INFUSE 2025: International Conference on Frontiers of Unified Science and Exploration

Report of Contributions

Contribution ID: **1** Type: **Poster**

Exploring the Potential of Menstrual Blood-Derived Mesenchymal Stem Cells in Regenerative Medicine

Abstract
For over half a century, stem cells have been used in therapeutic (molecular) medicine. Stem cells can be extracted from various sources, mainly embryonic, fetal, adult, and genetically reprogrammed somatic cells. Recent studies have found that menstrual blood carries Mesenchymal Stem Cells (MSCs), making them potential candidates for cell-based therapies in regenerative medicine and immune-related diseases. Menstrual stem cells (MenSCs) present various advantages, notably their easy accessibility due to collection using hassle-free and non-invasive techniques, and do not pose the threat of graft rejection. they possess all major stem cell properties and showcase greater proliferation and differentiation potential compared with bone marrow MSCS. MenSCs are promising for cartilage regeneration and have shown outstanding results in treating stroke, colitis, limb ischemia, coronary diseases, Duchenne's muscular dystrophy, and streptozotocin-induced type-1 diabetes in animal models. MenSCs also show potential in treating female infertility by improving ovarian and uterine functions. The study of MenSCs enables exploration of their utility in resolving controversies regarding stem cell markets and differentiation potential, improving reprogramming techniques for induced Pluripotent Stem Cell (iPSC) generation, and expanding applications in neurology, cardiology, and gynecology.
Keywords: MenSCs, MSCs, regenerative medicine, non-invasive techniques, iPSC, Stem Cell based therapy

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Track Classification: Biological Sciences

Contribution ID: **2** Type: **Poster**

Effects of the phytochemical extracts of Marigold flower on the development of Drosophila Melanogaster

Drosophila melanogaster, a well-established model organism, is extensively used in biological research due to its short life cycle, ease of genetic manipulation, and a fully sequenced genome. Its use has been instrumental in advancing our understanding of fundamental biological processes, from embryonic development to neurogenetics. This study investigates the potential bioactive effects of phytochemical compounds extracted from marigold flowers on *Drosophila melanogaster*. Marigold flowers are rich in secondary metabolites, including carotenoids, flavonoids, and terpenes, which are known for their potential pharmacological properties. The research aims to identify and characterize specific compounds from these extracts and evaluate their influence on the behavioral responses of *D. melanogaster*. The findings of this study could provide new insights into the biological activities of marigold-derived compounds and their potential applications in various fields.

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Track Classification: Biological Sciences

Contribution ID: **3** Type: **Poster**

Insilico analysis and antibacterial studies of methanolic extract of Allium sativum bulb coated with Titanium dioxide (TiO2) nanoparticles against Pseudomonas syringae, pathovar of Pea plant.

Background: The pathovars of Pseudomonas syringae translocate and interfere pathogen defensing cellular functions of the plant host Pea through the activity of effector protein like Hypersensitivity outer protein (Hop), involving type III secretion system pathway (TTSS) leading for bacterial disease progression.
Allium sativum (Garlic) methanolic extract contains an array of phytochemicals having antibacterial activities and thus helps in combating the action of bacterial phytopathogens on plant hosts infection.
Aim and Objective: Insilico analysis of selected phytocompounds against targeted proteins and Antibacterial activities of methanolic extract of Allium sativum bulb coated with Titanium dioxide (TiO2).
Methods: In this study, amino acid derivatives, alkaloid, thiophene and phthalates constituents from Garlic were docked against target Hop protein of Pseudomonas syringae using insilico analysis. Ampicillin was used as control.
Molecular docking analysis using Pyrx was carried out in order to find the inhibition properties of the Garlic followed by antibacterial assays. The antibacterial action effects like the disruption of the cell membrane and DNA damage of phytopathogen P.syringae using methanolic garlic extract doped with TiO2nanoparticles were successfully achieved through trypan blue and CellToxTM green uptake assays.
Results and discussions: The docking studies revealed that all the chosen Garlic constituents showed good binding energy values in comparison with Ampicillin followed by positive results in antibacterial assays conducted.
Conclusion: The selected Garlic constituents (ligands) proved effective in inhibiting the target protein (receptor) which enables in discovering novel antibacterial compounds against Pseudomonas syringae phytopathogen.
Key words: Pseudomonas syringae, Allium sativum, Garlic, Docking, Antibacterial assays.

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Track Classification: Biological Sciences

Contribution ID: **4** Type: **Oral**

A DSE-ESIPT-Active Organic Luminogen for Ratiometric Detection of Cu (II) Ions with "Off-On" Enantioselective Recognition of Amino Alcohols and Selective Hydrazine Sensing

The development of dual-state emissive organic luminogens has elevated the ease of recognition of various biological analytes, which demonstrates the multifaceted potential of dual-state emitters. Therefore, in this study we have synthesized a dual state emissive-excited state intermolecular proton transfer based organic luminogen (E)-4-(5-bromo-2-hydroxybenzylideneamino)-2,3-dimethyl-1-phenyl-1,2-dihydropyrazol-5-one (ANMB) exhibiting excitation depend phototunability with a large stork shift of 109 nm and 155 nm in both solution and solid state, underscoring its potential as biosensor. The metal-chelating ability of ANMB was investigated, revealing significant fluorescence quenching upon coordination with Cu^{2+} ions, leading to a 96% reduction in emission intensity. Introduction of biological analytes, such as amino alcohols, enabled fluorescence recovery, where ANMB demonstrated enantioselective recognition: a single emission peak for the S-enantiomer and dual emission peaks for the R-enantiomer. Furthermore, ANMB demonstrated high selectivity for hydrazine detection in both solution and solid states, with new emission bands observed at 411 nm and 432 nm, indicating a fluorescence shift from green to blue. Complementarily, ANMB was successfully applied for real-time imaging of hydrazine in food and plant samples, showcasing its practical adaptability. Overall, this work highlights the multifunctionality and tunability of DSE–ESIPT-based organic luminogens, positioning ANMB as a promising candidate for the selective recognition of biologically significant analytes in analytical and real-world contexts.

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Track Classification: Chemical Sciences

Contribution ID: **5** Type: **Poster**

Nature's Answer to Resistance: Antibacterial and Antioxidant Efficacy of Averrhoa bilimbi Leaves

ABSTRACT

The emergence of antibiotic-resistant bacterial infections has intensified the global need for safe, sustainable, and plant-based alternatives. This study investigates the antimicrobial and antioxidant potential of Averrhoa bilimbi leaf extracts, focusing on their efficacy against pathogenic bacteria implicated in skin and systemic infections. Leaf extracts were prepared using solvents of varying polarity—hexane, ethyl acetate, and methanol—and subjected to phytochemical screening, DPPH antioxidant assays, and a series of antimicrobial tests including Minimum Inhibitory Concentration (MIC), Minimum Bactericidal Concentration (MBC), disk diffusion, and time-kill assays.

Among all extracts, the methanolic extract demonstrated superior phytochemical richness and biological activity, exhibiting strong free radical scavenging capacity and broad-spectrum antibacterial effects, particularly against Staphylococcus aureus and Escherichia coli. Time-kill assays further confirmed its bactericidal nature, showing a dose- and time-dependent decline in bacterial viability.

The extract's potency is attributed to a synergistic interplay of flavonoids, phenols, alkaloids, and saponins—compounds known to disrupt microbial membranes and inhibit key enzymatic pathways. The study also integrates planned GC-MS analysis to identify and profile the bioactive constituents, laying a foundation for future therapeutic development.

This research validates the ethnomedicinal relevance of Averrhoa bilimbi and positions it as a promising candidate for next-generation plant-based antimicrobials, especially in the context of rising multidrug resistance. The findings advocate for the integration of phytotherapy into mainstream clinical research and drug discovery.

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Track Classification: Biological Sciences

Contribution ID: **6** Type: **Poster**

Exploring the impact of cold plasma treatment on seed germination and phytochemical content in Ocimum basilicum.

This study investigates the effect of electrical discharge plasma on the germination rate and phytochemical content in the seeds of *Ocimum basilicum*. Basil is known for its aromatic leaves along with its medicinal properties. The key focus of this study is to evaluate the significant changes occurring in the carbohydrate metabolism in basil after plasma treatment at varying incubation periods. The seeds were initially exposed to volume discharge and surface discharge plasma for varying time durations (30 seconds to 12 minutes). The plasma duration at which highest germination rate has occurred was selected as the optimal time and bulk quantity of seeds were exposed for this duration. The phytochemical changes were studied at the seed level as a function of incubation period starting from 7th, 14th and 21st days post-plasma treatment. The germination rates were observed to be highest when the seeds were exposed to surface discharge plasma for 30 seconds. The secondary metabolites like polyphenols, flavonoids, tannins, alkaloids and antioxidants showed an increase in their contents in response to the external stress by plasma. The proteins showed an increase by 471.42% compared to the control seeds. Meanwhile the concentrations of total carbohydrates and total dietary fibers decreased significantly by 22.22 % and 35.67% respectively on the 7th day of incubation indicating the enhanced enzymatic breakdown for energy during germination, which was accelerated by plasma treatment. These findings demonstrate that cold plasma treatment can modulate germination and phytochemical profiles in basil seeds, offering potential applications in agriculture and nutraceutical enhancement.

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Track Classification: Biological Sciences

Contribution ID: **7** Type: **Oral**

Characterizing Temporal Patterns of Urban Air Pollution and AQI Variability in Delhi

This study examines how concentrations of six key air pollutants ($PM_{2.5}$, PM_{10}, NO_2, SO_2, CO, and O_3) and their temporal variation and how they influence the Air Quality Index (AQI) across Delhi. Daily measurements of these pollutants from 2021 to 2024 were analyzed to capture seasonal, monthly and weekly variations. Visualization techniques such as time-series graphs, boxplots, and correlation matrices were applied to identify pollutant-specific behaviors. The analysis shows that $PM_{2.5}$ and PM_{10} have the most significant impact on AQI, with elevated levels during winter, while ozone concentrations peak in the summer. Weekly trends suggest pollutant levels are generally higher on weekdays than weekends. The outcomes provide a data-driven foundation for developing focused air quality management policies in Delhi.

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Track Classification: Mathematical & Data Sciences

Contribution ID: **8** Type: **Poster**

Assessment of Salutary properties of Schiff Base derived from Alloxan synthesised through Green Technology

ABSTRACT
The formation of complexes involves the binding of an intriguing class of ions or molecules called ligands to a central metal ion. The facility of ligands to behave as "Lewis Bases" or donate a single pair of electrons has revolutionized the pharmaceutical industry.This broad family of chemicals is created when a primary amine and an aldehyde or ketone condense under specific circumstances. Among other things, the ligands antiviral, antibacterial, anti-inflammatory, antiproliferative, anti-fungal, anticancer, and antioxidant properties make them effective. The antibacterial qualities of Schiff bases in vitro encourage researchers to develop new anti-biofoulants. A yield ranging from good to high is achieved using the moderate conditions used for ligand synthesis. Ligand-based redox reactions provide new principles for catalytic drug creation. The creation of new materials with a range of applications is made possible by organometallic complexes. The electrical shifts between ligand and metal complexes provide the framework for drug synthesis that is used in many different sectors.The synthesized ligand characterized using UV, IR, NMR and screened for their antibacterial activities and docking studies.
Key Words: Alloxan Semicarbazone , UV, IR, NMR, Antibacterial, Docking.

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Track Classification: Chemical Sciences

Contribution ID: **9** Type: **Oral**

Bacteriostatic and synergistic antibacterial effects of Piper betle and Petroselinum crispum extracts in combination with conventional antibiotics

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Abstract
The emergence of multidrug-resistant bacteria has prompted the search for novel therapeutic alternatives, including the use of plant-derived compounds. This study investigates the synergistic antibacterial potential of methanolic and hydroalcoholic extracts of Piper betel and Petroselinum crispum leaves in combination with conventional antibiotics against Escherichia coli and Staphylococcus aureus. Phytochemical screening revealed the presence of various bioactive compounds such as flavonoids, alkaloids, tannins, and coumarins. Antibacterial activity was evaluated using agar well diffusion for individual and mixture plant extracts. Both bacteriostatic and bactericidal activities of the extracts were determined, with minimum inhibitory concentration (MIC) by broth microdilution methods. Additionally, minimum bactericidal concentration (MBC) was evaluated, and the maximum bactericidal activity (0.313 mg/mL) was observed for methanolic extract of combined plants against S. aureus. Furthermore, the potential of the plant extracts to modulate the activity of standard antibiotics (gentamycin and ciprofloxacin) was assessed using the fractional inhibitory concentration index (FICI) to classify the interactions as synergistic, indifferent, or antagonistic. The results demonstrated that while the extracts exhibited moderate antibacterial activity individually, they significantly enhanced the efficacy of antibiotics when used in combination, suggesting their potential role as natural antibiotic adjuvants in combating drug-resistant bacteria.
Key words:
Synergism, antibiotic, Petroselinum crispum, Piper betle, fractional inhibitory concentration index

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Track Classification: Chemical Sciences

Contribution ID: **10** Type: **Poster**

Face scrub with Lipase activity

Face scrub is one of the most commonly used cosmetic preparations for exfoliating facial skin. Most commercially available face scrubs are stored and sold in plastic containers due to the fact that they are formulated as aqueous preparations. To overcome use of plastic as
packing material for face scrub, we have developed a powder formulation that can be sold and stored in environmentally friendly containers such as wooden boxes or paper pouches. Lipases are enzymes that act to hydrolyze lipids. Clogging of sebaceous glands with sebum could lead to undesirable outcomes. Use of lipase may be hypothesized to alleviate this due to hydrolysis of contents of sebum. The two part face scrub described herein delivers lipase as the enzymatic active principle and power of Syzygium cumini leaf as source of antioxidant activity. The face scrub also contains coarse powder of nutmeg shell as the physical exofialnt.

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Track Classification: Biological Sciences

Contribution ID: **11** Type: **Poster**

Is Graphology a Scientific Discipline? A Neuro-Psychological Evaluation

ABSTRACT
Graphology is considered as non-invasive technique to study about a person's characteristics or personality type. Despite being widely criticized for its lack of scientific evidence, graphology still remains one of the most prominent fields in the educational industry due to its psychological, cultural, and sociological appeal. Most of the people believe that graphological analysis can reveal their personality type, behavioral traits etc. A concept that is often dramatized in the entertainment industry (television, films), and in psychology. This fascination fuels the public interest especially in the regions with the low psychological literacy and pseudoscience gains traction without any strong empirical evidence. From a neuro-psychological perspective, currently there is no such mechanism by which one can decode personality traits by analysing pressure, strokes, or baseline. Current research in neuroscience shows that handwriting is a learned motor skill, not a direct window to someone's personality, leaving no biological basis for graphological claims. Additionally, the embedded status of graphology in various industries such as human resource management, personality development, career counselling help to maintain its popularity in the industry and resists change. With the advancement in the technology and artificial intelligence it objectifies and quantifies the handwriting analysis giving a renewed hope to graphologists. Moreover, the subjective nature of graphological analysis can generate vague interpretation which can be accurate sometimes much like horoscope, which further reinforces to believe its credibility. The illusion of accuracy keeps the belief alive in graphology.

Keywords: Forensic Science, Handwriting Analysis, Graphology, Pseudo-Science

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Track Classification: Forensic Sciences

Contribution ID: **12** Type: **Oral**

Microgreen-Mediated Zinc Oxide Nanoparticles: An Eco-Friendly Approach Against Food-Borne Pathogens

Food-borne diseases remain a significant public health concern due to the prevalence of pathogenic microorganisms in animal-derived foods such as poultry. In this study, microorganisms were isolated from chicken meat and subjected to pathogenicity assays, followed by identification and characterization. To develop a sustainable antimicrobial strategy, zinc oxide nanoparticles (ZnO NPs) were green synthesized using microgreens extract. Microgreens, being the early growth stage of plants, are rich in bioactive phytochemicals, vitamins, minerals, and antioxidants, offering higher metabolite concentrations compared to mature plant parts, which enhances their potential as reducing and capping agents in nanoparticle synthesis. The antimicrobial activity of the synthesized ZnO NPs was evaluated against the identified food-borne pathogens, i.e., Staphylococcus pasteuri and Aeromonas caviae, using the minimum inhibitory concentration (MIC) assay. The results demonstrated notable inhibitory effects, highlighting the potential of microgreen-derived ZnO NPs as an eco-friendly and effective alternative to conventional antimicrobial agents for mitigating meat-borne infections. This study underscores the integration of plant-based nanotechnology with food safety interventions to address microbial contamination in the meat supply chain.

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Track Classification: Biological Sciences

Contribution ID: **13** Type: **Poster**

Banana Peel as a sustainable substrate for microbial enzyme production

Banana peel, a readily available lignocellulosic agro waste, has gained increasing attention as a low-cost and environmentally
sustainable substrate for microbial enzyme production. This review emphasizes current scientific advances in utilizing banana
peel for the biosynthesis of industrially significant enzymes, including pectinase, cellulase, amylase, lipase, catalase, protease,
peroxidase and L-asparaginase, through fungal and bacterial fermentation systems. The influence of banana varietal
composition, ripeness stage, and substrate pretreatment on enzyme yield, along with comparing fermentation methods such as
solid-state and submerged fermentation, is assessed. Prominent microbial strains—including Aspergillus niger, A. japonicus,
Trichoderma reesei, Paenibacillus lactis, and Yarrowia phangngaensis—are highlighted for their enzyme efficiency.
Industrial applications are discussed in the context of biofuel generation, food processing, textile treatment, and environmental
remediation. Despite scale-up limitations and variability in substrate composition, integrating banana peel bioprocessing with
circular bioeconomy frameworks can transform food waste into valuable bioproducts, contributing to sustainable development
goals (SDGs).

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Track Classification: Biological Sciences

Contribution ID: **14** Type: **Poster**

Bacteriostatic and synergistic antibacterial effects of Piper betle and Petroselinum crispum extracts in combination with conventional antibiotics

Abstract
The emergence of multidrug-resistant bacteria has prompted the search for novel therapeutic alternatives, including the use of plant-derived compounds. This study investigates the synergistic antibacterial potential of methanolic and hydroalcoholic extracts of Piper betel and Petroselinum crispum leaves in combination with conventional antibiotics against Escherichia coli and Staphylococcus aureus. Phytochemical screening revealed the presence of various bioactive compounds such as flavonoids, alkaloids, tannins, and coumarins. Antibacterial activity was evaluated using agar well diffusion for individual and mixture plant extracts. Both bacteriostatic and bactericidal activities of the extracts were determined, with minimum inhibitory concentration (MIC) by broth microdilution methods. Additionally, minimum bactericidal concentration (MBC) was evaluated, and the maximum bactericidal activity (0.313 mg/mL) was observed for methanolic extract of combined plants against S. aureus. Furthermore, the potential of the plant extracts to modulate the activity of standard antibiotics (gentamycin and ciprofloxacin) was assessed using the fractional inhibitory concentration index (FICI) to classify the interactions as synergistic, indifferent, or antagonistic. The results demonstrated that while the extracts exhibited moderate antibacterial activity individually, they significantly enhanced the efficacy of antibiotics when used in combination, suggesting their potential role as natural antibiotic adjuvants in combating drug-resistant bacteria.
Key words:
Synergism, antibiotic, Petroselinum crispum, Piper betle, fractional inhibitory concentration index

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Track Classification: Health Sciences

Contribution ID: **15** Type: **Poster**

Spectral geometric aspects and applications to resonances and related themes

This work explores the spectral geometry of Laplace–Beltrami operators on compact and non-compact Riemann surfaces, emphasizing their role as quantum Hamiltonians. On compact manifolds, the Laplacian yields a discrete spectrum intimately tied to the geometry and energy distribution of the space. Through a modern geometric analytic viewpoint, we unravel how the chaotic geodesic flow on negatively curved surfaces imprints statistical patterns on eigenvalues, aligning with quantum chaos. The Selberg trace formula compares these spectral features to modular forms and arithmetic number theory, revealing deep algebraic structures. In contrast, non-compact arithmetic hyperbolic surfaces exhibit continuous spectra governed by scattering matrices, which connect to automorphic L-functions and analytic number theory. By applying various modern innovations involving geometric quantization, spectral invariants, and Hamiltonian dynamics, this study describes the interplay between classical trajectories, quantum states, and arithmetic symmetries thus offering new perspectives for integrable systems, topological field theories, and the spectral analysis of low-dimensional manifolds.
Key words: hyperbolic, spectra, scattering, GUE

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Track Classification: Mathematical & Data Sciences

Contribution ID: **16** Type: **Oral**

Precision Agriculture Using Deep Learning-Based Tomato Leaf Disease Diagnosis

Plant diseases are one of the greatest threats to food security across the world, particularly with regard to staple foods, such as tomatoes. Rapid and accurate identification of diseases is very important in curbing yield losses and maintaining sustainable agriculture. In this paper, we consider how we can use deep learning methods to identify tomato leaf diseases using the publicly available PlantVillage dataset. We trained, designed and assessed three architectures of Convolutional Neural Network (CNN), MobileNet and ResNet to differentiate between diseased and healthy tomato leaves. Qualitative comparison that took place was done to gauge the performance of the models against each other in terms of the level of accuracy and the capacity to generalise. The outcomes reveal that even though CNN and MobileNet are effective, ResNet would be more reliable in real life scenarios due to its greater accuracy. This research highlights the opportunities of the ResNet-related models to enter the precision agriculture domain, in which the farmers could receive the automated, accurate, and scalable diagnostic tools. Moreover, mobile or peripheral devices could be integrated with such models so as to offer diagnosis on-site, eliminating the expense of performing the diagnosis in a lab. The method also presents the prospects of live disease surveillance where the farmers are able to prevent or take corrective measures on the spot. With a long run view, such smart systems may be crucial in enhancing crop resilience, reducing pesticide, and achieving sustainable food production.

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Track Classification: Mathematical & Data Sciences

Contribution ID: **17** Type: **Oral**

CRISPR/Cas9-Mediated Knockout of Susceptibility Genes for Blast Resistance in Pusa Basmati Rice

Rice blast, caused by Magnaporthe oryzae, poses a major threat to yield and quality in Pusa Basmati rice. Conventional breeding for blast resistance is challenged by limited resistance sources and pathogen variability. This study applies the CRISPR/Cas9 genome editing system to precisely disrupt blast susceptibility genes. Guide RNAs were designed targeting conserved functional domains, and CRISPR constructs are being prepared for Agrobacterium-mediated transformation of Pusa Basmati. Mutations will be validated by Sanger sequencing, and edited plants will undergo blast resistance screening under greenhouse and field conditions. The objective is to develop blast-resistant lines without compromising the distinctive grain quality and aroma of Basmati rice. By eliminating susceptibility genes, this approach offers durable resistance and a faster, more targeted alternative to conventional breeding, contributing to sustainable rice production.

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Track Classification: Engineering & Technology

Contribution ID: **18** Type: **Poster**

Decoding Stellar Chemistry: The Impact of Non-Iron Metals on Exoplanet Formation and Characteristics

Stellar metallicity plays a key role in shaping the formation and evolution of planetary systems, but most studies have concentrated on overall [Fe/H] rather than the influence of individual elements. In this work, we explore how the abundances of metals beyond iron—specifically carbon, lithium, titanium, magnesium, nitrogen, and oxygen—in exoplanet host stars relate to planetary characteristics such as mass, radius, and orbital parameters. Using available spectroscopic data combined with exoplanet catalogs, we assemble a sample of host stars with measured abundances of these elements. Our analysis framework aims to investigate possible correlations between specific elemental enrichment and trends in planetary properties. Although this study is ongoing, the approach presented here is designed to provide new insight into the role of detailed stellar composition in planet formation and system architecture.

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Track Classification: Physical Sciences

Contribution ID: **19** Type: **Poster**

ELECTROSTATIC LAKE FOAM SUPPRESSION MODULE

Urban water bodies like Bengaluru's Bellandur Lake are facing increasing challenges due to toxic foam formation, mainly from untreated industrial and domestic waste. Traditional methods, such as chemical defoamers and mechanical interventions, provide limited and short-term relief. Often, they also introduce new pollutants. This paper describes the creation and use of a low-cost, floating Electrostatic Foam Suppression Module (EFSM) that is designed for air and water cleanup.

The treatment system works by creating a high-voltage electrostatic field between a suspended mesh and a grounded base. This field destabilizes the foam by interrupting the surfactant-stabilized film structures, causing them to collapse quickly. The setup can reduce foam by up to 92% within one minute, and it does this without using chemicals. Additionally, it has an onboard electrostatic precipitator (ESP) that removes airborne particles near the foam.

Made mostly from recycled materials and set on a buoyant thermocol platform, the EFSM includes an ESP32 microcontroller for monitoring air quality and controlling operations in real time. Its modular and energy-efficient design makes it easy to scale for decentralized use in polluted urban water bodies. The dual functionality and sustainable build show strong potential for patents, offering a new, eco-friendly way to address environmental damage in urban areas.

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Track Classification: Engineering & Technology

Contribution ID: **20** Type: **Poster**

From scene to DNA : A systematic approach to blood stain pattern analysis in complex crime scene.

From Scene to DNA: A Systematic Approach
to Bloodstain Pattern Analysis in Complex
Crime Scenes
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Bloodstain Pattern Analysis (BPA) is a forensic method that studies how bloodstains form and where they are found to understand events in violent incidents. By examining the size, shape, and spread of stains, investigators can identify the positions of people involved, their movements, and the sequence of actions. In firearm cases, BPA can reveal where individuals stood, how they moved, and how a weapon was used. Blood on a victim's hands can provide clues about weapon handling and firing positions in suspected suicides. To protect evidence, the scene must be documented before gunshot residue (GSR) testing or moving the body.Modern BPA goes beyond simple observation. Advanced techniques such as probabilistic modelling and fluid dynamics consider gravity, air resistance, and droplet deformation. These methods make it possible to accurately reconstruct how blood drops travel, even over distances greater than one metre or in downward paths, improving accuracy and reliability in complex cases.BPA examines various stain types, including arterial spurts, cast-off patterns, and contact marks, while addressing challenges like overlapping stains and environmental contamination. It can also guide DNA profiling when samples are mixed or unclear.The process follows a systematic approach—starting with a broad view of the scene and moving to detailed pattern analysis. It is performed by trained professionals with expertise in injury biomechanics and experience in both crime scene work and autopsies.When done with scientific precision, BPA is a valuable part of modern forensic science, helping reconstruct events, confirm or challenge witness accounts, and ensure correct interpretation of physical evidence in violent crime investigations.
Keywords: Bloodstain Pattern Analysis (BPA) , Forensic Reconstruction , Gunshot Residue (GSR) , Injury Biomechanics , DNA Profiling.

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Track Classification: Forensic Sciences

Contribution ID: **21** Type: **Oral**

Zebra fish as a model to study Acute pancreatitis- A novel method induced through Alcohol/L-arginine.

Acute pancreatitis (AP) is an inflammatory disorder characterized by premature activation of pancreatic zymogens, leading to autodigestion, systemic inflammation, and in severe cases, multi-organ dysfunction syndrome (MODS). Current animal models, such as rodents and pigs, have significantly advanced our understanding of AP pathogenesis but are associated with high costs and methodological limitations. Zebrafish (Danio rerio), owing to their genetic similarity to humans, external fertilization, transparent embryonic development, high fecundity, and regenerative capacity, represent a promising alternative model for studying AP. Existing zebrafish studies primarily rely on cerulein, a cholecystokinin analogue, for AP induction; however, the high cost of cerulein limits its applicability in large-scale research.

This study aims to establish a novel, cost-effective, and reproducible method for inducing AP in zebrafish using ethanol and L-arginine hydrochloride as alternatives to cerulein. Adult zebrafish will be divided into control, AP-induced, and L-Arginine-induced. Induction will be performed via intraperitoneal injection, followed by monitoring physiological and regenerative aspects. Tissue and blood samples will be analyzed for biochemical and histological alterations, including zymogen granule activation, pancreatic enzyme activity, and regenerative markers. Techniques such as 2D gel MALDI, LCMS/MS, SDS-PAGE, trypsin activity assay, and amylase quantification will be employed.

The expected outcomes include validation of a zebrafish AP model that is cost-efficient and reproducible, identification of key enzyme and regenerative markers, and insights into pancreatic injury and recovery. This model may overcome the limitations of current AP animal studies and provide a versatile platform for translational research and drug discovery.

Keywords: Acute pancreatitis, Zebrafish, Zymogen granules, Ethanol, L-arginine, Regenerative markers

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Track Classification: Health Sciences

Contribution ID: **22** Type: **Oral**

Trichoderma harzianum–Derived Nanoparticles as Antimicrobial and Antibiotic-Synergistic Agents

The worldwide emergence of multidrug-resistant (MDR) pathogens alongside infections associated with biofilms accentuates the imperative for alternative antimicrobial methodologies. This study examines mycosynthesized nanoparticles (NPs) utilizing Trichoderma harzianum as environmentally benign biogenic agents targeting resistant bacterial strains. Thorough physicochemical evaluations validated the existence of stable, well-characterized NPs exhibiting distinct surface modifications attributable to fungal metabolites. The NPs exhibited pronounced antibacterial efficacy against a spectrum of MDR clinical isolates, significantly diminishing bacterial viability and constraining the development of resistance in comparison to ionic controls. Importantly, they effectively disrupted established biofilms and diminished the survival of persister cells, thereby demonstrating their potency against tolerant bacterial subpopulations. Combination assays indicated the presence of synergistic relationships with various antibiotics, resulting in reduced effective drug dosages and the resensitization of resistant strains. These results underscore the potential of T. harzianum derived NPs as promising candidates for adjunctive antimicrobial therapy, possessing the dual capability to inhibit biofilm-associated infections while simultaneously augmenting the efficacy of conventional antibiotics.

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Track Classification: Biological Sciences

Contribution ID: **23** Type: **Poster**

RECENT ADVANCES IN GREEN HYDROGEN PRODUCTION TECHNOLOGY WITH SOCIO ECONOMIC ANALYSIS

Hydrogen (⊠2) is at the forefront of clean carbon free energy carrier, sustainable energy systems and has great power to decarbonize many industrial sectors. The hydrogen evolution reaction (HER) is the key phenomenon for the desirable generation of green hydrogen (⊠2).
However, the cost of the green hydrogen production is high due to the highly expensive platinum based electrocatalysts, pure water as electrolyte and grid electricity. Hence here we are going to discuss the recent (last 5 years) advances of the technologies like alkaline water
electrolysis (AWE), proton exchange membrane (PEM), photocatalysis etc. where they developed various membranes, electrolytes and electrocatalysts for the green hydrogen production which are cost efficient and gives much higher hydrogen (⊠2) production rate also the emerging future prospective. We will also be discussing about the possible utilisation of green hydrogen for various applications like transportation, industries and householding etc. and the case studies involved in economic aspects for the cost reduction.

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Track Classification: Physical Sciences

Contribution ID: **24** Type: **Oral**

Study on efficiency of bacteriocin from Lactic Acid Bacteria for increasing the shelf life of fruits and vegetables

Bacteriocins are ribosomally synthesized antimicrobial peptides produced by lactic acid bacteria (LAB), with promising applications in food preservation and human health. In this study, food samples were screened for bacteriocin-producing LAB using standard microbiological methods. The isolates were characterized by Gram's staining and biochemical tests, followed by molecular identification through 16S rRNA sequencing. Among them two isolates, A1b and A7a, showed strong antibacterial activity. The isolate A7a was chosen further studies as it stronger antibacterial activity. The same was identified as Enterococcus faecium based on 16s rRNA sequencing and phylogenetic tree analysis. The Enterococcus faecium was found to be positive for bacteriocin genes (entA and entB) based on PCR analysis. The antimicrobial effect of bacteriocin extracts was further validated in food models, where treated fruits and vegetables exhibited delayed spoilage compared to untreated controls. Both isolates were able to slow down spoilage when used on fruits and vegetables, as the treated samples stayed fresh longer than untreated controls. This shows that the bacteriocin purified from LAB, especially A7a, can be used as natural preservative to keep food safe and reduce the need for artificial chemicals. The findings highlight the potential of LAB-derived bacteriocins as natural bio-preservatives, offering an eco-friendly alternative to synthetic preservatives and contributing to food safety.

Keywords: Bacteriocins, Lactic acid bacteria, Food preservation, Enterococcus faecium, Antimicrobial activity

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Presenter: Ms M N, HUDA

Track Classification: Biological Sciences

Contribution ID: **26** Type: **Poster**

"Harnessing Banana Peel for Green Bioprocesses: Enzyme Production and Fungal Comparative Insights"

Banana peel, constituting nearly 30–40% of global banana fruit waste, represents an abundant lignocellulosic substrate with significant potential for sustainable microbial enzyme production. This work integrates a review of banana peel valorization strategies with experimental insights into the enzyme-secreting potential of two fungal strains—Aspergillus japonicus and Aspergillus carbonarius—isolated from decayed peel. Literature consolidates the peel's biochemical richness in cellulose, hemicellulose, and pectin, making it suitable for producing industrially relevant enzymes such as cellulase, pectinase, protease, lipase, and L-asparaginase. Comparative enzymatic profiling revealed species-specific capabilities: A. japonicus showed superior pectinase, protease, and L-asparaginase activities, while A. carbonarius exhibited higher cellulase and lipase yields. These findings underscore the dual significance of banana peel: first, as a sustainable feedstock supporting circular bioeconomy initiatives, and second, as a platform for targeted fungal enzyme production tailored to diverse applications in food processing, biofuels, pharmaceuticals, and environmental bioremediation. The synergy of review-based evidence with experimental results strengthens the case for scale-up studies, bioreactor optimization, and integration of banana peel bioprocessing into sustainable industrial pipelines.

