological blow to the police force, which has borne the brunt of anti-terror operations for years. As Pakistan continued to grapple with rising militancy, the Peshawar attack stood as a stark and tragic reminder of the ongoing threat posed by extremism and the urgent need for a unified national response.

13

Current affairs

Dancing Lights over Ladakh: April 2023's G4 Geomagnetic Storm and the Rare Low- Latitude Aurora

Suman Halder (2nd year)

In late April 2023, Earth experienced a powerful G4-class geomagnetic storm, one of the strongest in years, resulting in an extraordinary and rare visual phenomenon — low-latitude auroras. This rare event peaked on April 23, 2023, and was particularly notable for producing visible auroral displays in regions far south of the polar auroral zones, including Ladakh in northern India. Typically, auroras — commonly known as the Northern and Southern Lights — are confined to high-latitude areas near the Arctic and Antarctic Circles. However, the magnitude of this storm allowed the auroral oval to expand southward, offering a once-in-a-lifetime spectacle to regions like the Himalayas,

Central Asia, parts of Europe, and even parts of the contiguous United States. The geomagnetic storm was triggered by a coronal mass ejection (CME) — a massive burst of solar plasma and magnetic field from the Sun's corona — that erupted from a particularly active sunspot. This CME, traveling at high speeds, slammed into Earth's magnetosphere, disturbing its natural balance. The storm was categorized as G4 on the NOAA space weather scale, which ranges from G1 (minor) to G5 (extreme). G4 storms are severe and are capable of disrupting satellite operations, radio communications, navigation systems, and power grids. In this case, although minimal infrastructure damage was reported, the storm's effects were highly visible in the sky, creating colorful ribbons of green, red, and violet light dancing across the night sky in areas unaccustomed to such displays. In Ladakh, a region typically associated with its stark, high-altitude landscapes and clear night skies, the auroral display was both stunning and scientifically significant. Astronomers, photographers, and locals reported vivid green and pink hues streaking across the northern sky, captured in numerous long-exposure images and shared widely across global media and scientific platforms. The Indian Astronomical Observatory in Hanle confirmed the event, stating that such an auroral occurrence at Ladakh's latitude (around 33°N) was extremely rare, last seen possibly decades ago under strong solar maximum conditions. The phenomenon offered scientists a unique opportunity to study low-latitude auroras and their interaction with local geomagnetic and ionospheric conditions in the subcontinent.

The April 2023 event also sparked renewed public interest in space weather and solar cycle forecasting, particularly as Earth moves closer to the solar maximum of Solar Cycle 25, expected around 2025. As solar activity intensifies, CMEs and geomagnetic storms are likely to become more frequent and more powerful. The Ladakh aurora served as a vivid reminder of the Sun's ability to influence life and technology on Earth, even from 150 million kilometers away. In conclusion, the G4 geomagnetic storm of April 23, 2023, was a captivating and rare astronomical event that illuminated skies over Ladakh and many other unusual locations. It not only brought awe-inspiring visuals to unsuspecting regions but also highlighted the growing importance of space weather monitoring and preparedness in a world increasingly reliant on satellite and communication infrastructure. For observers in Ladakh, it was a moment where science met magic — a silent storm from the Sun painted the sky with light.

14

Current affairs

Honoring Tribal Legacy: PM Modi Declares Mangarh Dham a National Monument

Soham Chandra (2nd year)

On November 1, 2022, Prime Minister Narendra Modi officially declared Mangarh Dham a national monument, marking a historic and emotional recognition of the tribal freedom struggle that had long remained in the shadows of mainstream narratives. Located on the Rajasthan-Gujarat border in the Banswara district, Mangarh Dham holds immense historical and cultural significance, especially for the Bhil tribal community. It was here, on November 17, 1913, that thousands of Bhil freedom fighters, under the leadership of social reformer Govind Guru, were brutally massacred by British colonial forces during a peaceful protest. This tragic event, known as the Mangarh Massacre, claimed the lives of over 1,500 tribal men and women—yet it rarely found space in India's freedom movement chronicles.

