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A pharmaceutical magazine

SHADOW CULTIVATE

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2024-25



CHIEF EDITOR

Dr. Rajiv Jash

STUDENT EDITORS

Amisha Agarwal and Pratyushi De



**SUN
PHARMA**



**Sanaka
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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. 6 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.

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Shadow Cultivate Vol. 6

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 instill 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>Chirality and Its Role in Drug Action</i>	1
	2	<i>Analytical Techniques in Drug Quality Control</i>	2 - 3
	3	<i>Metal Complexes in Medicinal Chemistry</i>	4 - 5
	4	<i>Role of Excipients in Drug Delivery</i>	6 - 7
	5	<i>Neuropharmacology: Mechanism of CNS Acting Drugs</i>	8 - 9
	6	<i>Drug Abuse and Dependence: Pharmacological Insights</i>	10 - 11
	7	<i>Radiopharmaceuticals: Chemistry and Applications</i>	12 - 13
Art & Literature	8	<i>Morning Chores in the Village</i>	14
	9	<i>অভিসার</i>	14
		<i>ভোরের প্রতীক্ষা</i>	15 - 16
		<i>A Sky Without Borders</i>	16
		<i>শেষ চিঠি</i>	16 - 17
		<i>A Monsoon Memory</i>	18 - 19
Current affairs		<i>The Diary Left Behind</i>	19 - 20
	10	<i>Georgia's Political Meltdown: Disputed Elections and the Fight for Democracy</i>	21-22
	11	<i>Slovakia on Edge: Protests Erupt Over Fico's Moscow Visit and Alleged Coup Plotting</i>	23-24
	12	<i>Union Budget 2025–26 Unveiled: Bold Tax Reforms and a Strategic Push for Agriculture</i>	25-26
	13	<i>India–France Collaboration Deepens: Joint AI Policy Summit Sets New Milestones in Ethical Innovation</i>	27-28
	14	<i>Australia's Climate Crisis Deepens: 2024 Marked as Second-Warmest Year on Record</i>	29-30
	15	<i>Coding and AI in School Curriculum – CBSE & NCERT Reforms</i>	31-32
	16	<i>India–France AI Policy Summit 2025: A Strategic Alliance for Ethical and Inclusive Innovation</i>	33-34

1 *Scientific Advancements*

Chirality and Its Role in Drug Action

Pratyushi De, Abhimannu Shome

Triple-negative breast cancer (TNBC) is a highly Chirality, a fundamental concept in stereochemistry, refers to the geometric property of a molecule having a non-superimposable mirror image, much like human hands. This seemingly subtle asymmetry holds profound significance in pharmaceutical sciences, as many biological molecules—such as proteins, enzymes, and receptors—are inherently chiral. As a result, the chirality of a drug can greatly influence its pharmacodynamic and pharmacokinetic properties, including absorption, distribution, metabolism, and excretion (ADME), as well as its therapeutic efficacy and safety profile. Drugs often exist as enantiomers, which are pairs of chiral molecules that are mirror images of each other. Despite having identical chemical compositions and physical properties in an achiral environment, enantiomers can behave differently in a biological system. One enantiomer, referred to as the eutomer, may bind effectively to the intended target receptor and elicit the desired therapeutic effect, while the other enantiomer, known as the distomer, might be inactive, less active, or in some cases, even toxic. The classic example is

thalidomide, where one enantiomer acted as a sedative to treat morning sickness in pregnant women, but its mirror image caused severe birth defects. This tragic incident underscored the necessity of chirality awareness in drug design and development. Today, regulatory agencies like the FDA emphasize the importance of evaluating individual enantiomers during drug approval processes. Chirality also plays a vital role in drug metabolism; for example, the cytochrome P450 enzyme system may preferentially metabolize one enantiomer over another, leading to differences in drug clearance and half-life. This selective metabolism can influence dosage requirements and the duration of drug action. Additionally, chiral switching—developing single-enantiomer versions of racemic drugs—has become a common strategy to enhance drug efficacy and reduce side effects. Many widely used drugs are marketed as single-enantiomer formulations, such as esomeprazole (the S-enantiomer of omeprazole) and levofloxacin (the active enantiomer of ofloxacin). Advances in asymmetric synthesis and chiral chromatography have facilitated the production and separation of enantiomers, allowing pharmaceutical scientists to better control stereochemical outcomes. Moreover, computational modeling and molecular docking studies have improved our understanding of enantiomer-target interactions, thereby aiding rational drug design. In summary, chirality is a critical determinant of drug action, and its influence permeates all stages of drug development, from synthesis and analysis to therapeutic application. A thorough understanding of chiral behavior not only helps in maximizing a drug's therapeutic benefits but also minimizes adverse effects, ultimately contributing to the development of safer and more effective medications.

2

Scientific Advancements

Analytical Techniques in Drug Quality Control

Riya Pal, Moloy Roy

Analytical techniques play a pivotal role in drug quality control by ensuring the identity, purity, potency, and safety of pharmaceutical products throughout their lifecycle. These techniques form the backbone of regulatory compliance and are essential for maintaining consistency in drug manufacturing and safeguarding public health. Various sophisticated analytical tools are employed in both qualitative and quantitative assessments to detect impurities, verify chemical composition, and monitor stability. Chromatographic methods, such as High-Performance Liquid Chromatography (HPLC), Gas Chromatography (GC), and Thin Layer Chromatography (TLC), are among the most widely used techniques due to their precision, sensitivity, and applicability in separating complex mixtures. HPLC is especially favored for analyzing active pharmaceutical ingredients (APIs) and degradation

products in formulations, while GC is ideal for volatile compounds. Spectroscopic techniques, including Ultraviolet-Visible (UV-Vis) spectroscopy, Infrared (IR) spectroscopy, Nuclear Magnetic Resonance (NMR), and Mass Spectrometry (MS), provide detailed structural information and are crucial for compound identification. UV-Vis spectroscopy is often used for routine assays and dissolution testing due to its simplicity and speed, whereas IR spectroscopy helps in functional group analysis and fingerprinting. NMR and MS, though more advanced and costly, offer in-depth insights into molecular structure and are often used in research and regulatory submissions. Additionally, titrimetric methods like acid-base, redox, and complexometric titrations remain valuable for routine bulk drug testing due to their ease of use and cost-effectiveness. Thermal analysis techniques such as Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA) help evaluate the thermal stability and polymorphism of drugs. Moreover, modern hyphenated techniques such as LC-MS and GC-MS combine the separation capability of chromatography with the detection power of mass spectrometry, providing unparalleled accuracy in impurity profiling and pharmacokinetic studies. Quality control laboratories also rely on microbiological testing to ensure sterility and limit microbial contamination, particularly in parenteral and biological products. Regulatory guidelines provided by pharmacopeias like USP, BP, and IP outline the mandatory analytical parameters and procedures for drug quality evaluation. Validation of analytical

methods—covering parameters like accuracy, precision, specificity, linearity, robustness, and detection limits—is a critical requirement for ensuring the reliability of results. Furthermore, Good Manufacturing Practices (GMP) and Good Laboratory Practices (GLP) mandate rigorous documentation and calibration of analytical instruments to maintain data integrity and reproducibility. Stability testing, another cornerstone of quality control, uses analytical methods to assess how environmental factors such as temperature, humidity, and light affect the drug over time, aiding in the determination of shelf life and storage conditions. With the advent of automation and digital technologies, many pharmaceutical labs are transitioning towards high-throughput screening and real-time release testing, which enhance efficiency and reduce turnaround time. In conclusion, analytical techniques are indispensable in the pharmaceutical industry, ensuring that every drug that reaches the patient is of the highest quality, safe, effective, and compliant with regulatory standards.