Author: G, Kavya

Presenter: G, Kavya

Track Classification: Biological Sciences

Contribution ID: **27** Type: **Poster**

Bridging functional foods and nutraceuticals: Advances in bioactive compounds for health promotion and disease prevention

Nutraceuticals and functional foods together offer a novel approach for disease prevention and health enhancement. Nutraceuticals, formulated from natural sources and functional foods, are enriched with specific bioactive substances, that assures to provide health benefits that go beyond simple nourishment. This review offers a comprehensive study on classifications of significant bioactive compounds such as polyphenols, carotenoids, omega-3 fatty acids, phytosterols, probiotics, and bioactive peptides. In order to improve stability, bioavailability, and efficacy, these bioactive compounds are extracted using the most recent developments in extraction technologies, processing techniques, and delivery systems, such as controlled release, nanoencapsulation, and supercritical fluid extraction. The review also encompasses quality control, safety concerns, and labeling methods, acknowledging their importance for global regulatory compliance and consumer confidence. Current concerns including bioavailability optimization, sustainable sourcing, and integration into frameworks for personalized nutrition are emphasized along with potential approach for future research. It also highlights the potential of nutraceuticals and functional foods as long-term, cost-effective methods to improve global health outcomes by bridging diverse views.

Keywords: Functional foods, Nutraceuticals, Bioactive compounds, Health promotion, Disease prevention

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Track Classification: Health Sciences

Contribution ID: **28** Type: **Poster**

Phytochemical constituents and therapeutic prospects of Biophytum sensitivum

Biophytum sensitivum, commonly known as "little tree plant,"is a small annual herb valued in traditional medicine systems such as Ayurveda, Siddha, and folk remedies for its wide therapeutic applications. Traditionally, it has been used for treating respiratory disorders, wounds, arthritis, diabetes, and inflammatory conditions, reflecting its ethnomedicinal importance. Phytochemical investigations have revealed a rich diversity of bioactive compounds including flavonoids, saponins, polysaccharides, alkaloids, tannins, and phenolics, many of which contribute to its pharmacological efficacy. Modern studies have demonstrated multiple therapeutic potentials of B. sensitivum, particularly its antioxidant, anti-inflammatory, anticancer, antimicrobial, antidiabetic, and wound-healing properties, often linked to the modulation of molecular pathways such as NF-κB and cytokine signaling. Advances in phytochemical characterization, molecular studies, and biotechnological approaches such as tissue culture offer new opportunities for its conservation and pharmaceutical exploitation. This review consolidates current knowledge on phytochemistry and therapeutic prospects of B. sensitivum, highlighting future research directions and its potential role as a valuable source for novel drug discovery.
Key words: Biophytum sensitivum, phytochemicals, ethnomedicine, pharmacological activities, therapeutic potential

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Track Classification: Health Sciences

Contribution ID: **30** Type: **Poster**

Target-Specific Pesticide Against Thrips and Mites

ABSTRACT

The persistent infestation of thrips and mites on rose plants during summer poses a significant challenge to ornamental horticulture, often compounded by the ecological and health hazards of conventional pesticides. This project presents a computationally driven strategy for developing a target-specific pesticide formulation that achieves selective toxicity against pest organisms while safeguarding plant vitality, soil health, and farmer well-being.

Leveraging ligand–protein interaction modeling and molecular docking platforms such as PRinS3, pest-specific protein targets will be identified, followed by the design and screening of high-affinity ligands for efficacy and environmental safety. Predictive ADME/Tox profiling, QSAR modeling, and phytotoxicity analysis will ensure the compound's biodegradability, thermal stability under summer conditions, and non-disruption of rose physiology and pollinator activity.

The formulation will undergo laboratory bioassays, phytotoxicity testing, and small-scale field validation, culminating in a user-friendly product accompanied by multilingual farmer guidance. This integrative approach offers a promising roadmap for eco-safe pest control in floriculture and lays the groundwork for future innovations in ligand-based pesticide design.

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Presenter: SRIDHAR, Tanya

Track Classification: Biological Sciences

Contribution ID: **31** Type: **Poster**

AeroLume : Utilizing Nature's Synergy for Indoor Air purification

The declining Indoor air quality is an increasing issue in urban cities because of direct influence on human health and well-being. Poor air quality is a major threat as it leads to respiratory ailments, allergies and other long-term health issues. With rapid and continuous urbanization worldwide, prolonged indoor exposure to airborne pollutants such as particulate matter [PM 2.5 and PM 10], volatile organic compounds [VOCs], carbon dioxide(CO_2) and nitrogen & sulphur oxides (NO_x, SO_x) has become a major concern. Traditional air filtration systems, though efficient, tend to be based on synthetic material and high energy use and are therefore unsustainable over the long term. This project introduces a novel solution to the air filtration system by incorporating biological elements for effective air cleaning.

The prototype incorporates photosynthetic microorganisms which actively removes gaseous pollutants like VOCs, CO_2 and other pollutants through natural metabolic processes like bioremediation and biofixation. Along with the culture, the bio-air filter is positioned in the system to act as a natural absorber of fine particulate matter like PM 2.5 and PM 10, which are known to penetrate deep into the respiratory system and cause inflammation. A bio-system has been added in addition for passive filtration to trap airborne allergens such as dust, pollen and other microscopic pollutants. This biofilter system represents a sustainable yet energy-efficient alternative to mainstream air purification technologies. While mechanical filters need to be frequently replaced and create waste, the biological components need less or no maintenance. This prototype combines various natural metabolic processes to create a scalable, environmental-friendly option for indoor air purification systems.

Author: SRIDHAR, Tanya

Presenter: SRIDHAR, Tanya

Track Classification: Biological Sciences

Contribution ID: **33** Type: **Poster**

Genetically Modified Crops for Climate Resilience: A Comprehensive Review

Genetically Modified Crops for Climate Resilience: A Comprehensive Review
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Abstract
Climate change imposes severe constraints on global agriculture through elevated temperatures, altered precipitation patterns, increased frequency of droughts and floods, salinity intrusion, and shifts in pest and pathogen distributions, collectively undermining crop productivity and yield stability. One of the most critical impacts is the disruption of sexual reproduction in horticultural and cereal crops, threatening food security. Conventional breeding, though effective, is often too slow to match the accelerating pace of environmental change. Genetically modified (GM) crops provide a targeted and accelerated pathway to developing climate-resilient cultivars by enabling precise introduction of genes that confer tolerance to multiple abiotic and biotic stresses. Traits such as drought and heat tolerance help maintain physiological function under water scarcity and high temperatures, while salinity tolerance—achieved through genes like NHX1—prevents ion toxicity and growth inhibition. Pest-resistant crops such as Bt- cotton reduce losses from climate-aggravated pest pressures, while varieties like Sub1A rice and DroughtGard maize offer submergence and drought resilience, respectively. These traits are introduced via transgenic and cisgenic methods, particle bombardment, Agrobacterium-mediated transformation, and increasingly, genome-editing tools such as CRISPR/Cas9, enabling precise multi-trait stacking. Beyond yield stability, GM crops can lower reliance on irrigation, fertilizers, and pesticides, supporting sustainability goals. However, their adoption is influenced by biosafety regulations, public acceptance, and equitable access, particularly for smallholder farmers. Integrating GM technology with conventional breeding, genomic-assisted selection, and agroecological practices can produce multi-stress-tolerant cultivars tailored to regional needs, offering a strategic approach to safeguarding global food security under intensifying climate pressures.
Keywords: Climate resilience, genetically modified crops, abiotic stress tolerance, biotic stress tolerance, drought tolerance, heat tolerance, salinity tolerance, pest resistance, CRISPR/Cas9, transgenic crops, yield stability, food security, sustainable agriculture, genome editing, climate change adaptation

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Track Classification: Biological Sciences

Contribution ID: **34** Type: **Poster**

Optical and Photocatalytic applications of synthesized Strontium doped Zinc oxide nanoparticles through chemical co-precipitation method

Optical and Photocatalytic applications of synthesized Strontium doped Zinc oxide nanoparticles through chemical co-precipitation method.

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Abstract
Strontium (Sr) doped Zinc oxide (ZnO) nanoparticles were synthesized through a chemical co-precipitation method; (Zn1-xSrxO, x =0.00, 0.025, 0.05, 0.075.). The synthesized nanoparticles underwent comprehensive characterisation employing XRD, FTIR, SEM, PL and UV-Visible spectroscopy techniques. XRD analysis showed that the nanoparticles exhibited a hexagonal wurtzite structure, with decreasing average crystalline size and lattice parameters corresponding to higher levels of strontium doping. FTIR spectroscopy confirmed vibrational stretching modes of octahedral and tetrahedral sites, through SEM analysis the form and morphology of the nanoparticles was determined, which showed wurtzite structures with flower like dimensions. UV–Vis DRS spectral studies showed a decline in the band gap with an incline in doping concentration. Photoluminescence studies exhibited a green emission peak. Additionally, photodegradation of these nanoparticles was assessed through degradation of MB dye. (Poster presentation)
Keywords: ZnO, Sr doped ZnO nanoparticles, optical performance, photocatalytic.

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Track Classification: Chemical Sciences

Contribution ID: **35** Type: **Oral**

Insilico Molecular interaction study of Non-terpenoid and non-steroid constituents of neem (A. indica) against Breast cancer inducing protein (AXL receptor tyrosine kinase).

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Abstract
Breast cancer is a global concern among women. The patients benefit from the availability of diagnostics, prognoses, and treatments, but researchers continue to work on improving the quality of life for breast cancer patients. At present, breast cancer does not have a single known treatment that can render it cured. The goal of identifying molecular targets for treating cancer has been a research priority for decades. Growth arrest-specific protein 6 (GAS6) is a high-affinity ligand of the AXL protein, which is in the TAM family. In addition to tumor cell growth, metastasis, invasion, Epithelial-Mesenchymal Transition (EMT), angiogenesis, and drug resistance, the Gas6/AXL signaling pathway is involved in immune regulation, stem cell maintenance, and drug resistance. The cancer-associated protein Axl is also a potential therapeutic target for the discovery and development of novel therapeutics. The objective of the present study was to screen the Non-Terpenoid and non-steroid phyto constituents against Breast cancer inducing protein (AXL receptor tyrosine kinase).
Methods: In this study we have screened 15 Non-Terpenoid and non-steroid phyto constituents from neem (A. indica) which is reported previously. These compounds further screened Pharmacophore analysis by ChemMine Tools (OpenBabel Descriptors). The Lipinski rule passed compounds carried out their Molecular interaction and ADMET study by Cavity-detection guided Blind Docking and pkCSM online tools against AXL receptor tyrosine kinase. These compounds were further evaluated for Pharmacokinetic (ADMET) properties Analysis along with FDA approved anti breast cancer drug molecule Anastrozole.
Results and conclusion: In the present study we screened 15 bioactive among all 6 compounds were fulfilled the Lipinski's rule of 5. These compounds were used for against Breast cancer inducing protein (AXL receptor tyrosine kinase) inhibitors through molecular docking studies. The results were shown with high energy Compound Name and with CB-Dock Vina score Isorhamnetin (-8) > Nimbiol (-7.3) > Quercetin (-7.7) and Sugiol (-7.7), Kaemferol (-7.6) > 5-Hydroxy-methyl furfural (-4.6). And further these compounds need to be evaluated invitro and invivo as well performed on animal models to confirm the anti-Breast cancer activity.

Key Words: Receptor Tyrosine Kinase, Breast cancer, Molecular Docking, Pharmacokinetic properties, Non-terpenoid, non-steroid constituents, Epithelial-Mesenchymal Transition.

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Track Classification: Biological Sciences

Contribution ID: **36** Type: **Poster**

Optical and Photocatalytic applications of green synthesized nickel doped manganese oxide nanoparticles prepared via microwave assisted Combustion method.

Abstract:
Curd was used as fuel in the microwave aided combustion technique to synthesize nickel-doped manganese oxide nanoparticles. The prepared nanoparticles characteristics were examined using XRD, FTIR, SEM, EDAX, PL, and UV-VIS spectroscopy. XRD studies revealed that the synthesized nanoparticles, average crystalline size and lattice parameters decreases with increase in nickel doping. Vibrational stretching modes of metal-oxygen sites were confirmed by FTIR. Further SEM analysis revealed that nanoparticles are agglomerated with nano flakes like structure. Elemental composition was revealed by EDAX spectroscopy. From UV-Vis Spectroscopy analysis band gap of synthesized nanoparticle is observed which shows decrease in the band gap as nickel doping was increased. Luminescence spectra expose the decrease in the luminescence intensity with increase in nickel doping. Photodegradation of MB dye was carried out under visible light irradiation in presence of nickel doped manganese Oxide nanoparticles as photocatalyst.
(POSTER PRESENTATION)
Keywords: Nanoparticles, Green synthesis, Combustion, photodegradation.

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Presenter: B K, JEEVAN KUMAR

Track Classification: Chemical Sciences

Contribution ID: **37** Type: **Poster**

Metabolic Engineering of Anthocyanins: Tailoring Plant-Derived Bioactives for Nutraceutical and Personalized Medicine Applications.

Anthocyanins are one of the very important bioactive flavonoid pigments which are synthesized in plants. Many researchers found that these red, purple or blue pigments are rich in antioxidants and are required in the diet to increase nutrition and improve the immune system. These anthocyanin syntheses take place in the cytoplasm and are known to get accumulated in vacuoles where the acidic environment enables the synthesis of coloured pigment. It might be very efficient if such secondary metabolites can be easily synthesized by bacteria so they can be used as a supplement to the diet. Genes involved in the biosynthetic pathway can be isolated and transformed into many feasible strains to increase their synthesis. Manipulation of the possible pathways to synthesize anthocyanins had been tried by quite a few of them either by overexpression or silencing. The various strategies applied to manipulate the pathways in E. coli by the selection of genes from varied sources of cloning and targeting specific locations for the expression of anthocyanins were discussed here.

Keywords: Anthocyanins, antioxidants, genes, cloning, E. coli

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Presenters: Ms SHUKLA, Aastha; J, Ananya

Track Classification: Biological Sciences

Contribution ID: **38** Type: **Oral**

Decoding Host-Microbe Crosstalk: Novel Trends in Bombyx mori Gut Microbiota and Insect Immunity.

The silkworm, Bombyx mori, is a model organism of significant economic and scientific importance, particularly in sericulture and biological research. The gut microbiota of Bombyx mori plays a crucial role in host physiology, nutrition, and immunity, yet its diversity and functional significance remain unexplored. This project investigates the gut microbial diversity in Bombyx mori. The study also examines variations in microbial composition across developmental stages and their potential associations with host health and metabolism.

Gut samples were collected from Bombyx mori at different developmental stages, and microbial communities were isolated using culture-dependent methods. Selective media and anaerobic conditions were employed to cultivate a wide range of bacteria. Molecular characterization, including 16s rRNA gene sequencing followed by bioinformatics analysis using Basic Local Alignment Sequence Tools (BLAST) was performed to identify the microbial taxa.

Results indicated a diverse and dynamic gut microbial community in Bombyx mori, with distinct shifts in microbial populations during different life stages. This research provides valuable insights into the symbiotic relationships between Bombyx mori and its gut microbiota, contributing to a deeper understanding of host-microbe interactions in insects. The analysis might contribute in optimizing silkworm health and yield in sericulture techniques.

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Co-authors: PREETHA R, Archana; Mrs S, Hema (Assistant professor)

Presenter: Ms S, Anushree (Student)

Track Classification: Biological Sciences

Contribution ID: **40** Type: **Poster**

Impact of magnetic fields on Bacterial colony formation

Magnetic fields are invisible forces in our environment that can influence even the smallest forms of life. For bacteria, these fields have the potential to change how quickly they grow, how their colonies look, and how they organize into communities. Permanent magnets, in particular, provide a stable source of magnetic fields and are commonly used in experiments to study these effects. To explore this, bacterial suspensions are first prepared and standardized so that each experiment starts with the same number of cells. These suspensions are spread onto nutrient agar plates, which act as a growth surface. Some plates are placed under the influence of permanent magnets that produce static magnetic fields, while others are left as controls without exposure. The plates are incubated under the same conditions, and the resulting colonies are examined for differences in size, number, shape, and appearance. The results show a noticeable impact of permanent magnetic fields on bacterial colonies. In many cases, colonies grown under magnetic influence are smaller, slower to develop, and may even lose their usual pigmentation. The shape of the colonies can also appear irregular. Furthermore, magnetic fields tend to interfere with the bacteria's ability to form biofilms, which are protective layers that help them survive on surfaces. It is found that not all bacteria react the same way, some species like Escherichia coli is often more sensitive to magnetic exposure, while Staphylococcus aureus may be less affected. These changes can be explained by the way magnetic fields interact with bacterial cell processes. Since bacteria rely on electron transport, ion movement, and enzyme activity to survive, the presence of a magnetic field may disturb these delicate processes. It can also trigger stress responses, leading to damage in proteins and DNA, which ultimately alters the way colonies grow. In conclusion, permanent magnetic fields can significantly influence bacterial colony formation by slowing down growth, changing colony appearance, and reducing biofilm formation. The extent of these effects depends on the type of bacteria, the strength of the magnetic field, and the duration of exposure. These findings highlight the potential use of magnetic fields as a safe, non-chemical way to control bacterial contamination in areas such as medicine, food preservation, and industry, opening up new directions for research and practical applications.

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Track Classification: Biological Sciences

Contribution ID: **41** Type: **Oral**

Enhancing Recruitment through NLP-Driven Resume Screening

The recruitment process in modern organizations increasingly relies on automation to efficiently screen large volumes of resumes. Traditional manual evaluation of resumes is time-consuming, subjective, and often inconsistent, which highlights the need for intelligent systems capable of extracting and analyzing candidate skills in a structured manner. To address this challenge, this project introduces a Resume Analyzer built on Natural Language Processing (NLP) techniques, providing a systematic approach to text extraction, preprocessing, and skill evaluation.

The system accepts resumes in PDF and DOCX formats, extracts textual information using PyMuPDF and python-docx, and applies preprocessing methods including lowercasing, tokenization, stopword removal, and lemmatization through NLTK. Once cleaned, the textual data is compared against a predefined set of professional skills covering domains such as programming, data analysis, communication, and business tools. The analyzer identifies skills already present in the resume, highlights missing competencies, and generates a structured report containing both strengths and recommendations for improvement.

This dual evaluation not only benefits candidates by providing actionable insights to optimize their resumes but also assists recruiters by reducing manual effort and enhancing the accuracy of initial screening. The system is lightweight, extensible, and adaptable to different job profiles by modifying the underlying skill set, making it applicable to diverse recruitment scenarios.

By integrating open-source Python libraries and leveraging NLP-based text mining, this project demonstrates how intelligent automation can transform recruitment workflows. The Resume Analyzer therefore acts as a bridge between candidates seeking to enhance their employability and organizations striving to streamline talent acquisition.

Keywords:Resume Analyzer, Natural Language Processing, Automated Screening, Text Extraction, Tokenization, Lemmatization, Skill Gap Analysis, Recruitment Automation, PyMuPDF, NLTK

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Track Classification: Mathematical & Data Sciences

Contribution ID: **42** Type: **Oral**

Simultaneous detection of Sunset Yellow and Tartrazine using Al_2O_3 modified nanoparticles via Enhanced Carbon Paste Electrodes

Al_2O_3 nano metal oxide was prepared using the solution combustion method, and its properties were characterized with X-ray Diffraction, Scanning Electron Microscopy, and Energy Dispersive X-ray Analysis. This work involves fabricating electrochemical sensors with Al_2O_3 via carbon paste electrodes for the simultaneous detection of Sunset Yellow (SY) and Tartrazine (TZ), two major synthetic food dyes. Excessive consumption of SY and TZ can potentially be carcinogenic beyond the recommended daily intake. The Al_2O_3-modified electrode shows excellent sensitivity toward SY and TZ compared to a bare electrode. Cyclic voltammetry and differential pulse voltammetry (DPV) techniques were used to explore the electrochemical properties of SY and TZ. The pH and scan rate studies were conducted to determine the electron transfer number and the type of electrode process, respectively. The limits of detection (LOD) and quantification (LOQ) for SY were 0.103 µM and 0.346 µM, respectively; for TZ, they were 0.705 µM and 2.352 µM. The prepared electrode demonstrated 73% reproducibility for Sunset Yellow and 90% reproducibility for Tartrazine over 20 cycles.
Keywords: Aluminum oxide, combustion, sunset yellow, tartrazine, simultaneous.

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Presenter: MASUR, Puneeth

Track Classification: Chemical Sciences

Contribution ID: **43** Type: **Poster**

Evaluation of Hydrocotyle javanica Thunb. for it's application for combating cancer and and against multidrug resistant organisms.

Medicinal plants have long been valued in traditional medicine for their diverse bioactive compounds, offering promising therapeutic potential across multiple health challenges. This study examines the efficacy of selected medicinal plants in anticancer therapy, combating multidrug-resistant (MDR) bacteria, antioxidant activity, and wound healing. Through a detailed analysis of phytochemical constituents, including alkaloids, flavonoids, phenolic compounds, and terpenoids, we explore their mechanisms of action. These compounds demonstrate anticancer effects by inducing apoptosis and inhibiting tumor proliferation while their antibacterial properties target MDR bacterial mechanisms, including efflux pumps. Additionally, their potent antioxidant capabilities neutralize reactive oxygen species, reducing oxidative stress, and their wound-healing properties promote tissue regeneration through anti-inflammatory and collagen-enhancing effects. In vitro studies on Hydrocotyle javanica Thunb. highlights the synergistic potential of these phytochemicals in addressing complex health issues. This research emphasizes the need for further clinical trials to validate the efficacy and safety of these plant-derived therapies, paving the way for their integration into modern medical practices for holistic disease management.

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Track Classification: Biological Sciences

Contribution ID: **44** Type: **Oral**

Exploring black hole mergers through gravitational wave

Gravitational waves are the ripples in the fabric of spacetime predicted by einstein's theory of general relativity, have opened a new observational window into the dynamics of objects such as black holes. In this study, I present preliminary results from the analysis of publicly available LIGO data which has been associated with a binary black hole merger and gravitational wave. Using python-based data analysis, the strain signal from the Hanford (H1) detector was processed with a bandpass filter in the range of 30–400 Hz to suppress noise outside the astrophysical relevant frequencies. The whitening technique was then applied to enhance signal visibility against background noise. The resulting spectrogram illustrates the time–frequency evolution of the signal relative to the event. While much of the frequency band remains dominated by noise, the event region shows enhanced power at lower frequencies, consistent with the expected behavior of compact binary coalescence. Since this is a lower-SNR (signal-to-noise ratio) event, the chirp doesn't jump out clearly. Instead, you see slight enhancements in color power in the 30–100 Hz range near the event time. This is consistent with the idea that the merger signal is present but buried in noise.

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Track Classification: Physical Sciences

Contribution ID: **45** Type: **Oral**

pH-triggered pectin–silver nanogel as precision vehicle to 5-flourouracil for enhanced oral bioavailability and effective drug release in cancer therapy

A novel pectin hydrogel (Pec-Hgel) and silver nanogel (Pec-Ag-Ngel) material have been synthesized to enhance the bioavailability and therapeutic efficacy of 5-FU against cancer cells for progressive cancer therapy. Several techniques, such as UV-Vis spectroscopy, FT-IR spectroscopy, field-emission scanning electron microscopy (FE-SEM), and Energy dispersion X-ray Spectroscopy (EDX), are used to investigate the physicochemical features of Pec-Hgel and Pec-Ag-Ngel respectively. The synthesized Pec-Ag-Ngel material possess a higher encapsulation efficiency then Pec-Hgel. In-vitro drug release study demonstrates the gels' ability to provide controlled release of 5-FU at pH 2 and pH 5. Pec-Hgel and Pec-Ag-Ngel formulations exhibited excellent hemocompatibility, with hemolysis rates remaining below 5%. 5-FU alone exhibited a hemolysis rate of 17.98%. The cytocompatibility of the drug Pec-Ag-Ngel is assessed, and their in-vitro cytotoxicity is evaluated using the MTT assay on HepG2 cells. The results demonstrate that 5-FU loaded Pec-Ag-Ngel induce significant toxicity HepG2 cells. The LC50 values for 5FU and 5FU-Pec-Ag-Ngel, which were determined to be 0.35 µg/mL and 0.93 µg/mL respectively. This difference suggests that the nanogel formulation provides a controlled and sustained release of 5-FU, resulting in slower cellular uptake compared to the freely available pure compound. Acute oral toxicity studies were conducted on both the free drug and the drug-loaded nanogel formulation to evaluate and compare their in vivo safety profiles. The collective findings confirm the efficacy and suitability of Pec-Ag-Ngel for cancer treatment, underscoring its promise as an effective drug delivery platform. Nanogels, in general, present significant advantages for oral administration, including resistance to gastrointestinal degradation, enhanced solubility, improved absorption, and controlled drug release. This work demonstrates their therapeutic potential in cancer management and positions them as advanced oral nanocarriers in contemporary drug delivery strategies.
Key Words: Pectin Nanogel, HepG2 cells, drug delivery applications, in-vivo toxicity

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Track Classification: Health Sciences

Contribution ID: **46** Type: **Oral**

Temperature-Controlled Reduction of rGO–Polymer thin films and its effect on electrical conductivity and optical properties.

Reduced graphene oxide (rGO)–polymer thin films have emerged as adaptable components in flexible electronics, sensors, and optical devices. This article reviews how temperature-controlled reduction approaches –including thermal annealing, chemical reduction, and green reductants influence the structure and properties of graphene oxide (GO) embedded in polymer thin films. Emphasis is sited on how temperature affects reduction efficiency, oxygen removal, restoration of sp^2-carbon domains, and the resultant electrical conductivity and optical properties. We focus on thin-film composite systems with representative polymer hosts: poly(vinyl alcohol) (PVA), PEDOT:PSS, epoxy, thermoplastic polyurethane (TPU), and polyimide (PI). Key findings across multiple studies are compared to reveal consistent trends: higher reduction temperatures yield more extensive oxygen elimination and sp^2 network recovery, intensely boosting film conductivity while altering optical transitions. However, polymer thermal stability often limits the maximum temperature, necessitating careful selection of reduction methods. Structural–property relationships are analyzed –for example, how incremental oxygen removal sequentially restores graphitic domains and tunes the film's bandgap and transparency. The review also highlights practical implications for device applications, such as transparent electrodes and temperature sensors, and summarizes strategies - including low-temperature "green"reductions to achieve high conductivity without degrading polymer matrices. In conclusion, a clear understanding of temperature-dependent reduction in rGO–polymer films is essential for tailoring electrical/optical performance in next-generation flexible devices, and we outline future outlooks for optimizing these systems.

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Presenter: CHAKRABARTY, Ankan

Track Classification: Physical Sciences

Contribution ID: **47** Type: **Poster**

Facile Reduction of Graphene Oxide Thin Films Using Ascorbic Acid for Improved Electrical Properties

Graphene oxide (GO) is a modified form of graphene and shows great potential for various applications because of its unique structural and chemical properties. It is rich in oxygen-containing functional groups like hydroxyl, epoxy, and carboxyl. This composition makes GO easy to disperse in water and enables it to interact well with other compounds, which is useful for chemical modifications and creating composites. However, these functional groups interrupt the sp^2 carbon network, greatly lowering its electrical conductivity. To address this issue, GO can be chemically reduced to reduced graphene oxide (rGO). This process partially restores its conjugated structure, improving its electrical properties while still keeping some functional versatility. In this study, we synthesized GO using a modified Hummer's method. We characterized it with X-ray diffraction (XRD), energy-dispersive X-ray analysis (EDAX), UV-Visible spectroscopy, and Fourier-transform infrared (FTIR) spectroscopy to confirm its structural and elemental features. We prepared a thin film composite of GO and polyvinylpyrrolidone (PVP) in a 3:1 ratio using deionized water. We then deposited this mixture onto a substrate using the spin coating technique. After drying the film, we chemically reduced it by immersing it in ascorbic acid at 90 ℃ for one hour, which resulted in the formation of rGO. After reduction, we measured the film's electrical conductivity. We found a significant increase in conductivity, confirming the successful transformation of GO to rGO and its potential use in electronic and sensing applications.

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Presenter: CHAKRABARTY, Ankan

Track Classification: Physical Sciences

Contribution ID: **48** Type: **Oral**

Exploring $LiZnBO_3$ for Electrochemical Energy Storage: A Cost-Effective Borate-Based Electrode

The pursuit of cost-effective and high-performance electrode materials is essential for advancing supercapacitor technologies. Lithium zinc borate ($LiZnBO_3$) presents a compelling solution, offering structural robustness, low density, and electroactive metal centers that enhance charge storage capabilities. In this study, $LiZnBO_3$ was synthesized via a combustion technique and systematically characterized using X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM). These analyses confirmed the formation of a crystalline borate phase with uniform morphology and well-defined grain boundaries. Electrochemical evaluation in alkaline electrolyte was conducted through cyclic voltammetry (CV), galvanostatic charge–discharge (GCD), and electrochemical impedance spectroscopy (EIS). The $LiZnBO_3$ electrode delivered a specific capacitance of 77 F/g at a current density of 1 A/g, demonstrating excellent reversibility, rate capability, and low internal resistance. The enhanced performance is attributed to the synergistic interaction of lithium and zinc ions within the borate matrix, which facilitates rapid electron transport and efficient ion diffusion. These findings establish $LiZnBO_3$ as a promising, environmentally benign electrode material for next-generation supercapacitor applications.

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Track Classification: Physical Sciences

Contribution ID: **49** Type: **Oral**

PURIFICATION OF TOXINS FROM BACTERIAL ISOLATES OF FRUIT AND VEGETABLE SALADS

The study aimed at the purification of toxins produced by isolates from street fruit and vegetable salad samples. Four cultures were selected, out of 33 cultures, based on protein analysis, hemolysis, and antibiotic susceptibility tests. The selected cultures were identified based on morphological and molecular analysis. The isolate SS07-4 as *Pseudomonas aeruginosa*, the isolate SS08-1 as B*acillus licheniformis*, the isolate SS01-6 as *Mammaliococcus sciuri*, and the isolate SS03-5 as *Escherichia coli*. Further, PCR analysis was carried out on each isolate to check the presence of specific virulence genes. Based on the PCR results, the *Pseudomonas aeruginosa* isolate confirmed positive for the phzS, algD, toxA, exoY, and exoT genes, and the *Bacillus licheniformis* isolate was confirmed to be positive for the LicA, LicB2, and LicC genes, which were considered for purification of their specific toxin. The purification of proteins from *Pseudomonas aeruginosa* and *Bacillus licheniformis* were carried out using a sequential approach involving ammonium sulphate precipitation, dialysis, gel filtration, and ion exchange chromatography. The concentration of protein from *Pseudomonas aeruginosa* in crude sample was found to be 5.1mg/ml, ammonium sulphate precipitated sample was 0.20 mg/ml; dialysed sample was 0.48 mg/ml, ion exchange chromatography sample was 0.45 mg/ml, and gel filtration sample was 0.04 mg/ml. Whereas the concentration of protein from *Bacillus licheniformis* in crude sample was 4.2 mg/ml, ammonium sulphate precipitated sample was 0.25 mg/ml, dialysed sample was 0.58 mg/ml, ion exchange chromatography sample was 0.36 mg/ml and gel filtration sample was 0.39 mg/ml. The crude and purified toxins were evaluated for their protein profile using SDS-PAGE to check the effectiveness of the process.

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Track Classification: Health Sciences

Contribution ID: **50** Type: **Oral**

"Characterization of a novel leaf lectin isolated from Plectranthus zeylanicus plant exhibiting antimicrobial activity"

Plectranthus zeylanicus is a medicinal and aromatic plant, with a pungent oregano-like flavor and odor, belongs to the Lamiaceae family. P. zeylanicus, a lesser-known but highly valuable species, is native to tropical and subtropical regions, particularly in South and Southeast Asia. It has been traditionally used in Ayurvedic and folk medicine for its antimicrobial, anti-inflammatory, and digestive properties. After dialysis against deionized water for 24 hours, the crude extract of the leaves was extracted using an aqueous two-phase technique (sodium chloride, ammonium sulphate, and PEG) to separate the glycoprotein. The dialyzed sample was then purified using an affinity chromatography column that was made with galactose (Himedia, India) sugar and Seralose-4B beads (SRL, India) as a matrix. Epichlorohydrin was used as a cross-linking agent. The crude extract and purified sample had protein contents of 110.42µg/ml and 183.46µg/ml, respectively, as assessed by Lowry's technique. At 64 HU, it was discovered that the purified lectin (PZL) agglutinates chicken and sheep erythrocytes. Using the hemagglutination inhibition experiment, the PZL demonstrated a high affinity for galactose. Two near bands at 75.3 kDa were found when PZL's molecular weight was determined using SDS PAGE. Subsequent analysis of the lectin activity showed that it was stable between 4 and 7 pH and between 35 and 55 degrees Celsius. The metal chelation effect on hemagglutination activity showed that the presence of the Mg2+ cation increased the lectin activity. Using the phenol-sulfuric acid estimation method, the purified sample's total carbohydrate content was found to be 4.04%. Although the purified lectin lacked carbonyl or hydroxyl functionalities, the FTIR analysis revealed that it most likely contained aromatic compounds with ether, amine, or phosphate groups that aid in binding to the carbohydrate moiety. While no inhibition was seen against Staphylococcus aureus, Klebsiella pneumoniae, or Rhizopus oryzae, the PZL inhibited the growth of Bacillus subtilis and Aspergillus fumigatus, indicating that the lectin had a binding affinity for galactan residues present in the cell walls of these two bacteria. The lectin activity can be further examined in relation to its potential in immunomodulatory applications and cancer investigations. All things considered, this is the first report of a lectin isolated and purified from the leaves of the Plectranthus zeylanicus plant.