Prime Minister Modi's decision to elevate Mangarh Dham to the status of a national monument was not only a symbolic gesture but also a corrective historical act. During the announcement, made at a public gathering at Mangarh Hills attended by tribal leaders, historians, and community members, Modi emphasized that the sacrifices made by tribal communities for India's independence were no less than those made elsewhere. He noted that the official recognition of Mangarh Dham was long overdue and that the nation must embrace its complete history, not just selective episodes. By doing so, the government aimed to integrate the Adivasi struggle into the larger freedom movement narrative, thereby fostering a more inclusive understanding of India's past. Govind Guru, the central figure in the Mangarh struggle, was a revered social reformer and freedom fighter who worked tirelessly to uplift the tribal communities of the region. He led the Bhagat Movement, which sought to eliminate social evils, promote education, and inspire self-reliance among the Bhils and other tribal groups. His leadership culminated in the peaceful congregation at Mangarh Hill, where tribes gathered to demand justice and dignity. However, British authorities viewed this gathering as an act of rebellion and ordered a ruthless military crackdown, resulting in a mass slaughter that mirrored the infamous Jallianwala Bagh massacre of 1919, but tragically remained underrepresented in historical discourse. The declaration of Mangarh Dham as a national monument is expected to have far-reaching cultural, educational, and developmental implications. It will lead to improved infrastructure, conservation of historical records, and increased awareness

through museums and interpretive centers. More importantly, it will ensure that the story of the Bhil martyrs is taught in schools, discussed in academia, and commemorated nationally. The recognition has also resonated deeply with the tribal communities of Rajasthan, Gujarat, Madhya Pradesh, and Maharashtra, where Govind Guru remains a spiritual and cultural icon. In essence, PM Modi's announcement bridged a long-standing historical gap, finally honoring a legacy that was unjustly forgotten. By giving Mangarh Dham the status it rightfully deserves, the government not only paid tribute to the thousands of tribal martyrs who gave their lives for India's freedom but also took a vital step toward historical inclusivity and national unity. The move serves as a reminder that India's freedom was fought for in every corner of the land—by every community, including its most marginalized.

15

Current affairs

Revolutionizing Indian Agriculture: Launch of IFFCO's Nano- DAP Fertilizer by Home Minister Amit Shah

Devasmita Patra (4th year)

On April 26, 2023, India marked a significant milestone in the agricultural sector as Union Home and Cooperation Minister Amit Shah launched IFFCO's Nano-DAP (Di-Ammonium Phosphate) fertilizer at a grand event in Delhi. The launch of nano-DAP, following the earlier introduction of nano-urea, signified a transformative step in India's move toward sustainable, efficient, and high-tech farming practices. Developed by the Indian Farmers Fertiliser Cooperative Limited (IFFCO), one of the world's largest cooperative societies, nano-DAP is the second nano-technology-based fertilizer to

be approved for large-scale use in Indian agriculture. This innovation aligns with the government's vision of reducing chemical usage in farming, enhancing soil health, and promoting the self-reliance of Indian farmers under the banner of "Atmanirbhar Bharat". DAP is one of the most commonly used fertilizers in India, especially in cultivating wheat, rice, and oilseeds. Traditionally, it is imported in bulk and heavily subsidized due to its critical role in crop nutrition. However, conventional DAP usage has led to issues like overapplication, soil degradation, and environmental concerns. The nano-DAP formulation offers a highly efficient and eco-friendly alternative. It delivers essential nutrients — nitrogen and phosphorus — in nano-particle form, which allows for better absorption by plants, reduces wastage, and minimizes runoff into water bodies. According to IFFCO, a 500 mL bottle of nano-DAP is equivalent to a 50 kg bag of traditional granular DAP, offering logistical, economic, and environmental benefits. During the launch, Amit Shah emphasized that nano-fertilizers represent the future of Indian agriculture, combining technology with tradition to empower farmers and reduce the country's dependence on costly imports. He highlighted the government's commitment to innovation in agriculture through increased research funding, support for cooperatives, and favorable policies that encourage adoption of sustainable inputs. Shah noted that nano-DAP will cut input costs for farmers, reduce storage and transportation burdens, and help India save thousands of crores in fertilizer subsidies and foreign exchange. He also praised IFFCO's research and development efforts and stated that the production and distribution of nano-DAP

will be scaled up swiftly to reach all corners of the country. IFFCO's nano-DAP is expected to be made available through its vast network of cooperative societies and retail outlets, initially targeting key crop belts in states like Punjab, Haryana, Uttar Pradesh, Gujarat, and Maharashtra. Farmers are being trained to use nano-fertilizers through demonstration projects and educational campaigns, ensuring proper application and maximum benefit. The shift to nano-based inputs is part of a broader effort to promote precision agriculture, improve nutrient use efficiency (NUE), and address the challenges posed by climate change, declining soil fertility, and water scarcity. In conclusion, the launch of nano-DAP on April 26, 2023, marked a game-changing moment for Indian agriculture. It symbolized a convergence of science, sustainability, and rural empowerment, with the potential to transform the way crops are cultivated across the country. As India steps into a new era of agricultural innovation, nano-fertilizers like IFFCO's nano-DAP are set to become key instruments in achieving food security, environmental stewardship, and economic resilience for millions of farmers.



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