3

Scientific Advancements

Metal Complexes in Medicinal Chemistry

Md taukir Ali, Rupsa Mondal

Metal complexes in medicinal chemistry represent a significant and expanding frontier in drug discovery and therapeutic development, offering unique chemical properties and biological functionalities that organic molecules alone often cannot achieve. These complexes, formed by coordination between metal ions and organic or inorganic ligands, exhibit diverse structural geometries and redox behaviors, enabling them to interact selectively with biological targets such as DNA, proteins, and enzymes. One of the most iconic examples is cisplatin, a platinum-based complex that revolutionized cancer treatment by inducing DNA crosslinking, ultimately triggering apoptosis in cancer cells. Its success has spurred the development of second- and third-generation platinum drugs like carboplatin and oxaliplatin, which offer improved efficacy and reduced toxicity. Beyond platinum, other metals such as gold, ruthenium, copper, and iron are being explored for their therapeutic

potential. Gold complexes, for instance, have shown promise as anti-inflammatory and anti-arthritic agents, with auranofin being a notable example used in the treatment of rheumatoid arthritis. Ruthenium-based complexes are gaining attention in anticancer therapy due to their ability to mimic iron and bind to biomolecules, showing selective toxicity towards cancer cells while sparing healthy tissue. Copper and iron complexes are particularly intriguing due to their redox activity, allowing them to generate reactive oxygen species (ROS) within cells and thereby exert cytotoxic effects, especially in cancer and antimicrobial therapies. Chelation therapy is another important application of metal complexes, where agents such as EDTA and deferoxamine bind toxic metals like lead, mercury, and iron, facilitating their excretion and reducing heavy metal toxicity. In imaging and diagnostics, metal complexes also play a crucial role; gadolinium complexes are widely used as contrast agents in magnetic resonance imaging (MRI), while technetium-99m complexes are essential in nuclear medicine for radiopharmaceutical diagnostics. The design of these complexes often considers parameters such as ligand denticity, coordination number, oxidation state of the metal, and kinetic stability, all of which influence their biological activity and safety profile. Advances in bioinorganic chemistry, computational modeling, and structural biology have enabled the rational design of metal-based drugs with improved selectivity and minimized side effects. Moreover, the emerging field of metallodrugs is not limited to therapeutic applications alone; it also includes the development of metal complexes for enzyme inhibition,

photodynamic therapy (PDT), and targeted drug delivery systems, where the metal center can act as both a scaffold and a functional group. Despite their immense potential, challenges remain in understanding the full spectrum of metal-biomolecule interactions, optimizing bioavailability, and minimizing systemic toxicity. Regulatory and environmental concerns regarding the use of heavy metals in medicine also necessitate rigorous evaluation during drug development. Nonetheless, the multifaceted role of metal complexes in medicinal chemistry continues to evolve, offering innovative solutions to complex diseases and broadening the therapeutic arsenal beyond traditional organic compounds. Their ability to leverage unique chemical mechanisms makes them indispensable in the search for next-generation pharmaceuticals, combining the precision of coordination chemistry with the complexity of biological systems.

4

*Scientific
Advancements*

Role of Excipients in Drug Delivery

Arati Dubey, Ruchira Das

Excipients play a crucial and multifaceted role in drug delivery systems, serving as the non-active components of pharmaceutical formulations that ensure the safety, efficacy, stability, and manufacturability of the final product. While the active pharmaceutical ingredient (API) is responsible for the therapeutic effect, excipients are vital in facilitating the API's proper delivery to the intended site of action in the body. These substances are carefully selected to perform specific functions such as aiding in drug solubility, enhancing bioavailability, improving taste, controlling drug release, and extending shelf life. Common categories of excipients include diluents or fillers, which add bulk to formulations (e.g., lactose, microcrystalline cellulose), binders (e.g., starch, povidone) that help form cohesive tablets, disintegrants (e.g., croscarmellose sodium, sodium starch glycolate) that promote tablet breakup in the digestive tract, and lubricants (e.g., magnesium stearate) that ensure smooth tablet manufacturing. In advanced drug delivery systems, excipients also function as release

modifiers, enabling controlled, sustained, or targeted drug release. For instance, polymers like hydroxypropyl methylcellulose (HPMC) or ethylcellulose can be used in matrix tablets to regulate drug diffusion over time. Excipients also contribute to enhancing the solubility of poorly water-soluble drugs through techniques such as solid dispersion, use of surfactants (e.g., polysorbates, sodium lauryl sulfate), or lipid-based formulations like self-emulsifying drug delivery systems (SEDDS). In parenteral formulations, excipients like buffers, preservatives, and stabilizers ensure isotonicity, sterility, and pH balance. Moreover, in novel drug delivery systems such as nanoparticles, liposomes, and hydrogels, excipients serve as carriers and stabilizers, contributing to precise drug targeting and reducing systemic side effects. Their role in taste masking and improving the palatability of oral medications is especially important in pediatric and geriatric populations, with agents like sweeteners (e.g., saccharin, aspartame) and flavoring agents being commonly used. Excipients must comply with stringent regulatory requirements and be non-toxic, pharmacologically inert, and compatible with the drug and other components in the formulation. They are often listed in pharmacopeias like the USP or the European Pharmacopoeia, which provide standards for quality, purity, and performance. With the advent of precision medicine and complex biologics, the role of excipients has expanded to support stability and delivery of sensitive molecules like peptides, proteins, and nucleic acids. Excipients such as polyethylene glycol (PEG) are used to improve the half-life and reduce the

immunogenicity of biologics, a process known as PEGylation. In vaccine formulations, adjuvants such as aluminum hydroxide are used to enhance immune response. The development of multifunctional excipients that can perform several roles simultaneously—such as stabilizing the drug while also aiding its release—is a growing area of research. Overall, excipients are no longer considered just inert substances; they are essential functional contributors to the performance and success of pharmaceutical products. A well-designed formulation depends as much on the careful selection and optimization of excipients as it does on the active ingredient, highlighting their indispensable role in modern drug delivery technologies.

5 *Scientific Advancements*

Neuropharmacology: Mechanism of CNS Acting Drugs

Suman Mali, Priyanka Gupta

Neuropharmacology, the study of how drugs affect the central nervous system (CNS), explores the intricate mechanisms through which various pharmacological agents influence brain function, behavior, and neurological processes. The CNS, composed of the brain and spinal cord, is responsible for regulating sensory perception, motor activity, cognition, mood, and autonomic functions, making it a vital target for a broad spectrum of drugs used to treat disorders such as depression, anxiety, epilepsy, schizophrenia, Parkinson's disease, Alzheimer's disease, and pain. CNS-acting drugs typically exert their effects by interacting with specific neurotransmitter systems, including but not limited to dopamine, serotonin, gamma-aminobutyric acid (GABA), norepinephrine, acetylcholine, glutamate, and endorphins. These drugs may function as agonists, antagonists, reuptake inhibitors, enzyme inhibitors, or ion channel modulators, thereby modifying synaptic transmission. For example,

antidepressants like selective serotonin reuptake inhibitors (SSRIs) such as fluoxetine work by blocking the reabsorption of serotonin into presynaptic neurons, thereby increasing its availability in the synaptic cleft and enhancing mood. Antipsychotic drugs, such as haloperidol and risperidone, primarily act as dopamine D2 receptor antagonists to reduce the positive symptoms of schizophrenia by dampening dopaminergic activity in the mesolimbic pathway. In contrast, drugs for Parkinson's disease aim to enhance dopaminergic transmission; levodopa, a dopamine precursor, crosses the blood-brain barrier and is converted into dopamine, compensating for the loss of dopaminergic neurons in the substantia nigra. Benzodiazepines, used for anxiety and insomnia, act as positive allosteric modulators of GABA-A receptors, enhancing inhibitory neurotransmission and producing calming effects. Antiepileptic drugs like phenytoin, valproate, and carbamazepine stabilize neuronal membranes by modulating voltage-gated sodium or calcium channels or enhancing GABAergic inhibition to suppress abnormal electrical activity in the brain. Similarly, anesthetic agents like propofol and barbiturates induce CNS depression through GABA receptor potentiation or NMDA receptor inhibition. CNS stimulants such as amphetamines increase synaptic levels of dopamine and norepinephrine by promoting their release and inhibiting their reuptake, thereby enhancing alertness and cognitive function, often used in attention-deficit/hyperactivity disorder (ADHD). The blood-brain barrier poses a significant challenge in neuropharmacology, as only lipophilic or specially designed molecules

can cross it to reach their targets within the CNS. Hence, drug design must account for pharmacokinetics, especially CNS penetration, metabolism, and the potential for tolerance, dependence, or abuse. Emerging approaches in neuropharmacology include targeted drug delivery via nanoparticles, gene therapy, and the use of biologics like monoclonal antibodies that target specific neural receptors or proteins involved in neurodegeneration. Understanding the pharmacodynamics and pharmacokinetics of CNS drugs is crucial to minimize side effects such as sedation, motor impairment, or cognitive dulling. Furthermore, the interplay between different neurotransmitter systems means that many CNS drugs have complex mechanisms of action and may influence multiple pathways simultaneously. In conclusion, neuropharmacology provides the scientific foundation for developing effective therapies for a wide array of neurological and psychiatric disorders by elucidating how drugs interact with the CNS, offering hope for improved mental health and quality of life.