Keywords –Lectin, Purification, Hemagglutination, Antimicrobial activity
emphasized text

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Track Classification: Biological Sciences

Contribution ID: **51** Type: **Oral**

Impact of atmospheric moisture on Indian monsoon rainfall variability

The study reveals the importance of atmospheric moisture such as vertically integrated moisture flux, its divergence and precipitable water content on the changes in Indian rainfall. The analysis is carried out using the India Meteorological Department gridded rainfall measurements made from rain gauges installed at different places in India. The moisture flux is analyzed using the zonal and meridional wind components and specific humidity data taken from the National Center for Environmental Prediction and National Center for Atmospheric Research reanalysis. The result shows a strong evidence that the variability of Indian rainfall is largely controlled by the amount of moisture and its transport. The regression analyses with the moisture-related parameters, over the moisture source regions, could explain about 59 % of regional rainfall variability. This is an important finding as no other local or global factor could explain more than 40 % of Indian rainfall variability. The regression models could also reproduce most weather extreme events such as the drought of 2002 and 2004. Henceforth, this study demonstrates the significance of moisture content and its transport on regional rainfall distribution, and recommend that these parameters can be used in both statistical and dynamical models to better predict monsoon.

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Track Classification: Physical Sciences

Contribution ID: **52** Type: **Poster**

Target-Specific Pesticide Against Thrips and Mites

The persistent infestation of thrips and mites on rose plants during summer poses a significant challenge to ornamental horticulture, often compounded by the ecological and health hazards of conventional pesticides. This project presents a computationally driven strategy for developing a target-specific pesticide formulation that achieves selective toxicity against pest organisms while safeguarding plant vitality, soil health, and farmer well-being.

Leveraging ligand–protein interaction modeling and molecular docking platforms such as PRinS3, pest-specific protein targets will be identified, followed by the design and screening of high-affinity ligands for efficacy and environmental safety. Predictive ADME/Tox profiling, QSAR modeling, and phytotoxicity analysis will ensure the compound's biodegradability, thermal stability under summer conditions, and non-disruption of rose physiology and pollinator activity.

The formulation will undergo laboratory bioassays, phytotoxicity testing, and small-scale field validation, culminating in a user-friendly product accompanied by multilingual farmer guidance. This integrative approach offers a promising roadmap for eco-safe pest control in floriculture and lays the groundwork for future innovations in ligand-based pesticide design.

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Track Classification: Chemical Sciences

Contribution ID: **55** Type: **Poster**

Riboswitches as RNA-based Regulatory Switches: Molecular Mechanisms, Biological Roles, and Emerging Applications

Riboswitches are structured non-coding RNA elements that reside in the untranslated regions (UTRs) of mRNA and directly bind small molecule ligands to regulate gene expression. These RNA motifs represent a unique, protein-independent mechanism of genetic control, offering insights into the ancient evolutionary origins of gene regulation. This review comprehensively discusses the discovery, classification, and molecular mechanisms of riboswitches, emphasizing their biological significance in both prokaryotic and limited eukaryotic systems. We explore their structural dynamics, mechanisms of action, and the range of metabolites they sense. Moreover, we address the emerging applications of synthetic and natural riboswitches in biotechnology and medicine, particularly in synthetic biology circuits and antibiotic development. Despite extensive research, gaps remain in our understanding of riboswitch folding kinetics, their roles in eukaryotic systems, and their therapeutic potential. By identifying these limitations and proposing future directions, this review contributes to the ongoing academic conversation surrounding RNA-based regulation and its translational potential.
Keywords: Riboswitch, RNA regulation, gene expression, aptamer, synthetic biology, ligand binding

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Track Classification: Biological Sciences

Contribution ID: **56** Type: **Oral**

Assessment of probiotic properties in Lactic Acid Bacteria (LAB) isolated from different food sources

Lactic acid bacteria (LAB) were isolated from various food sources using standard microbiological techniques. The isolates were initially screened for probiotic properties, including acid tolerance and antimicrobial activity against selected pathogenic bacteria. Functional characterization of the LAB strains was carried out by evaluating their tolerance to phenol and sodium chloride (NaCl), as well as assessing cell surface hydrophobicity, auto-aggregation, and co-aggregation abilities. Safety evaluation of the isolates was performed by testing for hemolytic activity. These combined assessments were conducted to identify LAB strains with potential probiotic attributes suitable for application in food and health-related products.
Key words- LAB, Probiotics, Functional properties.

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Track Classification: Biological Sciences

Contribution ID: **57** Type: **Oral**

Enabling Trustworthy Big Data Analytics through Federated Learning

The exponential growth of data in sectors such as healthcare, finance, and smart infrastructure has underscored the transformative potential of Big Data analytics. However, centralizing sensitive information raises concerns related to privacy, security, and regulatory compliance, making traditional machine learning approaches increasingly unsuitable. To overcome these limitations, this research advances Privacy-Preserving Big Data Analytics using Federated Learning (FL), a decentralized paradigm where models are collaboratively trained across distributed nodes without transferring raw data.
The study proposes scalable FL architectures specifically designed for heterogeneous and large-scale datasets. To safeguard against adversarial threats and data leakage, the framework integrates differential privacy and secure aggregation techniques. Furthermore, it addresses practical challenges such as non-IID data distributions, communication overhead, and slow convergence, which often limit the effectiveness of federated deployments in real-world environments. The proposed framework has broad applicability in healthcare diagnostics, IoT ecosystems, and smart city solutions, where ensuring confidentiality while maintaining predictive accuracy is critical. The expected outcomes include the development of a robust, adaptable, and ethically responsible Big Data analytics framework that balances scalability, security, and performance. By bridging the gap between Big Data and privacy-preserving distributed learning, this research contributes to the advancement of trustworthy, next-generation AI systems.

Keywords: Big Data Analytics, Federated Learning, Privacy-Preserving Machine Learning, Differential Privacy, Secure Aggregation, Trustworthy AI

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Track Classification: Mathematical & Data Sciences

Contribution ID: **58** Type: **Oral**

Development of a bioinformatic tool to predict M1GS ribozyme target sites in RNA and demonstration of M1GS-mediated downregulation of nucleolar ribosomal RNA in a human cancer cell line

Ribonuclease P (RNase P) is a ribozyme conserved across all domains of life and plays a central role in the maturation of the 5′ end of transfer RNA (tRNA). Unlike most nucleases, RNase P recognises precursor tRNA based on structural features rather than sequence, a property that has been exploited to engineer RNase P for selective targeting and cleavage of diverse RNA molecules as gene inactivation strategies. One such approach, termed M1GS, involves coupling the *E.coli* M1 RNA to a short guide sequence that is complementary to the target RNA, enabling specific recognition and cleavage. Despite its simplicity and versatility, the M1GS approach has remained underutilised compared with other gene inactivation tools, partly due to the requirement for prior knowledge of the features that make a site suitable for M1GS targeting. To overcome this limitation and enable broader application, we developed a user-friendly Python-based bioinformatic tool that predicts potential M1GS target sites for any RNA of interest. The tool accepts DNA or RNA sequences as input and evaluates them using criteria derived from known M1GS targeting requirements. We demonstrate its utility by predicting M1GS target sites for human nucleolar 28S rRNA, a ribosomal RNA often upregulated in cancers. Customised M1GS constructs designed from these predictions successfully downregulated 28S rRNA in a human lung cancer cell line, highlighting the potential of M1GS-mediated rRNA cleavage as an anticancer modality. Additionally, an RNA mimic of GFP called squash was tagged to M1GS to visualise its localisation in human cancer cells, providing further insights into its intracellular behaviour. The tool was also validated by predicting M1GS target sites for previously studied RNAs, with predictions consistent with reported results.

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Track Classification: Biological Sciences

Contribution ID: **59** Type: **Oral**

Influence of calf sex on milk nutrition and fatty acid profile of Gir and Sahiwal cattle breeds of Karnataka, India

Colostrum, the vital first milk produced by mammals, is a complex biological fluid that provides essential nutrients and immunoglobulins to the newborn. In cattle, the composition of colostrum is highly variable and influenced by a myriad of factors, including breed, nutrition, genetics, management techniques, parity, lactation period, and age of the cow. While extensive research is done on these factors, literature on the influence of calf sex on bovine colostrum composition, especially in Indian indigenous breeds, remains limited. The study addresses this specific knowledge gap, focusing on two prominent Indian indigenous cattle breeds—Sahiwal and Gir—to determine if calf sex would influence the composition of the nursing cow's colostrum. This research is crucial in providing insights into less-explored areas of maternal investment and could have significant implications for dairy farming and calf management.

The study aimed to bridge this gap by examining the physical characteristics, proximate composition, and fatty acid profiling of colostrum from the first lactation of Sahiwal and Gir cows nursing male and female calves each. The colostrum nutritional analysis resulted in 0.7-0.9% ash, 7.2-12.7% proteins, 4.1-10.3% carbohydrates, and 2.3-8.1% fats with 75-80% moisture content, followed by the physical properties like pH ranging from 5.9 to 6.5, 0.4-0.1% titratable acidity, and density ranging from 1080 to 1100 kg/m^3.. Fatty acid profiles by Gas Chromatography–Flame Ionization Detector (GC-FID) revealed 6.4% and 2.9% higher saturated fatty acids (SFA) and 5.6% and 3.9% higher monounsaturated fatty acid (MUFA) in the colostrum for male calves than that for the female calves in both the studied breeds, leading to the conclusion of the presence of influence of calf sex on fatty acid composition in the tested breeds. This direct correlation suggests that the sex of the calf can indeed influence the fatty acid composition of the mother's colostrum, a phenomenon likely driven by biased maternal investment. Although the underlying mechanism is not clearly understood, a potential explanation ought to be as a result of the influence of fetal endocrine signals on maternal lipidogenesis. Another intriguing possibility is microchimerism, a process where fetal cells migrate into the mother's body and persist, potentially influencing the mother's physiological processes, including mammary gland function and milk synthesis. Understanding the influence of calf sex on colostrum composition can inform dairy producers about optimizing calf nutrition from birth, potentially leading to improved growth, health, and productivity of future dairy herds.

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Track Classification: Biological Sciences

Contribution ID: **60** Type: **Poster**

Process Optimization for High-Yield Lactic Acid from Agricultural Residues for Biomedical PLA Applications

The escalating plastic pollution crisis necessitates sustainable alternatives, with bioplastics like polylactic acid (PLA) emerging as a promising solution. This review explores the critical initial step: efficiently converting abundant agricultural waste into lactic acid, the fundamental building block for PLA. Repurposing starch- and cellulose-rich residues not only addresses waste management but also fosters environmental sustainability. However, challenges persist in achieving high lactic acid yields from diverse feedstocks and scaling production.

This work investigates various techniques to optimize lactic acid fermentation. We examine the efficiency of different agricultural residues, refine incubation parameters such as pH, temperature, and time, and evaluate synergistic microbial consortia, including Lactobacillus species and complementary fungal strains, to maximize lactic acid output. Starch-based feedstocks prove efficient, while cellulose requires pre-treatment. By providing insights into these critical factors, this review aims to guide the development of efficient and sustainable processes for lactic acid production, ultimately facilitating broader PLA adoption.

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Track Classification: Health Sciences

Contribution ID: **61** Type: **Oral**

High-performance PVA/PVP-based polymer film with a dual-crosslinked network of nanofillers for effective radiation shielding applications

Conducting polymers have attracted significant attention due to their metal-like conductivity combined with the flexibility and lightweight nature of plastics. Their tunable properties make them highly versatile for advanced technologies. With the growing demand for materials offering large surface areas to control radiation through absorption and reflection, polymer nanocomposites have emerged as promising candidates. Their adaptability and multifunctionality enable integration of diverse properties, making them vital for sustainable technological advancements and enhancing performance in electronic, energy, and shielding applications. The present research work focuses on fabricating a PVA/PVP-based polymer film with a network of conducting Ag2WO4 and CoZnFe2O4 nanofillers. The structural, functional, morphological, and elemental properties of the fabricated films were analysed using XRD, FTIR, SEM, and EDAX, respectively, confirming the successful incorporation of Ag2WO4 and CoZnFe2O4 nanofillers into the PVA/PVP polymer matrix. The electrical properties of the films were measured using an HP 4281A precision LCR meter in the frequency range of 20 Hz to 1 MHz. The AC conductivity of PVA/PVP was measured to be 1.494×10 -5 S/m, which was enhanced to 6.534×10 -4 S/m with the addition of Ag2WO4 and CoZnFe2O4 nanofillers to the film. This enhancement in AC conductivity acts as a foundation for radiation shielding applications.

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Track Classification: Chemical Sciences

Contribution ID: **62** Type: **Poster**

Development of a Microbial consortium for the production of fermented cocopeat.

The potential of coir pith, a lignocellulosic by-product of the coir industry, as a horticultural medium and soil conditioner is well known. Its high tannin content, however, has serious drawbacks because it prevents plant growth and seed germination. Biological degradation is a promising substitute for conventional tannin removal techniques, which are frequently expensive and unsustainable. The goal of this study is to create and assess a microbial consortium of fungi that break down tannins in order to efficiently bioconvert coir pith. In order to increase degradation efficiency through synergistic interactions, the study aims to isolate and characterize effective fungal strains with tanninolytic activity. Monitoring of the tannin and phenolic content as well as related biochemical parameters like protein, starch, and lignocellulosic fractions will be part of the experimental analyses, in order to comprehend the changes in metabolism that take place during treatment. It is anticipated that this work will develop a sustainable microbial strategy for lowering tannins in coir pith, increasing its value as a substrate that is both environmentally safe and agriculturally viable. The results will advance the use of microbial consortia in bioremediation and support environmentally friendly waste management techniques in the coir sector.

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Presenter: H KAMATH , Arpitha

Track Classification: Biological Sciences

Contribution ID: **63** Type: **Oral**

Multigenerational Toxicity Assessment of Potassium Sorbate and Sodium Benzoate in Drosophila melanogaster

Food preservatives are widely used in food industries, such as Potassium Sorbate (PS) and Sodium Benzoate (SB) are extensively used in processed food for extending shelf life. Although considered safe within regulatory limits, its chronic and multigenerational effects remain poorly understood. *Drosophila melanogaster* was employed as a model organism to examine the toxicological effects of PS and SB exposure across three generations (P0, F1, F2). Experimental groups were exposed through jaggery-semolina agar diet containing PS and SB, both individually and combined at two concentrations (0.025%, 0.1%). In this study, developmental duration, survival rate, larval crawling behavior, adult climbing performance and oxidative stress are the parameters that were systematically evaluated. Both preservatives caused dose-dependent toxicity, with higher concentration (0.1%) leading to delayed development, reduced survival, and impaired larva crawling and adult climbing ability, suggesting neuromuscular or metabolic disruption. The oxidative stress measured by the Nitro-blue tetrazolium blue (NBT) assay was elevated across all three generations, with combined treatment showing synergistic effects. The F2 generations displayed the strongest impairments, suggesting cumulative and hereditary impacts. Overall, the findings demonstrate that even within conventionally acceptable range, prolonged consumption of PS and SB can disrupt development, survival, behavior and increase oxidative stress. The study emphasizes the importance of incorporating multigenerational assessment in food additive safety evaluations and reinforces *Drosophila melanogaster* as a sensitive and reliable model for investigating long-term dietary risks of commonly used food preservatives.

Keywords: Food preservative, Multigenerational toxicity, Oxidative stress, Potassium Sorbate, Sodium Benzoate

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Track Classification: Health Sciences

Contribution ID: **64** Type: **Poster**

Solar Energy Statistics for Potential Development and Future Applications

Solar Energy has proven to be the most utilizable and abundant source of energy that is viable to planet Earth. Earth's surface area of 510.8 million km2 receives a fall of 174 PW (1PW= 1015 W) of solar energy constantly every hour. The energy that reaches the ground however remains highly variable. Out of the previously stated output, 30% is reflected back
by the Ozone. Considering even a loss of 45% energy by rounding off the altitude variation, canopy shades the power output would still estimate at up to 113 PW of energy. For reference, the earth only utilizes 19.2 TW of energy per hour (according to the International Energy Agency) this would indicate that the energy transmitted by the sun per hour is enough to power the earth for 8 months entirely for the necessary energy demand of 19.2 TW energy per hour. Yet even after such an amount of energy is available outside, conventional methods of generating electricity pollute the earth to irreversible damage and are subject to great amounts of power wastage. The objective of this study is to review the theoretical application of solar energy and determine its energy generation suitability.

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Track Classification: Physical Sciences

Contribution ID: **65** Type: **Oral**

Isolation and Characterization of Probiototic Species from Fermented Ragi Water

Fermentation is an age-old technique leveraged for enhancing the nutritional and sensory qualities of various foods by exploiting the metabolic activities of microorganisms. Ragi (Eleusine coracana), a pseudocereal widely valued for its rich composition in carbohydrates with a low glycemic index, essential amino acids, dietary fiber, vitamins, and minerals, serves as a balanced dietary staple in many cultures. This study focuses on the isolation and characterization of potential probiotic species from fermented ragi water, exploring its potential as a substrate for its production. Ragi was selected due to its notable health benefits, including blood sugar regulation and promotion of gut health. The research entailed to ferment the water that was used to wash the ragi powder and later was subjected to isolate microbes and was followed by a series of biochemical and microbiological assays to confirm the presence and probiotic potential of the species isolated.

Preliminary screening involved microbiological tests such as Gram staining, catalase, oxidase, and triple sugar iron (TSI) assays, where the isolates consistently exhibited traits typical of probiotic strain—Gram-positive, rod-shaped cells, catalase positive, oxidase negative, and TSI positive. Further tolerance tests demonstrated the adaptability of the isolates to NaCl (5–10%), bile salts (1.5%) and varying pH spectrum, affirming their resilience in gastrointestinal-like environments. Morphologically, colonies showed small to moderate size, white color, smooth texture, convex elevation, round form, and entire margins. Molecular identification using 16S rRNA gene sequencing was done and the results are yet to be published.

The findings could establish ragi as an effective medium for cultivating plant-based probiotic strains, underscoring its potential for developing functional foods and supplements aimed at enhancing human health. This probiotic strain isolated can also act as an alternative for inoculum in dairy industry. This has the potential for producing curd from plant-based milk which is dairy free and lactose free like soya milk, almond milk and coconut milk. The probiotic strain can be formulated in the form of pills to treat IBS and improves the overall health and modulates immune system. This work not only contributes to the expanding field of probiotic discovery from indigenous fermented foods but also highlights the value of ragi as a nutritionally superior substrate for probiotic development.

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Track Classification: Biological Sciences

Contribution ID: **66** Type: **Oral**

Brown Seaweed as a potential contender for Green Energy and Sustainable Chemical Processes.

The extended emphasis on environmental sustainability and green chemistry principles has driven noteworthy interest in biopolymer-based materials as a substitute for conventional synthetic polymers. Sodium alginate, a naturally derived anionic polysaccharide extracted from brown seaweed, has positioned itself as an excellent specimen of sustainable material design, encompassing the core ideals of green chemistry through its renewable origin, biodegradability, non-toxicity, and versatile functionality. This all-inclusive review examines the role of sodium alginate in progressing green chemistry and sustainable chemical processes, with special focus on its implementations in environmental remediation, materials science, and energy storage. This review critically analyzes the synthesis strategies for sodium alginate-based materials, highlighting low-toxicity and cost-effective preparation methods that align with green chemistry principles. We assess the efficacy of sodium alginate composites in water treatment applications, including heavy metal ion removal, organic pollutant adsorption, and oil-water separation, demonstrating their potential to replace current non-biodegradable separation materials. Furthermore, the review explores the incorporation of sodium alginate in energy storage systems as electrodes, electrolytes, separators, and binders, displaying a promising potential in sustainable energy technologies. Special attention is given to regeneration and recyclability strategies, waste valorization approaches, and life cycle considerations that support circular economy principles. The challenges and opportunities for scaling up sodium alginate-based technologies are discussed, along with future directions for enhancing material performance while maintaining environmentalcompatibility. This review offers valuable insights for researchers, scientists, and engineers looking to implement sustainable chemical processes and materials, placing sodium alginate as an ideal material for the transition toward a more sustainable chemical industry.

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Track Classification: Chemical Sciences

Contribution ID: **67** Type: **Poster**

The Molecular Mechanisms of Plant Stress Adaptation

Plants, as sessile organisms, have evolved intricate molecular strategies to perceive and adapt to a myriad of environmental stresses, including drought, salinity, and extreme temperatures. This review paper synthesizes the current understanding of these sophisticated mechanisms, starting with signal perception and transduction at the cellular level, where specific receptors initiate a cascade of downstream events. We delve into the transcriptional regulation of stress-responsive genes, highlighting how master transcription factors precisely orchestrate gene expression to activate adaptive responses. A key focus is on post-translational modifications (PTMs), such as phosphorylation and ubiquitination, which rapidly modulate protein function and stability, providing a swift regulatory layer. We also explore the roles of osmoregulation and compatible solute accumulation, which help maintain cellular turgor and protect macromolecules under osmotic stress. The paper further discusses the critical function of antioxidant defense systems in neutralizing reactive oxygen species (ROS) and mitigating oxidative damage. Finally, we examine the emerging field of epigenetic modifications, which contribute to a "stress memory" that allows plants to mount a more robust response to subsequent stress encounters. By integrating these diverse molecular pathways, this review provides a comprehensive overview of how plants achieve resilience in a dynamic and challenging world.

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Track Classification: Biological Sciences

Contribution ID: **68** Type: **Poster**

A study of risk factors and associated oral microbiome using NGS contributing to early childhood caries among the urban population of Bengaluru district.

Introduction: Early childhood caries is one of the most common childhood diseases worldwide. Determining risk factors and the oral microbiome of dental plaque through metagenomic study is crucial for targeted oral health intervention.

Objective: To assess the risk factors and dominant microbiome associated with early childhood caries using a metagenomic approach among the urban population of Bengaluru district.

Method: A case-control study was conducted on 356 (256 ECC cases, 100 controls) children who visited the Ramaiah Dental College from April to November 2024. Data were collected using standardized dental examinations and caregiver questionnaires. Random sampling of 40 children from various categories of ECC (mild, moderate, and severe) was sent for metagenomic study owing to the high precision of Illumina technology.Risk factors were analyzed using multiple logistic regression.

Findings: Logistic regression showed that birth weight [OR: 10.641 (4.064, 27.865)], frequency of brushing [OR: 0.163 (0.073, 0.363)], type of toothpaste [OR: 2.986 (1.380, 6.462)], duration of breastfeeding [OR: 9.498 (2.442, 36.935)], frequency of breastfeeding during the night [OR: 9.498 (2.442, 36.935)], age of eruption of first tooth [OR: 0.039 (0.009, 0.170)], and snacking frequency [OR: 13.426 (5.189, 34.734)] are significant risk factors contributing to ECC. Illumina MiSeq sequencing of oral samples revealed genera such as Tanerella, Actinomyces, Prevotella, Selenomonas, Lautropia, Corynebacterium, Cardiobacterium, and Neisseria.

Conclusion: ECC is a multifactorial disease with key risk factors including diverse microbial population, birth weight, brushing frequency, toothpaste type, breastfeeding duration and frequency, age of first tooth eruption, and snacking habits. Metagenomic analysis of the samples suggests that various genera of bacteria, like Tanerella, Actinomyces, Prevotella, Selenomonas, Lautropia, Corynebacterium, Cardiobacterium, and Neisseria, are risk markers for early childhood caries.

Keywords: Early childhood caries, Metagenomic analysis, Illumina sequencing, feeding behavior, Low birth weight, Sugar intake

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Track Classification: Health Sciences

Contribution ID: **69** Type: **Poster**

”PHYTOTOXICITY MITIGATION THROUGH BIODEGRDATIONOF TEXTILE AZO DYES BY MARINE HALOPHILIC BACTERIA”

Halophilic microorganisms, adapted to thrive in hypersaline environments, have emerged as promising candidates for bioremediation of saline industrial effluents such as textile wastewater. This study aimed to isolate and characterize halophilic bacteria from marine water samples collected along the Bay of Bengal (Tamil Nadu, India) and evaluate their potential for degrading Procion dyes, widely used but persistent pollutants in the textile industry. Six morphologically distinct bacterial isolates were obtained and screened for dye degradation ability. Among them, Bacillus subtilis SMJU-4 (ACT), Pseudomonas aeruginosa SMJU-3 (PSUDO), and Micrococcus luteus SMJU-2 (M1) demonstrated superior degradation efficiencies, achieving up to 97%, 89.3%, and 95% decolorization, respectively, within 96 hours. Biodegradation was confirmed through UV–Visible spectroscopy, FTIR, GC-MS, and TLC, which revealed cleavage of azo bonds, breakdown of aromatic rings, and formation of low-molecular-weight intermediates. Enzymatic assays indicated significant azoreductase activity, particularly in PSUDO (2.43 U), supporting its role in azo bond cleavage. Importantly, phytotoxicity assays showed that treated effluents significantly improved seed germination, root and shoot growth, and biomass compared to untreated dye controls, confirming reduced toxicity. This study highlights the underexplored potential of marine halophiles from the Bay of Bengal as eco-efficient agents for bioremediation of saline textile effluents, paving the way for sustainable wastewater management strategies.

Keywords: halophiles, textile dye, degradation, phytotoxicity

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Track Classification: Biological Sciences

Contribution ID: **71** Type: **Oral**

A Comparative Cytotoxic Study of Berberis Aristata Crude Extract on HeLa and K562 Cell Lines: An Integrated In-Vitro and In-Silico Approach

One of the leading causes for death worldwide is cancer which jeopardizes health and socioeconomic factors. Recent trends have increasingly seen the use of naturally occurring substances derived from medicinal plant preparations that contain plant-derived medicines from traditional medicinal flora showing selectivity for cancer cells. This study evaluates the cytotoxic effects of the crude ethanolic extract of *Berberis aristata* against two cancer cell lines (HeLa, a cervical carcinoma line and K562, a chronic myeloid leukemia cell line). In the dose dependant MTT assay assessment, HeLa cells demonstrated dose dependant measurable cytotoxicity (IC50 value of 205.12 ± 0.92 µg/ml) and K562 cells showed insignificant results post treatment. Additionally, research has shown over expression of growth receptors and formation of fusion proteins in many cancers which is linked to worse prognosis. Therefore, in this study BCR-ABL fusion protein tyrosine kinase and EGFR kinase were selected as targets since these are overexpressed in K562 and HeLa cell lines respectively. Thus, molecular docking studies has been conducted to evaluate the effect of plant phytochemicals and cancer-associated targets in *Berberis aristata*. It is clear that the phytochemicals identified in this study particularly Berbamine, had substantial docking scores (-9.1 for BCR-ABL and -8.4 for EGFR) against the kinases, showing that while Berbamine displayed more activity in K562, the combinatorial effect of other constituents present in the extract induced more cytotoxicity in HeLa cells. This integrated study demonstrates an in vitro and in silico study exploring the anti-cancer properties of a potential toxicity plant-derived anticancer agent *Berberis aristata*.

Key words: *Berberis aristata*, Cytotoxic Analysis, IC50, Molecular docking, Binding affinity, HeLa cell line, K562 cell line

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Track Classification: Biological Sciences

Contribution ID: **72** Type: **Poster**

Bioactive Fractions of Curcuma angustifolia Rhizomes as Natural Antimicrobial and Anti-Biofilm Agents.

Curcuma angustifolia Roxb. rhizomes were subjected to successive solvent extraction using a Soxhlet apparatus with petroleum ether, chloroform, and ethyl acetate as solvents. Among the fractions obtained, the ethyl acetate extract rich in polar bioactive constituents was selected for further investigation. The extract was fractionated using column chromatography, and the resulting fractions were evaluated for antimicrobial and anti-biofilm activities. Preliminary screening revealed that several fractions exhibited notable antimicrobial activity against tested bacterial strains, with some also demonstrating significant inhibition of biofilm formation. These findings suggest that Curcuma angustifolia rhizomes contain bioactive compounds with promising therapeutic potential, particularly as natural antimicrobial and anti-biofilm agents. This study highlights the importance of plant-derived metabolites as alternative strategies in combating microbial infections and biofilm-associated resistance.

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Track Classification: Biological Sciences

Contribution ID: **73** Type: **Oral**

Investigating the effects of wood smoke exposure on developmental health, neurological development, and lifespan in Drosophila melanogaster

Abstract
Wood smoke, a major source of indoor air pollution in many low-income and rural households, contains several toxic pollutants such as particulate matter, volatile organic compounds, carbon monoxide, and polycyclic aromatic hydrocarbons. These pollutants are known to induce adverse reproductive and developmental outcomes. This study investigates the effects of chronic exposure to wood smoke on developmental capacity, morphology, neurological and transgenerational consequences in Drosophila melanogaster. Wild-type flies were exposed to wood smoke for 30 seconds, three times daily, using a custom-built chamber simulating household combustion. Developmental parameters such as egg-laying capacity and pupation rate were recorded. Morphometric parameters like weight, height, and gut pigmentation were assessed in both F1 and F2 generations. The results revealed a significant decline in pupal formation and body weight in the exposed group. Additionally, pupal arrest was observed, indicating developmental delay. The neurological observations showed consistent and significant decline in both distance climbed and number of responsive flies in the exposed group points toward neurotoxicity potentially affecting motor neurons or muscular function. Gut pigmentation and internal darkening in larvae pointed to potential ingestion of particulate residues. The findings suggest that even sublethal, chronic wood smoke exposure can impair reproductive health and cause transgenerational morphological changes in Drosophila, highlighting the potential risks biomass smoke poses to living systems.
Keywords: Wood smoke, reproductive toxicity, transgenerational effect, Neurotoxicity, Endocrine disrupting properties

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Track Classification: Biological Sciences

Contribution ID: **74** Type: **Oral**

A Teratological Study Of Faulty Neural Tube Closure And Neuro- Protection In Gallus gallus domestics

Abstract
The most severe congenital abnormalities are known as neural tube defects (NTDs), which are characterized by defective neural tube closure during early development. The present study investigates the embryo-toxic effect of serotonin and cadmium chloride and the ability of folic acid and inositol to exert a neuroprotective effect in an in vivo model based on fertilized chick embryos (Gallus gallus domesticus). Fourteen eggs were assigned to graded serotonin exposure of 10, 25, and 50 µL, fixed cadmium chloride of 10 µL, and also co-treated with folic acid at 50 µL or inositol at 100 µL. Embryos were incubated for 48–72 hours, harvested, and examined for survival and gross structural changes. The outcome indicated that serotonin and cadmium chloride induced dose-dependent developmental abnormalities, comprising notches in the neural tube, notochord-brain separation, and spina bifida-like development. Combined exposure was embryonic lethal. Folic acid was able to prevent damage in lower dose groups but not with high serotonin. Inositol was not protective and all the inositol-treated embryos failed to develop. The results illustrate the dose sensitivity of embryonic tissues to teratogens and show the preeminent importance of folic acid. Inositol might need co-factors or combination therapy to be effective.
This study provides experimental evidence for prenatal screening, medically controlled use of drugs, and nutritional supplementations during pregnancy.
Key words: Neural tube defects (NTDs), Teratology, Chick embryo model (Gallus gallus domesticus), Serotonin, Cadmium chloride (heavy metal), Folic acid, Inositol, Neurodevelopment, Embryo-toxicity, Neuroprotection, Anencephaly, Spina Bifida Cystica, Meningocele, Encephalocele, Myelocele, and Meningomyelocele.

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Track Classification: Health Sciences

Contribution ID: **75** Type: **Poster**

”Closing the Loop: Optimizing Agricultural Waste Fermentation for Next-Gen Bioplastics”

Increased environmental load of fossil fuel-derived plastics has propelled interest in renewable bioplastics, of which polylactic acid (PLA) is notable due to its biodegradability, biocompatibility, and varied uses. The core of PLA manufacture is lactic acid, an organic acid of natural origin commonly manufactured via microbial fermentation of biomass feedstocks. Chirality (L- and D-isomers) and purity are key factors, as they dictate the properties of the polymer, including crystallinity, strength, and degradation rate. Aside from the production of lactic acid, the key step is its polymerization—direct condensation or ring-opening polymerization of lactide—to produce PLA of controlled molecular weight and activity. Characterization by thermal, mechanical, and spectroscopic means follows, determining relationships between polymer structure and function. Short-chain PLAs are appropriate for
biomedical applications such as drug delivery and sutures, whereas high-molecular-weight PLAs are applied in packaging, textiles, and structural applications. This review highlights post-fermentation strategies, polymerization routes, and customized applications, highlighting PLA’s significance in promoting circular bioeconomy solutions.

Keywords: Agricultural waste, hydrolysis, cellulose, condensation, Poly lactic acid.

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Track Classification: Biological Sciences

Contribution ID: **77** Type: **Oral**

Machine Learning and DFT - Driven Design of MXene Compositions for Enhanced Hydrogen Evolution Reaction Performance

MXenes ($M_{n+1}X_nT_x$) are rapidly emerging class of 2D transition metal carbides/nitrides. With their enormous surface area, high electrical conductivity, and tunable surface terminations, MXenes are promising electrocatalysts for the Hydrogen Evolution Reaction (HER). The composition of MXenes with their chemical formula (Mn+1XnTx) and surface terminations, significantly influences their properties and subsequent applications. In this work, we integrate machine learning (ML) and density functional theory (DFT) to accelerate the discovery of HER-optimized MXene compositions. A curated dataset reported in the literature and DFT-calculated HER descriptions (ΔG_H*, overpotential, Tafel slope) was combined with elemental and structural features to train predictive ML models. The optimized models identified several promising candidates, including $Ti_3C_2O_2$, Nb_2CO_2, and $Ta_4C_3O_2$, with near-thermoneutral hydrogen adsorption free energies, overpotentials and tafel slopes. Stability screening based on formation energy and energy above hull suggests these materials maintain structural integrity under electrochemical conditions. This ML-guided approach significantly reduces the search space for high-performance HER catalysts and offers a framework for the design of MXenes for sustainable hydrogen production. The methodology and predicted compositions will be experimentally validated, bridging computational predictions with practical electrocatalyst development.

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Track Classification: Physical Sciences

Contribution ID: **78** Type: **Oral**

Microbial Bioleaching of spent Lithium-Ion batteries for valuable Metal Recovery

The rapid proliferation of lithium-ion batteries (LIBs) in electronics, renewable energy systems, and electric vehicles has created dual challenges of environmental burden from spent batteries and depletion of critical raw materials. Conventional recycling methods, including pyro metallurgy and hydrometallurgy, are effective but often constrained by high energy requirements, hazardous chemical usage, and secondary pollution. Bioleaching emerges as a promising, eco-friendly, and low-cost alternative. This study investigated the potential of microbial bioleaching for selective recovery of metals from LIB powder using Aspergillus niger and Staphylococcus aureus.

Pre-treated battery powders were subjected to microbial incubation, followed by qualitative and semi-quantitative analysis of solubilized metals through colorimetric assays and UV-Visible spectrophotometry. Flame tests were further employed for lithium confirmation. Results revealed that A. niger demonstrated significantly higher leaching efficiency compared to S. aureus, with elevated solubilisation of nickel (27.9 ppm), manganese (25.6 ppm), and cobalt (20.8 ppm), attributed to organic acid secretion and medium acidification. In contrast, S. aureus displayed limited recovery due to its inability to produce strong acid metabolites, with residues showing incomplete structural degradation. Lithium detection through Eriochrome Black T was unreliable, but crimson flame emission confirmed its presence, whereas cadmium remained undetectable, consistent with modern LIB compositions. These findings validate fungal bioleaching as an effective and sustainable method for critical metal recovery, aligning with circular economy principles by reducing reliance on mining and mitigating e-waste hazards. Future directions include optimization of microbial consortia, bioreactor design, and advanced analytical quantification to enhance industrial applicability.

Keywords: Bioleaching, Lithium-ion batteries, Sustainable recycling and E-waste management.

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Track Classification: Biological Sciences

Contribution ID: **79** Type: **Poster**

Pristine Graphene Membranes for Highly Selective Gas Separation

Pristine graphene, a single-atom-thick carbon material, holds immense promise for revolutionizing gas separation technologies due to its unique properties, including atomic thinness, exceptional mechanical strength, and inherent impermeability to gases. This paper details the advancements in fabricating nanoporous pristine graphene membranes designed for highly selective gas separation, particularly for critical industrial applications such as carbon dioxide (CO2) capture and hydrogen (H2) purification. We explore both top-down (electron beam drilling, ion bombardment) and bottom-up (Chemical Vapor Deposition with intrinsic pore control) methodologies for creating precisely sized sub-nanometer pores. The fundamental principles of gas transport, driven by size-selective molecular sieving and pore-edge interactions, are discussed, supported by theoretical predictions from molecular dynamics simulations. Experimental characterization techniques, including Raman spectroscopy, TEM, and AFM, are highlighted for their role in validating pore structure and membrane integrity. Performance metrics, including permeability and selectivity, are presented, demonstrating how these membranes can potentially surpass the conventional Robeson upper bound. While challenges in scalability, cost-effectiveness, and defect management persist, ongoing research into sustainable production methods and advanced pore engineering continues to push the boundaries of this transformative technology, positioning pristine graphene membranes as a cornerstone for future sustainable industrial processes.

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Track Classification: Physical Sciences

Contribution ID: **80** Type: **Poster**

Unveiling Novel Bioactivities of Endophytic Fungi from Acorus calamus: Antimicrobial, Antioxidant, and Cytotoxic Properties

Endophytic fungi associated with medicinal plants are a rich source of bioactive compounds exhibiting diverse biological activities. This study investigated the antimicrobial, antibiofilm, antioxidant, and cytotoxic properties of ethyl acetate crude extracts (ECEs) from two endophytic fungi —*Plectosphaerella sp.* (ACR-12) and *Stilbella aciculosa* (ACR-15)—isolated from the rhizomes of *Acorus calamus*. The identity of these fungi was confirmed through morphological, microscopic, and molecular analyses (including ITS sequencing), and their sequences have been deposited in GenBank (PV082262 for *S. aciculosa*; PV082167 for *Plectosphaerella sp.*). GC-MS analysis revealed a range of bioactive metabolites, including erythro-9,10-dibromopentacosane from *Plectosphaerella sp.* and 1-nonadecene from *S. aciculosa*. Antimicrobial activity assessed via disc diffusion and microdilution assays showed significant inhibition against *Escherichia coli* (ATCC 25922), *Staphylococcus aureus* (ATCC 25923), *Pseudomonas aeruginosa* (ATCC 27853), *Bacillus subtilis* (ATCC 6633), *Aspergillus niger* (ATCC 16404), *Fusarium oxysporum* (ATCC 48112), and *Candida albicans* (ATCC 10231) with MIC values ranging from 3.125 to 50 µg/mL. Both ECEs exhibited antibiofilm activity against *S. aureus* (ATCC 25923) and *P. aeruginosa* (ATCC 27853), with *S. aciculosa* showing the highest inhibition (up to 67% at half the MIC). The DPPH assay indicated notable antioxidant activity for *Plectosphaerella sp.* (IC_{50} = 59.37 µg/mL). Cytotoxicity testing against MCF-7 breast cancer cell lines (24-hour exposure) revealed IC_{50} values of 95.39 µg/mL for ACR-12 and 32.58 µg/mL for ACR-15. These findings highlight the potential of *A. calamus* endophytes, particularly *Plectosphaerella sp.* and *S. aciculosa*, as promising sources of novel antimicrobial, antibiofilm, antioxidant, and cytotoxic agents, warranting further pharmaceutical exploration.

Keywords : Endophytes, *Acorus calamus*, *Plectospharella*, *Stilbela aciculosa*, antimicrobial, antibiofilm.

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Track Classification: Biological Sciences

Contribution ID: **81** Type: **Poster**

Comparative Analysis of Orbital Angular Momentum and Spin–Orbit Alignment in Circumbinary and Single-Star Planetary Systems

In this work, we perform a comparative analysis of orbital angular momentum (⌧⌧) across circumbinary, single-star single-planet, and single-star, multi-planet systems. Using archival data from the NASA Exoplanet Archive, supplemented by Kepler and TESS discoveries, we compile a dataset of well-characterized systems with measured orbital and stellar parameters. For each planet, we compute orbital angular momentum ⌧⌧. We then generate linear and non-linear plots between ⌧⌧ and difference properties of exoplanets. Our results demonstrate that circumbinary planets consistently exhibit higher orbital angular momentum compared to planets in single-star systems, regardless of planetary mass. In contrast, many planets around single stars, particularly hot Jupiters, leading to substantially lower angular momentum despite their large masses. Furthermore, multi-planet single-star systems tend to occupy an intermediate regime, with a wider spread in angular momentum that reflects their more complex dynamical histories. The comparison also reveals that eccentricity plays a secondary role: circumbinary systems cluster at low eccentricities, while single-star systems display a broader distribution, consistent with dynamical excitation through migration or planet–planet interactions. This work highlights how differences in system architecture fundamentally shape the dynamical properties of planetary orbits and provides an empirical foundation for future studies of spin–orbit alignment and long-term stability in diverse planetary systems.

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Track Classification: Physical Sciences

Contribution ID: **83** Type: **Poster**

St. John's Perception: A Neuroherbal Hypothesis on Hypericum perforatum in Alice in Wonderland Syndrome

Alice in Wonderland Syndrome (AIWS) is a rare and poorly understood perceptual disorder marked by transient visual and spatial distortions, commonly triggered by migraines, viral infections, or epileptic activity. Current treatments are limited and indirect, focusing on the underlying cause rather than the syndrome itself. In this context, Hypericum perforatum (St. John's Wort), a medicinal plant long used for neurological and mood-related conditions, presents an intriguing yet unexplored possibility.

Rich in neuroactive compounds like hyperforin and hypericin, H. perforatum exerts broad effects on serotonin, dopamine, and glutamate pathways—key neurotransmitter systems often disrupted in AIWS triggers. Its documented use in mild depression, migraine attenuation, and cognitive enhancement suggests potential overlap with AIWS pathophysiology. While no direct evidence links this herb to AIWS treatment, its neuroprotective, anti-inflammatory, and neurotransmitter-modulating actions open a speculative but promising avenue.

This paper proposes a novel neuroherbal hypothesis: that H. perforatum may offer therapeutic benefit in AIWS when linked to migraine or neuroinflammatory states. The concept demands further exploration through targeted pharmacological and clinical studies to validate efficacy and safety. In the realm of rare disorders with limited options, such plant-based hypotheses may hold seeds of future breakthroughs.

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Track Classification: Biological Sciences

Contribution ID: **84** Type: **Oral**

PERFORMANCE MONITORING AND POWER CONDITIONING OF ROOFTOP SOLAR PV SYSTEM USING AUXILIARY RESONANT CONVERTER

This work addresses the underutilization of solar energy, a vital renewable resource, in regions still heavily dependent on conventional energy sources. By focusing on the efficient installation and harvesting of solar photovoltaic (PV) power, this work aims to contribute to sustainable energy solutions aligned with the United Nations Sustainable Development Goals (SDGs) and enhance renewable power generation for societal well-being and environmental sustainability.
This work also envisions the creation of a functional solar PV system integrated with power electronic converters, enabling real-time testing and validation of designs to meet industry standards. Additionally, the facility will serve as a comprehensive data-logging center for Jakkasandra and its surrounding areas, recording annual solar insolation and atmospheric conditions. This dataset will act as a valuable reference for researchers and commercial entities interested in PV system deployment, while supporting ongoing academic studies in solar energy technologies.
To ensure successful implementation, the project involves a setup that includes two 500 W solar PV panels, configured in parallel to deliver a 1 kW output. The generated power will be routed through appropriately designed switchgear, wiring, and safety mechanisms to interface with an auxiliary resonant converter and a DC-DC converter, integrated with a control unit to regulate voltage for laboratory applications. Furthermore, the system incorporates instrumentation for monitoring solar irradiance, temperature, voltage, and current, with provisions for data storage to support research and analysis. By creating this dedicated infrastructure, this work contributes to the development of clean energy solutions that is expected to support India's transition toward a sustainable energy future.

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Track Classification: Engineering & Technology

Contribution ID: **85** Type: **Poster**

TMT

Abstract:
The Temporal Multiverse Theory (TMT) introduces a framework in which multiple universes are not only spatially parallel but also distributed along distinct temporal coordinates. Unlike the Many-Worlds Interpretation, which posits simultaneous branching realities, TMT suggests that universes may exist in the relative past, present, or future of one another. Within this model, black holes act as inter-universal entry points, while White Voids serve as corresponding exit points, thereby ensuring conservation of mass-energy across universes. This mechanism eliminates the paradoxes traditionally associated with time travel, as traversal to another temporal universe does not alter the causal structure of the originating timeline. Consequently, time travel is redefined as inter-universal transfer along a temporal gradient rather than retroactive modification of history. The theory offers testable implications for high-energy astrophysics, gravitational wave astronomy, and quantum cosmology.
Key words:
Temporal Multiverse, Black Holes, White Voids, Inter-Universal Travel, Time Gradient, Energy Conservation, Causality, Quantum Cosmology, Time Travel

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Track Classification: Physical Sciences

Contribution ID: **86** Type: **Oral**

Cryopreserved Human Sperm Showed Enhanced Motility via Temporary Energy Restriction

Abstract:
As male fertility rates have declined in recent years, this study explores potential interventions to improve sperm motility. Semen samples were collected, assessed, and cryopreserved. After several months, motility was re-evaluated.

Methods: This study included semen samples from 110 men undergoing fertility evaluation. Based on motility, samples were divided into normozoospermic (control) and asthenozoospermic (test) groups. All samples were cryopreserved, thawed, and cryoprotectants removed, followed by semen analysis to establish baseline motility. Samples were then exposed to culture media at incrementally higher concentrations, with incubation time, respectively. Motility was assessed at each stage to evaluate the effect of nutrient reintroduction after energy restriction

Results: Sperm motility in the asthenozoospermic group increased following exposure to culture media with increasing concentration at varying time intervals. The highest motility of 48% was recorded at 500 µL/mL culture media after 60 minutes.
Conclusion: Sperm motility can be improved by subjecting thawed semen samples to temporary energy restriction followed by controlled reintroduction of nutrients. The findings indicate that initial nutrient deprivation, when followed by timed exposure to culture media, resulted in measurable enhancement of motility. This suggests that semen samples need not be used immediately after thawing but may first undergo this treatment to achieve higher motility rates.
Keywords: Semen analysis, Asthenozoospermia, Normozoospermia, culture media, and incubation.

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Track Classification: Biological Sciences

Contribution ID: **87** Type: **Poster**

Enhancer RNAs Explained: New Players in Gene Regulation, Brain Function, and Cancer

Enhancer RNAs, or eRNAs, are a newly appreciated type of non-coding RNA produced from regions of our DNA called enhancers—special control panels that help switch genes on or off. For years, these RNAs were thought to be meaningless background noise. Today, scientists recognize that eRNAs are powerful molecules that help fine-tune how and when our genes are activated, especially in complex biological processes like brain development, cancer, and early growth in embryos.

Although eRNAs don't make proteins like traditional messenger RNAs (mRNAs), they are far from useless. These short, quickly degraded RNAs are produced exactly when and where certain genes need to be expressed. They assist in opening tightly packed DNA, making it easier for other molecules to access the gene. eRNAs also help bring distant parts of the DNA together, forming loops so that enhancers can directly contact gene promoters (the "on switch"areas of genes). This physical looping is essential for turning genes on at the right time.

Additionally, eRNAs help recruit RNA Polymerase II—the enzyme responsible for making RNA from DNA—and help it move smoothly along the gene so that the full message is copied correctly. Some eRNAs also interact with helper proteins that modify DNA-packaging proteins (called histones), keeping the chromatin in an "open"state that promotes gene activity.

In cancer, eRNAs have been found to boost the activity of genes that make cells grow uncontrollably. In the brain, eRNAs are quickly made in response to nerve signals and help activate genes needed for learning and memory. During development, eRNAs help guide the correct timing and pattern of gene activity so that cells grow into the right tissues and organs.

This Paper brings together all these insights to show how these small, overlooked RNAs are central to the big picture of gene control. We also discuss how modern technologies like CRISPR and RNA-targeting drugs might allow us to use eRNAs as future tools for diagnosing or treating disease.

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Track Classification: Biological Sciences

Contribution ID: **88** Type: **Oral**

Towards Intelligent Mirrors: A Review of Actuation Strategies in Adaptive

Abstract:

Adaptive optics for today's telescopes relies on actuators that can supply nanometer accuracy and stability in the extremely demanding environment. The types of traditional actuator systems (hydraulic, piezoelectric, voice-coil, and cryogenic hexapods) have all enabled significant advancements in adaptive optics; however, they all come with limitations in terms of hysteresis, thermal sensitivity, scalability, or energy consumption. Hybrid actuator approaches, such as voice-coil and variable reluctance systems (e.g., Kineto), offer improved response and linearity. However, their complexity remains a significant barrier to scalable and practical deployment. This review investigates the progression of actuator technologies, identifying the advantages and disadvantages of various conveniences, and recognizing new smart functional materials as viable alternatives; specifically, actuators based on carbon nanotubes (CNT), significant in its dual sensing- actuation, lightweight hierarchical functional integration, which likely offer a potential way forward toward efficient, adaptive, next-generation optical systems.

Keywords: Adaptive optics, actuators, deformable mirrors, CNT, smart materials, telescopes.

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Track Classification: Engineering & Technology

Contribution ID: **89** Type: **Oral**

RegTrace: USB-Based Windows Registry Forensic Tool

Abstract:
The Windows Registry is a critical source of evidence in digital forensics,containing extensive traces of user activity,system configurations and application behavior.Despite its value,obtaining Registry hives from live systems without altering data remains a major challenge for investigators.To address this,developed "RegTrace",a portable USB-based tool that automates both the acquisition and interpretation of Registry artifacts.Using Microsoft's Volume Shadow Copy Service (VSS),the tool acquires protected hives in a read-only manner, thereby maintaining forensic integrity.The acquired hives are then parsed to extract details on user actions,device history,software execution and network connections,while anomaly detection highlights irregular patterns such as time manipulation or missing entries..By combining evidence collection and automated reporting in a single workflow,RegTrace reduces examiner workload and enables rapid,reliable on-site analysis.Its design makes it particularly useful in incident response scenarios as well as traditional forensic casework.

Keywords: Windows Registry,Digital Forensics,Volume Shadow Copy Service,Artifact Acquisition, Timeline Analysis, Forensic Integrity.

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Track Classification: Physical Sciences

Contribution ID: **90** Type: **Poster**

A Review on correlation between sunspot umbra and solar flare

Sunspots, consisting of a dark umbra surrounded by a lighter penumbra, are visible manifestations of strong magnetic activity on the solar surface. The umbra, as the region of concentrated magnetic flux, is closely linked to the buildup and release of energy that drives solar flares. This review synthesizes findings from recent research exploring how umbral dynamics contribute to flare activity. Studies have shown that magnetoacoustic waves within the umbra can act as triggers, that structural and magnetic reconfigurations of sunspots accompany flare events, and that internal umbral motions respond dynamically during flaring. By bringing together these perspectives, this review highlights the crucial role of the sunspot umbra in solar flare processes and discusses its potential use as a diagnostic tool for improving space weather forecasting.

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Track Classification: Physical Sciences

Contribution ID: **91** Type: **Poster**

Bridging Traditional Healing and Nutritional Neuroscience for Sustainable Health

Neurological disorders such as Alzheimer's disease, Parkinson's disease, dementia, and depression are rising worldwide and pose a major challenge for ageing populations. Scientific literature highlights that poor nutrition, micronutrient deficiencies, and unhealthy dietary habits play a central role in the onset and progression of these conditions. Deficits in vitamins B, D, omega-3 fatty acids, zinc, and magnesium impair neurotransmitter synthesis, mitochondrial function, and neuronal survival, while processed and high-sugar diets accelerate inflammation, oxidative stress, and cognitive decline. These risks extend across the life course—malnutrition in early childhood disrupts neurodevelopment, adolescents and adults face heightened vulnerability to mood disorders, and older adults experience accelerated brain ageing.

In this context, SDG 2 (Zero Hunger) directly aligns with the science of nutrition and neuroprotection. Ensuring adequate and balanced diets for children under five, adolescent girls, pregnant women, and the elderly is not only vital for reducing stunting and wasting but also for preventing neurological impairment and age-related cognitive disorders. Nutritional neuroscience demonstrates that diets rich in antioxidants, polyphenols, flavonoids, and healthy fats—sourced from whole grains, legumes, nuts, seeds, and fruits—enhance synaptic plasticity, regulate neuroinflammation, and increase brain-derived neurotrophic factor (BDNF), thereby protecting cognitive health.

Traditional Indian healing systems provide valuable models for implementing these goals. Ayurvedic practices emphasize food (Ahara), lifestyle (Vihara), and herbs such as Ashwagandha, Gotu Kola, Shankhpushpi, turmeric, and saffron, which have been validated for neuroprotective, memory-enhancing, and stress-regulating effects. Preparations like triphala, ghee, and fermented foods support the gut-brain axis, while yoga and meditation enhance cerebral blood flow, reduce cortisol, and strengthen resilience against neurodegeneration.

Preventive strategies must therefore adopt a life-cycle approach: providing micronutrient security in childhood to support brain development, promoting balanced diets and stress management in adulthood to lower the risk of mood and memory disorders, and ensuring integrative nutrition in old age to delay dementia and preserve functional independence. Based on extensive literature review, this paper aligns modern nutritional neuroscience with sustainable agriculture and traditional dietary knowledge that supports both SDG 2's agenda and the global effort to break cycles of poverty and disease by promoting long-term cognitive health, productivity, and quality of life.

Keywords: Nutritional neuroscience, Ayurveda, SDG 2 Zero Hunger, Neuroprotection, Cognitive ageing

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Track Classification: Health Sciences

Contribution ID: **92** Type: **Oral**

Analysing The Distinctive Properties of Stars and Exoplanets.

Abstract
The angular momentum of stars and their planetary systems provides critical insights into stellar structure, rotational history, and star–planet interactions. Using observational data, we analysed the relationships between stellar angular momentum, mass, and radius for G-type main-sequence stars and evolved counterparts (subgiants and giants), separating the samples into single-planetary and multi-planetary systems. For main-sequence stars, angular momentum exhibits a clear positive correlation with stellar mass and radius, consistent with theoretical expectations from J\sim MRˆ2\mathrm{\Omega}. Multi-planet hosts display relatively tight scaling relations, whereas single-planet hosts reveal increased scatter, plausibly linked to tidal interactions with close-in massive planets. Evolved G-type stars demonstrate steeper angular momentum–mass relation and stronger dependence on stellar radius, with least-squares fits showing higher predictive power for radius than mass. These results indicate that envelope expansion during post-main-sequence evolution dominates angular momentum storage, while residual scatter reflects mass loss, magnetic braking, and differential rotation. Comparisons between single- and multi-planet systems suggest that tidal spin–orbit coupling is more significant in single-planet hosts, particularly in evolved systems where stellar envelopes are extended. Overall, the study emphasizes that stellar angular momentum is best described by a two-parameter scaling law involving both mass and radius, with planetary architecture further modulating the degree of scatter.

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Track Classification: Physical Sciences

Contribution ID: **93** Type: **Oral**

A REVIEW ON - IMPACT OF NANO ADMIXTURE TO IMPROVE THE DURABILITY AND STRENGTH OF CONCRETE

Nano additives contains various supplementary cementations' materials (SCMs) such as silica, fly ash, clay, and slag are used to improved concrete properties. New Nano modifies (a Nanometer, nm, is 10-9m), with possible applications in concrete technology, have the fine grinded particle size that is less than hundred nm. Nano additives of smaller in size and great potential to expose in large surface area. Nano materials are very reactive, in connection with improving concrete performance such as mechanical strength, durability properties of concrete. The objective of this present investigation is to evaluate the structural strength of Nano modified concrete by Nano silica and Nano clay material as supplementary cementitious material and potential use of non-destructive testing devices for in-situ strength parameters of NMC during and after construction. The concrete specimens of different for different mix proportions were analysed in the study. This research primarily focuses on the development of experimental evaluation for estimating the 7, 28, 60 and 90 days' compressive strength of concrete. Also 28 days of split tensile strength, flexural strength. To study the behaviour of bond action between concrete and steel performed using pull-out test at different levels of compressive strength were considered through the use of different Nano modified concretes, and different concentration of Nano modified with conventional curing, acid and saline curing.

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Track Classification: Engineering & Technology

Contribution ID: **94** Type: **Poster**

Next-Generation Solution for Water Disposal: Deep Soil Percolation

Urban regions are increasingly struggling with frequent street flooding, largely due to rapid urbanization and the inability of conventional drainage systems to manage sudden heavy rainfall. To address this challenge, we propose an Innovative Water Disposal System based on Deep Ground Percolation. This method is designed to efficiently channel excess stormwater away from streets during intense rain events.

The system operates through float-type water level sensors installed along roadways that continuously monitor surface water accumulation. Once the water level exceeds a predefined threshold, the sensors activate automated inlet mechanisms. These inlets allow stormwater to enter a network of vertical percolation pipes, directing it into an underground storage reservoir.

Since the process is automated, it requires minimal human supervision and maintenance, ensuring a real-time flood response that keeps roadways safer during extreme rainfall. Additionally, as the water infiltrates into the subsurface layers, it reduces surface runoff while contributing to groundwater recharge. The collected water can also be treated and reused for non-potable purposes, enhancing urban water sustainability.

Overall, this approach is scalable, eco-friendly, and climate-resilient, offering a smarter alternative to traditional drainage systems for managing urban flooding.

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Track Classification: Engineering & Technology

Contribution ID: **95** Type: **Poster**

DISORDER SEVERITY ANALYSIS OF COCONUT LEAVES THROUGH HYBRID DEEP LEARNING APPROACH

Coconut palms (*Cocos nucifera*) are highly vulnerable to foliar disorders, among which leaf yellowing is a critical early indicator of plant stress. Accurate assessment of yellowing severity can assist in timely intervention and precision management. In this work, we propose a dual-approach framework for automated severity classification of coconut leaf yellowing.

The first approach employs a deep learning model to categorize leaf images into four severity levels: Healthy, Mild, Moderate, and Severe. In parallel, a mathematical model is developed based on pixel-level color analysis of leaf regions, providing an interpretable measure of yellowing severity. The comparative performance of the two approaches will be evaluated in terms of classification accuracy and reliability.

This study aims to explore the complementary strengths of data-driven and rule-based methods, contributing toward practical and explainable solutions for monitoring coconut leaf health in agricultural applications.

Keywords
Severity classification, Deep learning, Precision agriculture, Semantic Segmentation

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Track Classification: Mathematical & Data Sciences

Contribution ID: **96** Type: **Poster**

Cigarette De-addiction Device Using Water Generated Steam

Abstract
The continued global prevalence of tobacco use and nicotine dependence underscores the urgent need for innovative harm-reduction strategies (World Health Organization [WHO], 2023). This paper proposes the development of a de-addiction cigarette that employs water-generated steam to replicate the sensory aspects of smoking without nicotine or toxic combustion products. The prototype integrates a heating element, water reservoir, and vapor delivery mechanism to simulate the behavioral and psychological components of cigarette use, thereby addressing key barriers to cessation that extend beyond chemical dependence (Cummings & Proctor, 2014). Unlike conventional tobacco products and electronic nicotine delivery systems (ENDS), the steam-based design is free from nicotine and chemical additives, offering a potentially safer and non-addictive alternative (National Academies of Sciences, Engineering, and Medicine [NASEM], 2018). To enhance user acceptability, the device may incorporate non-toxic flavoring agents or herbal extracts while maintaining a non-hazardous profile (Grana, Benowitz, & Glantz, 2014). Furthermore, its adoption could yield environmental benefits by eliminating cigarette butt waste and reducing airborne pollutants (Novotny & Slaughter, 2014). This paper examines feasibility, design considerations, and public health implications, arguing that a steam-based cigarette could serve as a novel harm-reduction tool with potential applications in smoking cessation programs and long-term relapse prevention.

Keywords: Smoking cessation, Harm reduction, Nicotine-free alternative, Behavioral dependence, Public health innovation, Environmental sustainability

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Track Classification: Health Sciences

Contribution ID: **97** Type: **Poster**

EFFECT OF VARYING CONCENTRATIONS OF RETINOIC ACID ON IN VITRO DIFFERENTIATION OF SHEEP SPERMATOGONIAL STEM CELLS

Being the precursor cells of spermatozoa, spermatogonial stem cells (SSC) are the only adult stem cell capable of transmitting genetic material to the next generation. They self-renew and differentiate into mature sperm through a process called spermatogenesis. The fate of SSC to self-renew or differentiate determine the foundation of normal spermatogenesis and fertility status of a male. One of the major differentiating signals for SSC arise from retinoic acid (RA), a vitamin A metabolite. Although it has been known that retinoids are essential for male fertility, the molecular and cellular events associated with RA remain largely undefined especially in livestock species. The objective of this study was to optimize the concentration of retinoic acid in inducing differentiation of sheep SSC in vitro. For this purpose, SSC were harvested from immature sheep testis (n=6) by two step enzymatic digestion followed by double enrichment in lectin and Geltrex (1%) coated plates. The purified SSC were cultured in differentiating media with 5% knockout serum replacement and varying concentrations of RA (0, 1, 5, 10, and 15μM). The same media without retinoic acid was taken as a control. After 24 hr and 48 hr of RA treatment, the cultured cells were trypsinized and subjected to toxicity assay, stemness (ALP) and metabolic activities (MTT) were compared among the groups. Gene expression studies were performed after 24 hr, 48 hr, 6th and 12th day. The viability percentage of the SSC in all the groups was comparable, with no toxicity for all RA doses. After 48hr of RA treatment there was significant ($p<0.05$) decrease in stemness activity (0.15±0.01 Vs 0.23±0.01 OD units) when treated with 15μM RA as compared to control group. Similarly, there was a significant increase in metabolic activity when treated with 15μM RA (1.3±0.04 Vs 1.1±0.02 OD units) as compared to control group. However, after 24 hrs, there were no significant difference either in stemness or metabolic activities among the groups. By the 12th day of RA treatment there was a significant ($p<0.05$) increase in CKIT expression (0.39±0.07 Vs 0.10±0.01 fold change). The study reveals that RA at 15μM concentration in SSC differentiating media improves metabolic activity and promote differentiation. These findings suggest 15μM RA can promote sheep SSC differentiation in vitro.

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Track Classification: Biological Sciences

Contribution ID: **98** Type: **Poster**

Computational analysis of FecA protein interactions: A docking and molecular dynamics approach

Klebsiella pneumoniae is one of the most common Gram-negative bacteria that cause nosocomial infections, including meningitis, pneumonia, and urinary tract infections. Traditionally, beta-lactam (β-lactam) based antibiotics, such as penicillin, are used to treat K. pneumoniae infections. However, these therapies, including other antibiotics, are losing their effectiveness because the bacteria produce other types of biomolecules that render the medications ineffective. Therefore, new targets are probed in Klebsiella pneumoniae that are essential for microbial survival and pathogenesis. In their microenvironments, microbes produce and release siderophores, which bind and dissolve precipitated or otherwise inaccessible iron. The FecA protein is a desirable target for the development of new treatments because of its involvement in KP pathogenicity. Researchers can potentially lessen the pathogenicity of the bacteria by developing techniques to interfere with the mechanisms of iron uptake in KP. This study focusses on the FecA protein, examining its potential as an inhibitory target and its therapy implications for KP. Lopinavir, Inosine, Famciclovir, Entecavir, and Abacavir were the five small molecule ligands that showed the highest inhibitory potential for the FecA protein. The current study's findings support lopinavir as a possible medication against Klebsiella FecA protein, lopinavir's inhibitory effect on Fec A protein implies that it is more effective at preventing iron from binding to FecA protein. The calculated binding energy of lopinavir to the FecA protein is -10.7 kcal/mol. Further, molecular dynamics studies will be carried out to further support the above results.
Key words: FecA protein, Klebsiella pneumoniae, Iron acquisition, Siderophore, Lopinavir, Molecular docking, Molecular dynamics

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Track Classification: Biological Sciences

Contribution ID: **99** Type: **Poster**

CRISPR in Agricultural Biotechnology: Molecular tools for crop improvement, abiotic stress resilience, and yield optimization

In agricultural biotechnology, CRISPR-based genome editing is rapidly becoming an important tool that provides unmatched accuracy in altering plant genomes to meet global food production concerns. CRISPR allows for the targeted, efficient and cost-effective editing of particular genes, while traditional breeding methods, regardless of their effectiveness, are time-consuming and have a restricted reach. Through the development of features including increased nutritional quality, disease resistance, and herbicide tolerance, this technique has been widely used to promote crop improvement. In the context of climate change and sustainable agriculture, CRISPR has shown exceptional potential in engineering abiotic stress tolerance, allowing crops to tolerate temperature, salinity, and drought stress. Crucially, in addition to improving traits, CRISPR makes functional genomics research easier by assisting in the understanding of gene networks that control plant yield and growth. New developments like base editing and prime editing increase its usefulness even more by opening up new possibilities for precise changes without adding extraneous DNA. Regulatory frameworks, public acceptance, and off-target impacts continue to be obstacles despite its potential, requiring careful consideration and open communication. In general, CRISPR has enormous potential to transform agriculture by connecting molecular advancements with feasible farming solutions, ensuring food security, environmental sustainability, and economic resilience.

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Track Classification: Biological Sciences

Contribution ID: **100** Type: **Oral**

Precision Agriculture Using Deep Learning-Based Tomato Leaf Disease Diagnosis

Plant diseases are one of the greatest threats to food security across the world, particularly with regard to staple foods, such as tomatoes. Rapid and accurate identification of diseases is very important in curbing yield losses and maintaining sustainable agriculture. In this paper, we consider how we can use deep learning methods to identify tomato leaf diseases using the publicly available PlantVillage dataset. We trained, designed and assessed three architectures of Convolutional Neural Network (CNN), MobileNet and ResNet to differentiate between diseased and healthy tomato leaves. Qualitative comparison that took place was done to gauge the performance of the models against each other in terms of the level of accuracy and the capacity to generalise. The outcomes reveal that even though CNN and MobileNet are effective, ResNet would be more reliable in real life scenarios due to its greater accuracy. This research highlights the opportunities of the ResNet-related models to enter the precision agriculture domain, in which the farmers could receive the automated, accurate, and scalable diagnostic tools. Moreover, mobile or peripheral devices could be integrated with such models so as to offer diagnosis on-site, eliminating the expense of performing the diagnosis in a lab. The method also presents the prospects of live disease surveillance where the farmers are able to prevent or take corrective measures on the spot. With a long run view, such smart systems may be crucial in enhancing crop resilience, reducing pesticide, and achieving sustainable food production.