6

Scientific Advancements

Drug Abuse and Dependence: Pharmacological Insights

Sk Mubaser Amin, Rajiv Jash

Drug abuse and dependence are complex medical and social phenomena characterized by the compulsive use of substances despite harmful consequences, with profound pharmacological underpinnings rooted in the way certain drugs interact with the brain's reward and regulatory systems. From a pharmacological perspective, drugs of abuse—including opioids, stimulants, depressants, hallucinogens, and cannabinoids—primarily exert their effects by altering neurotransmitter activity, particularly in the mesolimbic dopamine system, which is crucial for reward, motivation, and reinforcement. When drugs like heroin, cocaine, or methamphetamine are consumed, they trigger an abnormal surge in dopamine levels, producing intense feelings of euphoria and pleasure. This overstimulation of the brain's reward circuit reinforces drug-taking behavior,

leading to psychological dependence. Repeated exposure causes neuroadaptive changes such as receptor downregulation and altered neurotransmitter release, which result in tolerance—requiring higher doses to achieve the same effect—and withdrawal symptoms upon cessation. Opioids like morphine and heroin bind to mu-opioid receptors, not only relieving pain but also producing sedation and euphoria; chronic use can lead to both physical dependence and high addiction potential. Stimulants such as cocaine and amphetamines increase synaptic dopamine and norepinephrine levels by blocking reuptake or enhancing release, resulting in heightened alertness, energy, and a sense of invincibility, followed by a “crash” that promotes continued use. Depressants like benzodiazepines and barbiturates act on GABA-A receptors to enhance inhibitory neurotransmission, creating calming effects, but long-term use can impair cognitive and motor functions and lead to profound dependence. Alcohol, a widely abused legal substance, also acts on GABAergic and glutamatergic systems, disrupting the balance of CNS excitatory and inhibitory pathways. Its chronic consumption can lead to liver damage, tolerance, and severe withdrawal symptoms such as seizures and delirium tremens. Cannabis primarily acts on CB1 receptors in the brain, affecting mood, perception, and coordination; while often considered less addictive, it can still lead to dependence, especially with long-term, heavy use. The pharmacological basis of dependence involves not only neurotransmitter systems but also the brain's stress and memory circuits, making addiction a persistent relapsing disorder. Withdrawal symptoms vary with the drug

class and may include anxiety, insomnia, muscle pain, tremors, nausea, depression, or seizures, often making quitting extremely difficult without medical support. Treatment strategies often involve pharmacological interventions aimed at reducing cravings and withdrawal symptoms—such as methadone and buprenorphine for opioid dependence, or naltrexone and acamprosate for alcohol dependence—along with behavioral therapies to address psychological aspects. Recent advances in neuropharmacology are exploring new targets such as glutamate receptors, neuropeptides, and the endocannabinoid system to develop more effective anti-addiction medications. Moreover, the role of genetics, environment, and individual susceptibility is increasingly recognized, prompting the need for personalized treatment approaches. In conclusion, drug abuse and dependence are deeply rooted in the brain's neurochemical pathways, and understanding their pharmacological mechanisms is crucial for prevention, intervention, and the development of effective therapies to combat addiction and its widespread impact on individuals and society.

7

Scientific Advancements

Radiopharmaceuticals: Chemistry and Applications

Sushmita Chandra, Nandita Mondal

Radiopharmaceuticals are a unique class of medicinal compounds that combine radioactive isotopes with biologically active molecules to diagnose, monitor, and treat various medical conditions, primarily through nuclear medicine techniques. The chemistry of radiopharmaceuticals involves the careful selection and incorporation of radioisotopes—such as technetium-99m, iodine-123, fluorine-18, gallium-68, and lutetium-177—into compounds that can specifically target tissues, organs, or disease sites. These radioisotopes emit radiation detectable by imaging equipment or capable of delivering therapeutic doses directly to diseased cells. Diagnostic radiopharmaceuticals typically emit gamma rays or positrons, which are captured using devices like Single Photon Emission Computed Tomography (SPECT) and Positron Emission Tomography (PET), enabling detailed visualization of physiological and biochemical processes in real time. For instance, fluorodeoxyglucose labeled with

fluorine-18 (FDG-18) is widely used in PET imaging to detect cancer by highlighting regions of high glucose metabolism. Technetium-99m, the most commonly used diagnostic isotope, is incorporated into various compounds to image the heart, lungs, bones, liver, and kidneys due to its ideal half-life and gamma emission energy. On the therapeutic side, radiopharmaceuticals are designed to deliver targeted radiation to destroy malignant cells while sparing healthy tissue, a principle utilized in treating thyroid disorders with iodine-131 or in targeting neuroendocrine tumors with lutetium-177-labeled peptides. The development of radiopharmaceuticals requires a multidisciplinary approach involving radiochemistry, medicinal chemistry, and pharmacology to ensure the compound is stable, biologically effective, and safe for patient use. Chelating agents, such as DOTA or DTPA, are often used to securely bind metal radioisotopes to biological carriers like peptides, antibodies, or small molecules, ensuring proper biodistribution and target specificity. The radiolabeling process must maintain the biological integrity of the carrier while ensuring the radioisotope remains attached during circulation. Quality control is crucial in radiopharmaceutical production, including tests for radiochemical purity, sterility, pH, isotonicity, and radionuclide identity, given the compounds' short half-lives and rapid clinical use. Applications extend beyond oncology and include cardiology (e.g., myocardial perfusion imaging), neurology (e.g., imaging dopamine receptors in Parkinson's disease), nephrology (e.g., renal function assessment), and endocrinology (e.g.,

thyroid scans). The emergence of theranostics—a blend of therapy and diagnostics—has expanded the scope of radiopharmaceuticals, where the same molecule is used with different isotopes for imaging and treatment, allowing for personalized medicine approaches. For example, a patient’s tumor can first be imaged with a diagnostic isotope to assess suitability, followed by treatment with a therapeutic counterpart if effective targeting is confirmed. Despite their immense potential, radiopharmaceuticals face challenges related to radiation safety, limited availability of some isotopes, complex synthesis, and the need for specialized facilities like cyclotrons and radiopharmacies. Nonetheless, advances in molecular imaging, radiochemistry, and targeting strategies continue to drive innovation in the field. In conclusion, radiopharmaceuticals represent a powerful intersection of chemistry and medicine, offering precise, non-invasive tools for diagnosis and therapy that significantly improve disease management and patient outcomes in modern healthcare.

8 *Art & Literature* Paintings



Morning Chores in the Village

~ Sanjana Bhakat

A vibrant portrayal of rural life where women begin their day with household tasks, tending to children, animals, and daily routines in a serene village setting by the riverside.

অভিসার

~ Bornika Chattaraj

A soulful depiction of eternal love and spiritual connection between Lord Shiva and Parvati, where silence speaks volumes and devotion transcends the physical realm.



9 Art & Literature

Prose & Poetry

ভোরের প্রতীক্ষা

~ Payel Ghosh

ঠান্ডা হাওয়ার মৃদু স্পর্শে কেঁপে উঠল রুদ্রর শরীর। নভেম্বরের শেষ রাত, আকাশে চাঁদ ছিল না, কেবল ছায়া আর নিস্তব্ধতা ঘিরে রেখেছে গোটা গ্রামটাকে। সে বসে আছে নদীর পাড়ে, পাথরের উপর, পাশেই তার সাইকেলটা হেলান দেওয়া। চুপচাপ এক দৃষ্টিতে তাকিয়ে আছে পূর্ব দিগন্তের দিকে—ভোরের প্রতীক্ষায়।

রুদ্র একজন চাষির ছেলে, পড়াশোনায় ভালো, কিন্তু জীবনের বাস্তবতা তাকে বাধ্য করেছে বাবার পাটক্ষেতে সাহায্য করতে। শহরের কলেজে পড়ার স্বপ্ন চোখে নিয়ে সে অনেক লড়াই করেছে, এখনো করে। কিন্তু আজকের সকালটা অন্যরকম। আজ সে তার স্বপ্নের পথে এক পা এগোবে—আজ শহরের এক কলেজে ভর্তি পরীক্ষা।

কিন্তু তাও সে ভোরের জন্য অপেক্ষা করছে কেন?

কারণ, ভোর মানে শুধু আলো নয়, ভোর মানে তার জীবনের নতুন সূচনা। প্রতি ভোরে সে নিজেকে মনে করিয়ে দেয়—“এখনো সব শেষ হয়নি, সব শুরু হতে পারে!” আজও সেই একই বিশ্বাস নিয়ে এসেছে নদীর পাড়ে, ঠিক যেমন ছোটবেলায় তার মা বলত, “ভোর মানেই আশার আলো, প্রতিদিনের নতুন সুযোগ।”

মা আজ নেই। তিন বছর হলো চলে গেছেন। তার মৃত্যুর পর থেকেই রুদ্রর জীবন যেন থমকে গিয়েছিল। কিন্তু মায়ের রেখে যাওয়া কথাগুলোর মতোই, প্রতিটা ভোরে সে নিজেকে জাগিয়ে তোলে, আবার নতুন করে পথচলার সাহস খুঁজে পায়।

হঠাৎ করেই আকাশের কালচে রংটা একটু হালকা হয়ে এল। পূর্ব দিগন্তে লালচে রেখা দেখা যাচ্ছে। রুদ্রর চোখের তারা উজ্জ্বল হয়ে উঠল। সে নিজের ব্যাগটা কাঁধে তুলে নিল, সাইকেলের হ্যান্ডলে হাত রাখল। একবার চোখ বন্ধ করে মা'কে মনে করল—“তুমি সঙ্গে আছো জানি, মা।”

সেই মুহূর্তে একঝলক হাওয়া বয়ে গেল, যেন আশীর্বাদের মতো।

রুদ্র সাইকেলে চেপে রওনা দিল শহরের দিকে।

পেছনে পড়ে রইল ঘুমন্ত গ্রাম, পড়ে রইল তার ছোট্ট কুঁড়েঘর, আর নদীর পাড়ে পাথরের উপর বসে থাকা এক নিভীক তরুণের ছায়া। সামনে অপেক্ষা করছে জীবন—অনিশ্চিত, তবে সম্ভাবনাময়।

পূর্ব আকাশ এখন রঙিন হয়ে উঠছে। সূর্য উঁকি দিতে শুরু করেছে। পাখিরা ডাকছে।
ভোর এসেছে।

রুদ্রর প্রতীক্ষা শেষ হলো না, বরং শুরু হলো নতুন এক যাত্রা।

এই গল্প ভোরের প্রতীক্ষার মতোই—একজন তরুণের অন্তরের আলো জ্বালিয়ে রাখার
গল্প, হার না মানা বিশ্বাসের গল্প, আর প্রতিটা সূর্যোদয়ের মতো এক নতুন আশার গল্প।

A Sky Without Borders

~ Anubhab Bhandari

A sky without borders, vast and free,
Stretches beyond land and endless sea.

No lines divide, no walls contain,
Its winds sing songs of hope, not pain.

No flag can claim the morning light,

No law can bind a bird in flight.

The clouds, like dreams, in silence glide,

With sun and stars on either side.

Above the wars, above the fear,

A sky remains forever clear.

It welcomes all with open grace,

No passport asked, no chosen race.

So let us rise beyond our lands,

And hold the world with kinder hands.

For peace begins where hearts agree—

To live as one beneath the free.

শেষ চিঠি

~ Debangshu Tripathy

পাকা সড়কের ধারে বসে থাকা পোস্টবক্সটা আজও ঠিক আগের মতোই দাঁড়িয়ে আছে।
লাল রঙটা অনেকটাই ফিকে হয়ে গেছে, গায়ে ধুলোর আন্তরণ, তবু তার বুকোর ভেতর
এখনো কিছু চিঠির গন্ধ লেগে আছে।

রানু যখন শেষবার এই পোস্টবক্সে চিঠি ফেলেছিল, তখন তার বয়স ছিল মাত্র বিশ। ছোট
একটা গ্রামে বেড়ে ওঠা মেয়ে, লেখাপড়ায় বেশ ভালো, চোখে ছিল অনেক স্বপ্ন। কিন্তু
পরিবার, সমাজ—সব মিলিয়ে তার জীবনটা কখনই ছিল না খুব সহজ।

রানু প্রেমে পড়েছিল। চুপিচুপি, নিঃশব্দে। ছেলেটার নাম ছিল সৌরভ। শহর থেকে
এসেছিল গ্রামে, একটা ছোটো স্কুলে অস্থায়ী শিক্ষক হিসেবে যোগ দিয়েছিল। সৌরভের
চোখে ছিল আলাদা জ্যোতি—তার কথা বলার ভঙ্গি, বই পড়ার অভ্যাস, পৃথিবীকে দেখার
দৃষ্টিভঙ্গি—সবই রানুকে টেনেছিল এক অনিবার্য মোহে।

রানুর চিঠির অভ্যাস ছিল। দিনে দিনে চিঠি লিখতে শিখেছিল সৌরভের জন্য। প্রেমের
কথা, নিজের স্বপ্ন, সমাজের ভয়, মা-বাবার চোখ রাঙানি—সব লিখে ফেলত একেকটা

চিঠিতে। তবে সেই চিঠিগুলো কখনো হাতে দেয়নি, সাহস হয়নি। শুধু একটা চিঠিই পোস্ট করেছিল—শেষ চিঠি।

সেই চিঠিতে সে লিখেছিল:
 "তুমি চলে যাওয়ার কথা বললে। বললে, এখানে আর থাকতে পারবে না। আমি চুপ করে ছিলাম, কিছু বলতে পারিনি। কিন্তু আজ, তোমার চলে যাওয়ার একদিন আগে, আমি শুধু একটাই কথা বলতে চাই—ভালোবেসেছিলাম। এখনও বাসি। জানি, তোমার পথ আলাদা, জানি, আমি আটকে গেছি এ গ্রামে। তবু যদি কোনোদিন ফিরে তাকাও, জেনে রেখো, এই চিঠিটা ছিল আমার শেষ বলা কথা।"

রানু জানত না সেই চিঠি পৌঁছেছিল কিনা। সৌরভ চলে গিয়েছিল, আর কোনোদিন ফিরে আসেনি। না ফোন, না চিঠি—একটা নিঃশব্দ প্রস্থান।

তারপর কেটে গেছে তিরিশ বছর। রানু এখন স্কুলের শিক্ষিকা, একা থাকেন গ্রামের পুরোনো বাড়িটায়। বিয়ে করেনি, কেউ বোঝাতে আসেনি। তার জীবন বইয়ে, ছাত্রছাত্রীতে, আর একা চুপ করে জেগে থাকা সন্ধ্যায় আটকে ছিল।

আজ হঠাৎ করে ডাকঘর থেকে এক চিঠি এসেছে তার নামে—একটা পুরোনো খামে, তার হাতের লেখায় লেখা ঠিকানা। খামটা খুলতেই দেখা গেল চিঠিটার কাগজটা হলুদ হয়ে গেছে, তবুও লেখাগুলো স্পষ্ট:

"রানু,
 চিঠিটা পেলাম অনেক দেরিতে। সেদিনই তোমার গ্রাম ছেড়ে চলে যেতে হয়েছিল। মন ভেঙে গিয়েছিল, কারণ তুমি কিছু বলোনি। চিঠিটা পড়ে কেঁদেছিলাম। আমি তোমায় ভালোবাসতাম, এখনও বাসি। ফিরে আসতে পারিনি, সাহস হয়নি। তোমার ভালোবাসা বুকের মধ্যে সঞ্চয় করে রেখেছি এত বছর। এখন শেষ সময়ে দাঁড়িয়ে, এই চিঠি লিখছি। যদি কখনও তুমি এটি পাও, জেনে নিও, কোনোদিনও ভুলিনি।
 — সৌরভ"

রানু চুপ করে বসে ছিল পোস্টবক্সটার সামনে। চোখ দিয়ে গড়িয়ে পড়ছিল অশ্রু, আর মনে হচ্ছিল, এই চিঠিটার জন্যই বোধহয় এতদিন অপেক্ষা করে ছিল সে।

জীবনে কিছু অপেক্ষা থাকে, যেগুলোর উত্তর সময় মতো আসে না। কিন্তু তবুও, কোনো কোনো অপেক্ষা শেষ চিঠির মতোই—মন ভরিয়ে দেয়, চোখ ভিজিয়ে দেয়, আর হৃদয়টাকে এক অদ্ভুত শান্তিতে ভরে দেয়।

রানু মাথা তুলে আকাশের দিকে তাকাল। হঠাৎ যেন মনে হলো, বাতাসটা একটু নরম হয়ে এসেছে। একটা শেষ চিঠি যে এত কিছু বলেও যায়, তা আজ বুঝল সে।

A Monsoon Memory

~ Sonali dash

The first rain of July had arrived just as Meera stepped onto the old wooden balcony of her ancestral home in Darjeeling. The hills were wrapped in a soft mist, and the scent of wet earth rose like a nostalgic whisper. It had been five years since she last visited, and everything looked almost the same—except for the way her heart ached with memories. Back then, monsoon had meant something else. It had meant laughter echoing down the hill trails, stolen glances beneath dripping umbrellas, and the comforting weight of Ayaan’s jacket draped over her shoulders.

She closed her eyes, letting the rain patter gently on her face, and in that moment, she was transported to that one evening—the monsoon evening that changed everything.

It was a late July afternoon, and the sky had been heavy with clouds. She and Ayaan were just out of college for the summer, spending time in the hills before parting ways—he to Bangalore for a new job, and she to Delhi for graduate school.

They had walked for hours through the tea gardens, talking about everything and nothing. Meera remembered how Ayaan had picked a white camellia and tucked it behind her ear, saying, “When you wear this, the rain looks jealous.”

Just as they were heading back, the sky gave way. Rain poured down in thick silver sheets, soaking them in minutes. They had taken shelter under a small tin-roofed shed near the trail. Laughter spilled out of them as they shook off the water, breathless and drenched.

Then, without warning, Ayaan had taken her face in his hands and kissed her—slow, uncertain, yet filled with all the words neither had dared to speak before. The storm had raged around them, but all she could hear was the racing of her heart and the silence of everything else.

It wasn’t a grand confession. It was quiet, real. That kiss was their first and last.

Two days later, they left—no promises, no long goodbyes. Just a quiet understanding that life was pulling them in different directions. They kept in touch for a while. Calls turned to texts, texts to occasional birthday wishes, and eventually, silence.

Now, five years later, she was back, not expecting anything. Just visiting her grandmother, reliving the scent of old books, the warmth of tea by the window, and the hum of monsoon memories that still lingered.

As she turned to go inside, she heard footsteps on the gravel path below. Curious, she leaned over the railing.

There he was.

Ayaan.

Drenched, holding an umbrella in one hand, and a white camellia in the other.

For a moment, neither of them moved. Time held its breath.

Then he smiled, the same crooked smile she remembered, and called out, “You still make the rain jealous, Meera.”

She laughed, tears mingling with rain. “And you’re still terrible at first lines.”

He walked up the stairs and stood beside her on the balcony, his eyes searching hers.

"I was passing through," he said. "Didn't know if you'd be here. Thought I'd take the chance."

Meera nodded, heart thudding. "And?"

"I'm tired of passing through," he said softly. "I want to stay... if you still remember how the rain felt that day."

She looked out at the hills, the way the mist curled like a lover's breath, the rain soft against her skin. Then she turned to him, took the camellia, and tucked it behind her ear.

"I never forgot."

And just like that, the rain began again.

The Diary Left Behind

~ Priya Barman

The house on Hazel Street had always been a mystery. With ivy crawling up its stone walls and windows veiled in lace curtains, it stood like a forgotten memory on the edge of the town. Most people passed it without a glance, unaware of the stories that lingered in its quiet corners.

But for Aria, it wasn't just any house. It was her grandmother's. And after her passing, it became Aria's inheritance—both the house and its secrets.

She arrived on a rainy afternoon, suitcase in one hand, umbrella in the other. The air smelled of earth and nostalgia. As she stepped through the creaky door, a wave of stillness greeted her. Dust hung like glitter in the filtered sunlight, and the scent of old books, lavender, and time itself filled the air.

The house was untouched, just as her grandmother had left it. China cups lined the kitchen cabinet, crochet doilies sat under antique lamps, and the mantle still bore a framed black-and-white photograph of a smiling young woman—her grandmother in her twenties.

Aria spent the first few hours walking through each room, letting memories return with every creak of the floorboards. Then, in the attic, hidden behind a pile of old quilts, she found it—a diary. Bound in worn leather, its edges frayed with age. On the first page was her grandmother's name, "Lillian Grey," in elegant handwriting, and beneath it, the date: *June 14, 1947*.

Heart pounding, Aria sat by the attic window and began to read.

"Today, I met him. In the library, near the poetry shelf. His fingers brushed mine as we reached for the same book. I looked up, and he smiled. A smile that made the rain outside seem warmer."

Aria turned the pages slowly, feeling like she was stepping into another life. The entries spoke of a young Lillian, vibrant and curious, falling in love with a man named Thomas. They met often—at bookstores, by the lake, under moonlit skies. Their love bloomed through summer evenings and autumn winds.

But as she read further, the tone shifted.

"He says he's leaving. His family is moving west, and he must go with them. We held hands in silence. I wanted to ask him to stay. I didn't."

More pages followed—empty days, letters sent but never answered, quiet nights spent staring at the sky. Then came the final entry.

"I will stop writing about him now. Some loves do not end, they just fade into the shadows of who we become. But I will keep this diary, tucked away, so that some part of me always remembers."

Aria closed the diary, tears stinging her eyes. She had never known this side of her grandmother—a woman who once loved deeply, lost quietly, and lived gracefully. It made her wonder how many people carried untold stories within them, hidden behind smiles and tea cups and polite laughter.

She spent the rest of the week cleaning the house, but the diary never left her side. One evening, while dusting the old bookshelf in the study, a yellowed envelope slipped out from between two books. It was addressed to *Thomas Evans, Seattle*, with no stamp.

Inside was a letter. Unsent.

"Dear Thomas,

I never stopped wondering what could have been. If this letter ever finds you, know that you were loved, even in your absence.

— Lillian."

Aria sat in silence, the letter in her lap. The sun dipped below the horizon, casting the room in a golden haze. She knew then what she had to do.

A week later, she stood outside a quiet retirement home in Seattle. In her hand was the diary, and in her heart, a hope that stories deserve to be finished.

The nurse led her to a small garden where an old man sat under a blooming cherry tree. His eyes were pale but kind.

"Mr. Evans?" Aria asked softly.

He looked up, surprised. "Yes?"

"I'm Lillian Grey's granddaughter."

For a moment, the world stilled. Then, his eyes filled with tears, and he whispered, "Lillian..."

She handed him the diary.

"This was hers. And I think she'd want you to have it."

As he held the diary close to his chest, a smile broke across his face—trembling, tender, and filled with years.

And in that moment, across decades and silences, a love story found its final chapter.