Keywords: Deep Learning, Tomato Leaf Disease Detection, Convolutional Neural Networks (CNN), ResNet, Precision Agriculture

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Track Classification: Mathematical & Data Sciences

Contribution ID: **102** Type: **Poster**

Optimization of Ultrasound-Assisted Extraction of Okra Polysaccharides Using Response Surface Methodology

Okra (*Abelmoschus esculentus*) polysaccharides are valuable bioactive compounds with potential applications in food processing and functional foods. This study aimed to investigate the drying behavior of okra using a cross-flow dryer at 60℃, 70℃, and 80℃, evaluate the physicochemical properties of the resulting powders, and optimize polysaccharide extraction. Drying kinetics were studied using zero-, first-, and second-order equations, with first-order kinetics providing the best fit (R^2 = 0.9862, 0.9292, and 0.931 for 60℃, 70℃, and 80℃, respectively). Okra powder dried at 60℃ exhibited the highest swelling index 179.80 ± 22.65%) and solubility (37.67 ± 7.37%), indicating better retention of okra polysaccharide structure. Okra Polysaccharide extraction was performed using conventional solvent extraction (CSE) and ultrasound-assisted extraction (UAE) at 5, 15, and 30 minutes using ultrasonic probe system. FTIR analysis identified UAE at 15 minutes as the most effective method based on functional group retention. Further optimization was carried out using Response Surface Methodology with a Central Composite Design, varying sample-solvent ratio (1:30 to 1:50 w/v) and extraction time (10 to 20 minutes). The model predicted maximum polysaccharide yield at a sample-to-solvent ratio of 1:50 (w/v) and an extraction time of 20 minutes, with experimental validation yielding 17.64% (predicted 16.997%, R^2 = 0.9435). Future work will focus on characterizing the functional properties of the optimized polysaccharides to explore their application as natural emulsifiers and stabilizers in food systems.

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Track Classification: Chemical Sciences

Contribution ID: **103** Type: **Oral**

DEEP BELIEF NETWORK FOR DETECTION OF MARINE POLLUTANTS AND SEA SURFACE FEATURES

Marine ecosystems are increasingly threatened by pollutants such as plastics, oil spills, and natural debris, which deteriorate water quality and endanger biodiversity. Traditional pollutant detection methods are often restricted to specific categories, making them inadequate for addressing the diverse and complex nature of marine pollution. Recent advances in satellite remote sensing and deep learning provide a scalable and automated solution for monitoring these threats at a global level.

In this study, we propose a deep learning–based framework for detecting marine pollutants and sea surface features using satellite imagery. The methodology begins with clustering through Self-Organizing Maps (SOMs), which not only group pollutants but also reduce dimensionality for efficient processing. Subsequently, image features are extracted through convolution, flattened, and passed into a Restricted Boltzmann Machine (RBM) for unsupervised learning. Multiple stacked RBMs are then used to construct a Deep Belief Network (DBN), enabling the system to learn hierarchical feature representations. The DBN is trained to classify pollutants into 15 distinct categories, achieving accurate differentiation between multiple pollutant types and natural sea surface patterns.

By integrating SOM-based clustering with deep generative models such as RBMs and DBNs, the framework demonstrates strong generalization across diverse oceanic conditions, including coastal, seasonal, and open-ocean environments. Ultimately, this work shows how combining satellite data with deep unsupervised and hybrid learning methods can enhance pollutant detection, leading toward real-time monitoring solutions for sustainable ocean management.

Keywords: Marine pollution, Satellite imagery, Self-Organizing Maps, Deep Belief Network, Sustainable ocean management

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Track Classification: Mathematical & Data Sciences

Contribution ID: **104** Type: **Poster**

UNCOVERING THE LATENT DYNAMICS OF SOCIAL MEDIA ADDICTION USING A HYBRID HMM-RBM FRAMEWORK

Social media addiction is an escalating public health concern, yet its temporal dynamics remain poorly understood. This study proposes a novel hybrid machine learning framework combining **Hidden Markov Models** (HMMs) and **Restricted Boltzmann Machines** (RBMs) to elucidate the latent behavioral patterns underlying social media addiction. The HMM models the temporal evolution of user states—ranging from casual to habitual use to addiction—by analyzing observable behaviors such as posting frequency and interaction patterns. Concurrently, the RBM extracts latent features from complex, high-dimensional social media data, identifying critical patterns such as emotional content or temporal posting trends that signal addiction risk. By integrating RBM-derived features into the HMM, the framework enhances the accuracy of state predictions, capturing nuanced transitions in user behaviour. This hybrid approach not only reveals the dynamic pathways of social media addiction but also enables early identification of at-risk individuals, facilitating targeted interventions for healthier digital engagement.

Keywords: Social media addiction, Hidden Markov Model, Restricted Boltzmann Machine, Machine learning, Behavioural dynamics

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Track Classification: Mathematical & Data Sciences

Contribution ID: **105** Type: **Oral**

Predictive Analytics and Data-Driven Decision Making for Early Detection of Diabetic Retinopathy

Abstract
Diabetic retinopathy (DR) is a leading cause of vision impairment among individuals with diabetes, often progressing without symptoms until irreversible damage occurs. This paper explores the application of predictive analytics and data-driven decision-making techniques for the early detection and management of DR. Leveraging advances in artificial intelligence (AI), machine learning (ML), and deep learning, automated systems now enable accurate forecasting of DR risk based on clinical, imaging, and demographic data. Tools such as DeepDR Plus and ChatGPT-integrated risk calculators offer high diagnostic performance, allowing for timely intervention and personalized screening strategies. Furthermore, real-world implementations, including AI-based screening programs in India and clinical decision support systems, demonstrate the practical impact of these technologies. This study emphasizes the potential of accessible AI platforms to empower healthcare providers, improve diagnostic accuracy, and enhance patient outcomes, particularly in underserved populations. The integration of predictive models into routine diabetic care marks a transformative step toward proactive and equitable ophthalmic healthcare.
Keywords:
Artificial Intelligence, Clinical Decision Support Systems, Data-Driven Decision Making, Deep Learning, Diabetic Retinopathy, Early Detection, Predictive Analytics, Risk Prediction.

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Track Classification: Mathematical & Data Sciences

Contribution ID: **106** Type: **Poster**

DIGITAL GUILT: STUDYING THE PSYCHOLOGICAL EFFECT OF ONLINE TRANSACTION HISTORIES ON STUDENT BEHAVIOUR

The rise of digital payment systems, such as mobile wallets and UPI apps, has transformed financial transactions, particularly for students navigating the digital economy. This study explores the emotional and behavioural impacts of reviewing online transaction histories, introducing the concept of digital guilt—self-imposed emotional discomfort triggered by reflecting on digital spending patterns. Through structured questionnaires, students provided insights into their emotional responses, behavioral changes, and financial self-regulation strategies after examining their transaction records. Preliminary findings reveal that frequent exposure to digital spending histories is associated with increased guilt, anxiety, and self-criticism, particularly over impulsive or non-essential purchases like food delivery and entertainment. These emotional reactions often lead to short-term behavioural changes, such as reduced discretionary spending or temporary budgeting, though long-term effects vary based on financial literacy and emotional resilience. This research highlights the psychological consequences of financial transparency in digital platforms and underscores the need for educational interventions to promote financial literacy and emotional well-being, contributing to a nuanced understanding of how digital finance influences student behaviour.

Keywords: Digital guilt, Online transactions, Financial behaviour, Emotional impact, Financial literacy

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Track Classification: Mathematical & Data Sciences

Contribution ID: **107** Type: **Oral**

The Quantum topological hologram: A stabilizer code framework for black hole information preservation

This study introduces the quantum topological hologram (QTH) — a purely theoretical model in which the event horizon is treated as a hyperbolically embedded topological stabilizer code within a holographic tensor network. The logical degrees of freedom of infalling matter and the black hole interior are encoded in a redundant, nonlocal structure of physical qubits tiled across the horizon surface. The code inherits fault tolerance from topological order and geometric redundancy from its hyperbolic embedding, resulting in enhanced erasure thresholds compared to planar topological codes. Hawking radiation is modelled as a syndrome readout process: each emission step corresponds to the removal (erasure) of one or more horizon qubits, with the location of erasures known in principle. Using stabilizer code theory, the Knill–Laflamme error-correction conditions, and the decoupling theorem, this study formally proves that if the cumulative erasure fraction never exceeds a critical threshold, the global evolution remains unitary. This encoding naturally reproduces the Page curve: early radiation is nearly thermal and maximally entangled with the remaining black hole, but after the Page time, sufficient redundancy is exposed for decoding to become possible, causing the radiation entropy to decrease in a manner consistent with unitarity. The QTH also suggests, at a theoretical level, that certain observational or analog phenomena could be associated with its structure, although the focus of this paper is entirely on the mathematical framework using quantum simulators. This work provides a coherent framework uniting ideas from quantum error correction, holography, and topological quantum computation, offering a concrete, mathematically tractable approach to the information paradox without invoking exotic violations of quantum mechanics

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Track Classification: Physical Sciences

Contribution ID: **108** Type: **Poster**

DATA-DRIVEN PLAYER PERFORMANCE PREDICTION FOR ODI CRICKET TEAM SELECTION USING SUPERVISED MACHINE LEARNING

Cricket, a globally celebrated sport, depends significantly on individual player performances to shape One Day International (ODI) match outcomes. Traditional team selection methods, often reliant on intuition and historical records, lack objectivity. This study applies supervised machine learning to predict batsman and bowler performances in ODIs, facilitating data-driven team selection. Historical match data, player statistics, venue-specific trends, and opposition records are analyzed to develop two classification models: one for forecasting batsman run ranges and another for predicting bowler wicket ranges. Model performance is assessed through accuracy, precision, recall, and Area Under the Curve (AUC). Key performance indicators, such as batting consistency and bowling economy, are identified as critical predictors, providing actionable insights for team management. The proposed framework minimizes selection biases, optimizes team composition, and enhances decision-making, offering a robust methodology for professional cricket team selection.

Keywords: Player Performance Prediction, Machine Learning, Supervised Learning, Predictive Modelling, Sports Analytics.

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Track Classification: Mathematical & Data Sciences

Contribution ID: **109** Type: **Oral**

The Influence Of Ni Doping On Structural and Optical Properties Of Lanthanum Oxide (La2O3) Thin Films Synthesized Through Sol-gel Spin Coating Technique.

Lanthanum Oxide (La2O3), a well-recognized wide band gap rare-earth oxide, distinguished by its exceptional structural stability, high dielectric constant and notable optical properties, making them suitable for advanced thin film devices. In the present work, Ni doped La2O3 thin films with varying dopant concentration (La2(1-x)NixO3: x=0, 0.01, 0.03 & 0.05) were fabricated through conventional sol-gel spin deposition technique on the ultrasonically cleaned glass substrate. The effect of 'Ni'incorporation on the intrinsic properties of the La2O3 matrix were systematically characterized using XRD, Raman Spectroscopy, FTIR, SEM and UV-Visible spectroscopy to assess their structural, morphological and optical modifications. XRD results has exhibited enhanced crystallinity, pronounced effect of doping on lattice parameters and the coexistence of cubic and hexagonal structures. Raman and FTIR spectroscopy confirmed the phase purity and revealed the vibration modes associated with La-O bonds affirmed the integration of 'Ni'into the La2O3 lattice. The morphological properties and elemental composition were examined through SEM-EDX, which has demonstrated the formation of granular structures with average particle size ranging from ⊠84nm to ⊠126nm. The optical characterization has shown ⊠90% of transmittance in the UV-region, while the energy band gap calculated using tauc's plot analysis has yielded values of 4.01eV, 4.035eV, 4.051eV and 4.056eV for pure, 1% Ni, 3% Ni and 5% Ni doped La2O3 thin films respectively. These findings highlight the significant impact of Ni doping on the structural and optical properties of the prepared films, revealing their potential utility for photocatalytic and optoelectronic applications.

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Track Classification: Physical Sciences

Contribution ID: **110** Type: **Oral**

Electro-Osmotic Peristaltic Propulsion of a PTT Fluid with Ciliary Motion in Rough-Walled Channels with Thermal Radiation: Micro-fluidic and Biomedical Applications.

Abstract:
The present study analyzes the electro-osmotic peristaltic propulsion of a Phan–Thien–Tanner (PTT) viscoelastic bio fluid in rough-walled channels with ciliary motion, incorporating the effects of thermal radiation and heat generation. The model integrates the combined influences of electro-osmosis, peristaltic pumping, and metachronal ciliary activity, which are central to many physiological and biomedical transport processes. Employing the lubrication and long wavelength approximations, the governing nonlinear equations are derived and solved to obtain closed-form expressions for velocity distribution, volumetric flow rate, pressure rise, temperature profile. The incorporation of roughness effects provides a more realistic representation of physiological conduits such as microcirculatory vessels, mucus-lined respiratory channels, and other biological ducts. The results reveal that fluid relaxation time, electro kinetic parameters, and wall roughness substantially alter the flow resistance and pumping efficiency, while thermal radiation and viscous heating significantly influence the temperature field. The findings offer insights into physiological heat and mass transport, including cilia-driven respiratory clearance, microcirculatory flows, and electro kinetically actuated microfluidic systems for drug delivery. The study highlights the importance of coupling electro-osmosis, viscoelasticity, and thermal radiation for accurate prediction of biomedical and thermal engineering transport phenomena.

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Track Classification: Mathematical & Data Sciences

Contribution ID: **111** Type: **Poster**

Advancing Arson Investigation: A Comprehensive Review of Crime Scene Techniques, Analytical Methods, and Evidence Management

Catching arson has numerous constituents and is all about effectively establishing the scene, the cause, and how it occurred. This all-encompassing look highlights the evolution of crime scene tactics, analytical instruments, and management practices involved in managing arson investigations. The approach increasingly presents different technologies that can be utilized for fire scene documentation, including digital forensics and fire pattern analysis, as well as the significance of forensic chemistry in identifying accelerants. It also discusses evidence collection, preservation, and chain of custody methods considered best practices for maintaining the integrity of findings for use in litigation. The paper highlights how fire science and law enforcement skills are exploited with new analytical tools to make arson investigation an interdisciplinary field in precision and efficiency. It demonstrates how, through this analysis, ongoing development in the field may be noted and further recommendations made for improvement of investigatory outcomes concerning arson cases.

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Presenter: R, Dhanush

Track Classification: Forensic Sciences

Contribution ID: **113** Type: **Poster**

A Comprehensive Review of the OSI Reference Model: From Fundamentals to Recent Advancements

The OSI (Open Systems Interconnection) Reference Model by the International Organization for Standardization (ISO) in the late 1970s has been the most significant contributor to network communication protocol standardization and interoperability of various systems. The review paper outlines the OSI model's formal, seven-layered architecture, which encapsulates the data transmission complexities from the physical layer that deals with raw bits to the application layer that specifies user services. It explains the model's encapsulation and de-encapsulation processes towards data integrity and security, its role in network security with encryption, and its flexibility to accommodate new technologies. It reviews the OSI standardization challenges, compares it to practices such as TCP/IP, explores its conformity with new technologies such as wireless sensor networks and cloud computing, and its continued use in computer networking today, making it a useful reference document for researchers, practitioners, and students.

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Track Classification: Forensic Sciences

Contribution ID: **114** Type: **Poster**

Breaking the Pause: CDK9 and the Regulation of Transcription in Health and Disease

During developmental changes and cellular stress responses, this regulatory switch between stopping and active elongation enables rapid gene activation. A disruption in this delicate balance may result in aberrant transcriptional pathways that are connected to the emergence of cancer, according to recent studies. The growing knowledge that P-TEFb's catalytic component, CDK9, presents a potential therapeutic intervention option is particularly pertinent. This review covers the molecular mechanisms by which NELF, DSIF, and P-TEFb coordinate the promoter-proximal pause, how these processes change under stress, and the pathological consequences that arise when pause release is dysregulated in malignant environments.

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Track Classification: Biological Sciences

Contribution ID: **115** Type: **Poster**

AI and Big Data for Ageing Populations: Reimagining Digital Health Ecosystems in the Global South

Abstract
The COVID-19 pandemic accelerated the integration of digital health technologies, repositioning telehealth from a supplementary tool to a primary mode of healthcare delivery. While high-income nations leveraged robust infrastructure and AI-driven platforms, the Global South exposed persistent inequities that disproportionately marginalized older adults. This chapter critically examines these disparities through the lens of AI and Big Data in healthcare diagnostics, focusing on how computational intelligence can transform ageing and care in resource-variable contexts. Emerging technologies, such as artificial intelligence for predictive diagnostics, natural language processing for multilingual consultations, Internet of Medical Things (IoMT) for continuous monitoring, and blockchain for secure data governance, are analyzed for their potential to mitigate systemic gaps. Drawing upon policy frameworks, empirical studies, and grey literature, the chapter identifies structural barriers such as digital illiteracy, infrastructural fragility, and cultural resistance, while highlighting opportunities for creating intelligent, equity-focused healthcare ecosystems. The argument advances a transition from pandemic-driven emergency adoption to sustainable, AI-powered systems that embed socio-cultural realities of older adults in the Global South. By situating ageing at the intersection of health sciences, technology, and social equity, the chapter outlines pathways for building inclusive, ethical, and resilient digital health ecosystems for future populations.
Keywords: Artificial Intelligence in Healthcare, Big Data, Telehealth, Ageing, IoMT, Global South

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Track Classification: Health Sciences

Contribution ID: **116** Type: **Poster**

Harnessing RNA therapeutics: novel approaches and emerging strategies for cardiovascular disease management

Cardiovascular diseases (CVDs) are still the primary cause of death globally, responsible for nearly one-third of global mortality. Although existing pharmacological treatments are effective, they are often limited by side effects, incomplete protection, and their inability to target disease at the genetic level. RNA therapeutics have been a revolutionary method of directly modulating gene expression with the aid of tools like messenger RNA (mRNA), small interfering RNA (siRNA), microRNA (miRNA), antisense oligonucleotides, and RNA aptamers. Recent advances show their potential in treating hypertension, hypercholesterolemia, lipoprotein(a)-related risk, heart failure, and vascular inflammation, with notable clinical breakthroughs being mipomersen, inclisiran, and olpasiran. While promising results exist, delivery, safety, and long-term efficacy are yet to be overcome. Advances like lipid nanoparticles, exosome-based carriers, and ligand-targeted systems are enhancing specificity and stability. In the future, complementarity with personalized medicine, bioinformatics, and artificial intelligence provides the potential to revolutionize CVD management. In this study, the role of RNA therapeutics mechanism as revolutionizing tools for future cardiovascular therapy is emphasized.

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Track Classification: Health Sciences

Contribution ID: **117** Type: **Poster**

Biodegradation, decolourization and detoxification of natural melanoidins from distillery spent wash using Trametes versicolor

Environmental pollution caused by industrial effluents containing coloured compounds is widespread. One such effluent is distillery spent wash, the unwanted residual liquid waste generated during alcohol production, majorly consisting of large amount of brown pigments known as melanoidins. In this study, Trametes versicolor, a white rot fungus, was exploited for
decolourization and degradation of melanoidins present in distillery spent wash. The parameters effecting the decolourization and degradation of the effluent were optimized using Response Surface Methodology involving Box Bhenken design. Maximum decolourization of 71± 2% and COD reduction of 68 ± 2% was observed at 30℃, under shaking condition in acidic pH range of 5-5.5 at an inoculum size of 10 %(v/v). During decolorization, laccase, manganese independent peroxidase was detected however, these ligninolytic enzymes were not responsible for decolourization instead a membrane bound enzyme which was expressed in low nitrogen condition was found to bring about decolourization. Decolourization of sequential aliquots of molasses spent wash by the pellets of Trametes versicolor further confirmed that the process of decolourization was brought about by microbial metabolism and not by sorption. The toxicity of the untreated and treated distillery spent wash was evaluated by performing phytotoxicity using cow pea, (Vigna unguiculata) seeds and fish toxicity studies using comman guppy, Lesbistes reticulates. Ames mutagenecity test performed using tester strain TA-100 evaluated the mutagenecity of the effluent. Liver enzymes which are the biomarkers of stress such as aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase and catalase were estimated from the fish exposed to the various effluents where the enzyme levels in the microbially treated distillery effluent were same as that of the control. The present research shows that treatment of distillery spent wash by using white rot fungal culture Trametes vericolor is not only
feasible but also the most one of the most effective and economically benefiting treatment ‘technology.
Keywords: Distillery spent wash, Response Surface Methodology, Phytotoxicity, Fish toxicity

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Track Classification: Biological Sciences

Contribution ID: **118** Type: **Oral**

Comparative Analysis of Toe Prints Between Male and Female in Gujarat Population

Toe prints, much like fingerprints, consist of friction ridge patterns that remain unique and permanent throughout an individual's lifetime. While fingerprints have been extensively studied for personal identification, toe prints remain underexplored despite their potential forensic value. The present study aims to investigate sexual dimorphism in toe print patterns by comparing their occurrence and distribution between male and female participants. A cross-sectional sample of [insert sample size, e.g., 100 individuals; 50 males and 50 females] was collected using inked impressions on A4 sheets, and the ridge patterns were classified into arches, loops, and whorls. Preliminary findings from previous studies suggest that males exhibit a higher frequency of whorl patterns, whereas females more commonly display loop patterns, though overlaps exist. In addition, foot morphology and indices such as the Chippaux-Smirak Index (CSI) were recorded to provide a complementary metric for sex estimation. The results indicate that toe print analysis, when combined with morphological indices, can serve as a supplementary biometric marker in forensic identification, particularly in cases where fingerprints are unavailable, such as mass disasters, decomposed remains, or burn victims. However, limitations include the relatively small sample size and the absence of large-scale comparative databases, which restrict broader generalizations. Overall, the study highlights that toe prints have the potential to strengthen multidisciplinary approaches to personal identification in forensic science.

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Presenter: Mr MANSURI, Abdulkadir

Track Classification: Forensic Sciences

Contribution ID: **119** Type: **Poster**

Comprehensive insights into microbe-nanomaterial mediated phytoremediation

Xenobiotic pollution is a result of unbridled extension and careless management of industrial, agricultural, and anthropogenic activities that have been an object of concern for decades. The conventional methods of pollutant removal are expensive and time-consuming. Therefore, the implementation of bioremediation can be considered a safe and sustainable technology. Phytoremediation is a popular bioremediation method with low cost, simple operation, esthetic appearance, wide adaptability, and high public acceptance while Phytoextraction is among the most effective and recognized phytoremediation strategy for treating contaminated soil. However, phytoremediation usually needs a long time (several years), and its application is limited by weather conditions, soil quality, and pollutant phytotoxicity Microbe and Nanomaterial mediated phytoremediation is therefore recommended as a more reliable method of removal of contaminants from the environment as they enhance hyperaccumulator biomass production, scavenge pollutants through augmenting antioxidant activities, It provides beneficial aspects corresponding to cost-effectiveness, sustainability, and environmental implications. Hence the present review shed light on the underlying molecular mechanisms involved in microbe-nanoparticle mediated remediation in soil contaminated with heavy metals, as well as the current limitations and challenges that hinder its large-scale application.
Keywords: Phytoremediation, hyperaccumulators, nanotechnology, sustainability

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Presenters: VARGHESE, Dr.Ruby (Jain Deemed to be University); SRIDHAR, Tanya

Track Classification: Biological Sciences

Contribution ID: **120** Type: **Poster**

POSSIBILITIES OF AI IN MARINE WASTE BIOCOMPOSITES

AI is used almost everywhere in our daily lives to transform it for the better, but it can also be used for better sustainable development. Industries associated with waste management require a tool to make sorting, separating, recycling, and reusing much more effective. AI
acts as a saviour here- advancements in AI like NLP (Natural Language Processing) and CV (Computer Vision) prove the rate at which AI is advancing, improving, and enhancing. This will ensure the increased effectiveness of using AI to manage waste. Large quantities of waste, such as landfills and marine waste, result in an obvious degrading effect on our environment. The amount of plastic in oceans is around 1.7 million tonnes, according to Our World in Data, and this is just plastic. An innovative way to look at solving this problem is through biocomposites.
This chapter envisages the role played by biocomposites, which are sustainable and eco-friendly biopolymers that are biocompatible and formed by mixing resin with natural fibres made out of polysaccharides like cellulose. These materials offer an alternative to existing
substances that prove harmful to the environment. This chapter focuses on marine waste as raw materials to make biocomposites with the help of AI, and explores its multifaceted role in various industries
Keywords: Natural Language Processing, Artificial Intelligence, Sustainable development,Marine waste, recycling

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Track Classification: Biological Sciences

Contribution ID: **121** Type: **Poster**

Structural and Optical investigations of sodium zinc-manganese borate glasses

The physical, structural, and optical properties of sodium borate glasses doped with zinc and manganese, with the composition xNa2O-(100-x-y) B2O3 –yM (where x=30, 40, 50 mol%; y=0, 5 mol%; M=Zn, Mn, Zn + Mn) were studied. The samples were prepared using the melt-quenching method. Physical properties of the prepared samples were determined through density measurements, which were performed using the Archimedes method. Structural analysis was conducted using Raman spectroscopy in the range of 50 to 2000 cm-1 at room temperature. UV-Vis-NIR measurements were taken in the range of 190 to 2000 nm, at room temperature. In all the studied samples, it was observed that density increases while the molar volume decreases with an increasing concentration of Na. Various structural units were identified through Raman spectral deconvolution. For example, in borate-based glasses containing Na_2O, ZnO, and MnO_2, Raman peaks between 400–1600 cm^{-1} reveal structural changes in the glass network. Bands near 495–505 cm^{-1} indicate B–O–B bending, while peaks at 720–760 cm^{-1} and 1020–1100 cm^{-1} correspond to BO_4 unit formation and non-bridging oxygens. ZnO and MnO2 contribute sharp peaks at 400 cm^{-1} to 550 cm^{-1}. These Raman features provide insights into glass structure, modifier effects with doping ZnO and MnO2. In the UV analysis, as the Na concentration increases from 30 to 40 mol%, a decrease in the energy bandgap was observed. However, with a further increase in the Na concentration from 40 to 50 mol%, an increase in the energy bandgap was observed. This behavior can be attributed to the formation of different structural units in the borate glasses with changing Na concentration, which acts as a glass modifier. Additionally, in the manganese-doped sodium borate glasses, a continuous decrease in the energy bandgap was observed.

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Track Classification: Physical Sciences

Contribution ID: **122** Type: **Poster**

Artificial Intelligence in Construction 4.0 - A Systematic Review of Current Applications and Future Prospects

This critical review examines the advancement of AI technology driving Industry 4.0 transformation within construction. The study thoroughly examines AI applications in 7 essential areas like structural design and analysis; material design and Optimization; offset manufacturing and automation; smart building operation and health; construction management, progress and safety; architectural design and visualization; sustainability, life cycle analysis and circularity. By covering the complete building life cycle beginning with design to construction, maintenance and decommissioning- this article provides efficient insights by the integration of AI/ML Technology. The review concludes by presenting 3 crucial requirements for effective building industry 4.0 implementation: standardized analysis protocols, cross-disciplinary collaboration frameworks, and ethical implementation guidelines. The review paper summarizes by highlighting promising study direction and evolving technological synergies that may shape future industry advancement.

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Track Classification: Engineering & Technology

Contribution ID: **123** Type: **Oral**

Latent Fingerprint Development Using Plant-Based Powders Derived from Groundnut Shell

Abstract:
Fingerprints are regarded as one of the most dependable means of personal identification in forensic investigations. Latent prints, which are commonly encountered at crime scenes, often need to be developed for proper examination. While conventional fingerprint powders are widely used, their chemical composition may present environmental and health concerns. In this context, the present study examines the potential of groundnut shell, an agricultural by-product, as a sustainable option for latent fingerprint visualization.
Groundnut shells were processed into a fine powder and applied with a soft brush on latent fingerprints deposited over various non-porous substrates, including mirrors, glass slides, tempered glass, and compact discs. The developed impressions displayed clear ridge flow and recognizable pattern details with acceptable contrast and limited background smudging. Minor granularity was observed in certain samples, though the overall print quality was adequate. These findings suggest that groundnut shell powder can serve as an economical and eco-friendly alternative for fingerprint development on non-porous surfaces, with further refinement and comparison against commercial powders required to validate its forensic utility.
Keywords: Latent fingerprints; Groundnut shell powder; Forensic science; Eco-friendly fingerprint powder; Non-porous surfaces; Biodegradable alternatives

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Track Classification: Forensic Sciences

Contribution ID: **124** Type: **Oral**

AN INNOTIVE BIOGENIC FINGERPRINT POWDER DERIVED FROM SEASHELLS FOR LATENT PRINT IDENTIFICATION

Fingerprint identification plays a vital role in forensic investigations, yet traditional fingerprint powders often rely on synthetic chemicals that are costly and environmentally harmful. This pilot study presents an eco-friendly alternative by preparing a fingerprint powder derived from discarded seashells, which are naturally rich in calcium carbonate ($CaCO_3$). The collected shells were cleaned, dried, ground, and processed into a fine powder using simple laboratory methods. The prepared powder was tested on latent fingerprints deposited on non-porous surfaces such as glass, mirrors, glass slides, tempered glass and compact discs. Its effectiveness was evaluated in terms of ridge clarity, contrast, and powder adherence. The results demonstrated that the seashell-based powder successfully developed clear ridge details with good adhesion, highlighting its potential as a sustainable, low-cost material for forensic applications. This study emphasizes the scope of repurposing marine biowaste into a green forensic tool, aligning with environmentally conscious practices and supporting crime scene investigations.

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Track Classification: Forensic Sciences

Contribution ID: **125** Type: **Oral**

Influence of CuO Concentration on the Electrical Conductivity and Structural Properties of Lithium Borate Glasses

Borate glasses are notable for their unique combination of properties, including a low melting point, high transparency, large refractive index, and good thermal stability. Lithium borate glasses have attracted considerable attention due to their significant ionic conductivity and potential applications in solid-state batteries and electrochemical devices. Incorporating transition metal oxides such as CuO into the lithium borate matrix can significantly influence the glass structure and ionic transport properties.
The physical, structural, electrical, and optical properties of the (60-x)Li2O-40B2O3-xCuO glasses with x = 0, 5, 10, and 15 mol% were investigated. The glasses were prepared by the melt-quenching method. Samples were characterized by X-ray diffraction, density, Raman, FTIR, EPR, and impedance measurements. No sharp Bragg peaks were observed in the X-ray diffractograms of the prepared samples. The density of the prepared samples monotonically increases with increasing concentration of CuO. The molar volume, on the other hand, increases with an increase in CuO concentration till 10 mol% and decreases with further increase in CuO in the glasses. FTIR and Raman measurements were done in 400 to 4000 cm-1 to 50 to 2000 cm-1, respectively. The deconvolution of the Raman and FTIR spectra was carried out for all the samples to get the Gaussian peaks from which structural information was retrieved. Electrical conductivity measurements were done in the frequency range 100 Hz to 5 MHz at room temperature. The results show that increasing the copper ions in the glasses at the expense of lithium ions decreases the electrical conductivity due to the ion blocking effect. The Nyquist plots, electric modulus spectra of all the samples were used for finding the relaxation mechanism.

Keywords: Copper doping, electric modulus, Nyquist analysis, energy storage applications

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Track Classification: Physical Sciences

Contribution ID: **126** Type: **Oral**

Analysis of Toe Prints Between Male and Female in Karnataka Population Comparative

In both anthropology and forensic science, foot length analysis is an essential tool, especially for estimating stature and identifying individuals. The aim of this study's foot length analysis is to use anthropometric techniques to establish a relationship between a person's stature and foot length. Regression equations that reliably predict height can be created by measuring the foot dimensions of both male and female participants. This method supports studies of gender differentiation in addition to forensic investigations in which partial remains or footprints are found. Combining foot length analysis with other metrics like foot width and the Chippaux-Smirak Index (CSI) improves identification accuracy and expands the use of biometrics in criminal and medico-legal settings.

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Co-author: CHRISTAL, gloria

Presenter: H R, Kruthi

Track Classification: Forensic Sciences

Contribution ID: **127** Type: **Poster**

Influence of Citrus Peel Extract on Xylanase Enzyme Activity: Implications for crop growth

Our study investigates the effect of orange peel extract on the activity of xylanase enzyme, aiming to evaluate the potential of orange peel as a stimulant component in enzyme formulations for enhancing the growth of commercially important crops. Xylanase plays a critical role in the breakdown of hemicellulose, thereby improving nutrient availability and soil health. Orange peel, a readily available agricultural waste product, is rich in bioactive compounds such as flavonoids, essential oils, and polyphenols, which may influence enzymatic activity. The present research involves preparing an aqueous extract of orange peel and assessing its impact on purified xylanase activity through standard enzyme assays. The objective is to determine whether the extract acts as an activator or inhibitor of xylanase, providing insight into its potential use as a natural bio stimulant in agriculture. By exploring the interaction between orange peel extract and xylanase, the study aims to identify sustainable and cost-effective methods to boost enzyme efficiency for crop growth enhancement. The findings could contribute to developing eco-friendly agricultural inputs, utilizing citrus waste to support crop productivity. Further experimental results and analysis will clarify the role of orange peel extract on xylanase enzyme activity and its practical implications in agriculture

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Track Classification: Biological Sciences

Contribution ID: **128** Type: **Oral**

Enhanced Structural, Optical, and Photocatalytic Performance of Sm3+-Doped LaFeO3 Nanoparticles Synthesized via Solution Combustion

Sm3+-doped LaFeO3 nanoparticles were synthesized via a solution combustion method using isoleucine as fuel. The influence of Sm^{3+} incorporation (0–9 mol%) on the structural, morphological, optical, and photocatalytic properties was systematically investigated. X-ray diffraction (XRD) confirmed the formation of single-phase orthorhombic perovskite structures with reduced crystallite size upon Sm3+ doping. Rietveld refinement revealed variations in lattice parameters, strain, and dislocation density with increasing dopant concentration. Scanning electron microscopy (SEM) showed porous, agglomerated morphologies, while energy-dispersive X-ray spectroscopy (EDS) confirmed the elemental composition. Diffuse reflectance spectroscopy (DRS) indicated a reduction in optical band gap with Sm3+ substitution, enhancing visible-light absorption. X-ray photoelectron spectroscopy (XPS) revealed the presence of mixed-valence Fe2+/Fe3+ states and abundant surface oxygen, contributing to improved redox activity. BET analysis confirmed mesoporous structures with enhanced surface area at optimal doping. Photoluminescence (PL) spectra showed defect-related broad emissions, with quenching behavior at higher doping levels, suggesting improved charge separation efficiency. Photocatalytic experiments demonstrated significant degradation of Indigo Carmine dye under visible light, with maximum activity observed at 9 mol% Sm3+ doping. Furthermore, elevating the Sm3+ levels in the La1-xSmxFeO3 resulted in enhanced photocatalytic decomposition of the indigo carmine dye, exhibiting a maximum efficacy of 94 % at neutral pH and a stabilization period of 70 min under visible light. The enhanced photocatalytic performance is attributed to reduced particle size, increased surface area, optimized band gap, and defect-mediated charge carrier dynamics. These results highlight Sm3+ -doped LaFeO3 as a promising photocatalyst for wastewater treatment and related environmental applications.

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Track Classification: Physical Sciences

Contribution ID: **129** Type: **Oral**

Traceroute Analysis in Mobile Forensics Using AT&T Video Optimizer

Network traffic analysis represents an important element of mobile forensics that can provide an understanding of device communication patterns, application activity, and possible threats. Traceroute analysis, in particular, can determine network routes, the nodes in transition, and endpoint states, all of which can contribute critical forensic evidence. However, utilizing any model of this information, across multiple mobile applications like iPhones, rooted or locked Android devices, can be difficult because of the imbalances in system access as well as the variances in security and evidence retrieval.

In this study, we explore the capability of AT&T Video Optimizer, an open-source diagnostic tool typically used in mobile applications to analyze mobile application performance, to capture and analyze traceroute data in various device states. Based upon running test and trial environments on such distinctly different environments like iOS and Android, while being locked and rooted, we analyze the extent to which network traceroutes can be identified and analyzed for forensic collection. Our research implementation employs data collection that is non-intrusive, maintaining forensic integrity and consideration for any real-world applicability in investigative scenarios.

Consequently, the analysis is expected to demonstrate the feasibility and limitations of using the AT&T Video Optimizer as a network collector and analysis tool in mobile forensic investigations, especially in cases when traditional models were limited. This effort helps to close the gap between forensic probing and diagnostic performance tools by showing how available utilities can be diverted for digital evidence collection.

Keywords: Mobile Forensics, Network Traceroute, AT&T Video Optimizer, iOS, Android, Locked Devices, Rooted Devices

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Presenter: YOGA, Sanjana

Track Classification: Forensic Sciences

Contribution ID: **130** Type: **Poster**

Traceroute Analysis in Mobile Forensics Using AT&T Video Optimizer

Network traffic analysis represents an important element of mobile forensics that can provide an understanding of device communication patterns, application activity, and possible threats. Traceroute analysis, in particular, can determine network routes, the nodes in transition, and endpoint states, all of which can contribute critical forensic evidence. However, utilizing any model of this information, across multiple mobile applications like iPhones, rooted or locked Android devices, can be difficult because of the imbalances in system access as well as the variances in security and evidence retrieval.

In this study, we explore the capability of AT&T Video Optimizer, an open-source diagnostic tool typically used in mobile applications to analyze mobile application performance, to capture and analyze traceroute data in various device states. Based upon running test and trial environments on such distinctly different environments like iOS and Android, while being locked and rooted, we analyze the extent to which network traceroutes can be identified and analyzed for forensic collection. Our research implementation employs data collection that is non-intrusive, maintaining forensic integrity and consideration for any real-world applicability in investigative scenarios.

Consequently, the analysis is expected to demonstrate the feasibility and limitations of using the AT&T Video Optimizer as a network collector and analysis tool in mobile forensic investigations, especially in cases when traditional models were limited. This effort helps to close the gap between forensic probing and diagnostic performance tools by showing how available utilities can be diverted for digital evidence collection.

Keywords: Mobile Forensics, Network Traceroute, AT&T Video Optimizer, iOS, Android, Locked Devices, Rooted Devices

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Presenter: A M, Monisha

Track Classification: Forensic Sciences

Contribution ID: **132** Type: **Poster**

The Biopsychology of Enzymatic Degradation

Enzyme degradation is one of the important central processes that controls the chemical surrounding of the nervous system. Enzyme plays as bio catalysts that end neurotransmitter signals and also clear possible toxic proteins and maintains synaptic homeostasis. Imbalance of these processes is closely connected to cognitive end, mental illness, and neurodegenerative disordes, placing enzyme breakdown at the joining of biochemistry and psychology. It plays a important role in making neural signaling, protein homeostasis, and sensitivity to neurological disorders. The present review discusses about the role of four enzymes involved in the control of brain function and associated pathology. Studies of acetylcholinesterase activity have highlighted how catalytic efficiency varies with substrate concentration, pH, and temperature, while also revealing the role of specific inhibitors in modulating cholinergic signaling—an essential pathway in cognitive function. Investigations into the proteolytic degradation of amyloid-β peptides have demonstrated that monomeric forms are more readily broken down than aggregated species, providing insight into the molecular basis of amyloid accumulation observed in Alzheimer's disease. Additionally, monoamine oxidase assays have underscored substrate-dependent kinetics and selective inhibition, particularly in the enzymatic breakdown of dopamine and serotonin, with implications for understanding the biochemical underpinnings of mood regulation and psychiatric

disorders. Together, these findings offer a framework for exploring enzyme-mediated pathways central to neurobiology and neuropathology.

Keywords: Acetylcholinesterase, Amyloid-β degradation, Monoamine oxidase, Enzyme kinetics, Neurodegeneration, Cholinergic signaling

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Track Classification: Health Sciences

Contribution ID: **133** Type: **Poster**

Analysis and Forecasting of Stock price based on a univariate time series approach.

This paper examines how three time series modelling techniques Autoregressive Integrated Moving Average (ARIMA), Artificial Neural Networks (ANN) and a hybrid ARIMA-ANN model will help predict the stock price of Tata Consultancy Services (TCS). To understand the linear dynamics of the stock price series, the ARIMA model is used, and to learn the nonlinear relationships that exist in the data, the ANN model is used. In order to improve the performance of the forecasts, hybrid ARIMA-ANN model is developed that incorporates the advantages of the two approaches. The results of the experiment show that despite the good results of ARIMA in the modeling of linear structures and ANN in the modeling of nonlinear patterns, the hybrid model ARIMA-ANN provides results that are more reliable and valid than the results of both other models. The findings highlight the promise of hybrid models in financial time series prediction and give useful lessons to investors and scholars working in the field of stock market prediction.

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Track Classification: Mathematical & Data Sciences

Contribution ID: **134** Type: **Poster**

Biochar and Quantum Nanoparticles: Transforming Agriculture for a Sustainable Future

The integration of biochar with quantum nanoparticles (QNPs) presents an innovative strategy for advancing sustainable agricultural practices. Biochar, a carbon-rich material derived from Silkworm excreta, is well-regarded for its ability to enhance soil fertility, water retention, and microbial health. When combined with quantum nanoparticles, biochar's benefits can be greatly amplified, unlocking fresh avenues for precise nutrient management, increased crop productivity, and soil restoration. Quantum nanoparticles, characterized by their unique quantum properties including a high surface area, tunable chemical reactivity, and enhanced transport capabilities, can be engineered for targeted nutrient release, ensuring that plants receive the required nutrients at optimal times. Furthermore, QNPs show promise in boosting microbial activity, accelerating composting, and aiding in the remediation of contaminated soils. The synergy between biochar and quantum nanoparticles holds significant potential for climate-smart agriculture, providing sustainable solutions for nutrient recycling, water conservation, and reducing dependence on synthetic fertilizers. However, challenges related to the environmental impact, long-term stability, and cost-effectiveness of these quantum nanomaterials must be thoroughly investigated through extensive research and field trials.

Keywords: Biochar, quantum nanoparticles, soil fertility, water retention, Synthetic fertilizers.

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Track Classification: Biological Sciences

Contribution ID: **135** Type: **Poster**

”Bioactive Compounds from Coconut and Arecanut: Exploring By-Products for Value-Added Applications”

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Abstract:
Primary metabolites present in plants are largely used directly in growth and metabolism of various phases of plant tissues. Secondary metabolites which are organic small molecules are not directly involved and they mediate functions involved in adaptation of plants to environmental changes. Coconut and arecanut are important commercial crops. Betel nut is the economic part of the arecanut whereas every part of coconut is largely used by humans. As a valuable crop both are known for its range of medicinal properties that includes antioxidant and anti-inflammatory functions. Significant world-wide demand exists for functional molecules that are plant-based which are found to be abundance in these crops. In addition to the main products the by-product generated also contains huge bioactive compounds. It provides additional income for farmers and entrepreneurs engaged in processing and marketing. Thus, identifying and exploiting bioactive compounds from by-products for transformation into value-added products holds significant importance.
Key words: Coconut, bioactive compounds, secondary metabolites, antioxidants, anti-inflammatory

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Presenter: Ms G, Laithya

Track Classification: Biological Sciences

Contribution ID: **136** Type: **Oral**

Enhancing DES Architecture by Replacing XOR with NAND in the Feistel Network

The Data Encryption Standard (DES) has historically been a fundamental symmetric-key cryptographic algorithm, distinguished by its sixteen-round Feistel network that combines substitution via S-boxes, permutation by P-boxes, and a mixing function rooted in bitwise XOR operations, delivering a balance of operational efficiency and security suitable for its time. However, the fixed 56-bit key length and advances in computational power have exposed DES's vulnerability to brute-force attacks, pressing the need for alternative approaches to enhance or rethink its core mechanisms. This research introduces a novel adaptation to the DES framework by replacing the traditional XOR operation in the Feistel round function with the NAND logical gate, a universal gate known for its functional completeness and inherent non-linearity. By embedding NAND into the mixing stage, the design aims to infuse stronger non-linear transformations into the encryption process while preserving the established structure of key scheduling, expansion, S-box substitution, and permutation layers. The modified algorithm retains the fundamental Feistel symmetry and operates over sixteen rounds where the right half of the plaintext undergoes expansion, subkey mixing via NAND, substitution, permutation, and subsequent NAND-based combination with the left half. This substitution introduces a distinctly different bitwise transformation compared to standard DES, resulting in ciphertext outputs that markedly deviate from traditional patterns and thereby potentially augmenting resistance to certain cryptanalytic attacks, including linear and differential methods. Experimentally, the system demonstrates consistent and reversible encryption-decryption cycles for fixed plaintext-key pairs, substantiating the feasibility of NAND as a viable alternative logical operator within the Feistel context. Moreover, the use of NAND is particularly promising for lightweight cryptographic applications, especially in hardware-constrained environments such as Internet of Things (IoT) devices, given NAND gates'efficiency and dominance in digital circuit design. Nonetheless, the transition from XOR to NAND alters diffusion properties and error propagation dynamics, necessitating thorough cryptanalytic evaluation to assess possible vulnerabilities, biases, or novel strength characteristics introduced by this logical shift. This study thus underscores the adaptability of classical cryptographic frameworks to alternative algebraic primitives, encourages broader exploration of logical operations in cipher construction, and lays groundwork for future development of hardware-optimized, secure encryption systems that balance practical efficiency with cryptographic robustness.

Keywords: Data Encryption Standard (DES), symmetric-key cryptography, Feistel network, NAND gate, logical mixing, XOR replacement, block cipher, S-box, lightweight cryptography, encryption-decryption cycle, cryptanalysis, IoT security, hardware-efficient cryptography.

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Presenter: AJAI, Alwin (JAIN (Deemed-to-be University))

Track Classification: Forensic Sciences

Contribution ID: **137** Type: **Poster**

An overview on polyurethane-degrading enzymes

Polyurethanes are a class of multifaceted synthetic polymers joined by carbamate (urethane) links, which can be flexible as well as rigid. Once considered an advantage, polyurethanes cannot be easily degraded. The accumulation of plastic has become one of the major global concerns and enzymatic degradation is proving to be an effective solution. This review aims to provide an overview on the efficiency, recent discoveries and advancements of enzymes in degrading various polyurethane (PU) materials, underlying molecular mechanism of degradation process, characteristics of enzymes produced by filamentous fungi, and assessment of their ecological safety. Together, these investigations shed light on the efficiency of enzymatic PU degradation and track the evolution of research on these enzymes. Despite all the advancements and research on enzymatic degradation, there are still many challenges faced regarding the cost, degradation of complex PU, unfavourable environmental conditions, and so on. This review seeks to bridge the gaps in studies conducted on enzymes and to provide new direction for research
Keywords: Polyurethane- -degrading enzymes, Enzyme catalysis, Biodegradation, Bioremediation

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Track Classification: Biological Sciences

Contribution ID: **138** Type: **Poster**

Malware Reverse Engineering: Static Analysis for Threat Detection

Malware reverse engineering through static analysis is a vital cybersecurity process that involves dissecting malicious software, such as viruses, ransomware, and trojans, without executing them to uncover their design, functionality, and attack vectors. By employing tools like disassemblers and decompilers, analysts examine binaries or Android APKs, scrutinizing elements like the AndroidManifest.xml for suspicious permissions or code for obfuscated logic, enabling rapid identification of threats through comparison with malware signatures. This safe and efficient method supports initial triage and large-scale analysis but struggles with runtime behaviors and advanced obfuscation, necessitating complementary dynamic and manual analysis for comprehensive threat mitigation. As Android remains a prime target, static analysis, enhanced by evolving tools and threat intelligence, strengthens detection and countermeasures, safeguarding digital systems from sophisticated cyberattacks.

Keywords: Malware, Reverse Engineering, Static Analysis, Cybersecurity, Android APKs, Decompilers, Disassemblers, AndroidManifest.xml, Obfuscation, Threat Intelligence, Malware Signatures, Dynamic Analysis, Cyberattacks, Detection, Countermeasures.

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Track Classification: Forensic Sciences

Contribution ID: **139** Type: **Oral**

"Sustainable Soil Solutions: Harnessing Bio-Silica from Millet Husk"

Abstract
Millet husk, an abundantly available agro-waste, serves as a renewable source for bio-silica synthesis, supporting sustainable soil management. This study synthesized bio-silica from millet husk using acid leaching and calcination methods. The presence and purity of bio-silica were confirmed through SEM, EDAX, XRD, and FTIR analyses, which revealed its amorphous nature and silica-rich composition. When applied to soil, bio-silica improves porosity, enhances nutrient uptake, and strengthens plant tolerance to abiotic stress, thereby reducing dependency on chemical fertilizers. Its role as a biofertilizer offers an eco-friendly approach that promotes circular economy principles by converting agro-residues into value-added products. Furthermore, millet husk bio-silica demonstrates multifunctional potential in agriculture, water purification, and nanotechnology. By valorizing waste and improving soil health, this work aligns with the Sustainable Development Goals, particularly those addressing food security, climate resilience, and responsible resource use.
Keywords: Bio-silica, Millet husk, Acid leaching, Calcination, Sustainable agriculture

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Track Classification: Chemical Sciences

Contribution ID: **140** Type: **Oral**

Uncovering Digital Trails in IoT networks: AI-enhanced signal field-based Network Forensics

Network forensics represents an essential area within digital forensics that emphasizes the gathering, documentation, and examination of network traffic to identify the sources and techniques behind security incidents or breaches of policy. In contrast to evidence stored on disks, network information is transient and constantly changing—often retrievable only if it has been proactively captured using tools like packet sniffers or flow capture systems. The research focuses on tackling present difficulties, including the examination of encrypted traffic, handling large data streams, and addressing anti-forensic tactics, while showcasing cutting-edge solutions such as radio signal strength-based packet sniffing, AI-enhanced anomaly detection, machine learning-driven pattern identification, and sophisticated decryption methods—particularly in cloud and IoT settings. This study intends to function as a straightforward, summarised guide for incident responders and forensic professionals aiming to comprehend the evolving landscape of network-oriented digital investigations.

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Track Classification: Forensic Sciences

Contribution ID: **141** Type: **Poster**

Zero Trust Architecture in Digital Forensics: Underlying Vulnerabilities.

The increasing sophistication of cyber incidents and distributed infrastructures has intensified the need for security models that support both resilience and evidentiary reliability. Zero Trust Architecture (ZTA), built on the principle of "never trust, always verify,"represents a significant departure from perimeter-based security by embedding continuous authentication, dynamic policy enforcement, and least-privilege access across systems. For digital forensics, ZTA offers distinct advantages: comprehensive logging, high-resolution telemetry, and strong identity verification generate valuable metadata that strengthens attribution, incident reconstruction, and legal admissibility. Proactive evidence capture and compliance-oriented monitoring further contribute to forensic readiness. However, ZTA also introduces challenges that complicate the reliability of digital evidence. Dependence on identity management systems risks compromised audit trails, insider misuse may appear legitimate within logs, and policy misconfigurations or excessive data volumes can obscure relevant artifacts. Moreover, issues of log integrity, third-party dependencies, and jurisdictional restrictions in cloud environments may undermine evidentiary trust. This paper contributes by systematically analyzing these forensic implications, highlighting both the strengths and vulnerabilities of ZTA, and proposing safeguards such as tamper-evident storage, behavioral analytics, automation, and integrated forensic readiness measures. ZTA, when fortified with these safeguards, can evolve from a security paradigm into a framework that enhances both cyber defense and forensic reliability.

Keywords: Zero Trust Architecture (ZTA); Digital Forensics; Forensic Readiness; Evidence Integrity; Insider Threats; Cybersecurity Investigations

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Track Classification: Forensic Sciences

Contribution ID: **142** Type: **Oral**

Supervised learning approach for estimating human height from footprint measurements

Stature estimation plays a crucial role in forensic anthropology, particularly when identification has to rely on limited biological evidence such as footprints. Traditional regression approaches often struggle with accuracy, whereas machine learning (ML) methods can capture more complex relationships within biometric data, offering improved prediction. In this pilot study, we explored the use of supervised ML techniques—specifically Random Forest and Decision Tree models—for estimating stature from a dataset of 100 footprint samples. Foot length and breadth were considered as the main predictive features. The dataset was divided into training and testing sets, and model performance was evaluated using commonly applied error metrics. Among the methods tested, one algorithm demonstrated comparatively better outcomes, suggesting that ML-based approaches could be promising tools for forensic stature estimation.

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Track Classification: Forensic Sciences

Contribution ID: **143** Type: **Poster**

JAMMING RESPONSE SYSTEM (THEORETICAL)

Jamming is a deliberate attempt to disrupt wireless communication by transmitting interfering signals on specific frequencies. With the growing reliance on wireless systems in critical infrastructures, the threat of malicious signal interference has become a major concern for security and defense. Traditional jamming devices block communication across wide frequency ranges, but this often results in excessive collateral disruption. This paper focuses on the design of a Jamming Response System (JRS) using microcontroller-based architectures that introduces an adaptive and directional approach to signal jamming. The system analyses the frequency spectrum, detects suspicious activity, and activates targeted jamming only upon confirmation of a threat. This paper covers techniques such as frequency monitoring, dynamic frequency locking, adaptive filtering, power modulation, and directional antenna control for precision jamming. Recent advancements such as machine learning-based anomaly detection are also discussed to enable the system to differentiate between benign and malicious transmissions. The goal of this paper is to provide a theoretical design and simulation framework for intelligent and responsible jamming systems, highlighting their applications in cybersecurity, military defense, and critical infrastructure protection. Comparative discussion of adaptive jamming with conventional jamming methods is also included.

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Track Classification: Forensic Sciences

Contribution ID: **144** Type: **Oral**

Advanced Network Traffic Monitoring Tool

Growing cyber threats and the proliferation of complex network attacks present critical challenges for organizations seeking robust network defense. The Advanced Network Traffic Monitoring Tool is a Python-based solution engineered for real-time capture, analysis, and filtering of network traffic, with automated detection of suspicious activities. Integrating Wireshark command-line utilities and the Scapy library, it enables live packet capture, time-based filtering, trace merging, and multithreaded port scanning—all accessible via a streamlined Gradio web interface. This unified platform addresses usability gaps in traditional tools like Wireshark and Nmap, providing flexible monitoring, active probing, and instant threat alerts. Automated correlation of scanned ports with a database of high-risk indicators enhances detection of command & control, exfiltration, and lateral movement attempts. Modular architecture and customizable design ensure adaptability to emerging security requirements. The tool empowers both new learners and experienced security professionals to conduct comprehensive network audits, incident investigations, and proactive threat hunting efficiently.
Keywords: Network Traffic, Packet Capture, Wireshark CLI, Scapy, Port Scanning, Suspicious Activity Detection, Gradio Interface, Multithreading, Network Forensics, Real-Time Monitoring.

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Track Classification: Forensic Sciences

Contribution ID: **145** Type: **Oral**

Decentralized Anti-Counterfeiting System: Ethereum Smart Contracts and QR Code Integration for Product Authentication

The escalating threat of product counterfeiting demands sophisticated technological interventions to protect consumer interests and manufacturer intellectual property. This research proposes a decentralized authentication ecosystem leveraging distributed ledger technology and machine-readable optical codes for comprehensive counterfeit prevention.

The methodology employs Ethereum blockchain infrastructure to create immutable product registries through smart contract deployment, while QR code technology serves as the consumer-facing authentication interface. The system architecture integrates analytical frameworks including Open Refine for data preprocessing and Elasticsearch for high-performance product information retrieval and comparison. The authentication workflow encompasses cryptographic identifier generation, optical code encoding, blockchain transaction processing, and real-time verification protocols. Advanced data analytics capabilities enable sophisticated pattern recognition for identifying counterfeit products through comparative analysis of product attributes and supply chain metadata. Implementation results validate the framework's effectiveness in establishing tamper-resistant product authentication, demonstrating significant improvements in counterfeit detection accuracy and system reliability. The proposed solution offers scalable deployment across various industry verticals, providing a foundation for next-generation supply chain security and consumer protection mechanisms.

Keywords: Ethereum blockchain, smart contracts, QR code authentication, counterfeit prevention, distributed ledger technology, product verification, anti-counterfeiting systems, cryptographic identifiers, Open Refine, Elasticsearch, supply chain traceability, blockchain security, digital authentication protocols, tamper-resistant systems, real-time verification, data preprocessing, pattern recognition algorithms, optical code technology, decentralized authentication, immutable ledgers, consumer protection, brand security, fraud detection, supply chain integrity, blockchain deployment, product authenticity

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Track Classification: Forensic Sciences

Contribution ID: **146** Type: **Poster**

Electrostatics in a Crowded World: Bridging Theory and Cellular Reality in Macromolecular Interactions

Electrostatic interactions are fundamental drivers of macromolecular structure, recognition, and function. The pioneering work of Sharp and Honig established how these forces can be rigorously described through continuum electrostatics and molecular dynamics, offering predictive frameworks to quantify the delicate balance between charged residues and the surrounding solvent. Complementing this theoretical foundation, Mittal's contributions underscore the cellular context —where macromolecules exist in an environment of extreme crowding, confinement, and heterogeneity. Such conditions modulate electrostatic interactions in ways that can enhance stability, alter conformational landscapes, or disrupt associations altogether. Together, these perspectives reveal that electrostatics cannot be divorced from the physicochemical reality of the cell. While theoretical models provide mechanistic precision, the principle of macromolecular crowding captures the emergent complexity of life at the molecular scale. An integrated view highlights that the behavior of biological macromolecules is governed not only by long-range electrostatic forces, but also by the crowded, fluctuating milieu that defines living matter.
Key words: Electrostatic interactions, Macromolecular crowding, Continuum electrostatics, Molecular dynamics, Biomolecular interactions, Protein stability

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Track Classification: Physical Sciences

Contribution ID: **147** Type: **Poster**

Router Firmware Security: Bridging the Gap Between Network Infrastructure and Digital Forensics

Router firmware has emerged as India's most critical yet overlooked cybersecurity vulnerability, creating a dangerous blind spot that threatens millions of connected devices across homes and businesses. This embedded software, which controls the fundamental operations of networking equipment, remains largely ignored despite being the primary gateway through which all digital traffic flows. The situation is particularly alarming in India due to widespread deployment of legacy hardware, inconsistent firmware update practices, poorly configured default settings, and limited cybersecurity awareness among everyday users. Common vulnerabilities plaguing Indian networks include hardcoded or default passwords, weak encryption protocols, insecure update mechanisms, and the dangerous practice of storing sensitive credentials in plain text. Recent security advisories have exposed these theoretical risks as real-world threats: Digisol's DG-GR6821AC XPON ONU routers, widely deployed by Indian ISPs, contain multiple critical flaws including hardcoded root access credentials and unencrypted password storage. Similarly, TP-Link's popular Archer C50 router uses a static, hardcoded DES encryption key to "protect" configuration files, making it trivial for attackers to decrypt administrative and Wi-Fi credentials offline. CERT-In has responded by assigning CVE identifiers to these vulnerabilities and issuing urgent patching recommendations, though many affected devices have reached end-of-life status, forcing users toward expensive hardware replacement rather than simple software updates. Once cybercriminals exploit these firmware vulnerabilities, they can install persistent malware that survives reboots, factory resets, and power cycles, effectively transforming compromised routers into permanent surveillance outposts for long-term data theft, botnet recruitment, and staging attacks against other network-connected devices. India faces significant structural challenges in addressing this threat landscape, as proprietary firmware complicates security analysis, specialized reverse-engineering tools remain uncommon, and many organizations delay updates due to operational concerns or lack of awareness. The solution requires fundamental changes across multiple levels: users must abandon default credentials, enable automatic updates, and implement network segmentation; manufacturers need secure coding practices including cryptographic firmware signing and transparent vulnerability disclosure; and India's incident response capabilities must evolve to include firmware acquisition and analysis as standard procedures. With India's rapid IoT adoption and smart device proliferation, router firmware vulnerabilities create cascading risks that can compromise entire digital ecosystems, making coordinated improvements across policy, engineering, and operational domains essential for reducing attacker persistence and strengthening public confidence in digital services.

Keywords: Persistent malware routers, firmware anti-forensics, digital forensics India, IoT security India, firmware update best practices, firmware reverse engineering, network security India, secure firmware update, vulnerability management India

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Track Classification: Forensic Sciences

Contribution ID: **148** Type: **Poster**

Comparative Study on Extraction of Bioactive Compounds and Biological Activities of Coconut Husk and Arecanut Husk- A Step Towards Solid Waste Management

Abstract:
Sustainable utilization and environmental concerns have become a major challenge in agricultural and domestic wastes. Two most commonly cultivated plantation crops worldwide in tropical region belonging to Arecaceae family are Coconut and Arecanut. About 40% of coconut husk and 65-80 % of arecanut constitute to the agrarian waste. The lignocelluloses fibres present in these husks are exploited for the production of papers, biofuels and bioadsorbents. The husks of coconut and arecanut are an excellent source of numerous bioactive components like phenols, alkaloids, flavonoids, reducing sugars, tannins etc. The present research work focuses on the methanolic soxhlet extraction of the bioactive components of coconut and arecanut husks. Qualitative analysis of both the bioactive components showed the presence of various secondary metabolites. The bioactive components were screened for antimicrobial properties using disc diffusion method and minimum inhibitory concentration using both gram positive and gram negative bacteria. We also elucidated the antioxidant and anti inflammatory properties of coconut and areca nut husks by DPPH and Protein Denaturation Assays. The findings highlight the bioactive potential of these two husks and their antimicrobial, antioxidant and anti inflammatory properties encouraging its application in medical field. The work highlights the potential of valorizing material in alignment with sustainability and waste management to promote circular economy.
Key words: Coconut, Arecanut, Sustainability, Bioactive compounds, Antimicrobial, Antioxidant

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Track Classification: Biological Sciences

Contribution ID: **149** Type: **Poster**

Structural and thermal studies of barium doped phosphate bioactive glasses

Phosphate glasses doped with barium were synthesized using conventional melt quench technique. Glasses were subjected to in vitro bioactivity test and hence, were found to be bioactive.
In this article, the structural and thermal properties analysed using FTIR and MDSC are discussed. All functional groups of the glasses were obtained and modifications were observed due to bioactivity. The metrics related to fragility of glasses found using MDSC results showed that the glasses are strong.

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Track Classification: Physical Sciences

Contribution ID: **150** Type: **Oral**

Hypotaurine protects viability and mitochondrial membrane potential during cryopreservation of Sheep spermatogonial stem cells

Spermatogonial stem cells (SSCs) are germline stem cells that form the foundation of spermatogenesis and are essential for maintaining male fertility throughout life. For their effective application in animal genetics and reproductive biotechnology, it is crucial to preserve SSCs over long periods while ensuring maximum viability and cryosurvival. Since cryopreservation induces oxidative stress, the present study was undertaken to optimize cryopreservation media by supplementing antioxidants. Specifically, the objective was to evaluate the effect of different concentrations of hypotaurine on reducing cryoinjury during SSC cryopreservation.

Sheep SSCs (n = 6) were isolated, purified, cultured, and cryopreserved using a basal cryopreservation medium composed of 10% DMSO, 40% FBS, and 200 mM trehalose. The antioxidant hypotaurine was supplemented at concentrations of 1, 5, 10, 15, 20 and 50 mM, while the control group was maintained without hypotaurine. Post-thaw cell viability was assessed using the trypan blue exclusion test, reactive oxygen species (ROS) production was measured via H2DCFDA staining, and mitochondrial membrane potential (MMP) was evaluated using JC-1 staining. Quantification of ROS and MMP-positive cells were performed by flow cytometry

The post-thaw viability (%) was significantly higher ($P<0.05$) in cryomedia containing hypotaurine at 50 mM (69.00 ± 1.66) when compared to the control group (56.12 ± 6.08). Moreover, SSCs cryopreserved with hypotaurine at 1 mM (28.61 ± 1.95), 5 mM (27.17 ± 2.21), 10 mM (22.92 ± 2.07), 15 mM (24.25 ± 2.34), 20 mM (25.86 ± 1.23), and 50 mM (27.84 ± 1.37) showed a significantly lower ($P < 0.01$) proportion of ROS-positive cells compared to the control group (41.17 ± 2.72). In addition, the JC-1 polymer-to-monomer ratio, an indicator of MMP, was significantly higher in 15 mM (1.18 ± 0.02; $P < 0.05$), 20 mM (1.21 ± 0.07; $P < 0.05$), and 50 mM (1.39 ± 0.08; $P < 0.01$) hypotaurine supplemented as compared to control group (1.00 ± 0.07). These findings indicate that the inclusion of 50 mM hypotaurine in the cryopreservation medium is effective in protecting the viability and quality of SSCs during cryopreservation.

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Track Classification: Biological Sciences

Contribution ID: **151** Type: **Poster**

Skin Anti-Aging Efficacy of Enzyme-Treated Supercritical Caviar Extract

Skin aging is a gradual and multifactorial process influenced by intrinsic changes and external stressors such as sun exposure and pollution. These factors contribute to dryness, wrinkles, reduced firmness, and uneven skin tone. The present work explores the potential role of enzyme-treated caviar extract, obtained through a clean and advanced extraction method designed to preserve active nutrients, as a natural approach to managing skin aging. Evidence from existing literature indicates that bioactive components in caviar extracts may enhance skin hydration, improve elasticity, and reduce visible signs of aging. Preclinical reports suggest mechanisms such as boosting antioxidant activity, supporting collagen and hyaluronic acid production, and reducing enzyme-mediated structural damage following UV exposure. This review highlights enzyme-treated caviar extract as a promising nutraceutical candidate for promoting youthful, healthy skin. While preliminary findings are encouraging, further well-designed clinical trials are required to establish its efficacy and safety as a dietary supplement for anti-aging skincare.
Keywords: Aging, Caviar extract, oxidative stress, nutraceuticals

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Track Classification: Health Sciences

Contribution ID: **152** Type: **Oral**

In-vitro transfection efficiency of Sheep Spermatogonial Stem cells using Lipofectamine Reagents

Spermatogonial stem cells (SSCs) are the foundational cells of the male reproductive system, responsible for the lifelong production of sperm. As the progenitors of spermatozoa, SSCs hold significant potential for germline genetic modification, wherein any alterations introduced into these cells can be stably transmitted to the offspring. This makes SSCs a powerful tool for the direct incorporation of desirable traits such as enhanced growth, fertility, or disease resistance. To harness this potential effectively, it is essential to evaluate transfection efficiency in SSCs. The objective of the study is to optimize the enhanced green fluorescent protein (eGFP) gene transfection efficiency into sheep SSC using the liposomal carriers

SSCs were harvested from prepubertal sheep testis (n=6) by two-step enzymatic digestion and purified by double enrichment through differential plating. The purified SSC were proliferated and trypsinized for transfection with plasmid DNA (pPy-CAG-GFP-IRES-Pac). The transfection was done using Lipofectamine™ 3000 reagent.