10

Current affairs

Georgia's Political Meltdown: Disputed Elections and the Fight for Democracy

Aiswarya Mondal (3rd year)

Georgia plunged into a deep political crisis following its parliamentary elections on October 26, 2024, triggering one of the most turbulent periods in the nation's post-Soviet history. Accusations of widespread electoral fraud, vote manipulation, and state-backed intimidation erupted almost immediately after the initial results were declared, painting the ruling Georgian Dream party as the architect of a tainted democratic process. What followed was a storm of political chaos: claims of a rival presidency, large-scale opposition sit-ins, mass protests in the streets of Tbilisi, and the dramatic self-convening of a parallel Parliament by opposition leaders. The heart of the crisis lay in the widespread rejection of the election outcome by opposition parties, led prominently by the United National Movement (UNM) and a coalition of liberal and pro-European

groups. These factions refused to recognize the legitimacy of the declared results, citing systematic irregularities observed both by domestic monitors and international observers. Allegations included ballot stuffing, voter suppression, and manipulation of voter rolls. The situation quickly escalated from a contested vote count into a full-blown legitimacy crisis. In response, opposition leaders declared the formation of a "People's Parliament" and called for an immediate re-run of the elections under international supervision. Days later, thousands of Georgians flooded the streets of the capital, demanding justice, democratic accountability, and the resignation of Prime Minister Irakli Garibashvili. The protests soon transformed into prolonged sit-ins around key government institutions, including the Parliament building, further deepening the standoff between state authorities and the opposition. Amid the chaos, confusion over executive authority emerged when opposition-aligned political figures announced the appointment of a "transitional president" to oversee the movement toward fresh elections and constitutional reform. This rival presidency, though symbolic in nature, further undermined institutional coherence and challenged the authority of the sitting president, Salome Zurbashvili. The move, while controversial, was interpreted by many protestors as a necessary pushback against what they saw as a democratic backslide orchestrated by the ruling elite. The self-convened Parliament, operating independently of state oversight, held symbolic sessions discussing constitutional amendments, election law reforms, and re-commitment to Euro-Atlantic integration.

The gesture, while legally non-binding, drew both local and international attention to the deteriorating democratic institutions in Georgia. European Union diplomats and representatives of the OSCE issued multiple statements urging dialogue, transparency, and the protection of civil liberties. However, mediation efforts made little headway, as the ruling party refused to negotiate under the precondition of repeating the elections. As of early 2025, Georgia remains politically fragmented, with its streets still simmering with civil unrest. The crisis has exposed deep fissures in the country's democratic framework and threatens to derail its Euro-Atlantic ambitions. Unless urgent institutional reforms and credible negotiations occur, Georgia risks slipping further into authoritarianism and civil instability, undoing decades of hard-earned democratic progress. The world watches closely as the Georgian people continue their struggle to reclaim their democracy amid growing internal and geopolitical pressures.

11

Current affairs

Slovakia on Edge: Protests Erupt Over Fico's Moscow Visit and Alleged Coup Plotting

Sana Parveen (2nd year)

Slovakia entered a state of political turmoil in late December 2024 after Prime Minister Robert Fico's unexpected visit to Moscow and meeting with Russian President Vladimir Putin ignited a firestorm of public outrage. The visit, which took place on December 23, drew immediate condemnation both domestically and internationally, as critics accused Fico of undermining Slovakia's pro-European and NATO-aligned stance. The timing was especially provocative—occurring amid escalating tensions in Europe due to the ongoing war in Ukraine and growing fears of Russian influence in Central and Eastern Europe. What began as peaceful demonstrations quickly snowballed into mass nationwide protests throughout January 2025, fueled by widespread allegations that Fico was involved in plotting an unconstitutional power grab.

The initial outcry began in Bratislava, where thousands gathered in front of the National Parliament building within days of Fico's return from Moscow. Protesters, largely comprising students, civil society organizations, opposition leaders, and war veterans, denounced the visit as a betrayal of Slovakia's democratic values and sovereignty. Demonstrators carried EU and NATO flags, chanted anti-authoritarian slogans, and demanded Fico's resignation, accusing him of aligning the nation with an increasingly autocratic Kremlin regime. As images of the two leaders shaking hands in the Kremlin circulated widely on social media, public trust in Fico's government eroded further. The situation escalated rapidly in early January when leaked intelligence reports suggested that certain high-ranking officials close to Fico were engaged in backchannel discussions to alter the constitutional balance of power in favor of the executive branch. Allegations of coup plotting began to surface, with claims that Fico intended to dissolve Parliament or bypass it entirely through emergency decrees. Opposition parties, including Progressive Slovakia and Freedom and Solidarity, called for an immediate parliamentary inquiry, while civic groups organized round-the-clock protests in major cities such as Košice, Žilina, and Prešov. By mid-January, the protests had grown into one of the largest mobilizations in Slovakia since the Velvet Revolution. Trade unions, teachers, healthcare workers, and artists joined the movement, creating a unified front against what many now viewed as an authoritarian drift. Fico's administration responded with increasingly heavy-handed tactics, including detentions of activists, media restrictions, and deployment of riot police to disperse demonstrators. These actions only intensified public anger and drew harsh criticism from international human rights organizations and EU institutions, which warned of sanctions if democratic norms continued to be undermined.

Hindustan

PATEL ON GRAVITY OF PROBLEM

UNDISTURBED PASSAGE TO BE
ENSURED

PUNJAB STATES OFFER TO ABSORB REFUGEES

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the fact that the Government of West Pakistan has been unable to take steps to give effect to the provisions of the constitution of India.

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Page | 24

GANDHIJI ASKS PEOPLE
HIM TO VISIT W.

12

Current affairs

Union Budget 2025–26 Unveiled: Bold Tax Reforms and a Strategic Push for Agriculture

Babin kar (3rd year)

On February 1, 2025, the Government of India unveiled the Union Budget for the financial year 2025–26, presenting a comprehensive and reform-oriented roadmap aimed at economic revival, middle-class relief, and agricultural transformation. Delivered by Finance Minister Nirmala Sitharaman, the budget was marked by its dual focus on rationalizing the tax structure and addressing agrarian distress through targeted interventions. In one of the most anticipated announcements, the government raised the income tax exemption limit to ₹12 lakh under the new tax regime, a major relief for the middle-income group that instantly drew widespread public and political attention. Simultaneously, the introduction of the “Dhan-Dhaanya Krishi Yojana” signaled a renewed commitment to boosting agricultural productivity, rural employment, and food security across the nation.

The revised tax slabs under the new regime were touted as a major reform to simplify the system and increase disposable income. With the ₹12 lakh exemption ceiling, salaried individuals and professionals stood to benefit significantly, especially in the context of inflationary pressures and post-pandemic economic strain. The government stated that this move aimed to enhance consumption and household savings while reducing tax-related compliance burdens. Furthermore, digital processing of returns and automated assessments were emphasized, continuing the government’s agenda of greater transparency and ease of doing business for both individuals and MSMEs.

On the rural and agricultural front, the Dhan-Dhaanya Krishi Yojana emerged as a centerpiece of the budget. Allocated a starting outlay of ₹1.85 lakh crore, the scheme is designed to improve farm infrastructure, promote sustainable agricultural practices, and support marginal and small farmers through direct income assistance and access to agri-tech. The scheme integrates climate-resilient farming techniques, crop diversification incentives, and a digital platform for farmer-market linkages, intending to modernize rural India while addressing long-standing structural issues in the sector. Additionally, the government increased the allocation for the PM-KISAN scheme and promised improved procurement mechanisms for pulses and millets to align with nutrition and food security goals.

The budget also made significant provisions in the areas of infrastructure, green energy, and education. A ₹6.2 lakh crore capital expenditure allocation was proposed to accelerate national highway construction, railway electrification, and urban mobility projects. In a nod to environmental goals, the Green Hydrogen Mission and solar rooftop initiatives received renewed funding, positioning

India toward its 2070 net-zero ambitions. In education and skilling, the establishment of 500 new Skill India Centers and digital learning hubs in tier-2 and tier-3 cities was announced to address youth employability gaps.