Transfection efficiency was evaluated 72 hours post-transfection using varying concentrations (3.75 Vs 7.50 µl) of LipofectamineTM 3000. Additionally, the effect of media change at 24 and 48 hrs hours post-transfection was assessed. Following this initial optimization, different concentrations of puromycin (0.75,1.00,1.25 and 1.50 µg/ml) were tested to determine the optimal dose for effective selection of transfected cells. The identification of transfection was monitored by green coloured SSC colony through fluorescent microscopy, and eGFP quantification were carried out using flow cytometry. Lipofectamine at 7.5 µl for 48 hrs induces transfection efficiency of 21% in SSCs. Puromycin @ 1µg/ml enriched the eGFP positive SSCs to 29%.

Lipofectamine @ 7.5 µl for 48 hrs along with puromycin selection effectively induces 29% transfection in Spermatogonial stem cells

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Track Classification: Biological Sciences

Contribution ID: **153** Type: **Poster**

DEVELOPMENT OF AN ECO-FRIENDLY NOVEL METHOD TO EXTRACT SOLUBLE DIETARY FIBERS FROM MEDICINAL SEEDS AND THEIR APPLICATION IN POPULAR FMCG FOOD PRODUCTS

DEVELOPMENT OF AN ECO-FRIENDLY NOVEL METHOD TO EXTRACT SOLUBLE DIETARY FIBERS FROM MEDICINAL SEEDS AND THEIR APPLICATION IN POPULAR FMCG FOOD PRODUCTS
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Dietary fibers, comprising indigestible complex carbohydrates, play a vital role in maintaining human health. While insoluble fibers primarily serve as roughage, soluble dietary fibers are associated with crucial health benefits, including regulation of blood glucose uptake, improved cardiovascular function, and prebiotic effects on gut microbiota. In this work, we report an innovative enzymatic approach to isolate 100% soluble dietary fibers from medicinally important seeds—Trigonella foenum-graecum (Fenugreek), Cassia auriculata (Haritaki), and Samanea saman (Raintree). The process employs a sequential enzymatic digestion strategy using cellulase, amylase, and protease, resulting in a breakthrough yield of 34% (w/w) soluble fiber with 99.7% solubility in water. This represents a significant improvement over previously reported solvent-driven methods, which achieved yields of only up to 14.2% (w/w). The isolated fibers have been successfully incorporated into various fast-moving consumer goods (FMCG) applications, including cookies, dosas, and khakhras, demonstrating their versatility and market potential. Beyond enhancing digestive health, the functional properties of these fibers—such as gel formation, delayed digestion, reduced fat and glucose absorption, and microbiota enrichment—position them as a promising ingredient for nutraceutical and functional food industries. Ongoing work focuses on detailed fiber characterization (monosaccharide composition, moisture retention, and calorie profiling) and extending applications to products such as chutneys, pastas, and muffins. A patent for this innovation is currently under process.

Keywords: Soluble dietary fiber; Enzymatic isolation; Functional foods; Prebiotics; FMCG applications; Blood glucose regulation

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Track Classification: Health Sciences

Contribution ID: **154** Type: **Poster**

Nanomaterial-Driven Smart Biosensors: Bridging Personalized Healthcare and Environmental Safety

Smart biosensors are rapidly advancing as powerful tools at the interface of healthcare and environmental science. Built on progress in nanomaterials, microfluidics, artificial intelligence, and the Internet of Things (IoT), these devices convert faint biological or chemical signals into actionable, real-time data. In healthcare, they are reshaping monitoring practices by moving beyond episodic testing toward continuous and personalized assessment. For example, continuous glucose monitoring systems such as the Dexcom G6, electrocardiogram-based wearables like the Apple Watch, and experimental microneedle patches for lactate and cortisol sensing illustrate how biosensors are already improving patient self-management and clinical decision-making.

The same principles extend to environmental applications. Biosensors are being designed to detect pesticide residues in crops, heavy metals such as lead in drinking water, and microplastics in marine ecosystems, emerging as early-warning platforms for safeguarding ecosystems and communities. Wastewater biosensing during the COVID-19 pandemic, for instance, proved indispensable in tracking local infection dynamics before clinical testing revealed outbreaks.

Recent developments, including graphene- and MXene-based transducers, self-powered platforms that harvest energy from motion or body heat, and wireless connectivity through smartphones, are expanding accessibility and use. However, challenges such as ensuring reproducibility, achieving large-scale manufacturing, maintaining biocompatibility, and securing sensor-derived data must be addressed before these technologies become routine in clinics or environmental agencies.

This review synthesizes current advances in smart biosensors across medical and environmental fields, outlines key challenges, and explores emerging opportunities. It suggests that biosensor networks could evolve into integrated systems that simultaneously advance precision medicine and environmental stewardship, acting as guardians of both people and the planet.

Keywords: Smart biosensors, nanomaterials, artificial intelligence, Internet of Things, personalized healthcare, environmental monitoring.

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Track Classification: Biological Sciences

Contribution ID: **155** Type: **Poster**

Stinging Nettle and Male Fertility: A Context-Dependent Paradox

Abstract

Urtica dioica (Stinging nettle) has long been employed in traditional medicine for its numerous pharmacological qualities, which include anti-inflammatory, antioxidant, and reproductive health benefits. Phytochemical studies show that nettle is particularly rich in phenolic compounds and flavonoids, which contribute to its strong radical scavenging and reducing properties. Several in vitro and in vivo studies have shown that these components serve as the biochemical foundation for the plant's bioactivity. However, recent experimental work has revealed seemingly contradicting roles for *U. dioica* in male reproductive physiology, raising significant questions concerning its context-dependent activities.

One line of evidence, obtained from isolated rat prostate tissue and mouse mating research, shows that aqueous leaf extracts of *U. dioica* work as P2X1-purinoceptor antagonists, significantly reducing ATP-induced smooth muscle contractions. A significant decrease in male fertility resulted from this disruption of sperm transport, indicating a possible use of contraceptionIn contrast, research using a nicotine-induced reproductive damage model in mice show that hydroalcoholic extracts of *U. dioica* enhance sperm parameters, raise blood testosterone levels, and improve testicular histology in a dose-dependent manner. These protective effects are linked to the extract's antioxidant and anti-inflammatory properties, which reduce the oxidative stress caused by nicotine exposure. Reconciling these opposing conclusions emphasizes *U. dioica*'s dual nature. In healthy, physiologically normal systems, nettle's purinoceptor antagonism may reduce fertility by restricting sperm transport. Conversely, under oxidative or toxicological stress, its phytochemical content provides protection and restores reproductive function. The extraction process, dosage, and experimental model all influence these results, highlighting the bioactivity's complexity.

Taken together, these reports indicate that *U. dioica* plays a unique role at the intersection of reproductive suppression and protection. Rather than being contradictory, the available data highlights the significance of biological context in shaping the consequences. Future research should seek to distinguish between the situations under which nettle acts as a context-based contraceptive and a fertility enhancer, providing clarity for both clinical uses and the safe use of this widely available medicinal plant.

Keywords: *Urtica dioica*, stinging nettle, male fertility, purinoceptor antagonism, oxidative stress, reproductive health

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Track Classification: Biological Sciences

Contribution ID: **156** Type: **Oral**

Latent Print Enhancement Using Plant-Based Powders Derived From Date Seed

Abstract:
As fingerprints are unique, permanent, and everywhere they continue to be one of the most reliable methods in forensic identification. Latent fingerprints, which are left on different surfaces, are usually not visible to the naked eye and need to be developed properly in order to be seen. Despite being widely used, conventional fingerprint powders are frequently synthetic, expensive, and cause health and environmental issues, which is the reason why individuals are looking for natural and biodegradable alternatives.
The use of date seed powder, which is derived from agricultural waste, as a green medium for latent fingerprint development is explored in this work. A variety of non-porous surfaces, including mirrors, glass slides, tempered glass, and compact discs, were used to evaluate the powder. The results revealed the powder's good adhesion and ability to produce identifiable ridge patterns with appropriate intensity. However, granulation was seen to some extent and ridge minutiae were not always clearly defined, which affected the visibility of tiny details. Despite these drawbacks, the powder worked well for overall ridge visibility and shows
promise as an affordable, environmentally responsible substitute for synthetic powders in forensic applications.
Keywords: Latent fingerprints; Date seed powder; Forensic science; Eco-friendly fingerprint powders; Non-porous surfaces; Biodegradable materials

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Track Classification: Forensic Sciences

Contribution ID: **157** Type: **Poster**

Pioneering Insights into Warfarin-HSA Dynamics via Advanced Molecular Docking pharmacokinetics and therapeutic efficacy

Abstract : Human Serum Albumin (HSA), the most abundant plasma protein, is vital for the transport and distribution of endogenous molecules and exogenous drugs. Warfarin, a commonly prescribed anticoagulant, exhibits significant plasma protein binding, primarily to HSA, which profoundly affects its pharmacokinetics and therapeutic efficacy. This study employed molecular docking using AutoDock 4, in conjunction with Discovery Studio, to investigate warfarin's binding affinity and interaction profile with HSA.The methodology involved preparing the protein and ligand by adding polar hydrogens, assigning Kollman charges, and defining torsional flexibility, followed by generating a grid box around the binding region. Docking simulations, conducted via the Genetic Algorithm, yielded multiple poses and their corresponding binding energies. A lowest binding energy of -7.49 kcal/mol was obtained for warfarin, which indicates a strong and favorable interaction between warfarin and HSA. However, this binding affinity was less favorable when compared to that of 4,7-dihydroxycoumarin. Cluster analysis revealed that warfarin's primary binding site is stabilized by hydrogen bonds, electrostatic interactions, and aromatic contacts. Key interacting residues, including ARG117, ARG186, TYR138, TYR161, and GLY199, facilitate electrostatic stabilization, π–π stacking, and hydrogen bonding with warfarin's aromatic and acidic groups. Alternative clusters displayed weaker or secondary binding modes with reduced affinities. These computational findings align with previous experimental studies that identify HSA as warfarin's principal carrier in plasma. The reliability of AutoDock in predicting drug-protein interactions and offering structural insights into warfarin's pharmacokinetics highlights the significant value of such computational approaches in drug design, optimization, and understanding drug-protein dynamics.
Keywords: Human Serum Albumin (HSA),Molecular Docking,Drug-Protein Interaction,Pharmacokinetics, Binding Affinity

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Track Classification: Biological Sciences

Contribution ID: **158** Type: **Poster**

Structural Insights into the Inhibition of Human Ferroportin by Ciclopirox: A Putative Therapeutic Strategy for Iron Overload in β-Thalassemia

Abstract : Ferroportin (FPN), an iron exporter, emerged as a crucial therapeutic target for β-thalassemia due to the disease's characteristic ineffective red blood cell production and elevated systemic iron levels. By inhibiting FPN, the aim is to restrict iron availability, thereby mitigating both anemia and iron toxicity associated with β-thalassemia. Ciclopirox, an antifungal medication, was identified as a potential candidate for interacting with human iron transport proteins given its strong iron-binding properties. A study involving computational docking of Ciclopirox to the human FPN structure (PDB: 6w4s) yielded promising results. The docking analysis indicated a robust binding energy of −12.3 kcal/mol, suggesting the formation of a stable and effective complex. Further examination of the binding pose revealed that Ciclopirox effectively obstructed the central iron efflux channel of FPN. Specifically, the hydroxamic acid group of Ciclopirox established a critical hydrogen bond with Cys326, a residue known to be essential for regulation by the hormone hepcidin. These findings propose that Ciclopirox functions as a competitive inhibitor, effectively mimicking the natural action of hepcidin. This mechanism of action aligns with several novel inhibitors currently undergoing investigation for the treatment of β-thalassemia. Consequently, Ciclopirox is highlighted as a promising FPN inhibitor and a strong candidate for drug repurposing. Given its established oral bioavailability and favorable safety profile, Ciclopirox merits further experimental evaluation as a therapeutic option to manage iron overload in patients afflicted with β-thalassemia.

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Track Classification: Biological Sciences

Contribution ID: **159** Type: **Poster**

Bridge Resilience to Earthquakes: Comprehensive Review of Seismic Response, Fragility, and Isolator Effectiveness

ABSTRACT
Bridges are critical lifeline structures whose functionality is pivotal to minimizing social and economic losses in the aftermath of an earthquake. Their operational integrity directly affects the resilience of the entire transportation network. Given the risk of strong aftershocks exacerbating damage to bridges already weakened by the mainshock, precise evaluation of their structural performance in real-time during seismic sequences is crucial. It is important to assess the performance of the bridge accurately in these situations in order to be able to quickly and effectively implement response plans. Besides, this evaluation is also the source of information on long-term initiatives to replace, retrofit, or repair the structure that is being provided to the immediate post-earthquake period such as examination of the safety systems of bridges and the fragility assessment. The research presents advantages and disadvantages of different types of seismic isolators, bridge fragility assessments, and fragility assessment methodologies for the purpose of setting a deeper understanding of fragility in seismic circumstances as a way to guide the creation of new and more rigid bridge design and assessment procedures.

Keywords: Seismic Response, Bridge Structures, Fragility Assessment, Seismic Vulnerability, Seismic Isolators

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Track Classification: Engineering & Technology

Contribution ID: **160** Type: **Poster**

HERBAL FORMULATION FOR ORAL HYGIENE

Abstract
The present study focuses on the formulation of an herbal oral mouth spray as a sustainable alternative to synthetic fresheners. The formulation was designed to integrate plant-derived bioactives (Clitoria Ternatea) exhibiting antioxidant and antimicrobial potential, combined with non-cariogenic sweetening and natural preservation strategies. Physicochemical characterization and preliminary stability assessments confirmed acceptable pH, clarity, and storage resilience. Functional evaluation demonstrated rapid breath-freshening effects with indications of antimicrobial activity against common oral pathogens. Sensory analysis suggested positive consumer acceptability. These findings support the potential application of herbal-based formulations in promoting oral hygiene, while offering a safe, effective, and environmentally responsible solution for oral care.

Keywords:
Antioxidant; Antimicrobial, Herbal-based spray, Sustainable oral care.

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Track Classification: Health Sciences

Contribution ID: **161** Type: **Poster**

Bacterial Survival Through RNA: Mastering Rapid Gene Control

Bacteria survive changing environments by quickly adapting to stress. They do this using advanced genetic controls based on RNA. This review explains how RNA systems help bacteria react fast. RNA is highly flexible. Its structure can change in response to the environment. This makes it perfect for rapid and precise gene regulation. We first cover the basics of how RNA folds into functional shapes. We then analyse key regulatory methods. These fall into three main types: small noncoding RNAs, riboswitches, and RNA modifications. These tools let bacteria control gene expression with high precision. They are vital for managing virulence, antibiotic resistance, and immune evasion. The role of long non-coding RNAs is also explored. These molecules bind to DNA, proteins, and other RNAs. They act as major control hubs during infection for both the pathogen and the host. Finally, we assess new technologies pushing the field forward. Understanding these RNA mechanisms is key to developing new treatments for bacterial infections.

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Track Classification: Biological Sciences

Contribution ID: **162** Type: **Poster**

Role of microbes in degradation of pesticides and dyes: A Review

Abstract

The extensive use of pesticides in agriculture and synthetic dyes in industries has led to widespread environmental pollution, affecting soil quality, water resources, and ecosystem stability. These pollutants are highly persistent due to their complex structures and resistance to natural degradation, while conventional treatment methods remain costly and inefficient. Microorganisms provide an eco-friendly alternative by utilizing diverse enzymatic systems to degrade, transform, or mineralize such compounds. Bacteria, fungi, and actinomycetes play a crucial role in breaking down organophosphates, chlorinated pesticides, azo dyes, and related xenobiotics into non-toxic or less harmful products. Enzymes such as laccases, peroxidases, oxygenases, and hydrolases drive these biotransformations, often resulting in complete mineralization. Microbial consortia further enhance degradation efficiency through synergistic interactions. For instance, bacterial species like Pseudomonas putida and Bacillus subtilis have been widely reported for pesticide and dye degradation, while fungi such as Phanerochaete chrysosporium and Aspergillus niger exhibit strong ligninolytic enzyme activity aiding in pollutant breakdown. Thus, microbial bioremediation offers a sustainable and cost-effective solution to pesticide and dye contamination, while advancements in genetic engineering and bioaugmentation strategies continue to improve its large-scale applicability.

Key words: Pesticides, Dyes and Microbial degradation

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Track Classification: Biological Sciences

Contribution ID: **163** Type: **Poster**

Dusty Giants of the Early Universe: A Multiwavelength Look at SMGs

Submillimeter galaxies (SMGs) are potentially the most luminous and dust-enshrouded star-forming systems in the early universe, and provide important insight into galaxy evolution, ongoing starburst activity, and the formation of stellar mass at high redshift. By studying spectral energy distributions (SEDs) from multi-wavelengths, we can investigate the important physical properties of these systems, including the amount of dust contained, how much star-formation is taking place and whether or not AGN are influencing the star-formation. This work explores a representative sample of SMGs to examine their contribution to the cosmic star-formation history and cosmic infrared background. This study demonstrates how multiwavelength observations of these dusty starbursts help to disentangle the complex relationship between star formation and AGN activity and further our understanding of galaxy evolution in the early universe.
Keywords: Submillimeter galaxies (SMGs), dusty starbursts, galaxy evolution, cosmic star-formation history, spectral energy distribution (SED), high-redshift universe

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Track Classification: Physical Sciences

Contribution ID: **164** Type: **Poster**

In Silico Strategy for the Identification of Novel Efflux Pump Inhibitors Targeting MexB

The escalating crisis of antimicrobial resistance (AMR) in Gram-negative bacteria, particularly Pseudomonas aeruginosa, necessitated novel treatment strategies. Efflux pump inhibitors (EPIs) emerged as a promising approach to enhance the efficacy of existing antibiotics. This report outlines a detailed computational strategy developed to identify new EPIs specifically targeting the MexB protein, a crucial component of the MexB-OprM efflux pumpThe method employed structure-based virtual screening using the co-crystallized, inhibitor-bound crystal structure of MexB (PDB ID: 3w9i). During docking with a test drug molecule, the known EPI Phenylalanine-arginyl β-naphthylamide (PAβN) was used as a benchmark, showing a binding energy of approximately −6.27 kcal/mol. For comparison, Dodecyl-β-D-maltoside exhibited a binding energy of −4.62 kcal/mol.. These results aim to guide future research, establishing a clear pathway from in silico prediction to experimental validation. This strategy has the potential to facilitate the development of clinically valuable compounds to combat multidrug resistance.

Keywords:, Efflux pump inhibitors (EPIs), MexB , Molecular docking, Virtual screening.

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Track Classification: Biological Sciences

Contribution ID: **165** Type: **Poster**

Comparative analysis of efficiency of various Immobilized systems used in biodegradation of dyes: A Review

Abstract

The biodegradation of synthetic dyes represents a major challenge due to their chemical recalcitrance and toxicity. Immobilization of microbial cells and enzymes has emerged as an effective strategy to enhance the stability, reusability, and efficiency of biodegradation processes. Various immobilization systems, including adsorption, entrapment, covalent binding, and encapsulation, have been investigated for their comparative efficiency in dye degradation. Entrapment in alginate and polyacrylamide matrices provides high microbial viability and protection, whereas adsorption on natural carriers like biochar and activated carbon offers cost-effectiveness and enhanced surface interaction. Encapsulation in nanomaterials and covalent binding to synthetic polymers exhibit improved durability and operational stability, making them suitable for repeated use in continuous systems. Studies reveal that immobilized systems generally outperform free microbial cells by providing resistance to environmental stress, higher degradation rates, and extended activity. For example, bacteria such as Pseudomonas fluorescens and Bacillus cereus have shown enhanced azo dye degradation when immobilized, while fungi like Trametes versicolor and Aspergillus oryzae demonstrate efficient decolorization due to their robust ligninolytic enzymes. Comparative evaluation highlights that the choice of immobilization method depends on dye type, microbial strain, and application scale. Overall, immobilized systems hold significant promise for developing sustainable, scalable bioremediation strategies for industrial dye effluents.
Key words: Immobilization, Biodegradation, Dyes

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Track Classification: Biological Sciences

Contribution ID: **166** Type: **Poster**

Riboswitches and their part in Ligand Binding, Molecular Mechanisms, and Biotechnology.

Riboswitches are evolutionarily conserved RNA regulatory motifs that regulate gene expression by binding particular small-molecule ligands. Such native RNA sensors recognize metabolites or ions using their aptamer domains, whose structure changes upon ligand binding. This, in turn, causes structural changes in RNA folding that affect transcription termination, translation initiation, or RNA splicing. The aptamer region sequesters the ligand in a binding cleft through hydrogen bonding, base stacking, and metal ion coordination, imparting high specificity and affinity. Ligand-induced conformational changes stabilize RNA secondary structures within the expression platform, enabling sensitive and specific control of gene expression in response to metabolite levels.

The structural complexity of riboswitches is remarkable, with distinct classes adopting folds such as pseudoknots and multi-helix junctions, while still maintaining shared ligand-binding principles. Recent advances in X-ray crystallography, NMR, single-molecule fluorescence, and molecular dynamics simulations have provided insight into riboswitch folding pathways, binding kinetics, and conformational dynamics. Mechanistic models such as conformational selection and induced fit explain how riboswitches tune ligand affinity and regulatory responses.

Functionally, riboswitches often regulate bacterial metabolic pathways, ion transport, and stress responses, acting as ON or OFF switches depending on ligand availability. Their ability to regulate gene expression without protein cofactors highlights their efficiency. Beyond natural roles, riboswitches have been engineered in synthetic biology as ligand-inducible tools for metabolic engineering and biosensing. Therapeutically, riboswitches are promising antimicrobial targets since small-molecule analogs can disrupt essential bacterial gene regulation. Structural insights into riboswitch classes have enabled rational drug design.

Despite major progress, questions remain regarding riboswitch folding and ligand recognition under physiological conditions. Further discoveries of riboswitches across diverse organisms may uncover novel regulatory pathways and applications. Overall, riboswitches represent sophisticated RNA-based molecular sensors with high specificity and regulatory flexibility, with great promise in biotechnology, synthetic biology, and therapeutics.

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Track Classification: Biological Sciences

Contribution ID: **167** Type: **Oral**

DEWAT SYSTEM IN DSCE COLLEGE AS FUTURE FORECASTING PERSECTIVE BY IOT TECHNIQUES

Introduction

Decentralized Wastewater Treatment Systems (DEWATS) are sustainable, low-maintenance treatment units designed for institutions, campuses, and small communities. DSCE (Dayananda Sagar College of Engineering), with its large student population, generates significant wastewater from hostels, canteens, laboratories, and residential areas. A DEWAT system can be deployed on campus to reduce environmental impact and promote water reuse.
In the future, the integration of Internet of Things (IoT) can enhance DEWAT performance by providing real-time monitoring, automation, and predictive analytics, making the system more efficient, reliable, and student-research oriented.

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Track Classification: Engineering & Technology

Contribution ID: **168** Type: **Poster**

Biodegradable Water Bottles for a Plastic-Free Tomorrow

Biodegradable and compostable water bottles can be made from agricultural by-products like sugarcane bagasse and rice husk. These bottles offer a sustainable alternative to petroleum-based plastics. They change agricultural waste from open burning, which will help to reduce air pollution and greenhouse gas emissions. By converting waste products into value-added goods, they support the concept of a circular economy. It will be lightweight, durable, and naturally textured. These bottles retain their strength but require less energy to produce than conventional plastics. Their non-toxic, microplastic-free breakdown will ensure that no harmful materials can enter soil or aquatic systems, which helps protect freshwater ecosystems from plastic pollution. Natural coatings can be used, allowing for safe water storage without synthetic materials. These innovations reduce reliance on fossil fuels and promote the use of renewable, low-carbon materials. As a result, they present a sustainable path to water packaging, helping to conserve the environment and protect the global water crisis.

Keywords - sustainability, reusable bottles, durable, bagasse, rice husk.

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Presenter: Ms ELSA SANTHOSH, Aimee (School of Sciences)

Track Classification: Chemical Sciences

Contribution ID: **169** Type: **Poster**

Induced magnetic field variability between day and night in the Martian ionosphere: Insights from MAVEN/MAG

Mars does not possess a global magnetic field like Earth; instead, it has localized crustal magnetic fields that are primarily found in the southern hemisphere. These crustal fields show spatial variability and can change over time. A significant focus of research into the interaction between these crustal fields and the Martian ionosphere is their influence on total ion loss over time. This central question is being investigated by the Mars Atmospheric and Volatile EvolutioN (MAVEN) spacecraft, which is currently in orbit around Mars. The spacecraft has a periapsis altitude of 150 km and an apoapsis of 6200 km. To study variations in magnetic field strength, we have compared crustal field models with the magnetic field measurements collected by MAVEN's magnetometer instrument (MAG). The MAG measures vector magnetic fields along MAVEN's orbit, while the crustal fields are derived from the Morschhäuser (2014) model, following the same orbital trajectory as MAVEN/MAG. The differences between the measured and crustal fields are termed induced magnetic fields. In this study, we calculate the induced magnetic fields for both the dayside and nightside of Mars, up to an altitude of 1000 km with data coverage from 2015 to 2019.
Our observations reveal that induced magnetic fields on the dayside are larger than those on the nightside. In the northern hemisphere, higher induced fields are observed during both the dayside and nightside. Specifically, on the dayside, low-latitude induced magnetic fields in the northern hemisphere dominate up to an altitude of 800 km; above that altitude, the southern hemisphere takes precedence. Additionally, mid- and high-latitude induced fields in the northern hemisphere are more pronounced up to 600 km, after which the southern hemisphere becomes dominant. Conversely, on the nightside, the northern hemisphere consistently shows stronger induced fields across all latitudes. During periods of high solar wind dynamic pressure, the induced magnetic fields increase by 50% on both the dayside and nightside of Mars. On the dayside, these induced fields in the northern hemisphere are significantly influenced by open and draped fields, with maximum induced fields observed below 500 km. Similarly, on the nightside, the northern hemisphere continues to exhibit stronger induced fields compared to the southern hemisphere, once again driven by open and draped fields. These findings are crucial, as they have a direct impact on the ionosphere.

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Presenter: Ms G, Prarthana (St.Joseph University)

Track Classification: Physical Sciences

Contribution ID: **170** Type: **Poster**

Nutrigenomics and Vitamin Metabolism: Implications for Deficiency and Health

Nutrigenomics and Vitamin Metabolism: Implications for Deficiency and Health
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Abstract:
Vitamins are more than essential nutrients, they act as molecular signals that interact with our genes to shape health outcomes. Nutrigenomics, the study of nutrient–gene interactions, has revealed that genetic variation plays a crucial role in determining how individuals absorb, metabolize, and utilize vitamins. A recent systematic review of studies over the past two decades highlights strong evidence linking polymorphisms in genes such as GC, CYP2R1, and DHCR7 with circulating vitamin D levels, while variations in folate and vitamin B12 pathways significantly influence homocysteine metabolism, with consequences for cardiovascular and neurological health. Similar associations have also been identified for vitamin E and carotenoids. These findings demonstrate why some individuals remain vitamin deficient despite adequate intake, while others respond more efficiently to supplementation. The implications are shifting nutrition science from generalized recommendations towards precision nutrition, where dietary strategies are guided by genetic profiles. However, challenges remain in integrating such approaches into healthcare, including cost, accessibility, and ethical considerations around genetic data. By bridging genomics and nutrition, nutrigenomics transforms vitamin deficiencies from simple dietary shortcomings into opportunities for personalized healthcare, which will pave the way for improved global health outcomes.By discussing this, I aim to highlight why nutrition should move beyond generalized dietary recommendations, and how understanding these genetic influences can guide personalized nutrition strategies. This shift from standard advice to more precise, genetics-based interventions has the potential to reduce deficiencies, improve metabolic health, and ultimately contribute to better public health outcomes.
Keywords: Nutrigenomics, Vitamin deficiency, Healthcare , Nutrition, Public Health.

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Track Classification: Health Sciences

Contribution ID: **171** Type: **Oral**

Design and Verification Methods of Digital System: An Overview

Abstract
Digital systems are the backbone of modern computing and embedded system applications. The design and verification of these systems are critical to ensure functionality, performance and reliability. This paper presents an overview of the key design methodologies utilized in digital system development and the verification techniques employed to validate their correctness before fabrication or deployment. Emphasis is placed on design principles, RTL design, simulation, formal verification and contemporary methodologies that address increasing system complexity. Design and verification of digital systems are fundamental aspects of digital electronics and VLSI (Very Large Scale Integration) design. These processes ensure that a digital system performs its intended function correctly, reliably and efficiently.
Key Words: Digital systems, Embedded system, Design and Verification Methods, Fabrication, RTL design, Simulation techniques.
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Track Classification: Physical Sciences

Contribution ID: **172** Type: **Poster**

The Role of Long Non-Coding RNAs (lncRNAs) in Host-Pathogen Interactions.

Long non-coding RNAs (lncRNAs) have emerged as pivotal regulators in the intricate molecular dialogue between hosts and pathogens. Once dismissed as transcriptional noise, lncRNAs—transcripts longer than 200 nucleotides that do not encode proteins—are now recognized for their diverse roles in gene regulation, chromatin remodeling, and cellular signaling. In the context of host-pathogen interactions, lncRNAs orchestrate a wide array of immune responses, modulating both innate and adaptive immunity. They act as molecular scaffolds, decoys, guides, and sponges, influencing the expression of cytokines, chemokines, and other immune effectors. Recent research has illuminated how lncRNAs can either bolster host defenses or be co-opted by pathogens to facilitate their own survival and replication. Specific lncRNAs, such as NEAT1, lincRNA-Cox2, and Lethe, have been shown to regulate inflammatory pathways, cell survival, and the balance between immune activation and tolerance. The dynamic expression of lncRNAs during infection not only shapes the outcome of disease but also offers promising avenues for therapeutic intervention and biomarker discovery. Advances in high-throughput sequencing and single-cell technologies have accelerated our understanding of lncRNA functions, revealing their potential as both diagnostic tools and targets for novel antimicrobial therapies. This review synthesizes current knowledge on the fundamental biology of lncRNAs, their mechanisms of action in host-pathogen interactions, and the emerging therapeutic strategies targeting these versatile molecules. By unraveling the complex roles of lncRNAs, we gain deeper insights into the molecular arms race between hosts and pathogens, paving the way for innovative approaches to combat infectious diseases.

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Track Classification: Biological Sciences

Contribution ID: **173** Type: **Poster**

Design, Development and Implementation of Solar Power-Based Bluetooth Controller for an Industrial Automation System

Abstract
Industrial automation is an emerging technology and vital for enhancing productivity, safety and efficiency in manufacturing and process industries. The integration of renewable energy sources and wireless control in industrial automation is pivotal for sustainable and efficient production systems. This paper presents design, development and implementation of a solar power-based Bluetooth controller for industrial automation system using an Arduino microcontroller. The proposed system leverages solar energy for power supply and Bluetooth technology for wireless device control, reducing operational costs and enhancing flexibility in industrial environments.
Key Words: Industrial automation, Renewable energy, Wireless control, Bluetooth controller, Arduino microcontroller.

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Track Classification: Physical Sciences

Contribution ID: **174** Type: **Oral**

Integrated Data Center Architecture for Carbon-Aware Operations and Lifecycle Sustainability

Global data center capacity is projected to more than triple by the end of 2030 and nearly double in power consumption, studies say. This is mainly attributed to the rapid growth of Artificial Intelligence and the increasing demand for massive amounts of data on a daily basis. With advancements in cloud computing, this surge is exponential. Existing data centers are being hyper-scaled, with centers exceeding 50 MW energy capacity to meet the ever-growing demand for data. They are optimized for performance and cost but often overlook carbon signals. As the number of data centers increases, their energy usage grows, leading to higher carbon emissions, often quantified in terms of carbon intensity per unit of power consumed. Numerous state-of-the-art techniques have been proposed, such as DVFS, carbon-aware data transfer, etc. However, these methods often address only a single aspect of the data center, neglecting the joint optimization of all its components. In this paper, we propose an integrated data center architecture that minimizes both operational and embodied emissions.To our knowledge, this is the first framework that jointly optimizes energy, cooling, workload scheduling, and lifecycle emissions within a single architecture. The framework combines energy-proportional hardware, intelligent cooling with waste-heat reuse, carbon-aware scheduling, and on-site renewables with microgrid management. Lifecycle assessment and circular design principles ensure long hardware lifetimes and transparent carbon accounting across the supply chain. We discuss the expected benefits of this unified approach and outline how it can enable substantial reductions in operational and embodied emissions compared to existing siloed methods. This unified architectural framework not only holistically integrates sustainability strategies across data centers, reducing total CO_2 emissions, but also maintains performance and service-level agreements. Together, these strategies shift the focus from reducing watts to minimizing kilograms of CO_2e per job, advancing sustainable data center operations.