While the budget drew praise for its pro-middle-class and pro-farmer orientation, critics pointed out a lack of clarity on fiscal deficit management and healthcare spending. Nonetheless, the Union Budget 2025–26 sets a transformative tone, blending tax relief, agricultural revitalization, and growth-centric policies. With national elections on the horizon in 2026, this budget positions itself as both a governance milestone and a political statement, aimed at balancing economic prudence with populist outreach in a rapidly evolving economic landscape.

Liabilities

Hindustan

NEW DELHI: SATURDAY, SEPTEMBER 27, 1946.

WAYS ESSENTIAL

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Sardar Patel said: "It is of the utmost importance that this progress of evacuation should get a possible help and facility by all the means at our disposal and I should like to remind you that in this matter time is of the essence. If we cannot evacuate within as short a time as possible, we shall be faced with consequences too terrible to contemplate."

"It is, therefore, with great concern and anxiety that we have been observing recently the mounting toll of hundreds of trains which have been stranded at various points."

"Even otherwise, our refugees on the other side were being attacked by the various elements of West Punjab. Millions were being driven to the borders and savages, British, Indian and Muslim, were attacking them."



Sardar Vallabhbhai Patel, Miss Mambani, Pandit Nehru, and others at Birla House after the first meeting of the Working Committee on Thursday.

RESTORE REAL IN DELHI

GANDHIJI ASKS PEOPLE HIM TO VISIT W.

13

Current affairs

India–France Collaboration Deepens: Joint AI Policy Summit Sets New Milestones in Ethical Innovation

Prasenjit Mahato (4th year)

The Russia-Ukraine war, which began in February 2022, has significantly altered the global geopolitical landscape. As the conflict entered 2023, the international community faced the complex task. In a landmark move to reinforce global cooperation in emerging technologies, India and France co-hosted the first-ever Joint AI Policy Summit in New Delhi in January 2025, marking a pivotal chapter in their strategic partnership. This high-level summit brought together leading policymakers, researchers, entrepreneurs, and technology experts from both nations to craft a shared vision for responsible artificial intelligence. The summit featured multiple working groups that tackled key themes such as AI ethics, open-source governance, innovation ecosystems, regulatory harmonization, and cross-border data collaboration. As artificial intelligence continues to reshape industries

and governance models worldwide, the India–France collaboration emerged as a blueprint for balancing innovation with accountability and inclusivity. A central focus of the summit was on AI ethics and human-centric development. The dedicated working group emphasized creating transparent, fair, and explainable AI systems, particularly for public sector use in areas like healthcare, education, and agriculture. Drawing from France's experience in AI ethics charters and India's vast data-driven digital public infrastructure, the delegates proposed joint frameworks to safeguard algorithmic fairness, prevent biases, and ensure that AI technologies respect democratic values and individual privacy. The two sides agreed to launch a bi-national "AI Ethics Observatory," tasked with monitoring the ethical impact of high-risk AI systems and advising on best practices.

Another major highlight was the discussion on open-source governance and AI innovation ecosystems. Both countries acknowledged the need to build AI that is not only powerful but also accessible and community-driven. A joint initiative was announced to develop an Indo-French AI Commons, a repository of open datasets, shared tools, and machine learning models that can be freely used by researchers, startups, and civil society organizations. This open-access approach is expected to lower entry barriers for innovation and enhance transparency in AI development, particularly in low-resource and non-English languages. India's leadership in open digital platforms like UPI and France's strength in academic AI research formed a complementary alliance for inclusive technology.

In terms of innovation policy, the summit committed to cross-border AI R&D hubs, focusing on sectors like climate forecasting, precision farming, smart cities, and defense applications. Both governments pledged increased funding

for Indo-French AI fellowships and collaborative doctoral programs, with key institutions such as IITs, CNRS, and INRIA playing a lead role. Regulatory experts from both countries also exchanged insights on aligning AI regulations with the EU's AI Act and India's forthcoming Digital India legislation, aiming to promote interoperability and trust between systems.

The Joint AI Policy Summit concluded with a shared declaration underscoring the need for democratic and sovereign AI governance, resisting monopolistic control by a few tech giants and prioritizing ethical innovation for the global South. This collaboration between India and France stands not just as a bilateral achievement, but as a powerful message for the world—that the future of AI must be rooted in shared values, open cooperation, and the collective good. As both nations look ahead, this summit sets the foundation for a resilient AI alliance that can shape the global digital order.

14

Current affairs

Australia's Climate Crisis Deepens: 2024 Marked as Second-Warmest Year on Record

Tarik Aziz (1st year)

Australia's escalating climate emergency was starkly underscored in 2024, officially recorded as the second-warmest year in the nation's history, according to comprehensive data released by the Australian State Bureau of Meteorology (ASBO) and corroborated by the World Meteorological Organization (WMO). The reports paint a dire picture of a continent in climate distress, with intensifying heatwaves, marine temperature anomalies, and long-term environmental threats steadily reshaping Australia's natural and human systems. The warming trend not only surpassed multiple historical benchmarks but also revealed alarming shifts in Australia's climatic baseline, prompting urgent calls for deeper mitigation and adaptation strategies. ASBO's annual climate assessment revealed that 2024 saw average national temperatures rise 1.68°C above pre-industrial levels, inching dangerously close to the internationally recognized 1.5°C

threshold that scientists say is vital to avoid the worst consequences of global warming. Particularly concerning was the record-breaking number of extremely hot days, with several cities, including Sydney, Adelaide, and Perth, logging 30 or more days above 40°C—a stark increase from historical norms. Heatwaves were longer, more frequent, and deadlier, stressing vulnerable populations, especially the elderly, outdoor workers, and Indigenous communities in remote areas. Marine heatwaves added another dimension to Australia's climate emergency. The Great Barrier Reef, already under severe stress from previous coral bleaching events, experienced above-average sea surface temperatures for 68% of the year, placing marine biodiversity in critical jeopardy. WMO's findings confirmed that these marine heatwaves were part of a broader pattern of ocean warming around Australia's coastline, fueled by El Niño events and global greenhouse gas emissions. The ecological consequences extend far beyond coral reefs, affecting fish migration patterns, marine farming, and coastal livelihoods dependent on healthy ocean ecosystems. Australia's climate-sensitive industries, particularly agriculture, tourism, and insurance, faced substantial challenges in 2024. Crop yields in key regions such as the Murray-Darling Basin were significantly reduced due to heat stress and erratic rainfall patterns, while bushfire seasons grew longer and more intense, increasing financial burdens on state and federal resources. Urban centers also felt the heat, both figuratively and literally, as energy demands surged due to prolonged heatwaves, stretching grid capacities and raising power costs. The reports from ASBO and WMO underscored that these are not isolated events, but signs of a long-term climate trajectory that threatens Australia's environmental resilience, public health, and economic stability. Climate scientists emphasized the need for more aggressive emissions reduction

policies, investments in green infrastructure, and community-level adaptation programs. The warnings also echoed internationally, urging Australia to do more in aligning with its climate pledges under the Paris Agreement, including transitioning away from fossil fuel dependency. In summary, 2024 has served as a climatic turning point for Australia, highlighting the widening gap between climate realities and policy responses. With heatwaves and marine temperature spikes expected to intensify in the coming years, the country faces an urgent imperative to act decisively. Without swift and sustained climate action, Australia risks moving from climate crisis to climate catastrophe—a reality that can no longer be ignored.

Hindustan

NEW DELHI: SATURDAY, SEPTEMBER 27, 1947.

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"It is, therefore, with great concern and anxiety that we have been observing recently the mounting toll of hundreds of trains which have been stranded at various points of evacuation."

"Even otherwise, our refugees on the other side were being attacked by the various elements of West Punjab, leading to the loss of lives and property and the refugees were being treated with cruelty and savagery. Besides, these refugees were being treated with cruelty and savagery."



Sardar Vallabhbhai Patel, Minister of States, Punjab, and Ahmed Raza Khan, at Birla House after the meeting of the Working Committee on Thursday.

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GANDHIJI ASKS PEOPLE HIM TO VISIT W.

15

Current affairs

Coding and AI in School Curriculum – CBSE & NCERT Reforms

Deep Sebait (1st year)

In a significant milestone for India's growing presence in space research, a team of Indian astronomers has discovered a new exoplanet named TOI-6038A b, a dense sub-Saturn-class planet located in a rare binary star system. The breakthrough was made possible through observations at the Mount Abu InfraRed Observatory in Rajasthan and in collaboration with global datasets, including NASA's Transiting Exoplanet Survey Satellite (TESS). The discovery not only highlights India's expanding capabilities in exoplanet detection and characterization but also contributes valuable insight to planetary science, particularly in understanding how giant planets evolve in complex stellar environments. TOI-6038A b is located approximately 480 light-years away from Earth and orbits one of the two stars in the TOI-6038 binary system. Classified as a sub-Saturn, the planet has a radius roughly 5.5 times that of Earth but a surprisingly high density—significantly denser than typical gas giants of similar size. This unique characteristic has piqued the

interest of astronomers, as it suggests a substantial heavy-element core, challenging existing models of gas giant formation. Its orbital period is about 3.9 Earth days, indicating a tight and rapid orbit around its host star, TOI-6038A. Despite its proximity, it manages to maintain atmospheric stability, hinting at the planet's potential for intriguing chemical compositions. What makes this discovery particularly rare and scientifically valuable is its location in a binary star system—a setting where gravitational dynamics are much more complex. Binary systems are known to create unstable environments that can hinder planet formation, yet TOI-6038A b's existence challenges that assumption. It provides a crucial test case for studying planetary formation theories in dual-star systems and may offer new perspectives on the survivability and migration of planets in such settings. The companion star, TOI-6038B, lies at a significant enough distance to allow planetary stability but exerts measurable gravitational influence that researchers hope to model through future studies. The discovery was enabled by a combination of photometric and spectroscopic techniques, with Mount Abu's 1.2-meter telescope playing a key role in ground-based follow-up observations. These observations confirmed the transit signals initially flagged by TESS and allowed scientists to calculate the planet's mass, density, and orbital dynamics with remarkable precision. The Indian team, composed of researchers from the Physical Research Laboratory (PRL), the Indian Institute of Astrophysics, and several universities, emphasized the role of collaborative astronomy and open-access satellite data in making such discoveries possible. TOI-6038A b's discovery strengthens India's growing contribution to exoplanetary science, a field once dominated by space agencies like NASA and ESA. It underscores the importance of investing in indigenous observational

infrastructure and fostering international scientific cooperation. Moreover, it raises important questions about planet diversity, system architecture, and atmospheric evolution in hostile stellar environments. As Indian scientists continue to refine their tools and methods, TOI-6038A b represents not only a celestial marvel but also a beacon of India's expanding scientific horizons in the global search for worlds beyond our own.

The Hindustan

LARGEST CIRCULATION IN NORTHERN, NORTH-WESTERN AND

NEW DELHI: SATURDAY, SEPTEMBER 27, 1947.

SPEEDY EVACUATION BOTH WAYS ESSENTIAL

17 Lakhs Evacuated From W. Punjab

INDIA'S GROWING ORGANIZATION

More than 17,00,000 non-Muslims have been evacuated from West Punjab since August 15. September 22. Traveling by air, by train or marching in caravans, large and small, they continue to arrive in the Indian Dominion at the rate of several thousands daily. At the same time as this, Muslims have left East Punjab and are still leaving by train.

The railways have been utilized to the capacity to transport evacuees since August 15 and September 14. Over 200 trains were run to convey Muslim and non-Muslim refugees and from the border and to bring them across the border either by train or by road.

The largest number of refugees have moved on foot and some 10,000 on foot. A few hundreds were evacuated by air. The late moves from West to East Punjab and from the areas of Gurgaon, Haryana and Jammu and Kashmir to India. They moved to India by train, by road, by foot and by air. The late moves from West to East Punjab and from the areas of Gurgaon, Haryana and Jammu and Kashmir to India. They moved to India by train, by road, by foot and by air.

Difficulties Overcome. The late moves from West to East Punjab and from the areas of Gurgaon, Haryana and Jammu and Kashmir to India. They moved to India by train, by road, by foot and by air.

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"It is, therefore, with great concern and anxiety that we have been observing recently the mounting toll of hundreds of trains which have been stranded at the border."

"Even worse, our refugees on the other side were being attacked by the various elements of West Punjab. Millions were being killed, maimed, and driven to the borders. It is, therefore, with great concern and anxiety that we have been observing recently the mounting toll of hundreds of trains which have been stranded at the border."



Sardar Vallabhbhai Patel, Minister of States, Ahmed Raza Khan, at Birla House after the formation of the Working Committee on Thursday.

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GANDHIJI ASKS PEOPLE HIM TO VISIT W.

16

Current affairs

India–France AI Policy Summit 2025: A Strategic Alliance for Ethical and Inclusive Innovation

Hirak Sarkar (1st year)

In a landmark stride toward international technology cooperation, India and France jointly hosted the AI Policy Summit 2025, bringing together top minds from government, academia, industry, and civil society. Held in New Delhi, the summit was a culmination of years of bilateral scientific dialogue and strategic collaboration, and it aimed to craft a shared framework for the development and regulation of artificial intelligence. The summit's agenda was expansive and forward-looking, with working groups focusing on AI ethics, responsible innovation, and open-source governance. The event not only strengthened India–France research ties but also set the stage for shaping a global AI order rooted in transparency, democracy, and accessibility. One of the summit's most critical working groups focused on AI ethics, a domain where France has been a

strong advocate globally. Building on shared democratic values, India and France proposed the formation of a Joint AI Ethics Council, which will draft actionable guidelines to address algorithmic bias, data privacy, and the accountability of autonomous systems. The group stressed the need for creating “explainable AI” models, especially in public-facing sectors like health, education, and digital governance. This initiative drew from India's experience in digital public infrastructure (like Aadhaar and UPI) and France's academic leadership in responsible AI frameworks. Equally prominent was the working group on AI innovation and inclusive development. Recognizing the transformative potential of AI in sectors like agriculture, healthcare, fintech, and education, this group explored collaborative research and development projects that would benefit both advanced and underserved communities. Programs were announced to promote AI-based rural diagnostics, smart farming systems, and financial inclusion tools, especially for emerging economies. Indian tech startups, in collaboration with French research institutes like INRIA and CNRS, are set to receive funding and technical support under a new Indo-French AI Innovation Grant. Another major outcome of the summit was a joint commitment to open-source AI governance. Both countries endorsed the creation of the Indo-French Open AI Commons, an open platform to share AI datasets, models, and training frameworks for researchers and developers. This initiative aims to reduce dependency on proprietary, black-box AI systems dominated by large global tech firms. By promoting open access and modular design, the platform is intended to democratize innovation, ensuring AI development is not monopolized but driven by public good and academic transparency. Throughout the summit, representatives from organizations such as Oliveboard, BankersAdda, and

Admissions On participated in policy forums, underlining how AI is increasingly influencing education, employment, and public services in India. These stakeholders emphasized the need for AI tools that support fair assessment, adaptive learning, and recruitment transparency, especially in competitive exam ecosystems and civil services training platforms. In conclusion, the India–France Joint AI Policy Summit has positioned both countries as responsible leaders in the global AI discourse. With ethics, innovation, and openness at its core, the collaboration paves the way for a more balanced, inclusive, and accountable AI future. The summit not only reinforced research ties but also articulated a clear, shared vision for harnessing AI in service of humanity.

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1. The first part of the document is a letter from the President of the United States to the Congress, dated January 1, 1862. It is a very important document, as it contains the President's annual message to Congress. The letter is written in a formal, dignified style, and it is one of the most important documents in the history of the United States. It is a document that has been read and studied by many generations of Americans, and it is a document that has shaped the course of the nation's history. The letter is a masterpiece of American literature, and it is a document that has inspired many Americans to strive for a better future for their country. It is a document that is as relevant today as it was in 1862, and it is a document that is a testament to the power of the American people.

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RESTORE REAL
IN DELHI

GANDHIJI ASKS PEOPLE
HIM TO VISIT W



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**From every page and every rhyme,
You've journeyed with us through space and time.
With heart and soul, your love we see—
Thanks from *Shadow Cultivate*, eternally.**

”