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Track Classification: Engineering & Technology

Contribution ID: **175** Type: **Poster**

Characterizing the Martian Ionospheric M2 layer using MAVEN / ROSE

Mars'atmosphere consists of mostly Carbon dioxide (˜95%). The dayside of the ionosphere is formed primarily due to photoionization of CO2 by the Extreme Ultraviolet (EUV) radiation from the Sun. The electron density structure of Martian ionosphere is similar to E and F1 layers of Earth' s ionosphere. The altitude where maximum electron density formed by photoionization is known as the peak altitude is found to be near ˜ 130 Km. This layer is termed as M2 layer. To study this layer, we use the instrument Radio Occultation Science Experiment (ROSE) on board the Mars Atmosphere and Volatile EvolutioN (MAVEN). A total of 1400 electron density profiles were obtained between July 2016 and February 2025. Peak altitudes and densities were extracted by Chapman fitting the profiles. Nearly 600 profiles were found have a good fit and results were obtained from them. The solar irradiance is measured by the instrument EUV Monitor on-board MAVEN. The EUV irradiance of 30.5 nm is chosen as it ionizes CO2 the most.
The observation reveal that peak altitude and densities vary with different parameters such as SZA, Local time, Seasons, Solar irradiance. Peak altitudes ranging from 120 −170 Km is found to be inversely related to peak densities ranging from 2 x 104 to 2 x 105 cm-3. The observation is also separated into Martian Year (MY), and positive correlation is found for most Martian years except MY 34 where a negative correlation is found for electron density and irradiance. This could be due to other parameters like Dust storms affecting the M2 layer. Studying the M2 layer is crucial since it is the most dominant layer in the ionosphere containing the most electron density.

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Track Classification: Physical Sciences

Contribution ID: **176** Type: **Poster**

Smart Nanoplatforms: Chitosan Nanoparticles for Next-Generation Antimicrobial Strategies

Smart Nanoplatforms: Chitosan Nanoparticles for Next-Generation Antimicrobial Strategies

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Abstract
Antimicrobial resistance (AMR) is a growing global health concern that limits the effectiveness of many antibiotics. To address this challenge, nanotechnology is being explored for innovative antimicrobial solutions. Chitosan, a natural biopolymer derived from chitin, offers unique advantages such as inherent antimicrobial activity, safety, and biodegradability. When formulated into nanoparticles, chitosan becomes a smart nanoplatform capable of both directly attacking pathogens and delivering therapeutic agents.
Chitosan nanoparticles (CNPs) disrupt microbial membranes, inhibit biofilm formation, and enable controlled drug release. They can also be combined with antibiotics or metals to enhance treatment and restore antimicrobial sensitivity. Recent advances include stimuli-responsive systems, where CNPs release drugs in response to changes in pH, temperature, or enzymes, ensuring precise delivery at infection sites. These features reduce side effects and improve treatment outcomes.
Although large-scale production, regulatory approval, and long-term safety remain challenges, CNPs show strong potential as next-generation antimicrobial strategies. By combining natural bioactivity with nanotechnology, chitosan nanoparticles represent a promising tool in managing infections and combating resistance.
Keywords: Chitosan nanoparticles, antimicrobial resistance, smart nanoplatforms, biofilm inhibition, drug delivery

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Track Classification: Health Sciences

Contribution ID: **177** Type: **Oral**

Analysis and Detection of Multi-Lesion for Diabetic Retinopathy using CNN Based Approach

Abstract:
Diabetes is a global health concern affecting individuals across all age groups. Diabetic retinopathy (DR), a major ocular complication of diabetes, can lead to vision loss if not diagnosed and treated promptly. Traditional DR detection methods rely on manual examination by specialists, which is time-consuming and inconsistent. Key steps in DR diagnosis include retinal vasculature extraction and optic disc/fovea segmentation. Detecting lesions such as microaneurysms (MA), hemorrhages (HM), and exudates (EX) is essential for determining the DR stage.With advancements in deep learning, Convolutional Neural Network (CNN)-based methods have become prominent in DR research. This study presents a CNN-based framework for segmenting and classifying retinal lesions. A comprehensive literature review is conducted, and the proposed method is evaluated on publicly available datasets.
Keywords: Diabetic Retinopathy, CNN, Retinal Blood Vessel Segmentation, Lesion Detection

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Track Classification: Physical Sciences

Contribution ID: **178** Type: **Oral**

Immunomodulatory effect of NF-κB and Nrf2 by R-Phycoerythrin: A Natural Anti-Inflammatory and Cytoprotective Agent

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Marine red algae are well-known for their bioactive compounds that offer immense potential in nutraceuticals and pharmaceutical applications. Geledium micropterum, red marine macro algae, is recognized for its considerable attention due to the pigment Phycoerythrin (R-PE) extensively studied for its therapeutic and biomedical applications. The current study focused to explore the immunomodulatory potential of the pigment with the key inflammatory markers on RAW 264.7 murine macrophage cells. The current study investigated the transcriptional relative gene expression of NF-κB and Nrf2 using qRT-PCR, and the results were normalized with β-actin which was kept as an internal standard. Briefly, cells treated with 40μg/ml and 80 μg/ml of R-PE was observed to exhibit a substantial downregulation of NF-κB gene expression in comparison to LPS group indicating a potential anti-inflammatory property of the R-PE fraction with a fold change of 0.24, which clearly indicates a dose-dependent inhibition of NF-κB activation. In contrast, an upregulation of Nrf2 gene was observed where, the cells treated with 40 and 80 μg/ml has displayed a significant up regulation of the Nrf2 gene expression with a fold change of 1.70. In summary, R-PE exhibits a dual modulatory function by suppressing oxidative stress–driven inflammatory responses through downregulation of NF-κB, while simultaneously enhancing cellular defense mechanisms through activation of Nrf2, underscoring its promise as a natural anti-inflammatory and cytoprotective compound.

Keywords: Inflammatory markers, phycoerythrin, RAW 264.7 murine macrophage cells, NF-κB and Nrf2 pathway

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Track Classification: Biological Sciences

Contribution ID: **179** Type: **Poster**

Non-essential Heavy Metals and Their Influence on Cardiovascular Disease and Therapeutic Efficacy

Non-essential heavy metals such as arsenic (As), cadmium (Cd), lead (Pb), mercury (Hg), and chromium (Cr) have no biological role and are toxic even at low levels. In developing countries like India, environmental concentrations of these metals in industrial waste disposal, fertilizers, pesticides, polluted air and water, etc, are steadily increasing. Exposure to non-essential heavy metals raises cardiovascular disease (CVD) risk mainly through oxidative stress, inflammation, and disruption of mineral balance. However, critical gaps remain in understanding their effects on cellular, tissue, and organ-level disease progression, their effect on drug absorption, distribution, metabolism, and excretion (ADME), and how they influence CVD drug efficacy and targets. Additionally, limitations in existing survey data hinder effective assessment of heavy metal impact on CVD. Addressing these research gaps through improved data collection, longitudinal studies, and advanced analytical tools is essential to advance CVD treatment in exposed populations.

Keywords: Non-essential heavy metals, environmental pollution, cardiovascular disease progression, heavy metal-drug interaction.

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Track Classification: Health Sciences

Contribution ID: **180** Type: **Poster**

Electron Density Profiles in the Martian Ionosphere from MAVEN Observations (MY 32–36)

The Martian ionosphere controls solar–atmosphere interactions and is central to atmospheric escape. From MAVEN electron density observations over Martian Years (MY) 32–36, we describe ionospheric structure at altitudes of 150–500 km. Inbound and outbound orbital pass data were averaged in 10-day bins to enhance robustness. The resulting profiles systematically show a sharp ionospheric peak at 150–200 km (10^3–10^4 cm^{-3}) with precipitously decreasing densities above 300 km. Every-day comparisons show stability of the lower ionosphere, whereas variability with higher altitudes indicates solar zenith angle dependence and solar forcing. Consistency between inbound and outbound passes verifies dataset reliability. Preliminary interannual comparisons show lower electron densities by MY 36, as expected with decreasing solar activity, and clearly indicate solar cycle influence.

The Martian ionosphere controls solar–atmosphere interactions and is at the center of atmospheric escape. From electron density measurements from MAVEN between Martian Years (MY) 32–36, we describe ionospheric structure from 150–500 km altitude. Inbound and outbound orbital pass data were averaged on 10-day periods to enhance robustness. The resulting profiles uniformly show a prominent ionospheric peak at approximately 150–200 km (10^3–10^4 cm^{-3}), with densities dropping steeply above 300 km. Day-to-day comparisons exhibit stability of the lower ionosphere and variability at higher altitudes reflecting solar zenith angle dependence and solar forcing. The agreement between inbound and outbound passes validates the quality of the dataset. The results set limits for models of the Martian ionosphere and improve our understanding of how the Sun interacts with the atmosphere without a global magnetic field.

The study provides solid ionospheric electron density profiles for Martian Years 32–36, offering important insights into the planet's upper atmosphere. It illustrates a dual control mechanism, where photochemistry dominates processes below 200 km, while solar forcing plays a stronger role above 300 km. The results also briefly indicate a dependence of ionospheric density on the solar cycle. Additionally, the findings highlight certain limitations for ionospheric models while supplying valuable information about atmospheric escape. Beyond Mars itself, this work contributes to comparative planetology by examining ionospheric dynamics in the context of an unmagnetized planet.

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Track Classification: Physical Sciences

Contribution ID: **181** Type: **Poster**

Radiation shielding studies of Phosphate based heavy metal oxide glasses for Radiation shielding applications.

The development of efficient glass materials for radiation shielding is crucial for the safe handling and long-term storage of nuclear materials and their waste. In the present study, phosphate-based heavy metal oxide glasses were synthesized by the conventional melt-quench technique using a muffle furnace. The density and molar volume of the glasses were found to vary systematically with composition. FTIR analysis confirmed the incorporation of different phosphate structural units in the glass network, as indicated by distinct vibrational modes. Radiation shielding parameters, including the mass absorption coefficient, linear attenuation coefficient, half-value layer, and effective atomic number, were established in the energy range ranging from 667 KeV to 1.3MeV using PHY-X software. The results were further correlated with the effective field distribution within the glass matrix, highlighting the influence of varying heavy metal ion concentrations on the shielding performance.

Keywords: Phosphate glasses, Heavy metal oxides, Radiation shielding, FTIR spectroscopy

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Track Classification: Physical Sciences

Contribution ID: **182** Type: **Oral**

Correlation between breadth of the footprint and the human stature, in Tamil Nadu population

Abstract
Stature estimation is a fundamental aspect of forensic Science, particularly in cases where only Footprint are available for analysis. While foot length has been widely studied, Breadth of the footprint is an equally valuable but less frequently explored parameter for height prediction. This study investigates the relationship between Breadth of the footprint and stature in the Tamil Nadu population to establish its forensic applicability. Adult male and female participants, with stature measured using a stadiometer and Breadth of the footprint recorded at the widest part of the foot. Previous studies have demonstrated that Breadth of the footprint can serve as a reliable supplementary marker for stature estimation. Regression models specific to the Tamil Nadu population will be developed to determine predictive equations for estimating height from Breadth of the footprint. It is anticipated that a statistically significant positive correlation will be observed, indicating that individuals with greater Breadth of the footprint tend to have proportionally higher stature.
The outcome of this study is validated that Breadth of the footprint as an independent parameter for stature estimation. By generating population-specific data, this research will strengthen the forensic database and enhance the accuracy of human identification methods in South Indian contexts.

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Track Classification: Forensic Sciences

Contribution ID: **183** Type: **Oral**

Use of Placket Burman design in optimizing the process parameters for decolorization of VAT blue 4 by the fungus Lividopora vincta isolated from textile industry effluents.

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The textile industry, a major user and polluter of water, generates wastewater laden with diverse chemical contaminants such as dyes, organic substances, salts, and heavy metals. This makes it one of several high-water-consumption sectors, alongside industries like paper, plastics, food, and leather. Decolorization of Vat blue 4 has been taken up in the current investigation. Vat blue is commonly used for dyeing cotton and other cellulose fibers. In this study, Lividopora vincta was isolated from textile industry effluents of Bangalore and identified using ITS gene based molecular method. Using one-factor-at-a-time approach, the optimized conditions for decolorization of VAT blue 4 using Lividopora vincta were a pH of 5, a temperature of 30℃, a dye concentration of 300 mg/L, and 100 mg/L each of maltose and Potassium nitrate and an inoculum concentration of 3% v/v. The factors significant in decolorization were further found out using Placket-Burman design with the software Design expert. Maltose, temperature and dye concentration were found to be the significant factors in decolorization of VAT blue 4 using Lividopora vincta. Further studies with response surface methodology would be carried out using these significant factors.
Key words: Optimization, Decolorization, VAT Blue 4, Lividopora vincta, Placket-Burman Design

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Track Classification: Biological Sciences

Contribution ID: **184** Type: **Poster**

Design, Development and Implementation of Smart Solar Streetlight Control System

Abstract
The increasing demand for sustainable and energy-efficient public lighting solutions motivates the adoption of solar-powered smart streetlights. This paper presents the design, development and implementation of an intelligent solar streetlight control system using the Arduino microcontroller. The system integrates solar energy harvesting, automated light intensity adjustment based on ambient conditions and motion detection for optimized power consumption. The proposed solution enhances energy efficiency, reduces operational costs, and provides adaptive street lighting suitable for smart city applications.
Key Words: Sustainable, Energy-efficient, Smart streetlights, Streetlight control system,

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Track Classification: Physical Sciences

Contribution ID: **185** Type: **Poster**

Optimization of process parameters for decolorization of VAT blue 4 by the fungus Epicoccum thailandicum isolated from textile industry effluents.

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Vat dyes represent a distinct category of dyes characterized by their unique chemical properties. They originated from the natural dye indigo, which is now manufactured synthetically. These dyes are widely applied in coloring cellulosic fibres such as cotton, as well as wool and various other textiles. The present study focuses on the decolorization of Vat Blue 4. In the current investigation, Epicoccum thailandicum was isolated from textile industry effluents of Bangalore and identified using ITS gene based molecular method. The optimal conditions for Vat Blue 4 decolorization were determined using a one-factor-at-a-time approach. Optimal decolorization by Epicoccum thailandicum was achieved at pH 7, 30 ℃, with a dye concentration of 300 mg/L, supplemented with 100 mg/L each of maltose and ammonium nitrate, and an inoculum level of 3% (v/v). The significant factors influencing decolorization were identified using the Plackett–Burman design with Design Expert software. Maltose, pH and dye concentration were found to be the significant factors in decolorization of VAT blue 4 using Epicoccum thailandicum. Further studies with response surface methodology would be carried out using these significant factors.
Key words: Decolorization, Optimization, VAT Blue 4, Epicoccum thailandicum, Placket-Burman Design

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Track Classification: Biological Sciences

Contribution ID: **186** Type: **Oral**

REVIEW OF TRAFFIC MODELLING TECHNIQUES

Traffic modeling is a vital component of transportation research, offering a range of mathematical frameworks to analyze, forecast, and manage vehicle flow across highways and urban networks. These models enable a deeper understanding of traffic dynamics and help anticipate future conditions under varying scenarios. This study presents a comprehensive review of traffic modeling methodologies, including data-driven techniques that incorporate machine learning and simulation tools. It critically assesses the strengths and limitations of these approaches in relation to congestion mitigation, network efficiency, and the development of intelligent transportation systems. The insights gained provide a valuable foundation for traffic management research and inform evidence-based strategies in urban mobility planning.
Key Words: Traffic modeling, traffic dynamics, congestion mitigation, network efficiency

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Track Classification: Mathematical & Data Sciences

Contribution ID: **187** Type: **Oral**

”Effect of CuO, ZnO, and TiO_2 Nanoparticles on Withanolide Production in Withania somnifera”

The vegetative phase (60 days) of *Withania somnifera* was assessed for the effects of CuO, ZnO, and TiO_2 nanoparticles on withanolide biosynthesis through HPLC quantification. Results indicated that nanoparticle exposure caused significant, dose-dependent alterations in withanolide content. Withaferin A accumulated the most in ZnO at 25 ppm (˜7.5 mg/g DW), showing that it has a lot of potential to boost secondary metabolism. TiO_2 at 8 ppm was the best at increasing Withanolide A levels (about 2.8 mg/g DW), and moderate amounts of CuO (75 ppm) also increased withanolide levels compared to the control. Conversely, elevated concentrations of CuO and ZnO (100 ppm) inhibited withanolide synthesis. These results show that the type and amount of nanoparticles have different effects on the production of secondary metabolites. ZnO and TiO_2 were the best treatments for increasing withanolide yield during vegetative growth. This suggests that they could be useful in nanotechnology-based ways to improve the productivity of medicinal plants.

KEYWORDS: *Withania somnifera*; CuO, ZnO, TiO_2 nanoparticles; Withaferin A; Withanolide A; HPLC; Vegetative phase

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Track Classification: Biological Sciences

Contribution ID: **188** Type: **Poster**

THE NEPTUNIAN DESERT

The Neptunian desert is a region in the exoplanet parameter space that has scarcity of Neptune-sized planets at short orbital periods. It was first noticed in the 2000's during analysis of observational data of exoplanets, and was first clearly identified and confirmed in the 2010's. The Neptunian desert does not arise because of bias in observational studies as such planets are easily detectable with transit photometry and radial velocity techniques. Aim of this study is to review several theories that have been proposed to explain the existence Neptunian desert. We reviewed several mechanisms that have been proposed, including the stripping of atmospheres by intense stellar radiation, atmospheric loss from internal heat, tidal disruption near the Roche limit, and the influence of stellar metallicity on planet formation.
To better understand this population, examination of trends among different properties like orbital periods, planet masses and radii, atmospheric fractions, and stellar properties has to be done. In addition, these should be supported by simulations of planetary formation and tidal evolution. Exploring the reason behind the existence of gap provides important clues about how planetary systems are formed.

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Track Classification: Physical Sciences

Contribution ID: **189** Type: **Poster**

Emerging Combination Strategies for Colorectal Cancer: Moving Toward Accessible, Precision-Guided Care –A review

Colorectal cancer (CRC) remains a major global cause of cancer death, with incidence accelerating in low- and middle-income countries (LMICs). Standard cytotoxic regimens (FOLFOX/FOLFIRI/FOLFOXIRI) and biologics (anti-VEGF; anti-EGFR in RAS/BRAF wild-type disease) have extended survival, yet transformative benefit is largely confined to MSI-H/dMMR tumors responsive to PD-1 blockade. The predominant microsatellite-stable (MSS) population remains immunologically "cold,"limited by immune exclusion, adaptive resistance, toxicity, and cost barriers. This review synthesizes converging strategies to widen durable benefit while keeping care practical and equitable.

(1) Next-generation combinations. Rational, pathway-aware regimens are advancing beyond single-node inhibition. In KRAS-mutant disease—especially KRAS G12C—vertical and parallel blockade (e.g., KRAS inhibitors combined with SOS1/SHP2 or EGFR inhibition) seeks deeper, more durable responses. Immune-priming approaches, including Wnt/porcupine and TGF-β modulation, aim to convert MSS tumors to IO-responsive states. Tumor-selective platforms—bispecific T-cell engagers and antibody–drug conjugates directed to CEA/CEACAM5 or CLDN18.2—offer higher intratumoral payload with potentially lower systemic toxicity.

(2) Treatment personalization. Broad molecular profiling now underpins first-line choices, while circulating tumor DNA (ctDNA) is emerging to guide adjuvant escalation or de-escalation and to surveil minimal residual disease. In rectal cancer, total-neoadjuvant therapy paired with response-adapted, organ-preserving strategies can maintain oncologic control while improving function, provided robust selection and follow-up.

(3) Microbiome and metabolism. Microbiome modulation—through fecal microbiota transplantation, targeted probiotics such as Akkermansia muciniphila, and high-fiber diets—may enhance checkpoint responsiveness and mitigate treatment-related toxicity. These low-cost, scalable levers are particularly attractive for LMIC settings when integrated with standard systemic therapy.

(4) Pragmatic repurposing and enabling technologies. Widely available agents—aspirin, metformin, statins, disulfiram—intercept COX-2, AMPK/mTOR, mevalonate/RAS prenylation, and ALDH/proteasome axes to complement standard care. Emerging nanocarriers enable co-delivery (e.g., cytotoxic plus immunomodulator) to heighten synergy and attenuate off-target effects. In parallel, AI/ML models that integrate radiomics, histopathology, and ctDNA dynamics are maturing to predict response, toxicity, and optimal combinations.

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Track Classification: Biological Sciences

Contribution ID: **190** Type: **Poster**

Computational Insights into Trypsin–Benzamidine Interactions: Implications for Protein Degradation in Huntington's Disease

Abstract:
Huntington's disease (HD) is a progressive neurodegenerative disorder characterized by abnormal protein aggregation and selective neuronal death, primarily caused by an expanded CAG repeat in the huntingtin (HTT) gene. This mutation leads to the accumulation of mutant huntingtin protein, which disrupts cellular homeostasis and impairs normal protein degradation pathways, including the ubiquitin–proteasome and autophagy systems. Among therapeutic strategies, small-molecule inhibitors targeting protease activity have gained attention as they can modulate protein processing and reduce aggregation-associated toxicity.

In this study, trypsin, a representative serine protease, was investigated for its interaction with benzamidine, a well-established competitive inhibitor, using molecular docking. Benzamidine serves as a prototypical model ligand to understand protease inhibition, providing insight into how small molecules may stabilize enzyme-inhibitor complexes relevant to protein degradation pathways implicated in HD. The docking simulations revealed a lowest binding energy of −4.29 kcal/mol, indicating a moderate and favorable interaction between benzamidine and the catalytic site of trypsin. Cluster analysis highlighted that the stability of this interaction is mediated by hydrogen bonding, electrostatic contacts, and aromatic stacking with key residues within the active site pocket.
These findings emphasize the relevance of computational docking in exploring protease-ligand interactions as part of therapeutic development strategies for neurodegenerative disorders. While benzamidine itself is a model compound, the study underscores the potential of rational inhibitor design in targeting protein degradation dysfunctions in Huntington's disease and related conditions.
Keywords: Huntington's disease, Trypsin, Benzamidine, Molecular Docking, Protein Degradation, Neurodegeneration

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Track Classification: Biological Sciences

Contribution ID: **191** Type: **Oral**

"Comb-Shaped Nanotube Architectures Synthesized under Oxygen-Free Conditions for Forensic Biomarker Detection

Abstract The development of nanotechnology has created new opportunities in forensic science to more sensitively detect biological evidence traces. This study produced stable nanostructures and controlled carbonization by synthesizing comb-shaped nanotube structures from pistachio shells in an oxygen-free environment. Scanning Electron Microscopy (SEM) was used to analyze the morphology. The results showed well-defined comb-like nanotube arrangements with high surface area and porous surfaces, which greatly improve biomolecule adsorption. X-ray diffraction (XRD) analysis revealed a broad peak at $2\theta \approx 24–26^{\circ}$, confirming the nanotubes' amorphous carbon nature with defect-rich sites that are ideal for adsorption and interaction with forensic biomarkers. Fourier Transform Infrared Spectroscopy (FTIR) was used to further validate the structure and revealed distinctive peaks that corresponded to the –OH, C=O, and C–H groups. These groups of functions offer

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Track Classification: Forensic Sciences

Contribution ID: **192** Type: **Oral**

Solar MPPT using fuzzy logic and adaptive mutation

The growing demand for green energy has motivated researchers to explore various clean energy sources like wind energy and solar energy. Among all of the renewable energy resources, solar energy is used the most because of its efficiency and abundance. Most recently the use of photovoltaic (PV) cells has significantly increased in both grid-connected and standalone inverter systems. However, the performance of PV cells is strongly depends on the environmental factors like solar irradiation. To increase the efficiency of solar PV systems we can make use of Maximum Power Point Tracking (MPPT) techniques. This paper introduces a novel MPPT approach that integrates a fuzzy logic controller with adaptive mutation. Conventional fuzzy logic-based MPPT algorithms perform well under variable environmental conditions, but they depend on fixed membership functions and static fuzzy rule sets. In order to overcome this limitations, we propose a method which uses adaptive mutation to dynamically adjust fuzzy parameters, ensuring optimal duty cycle generation.

keywords: MPPT, Renewable energy resources, Adaptive mutation, fuzzy logic

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Track Classification: Engineering & Technology

Contribution ID: **193** Type: **Poster**

Analysis of levels of free fatty acids and alpha linolenic acid in Portulaca oleracea

This study evaluates purslane (Portulaca oleracea) as a plant-based source of omega-3s by quantifying free fatty acids (FFAs) and probing alpha-linolenic acid (ALA) signatures using standardized wet-chemistry and chromatographic methods . Seeds and aerial parts were processed via Soxhlet extraction with petroleum ether under controlled temperature, followed by acid value titration using a neutral solvent and phenolphthalein to estimate FFAs, a quality marker for lipid stability and processing suitability . Unsaturation was assessed by Hanus iodine value, reflecting double-bond density typical of PUFA-rich matrices like purslane oils . Seed extracts were profiled on HPLC-UV with methanol:water to observe reproducible PUFA-associated peaks supporting ALA-rich composition reported for P. oleracea seeds and tissues . Together, these measurements benchmark FFA status and unsaturation toward validating purslane as a sustainable ALA source for nutraceutical and functional food applications.

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Track Classification: Biological Sciences

Contribution ID: **194** Type: **Poster**

LATEST UPDATES ON DETECTING EXOPLANETS

An exoplanet is any planet located outside of our own solar system, orbiting a star other than our sun or floating independently in space. Once detected, scientists can analyze their size, mass, and even their atmospheres to infer their composition, temperature, and the presence of potentially life-supporting elements. The first discovery of exoplanets occurred in 1992 when astronomers Aleksander Wolszczan and Dale Frail found two planets orbiting a pulsar (a type of neutron star) named PSR B1257+12.

Transit method, it detects the dip in starlight that is dimmed brightness of the star when a planet passes in front of it's host star. Both Kepler and TESS use the Transit method to detect exoplanets. Kelper introduced the method with deep, long-term observations, while TESS expands the search to the whole sky, targeting nearer and more easily studied systems. Direct imaging method detects exoplanets by capturing actual images of the planets. While challenging, it provides valuable information about a planet's atmosphere, temperature, orbit and the sizes of the planets using coronograph and star shade method. The astrometry method finds exoplanets by measuring the tiny wobble in a star's position caused by the gravitational tug of orbiting planets. Challenges that we are facing are, it requires ultra-precise instruments, the motion is very small, especially for the distant stars, making it a difficult method to use from the earth.

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Track Classification: Physical Sciences

Contribution ID: **195** Type: **Poster**

THERMAL DEGRADATION OF INK USING FTIR SPECTROSCOPY

Ink analysis plays a crucial role in forensic document examination by enabling the differentiation between genuine and counterfeit documents through the examination of ink composition and characteristics. This research investigates the effectiveness of Fourier Transform Infrared (FTIR) spectroscopy for the forensic characterization of ballpoint pen inks. Standard samples were prepared using various solvents and analysed to establish reference spectra. The study evaluates the impact of different drying methods for FTIR, examines the effects of temperature exposure on ink properties, and spectral differences between inks of various brands and batches. The results aim to enhance the detection of forgery, overwriting, and alterations, provide insight into the thermal degradation of inks, and improve the discrimination of ink types even in minimal or tampered samples. This spectroscopic approach demonstrates significant potential for advancing non-destructive, reliable, and reproducible ink examination in forensic science.
Keywords: Forensic document examination, Ballpoint pen inks, Fourier Transform Infrared Spectroscopy (FTIR), Forgery detection.

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Track Classification: Forensic Sciences

Contribution ID: **196** Type: **Poster**

Mirror, Selfie, Society: Age and Gender Influences on Selfitis Behavior

Abstract:
Selfitis, described as the compulsive inclination to capture, edit, and post selfies, has emerged as a behavioral concern in contemporary digital culture. Young adults are particularly vulnerable to this phenomenon due to their heightened social media engagement, identity exploration, and peer influence. The concept of "selfitis" is not recognized as an official diagnosis, but research indicates that it represents a behavioral manifestation of underlying psychological issues rather than being a standalone condition. The obsessive and compulsive need to take and share selfies is often linked to low self-esteem, where individuals seek external validation to compensate for feelings of inadequacy.
The present study investigates selfitis behavior among 150 students aged 18–25 years, including both male and female participants pursuing undergraduate and postgraduate education. Data were collected using the Selfitis Behavior Scale (SBS) developed by Balakrishnan and Griffiths (2018), which assesses six domains: environmental enhancement, social competition, attention seeking, mood modification, self-confidence, and social conformity.
An analysis of the responses showed a notable gender difference, with more female participants than males. The age range of the participants also exhibited wide variation. We used ANOVA to determine if there were significant differences in selfitis behaviours based on age and gender. Our results indicate a significant gender difference in selfitis scores, along with notable variations across different age groups. Females typically exhibit a higher incidence and frequency of selfitis compared to males. They often score higher in terms of selfie addiction and experience greater appearance anxiety related to their selfie behavior. Although some studies report no gender differences or even a higher prevalence among males in certain samples, these findings are less common.
Keywords: Selfitis, selfies, gender differences, age, and digital behavior

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Track Classification: Forensic Sciences

Contribution ID: **197** Type: **Poster**

CENTRALIZED CCTV AND GPS-BASED AUTOMATED TRAFFIC LIGHT SYSTEM (CATS)

ABSTRACT
Urban traffic congestion and emergency delays remain critical challenges as traditional fixed-time signals fail to adapt to real-time conditions. This paper proposes the Centralized CCTV and GPS-Based Automated Traffic Light System (CATS), a smart, adaptive framework integrating computer vision, IoT, GPS, and AI. CCTV cameras monitor vehicle density, pedestrian flow, and incidents, while each traffic light is equipped with self-localizing GPS for plug-and-play installation. An IoT-enabled mesh network connects traffic lights, enabling them to share data, synchronize signals, and maintain local decision-making through distributed caching. A centralized hub with AI algorithms dynamically adjusts cycles, detects violations, and generates green corridors for emergency vehicles. By combining CCTV, IoT communication, and GPS intelligence, CATS delivers a scalable, fault-tolerant, and future-ready solution that reduces congestion, enhances emergency response, and forms the backbone of next-generation smart city mobility.
Keywords: CATS, CCTV Analytics, IoT Mesh, GPS Self-Localization, Adaptive Traffic Lights, Emergency Corridor, Smart Cities.

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Track Classification: Forensic Sciences

Contribution ID: **198** Type: **Oral**

Comparative study of Automobile Paint using FTIR and chemometrics _ A Review

Abstract
This study aims to examine the automobile paint evidence analysis, which is crucial in forensic science, especially in vehicle accident cases. The binder, a fluid or polymeric component, provides adherence to the paint, ensuring the coating retains pigments and additives. Pigments, either inorganic or organic, provide color and corrosion resistance. Solvents are essential in paint to ensure a liquid state for easy application. Small amounts of additives are added to paints to enhance performance qualities. Thickeners, surfactants, and driers function as catalysts. A Fourier Transform InfraRed (FTIR) Spectrometer acquires broadband Near Infrared (NIR) to Far Infrared (FIR) spectra, converting the interferogram into an IR spectrum. FTIR spectroscopy and chemometric techniques have become powerful tools for comparing and evaluating paint evidence from automobiles. FTIR spectroscopy provides information about the molecular structure of a sample and can identify paint components, distinguish between samples, and differentiate between them based on unique spectral signatures. Chemometric techniques, such as multivariate analysis, can analyses and interpret the complex data generated by FTIR spectroscopy, enhancing spectral resolution and allowing for more accurate identification of paint components.

Keywords: Automobile paint, FTIR, Chemometrics, Road traffic accident, Hit-and-run cases

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Track Classification: Forensic Sciences

Contribution ID: **199** Type: **Poster**

Mobile Network Security: Challenges, Vulnerabilities, and Future Directions

Mobile communication networks have progressed rapidly, from 2G and 3G to 4G and now 5G, with work already underway toward 6G systems. Each generation has brought faster data speeds, reduced latency, and new applications such as video streaming, cloud services, and the Internet of Things (IoT). These advancements have changed the way people connect and businesses operate, but they have also introduced a wide range of security issues that cannot be overlooked. In earlier systems like 2G and 3G, the main problems were weak encryption, poor authentication, and vulnerability to eavesdropping and SIM cloning. The shift to 4G, with its all-IP architecture, offered much better connectivity but also exposed networks to internet-based threats such as denial-of-service attacks, man-in-the-middle interception, and IP spoofing. New challenges also arose in signalling security, handover procedures, and identity protection. With the arrival of 5G, stronger encryption, mutual authentication, and technologies such as network slicing and software-defined networking have improved resilience. However, concerns remain, particularly with backward compatibility, the security of billions of IoT devices, and the risk of advanced cyberattacks. This study examines these security challenges across all generations of mobile networks. It reviews vulnerabilities in authentication, encryption methods, privacy-preserving techniques, and access control, while also analysing the potential of new approaches such as AI-driven intrusion detection and anomaly monitoring. The findings show that although each generation has improved security in some areas, persistent weaknesses remain, especially where older systems coexist with newer ones. Attackers often exploit downgrade flaws or insecure protocols from previous generations, making unified solutions essential. The research highlights the need for stronger cryptographic methods, better authentication protocols, and smarter detection systems, alongside global cooperation between network providers, device manufacturers, and policymakers. It also points to future research directions such as post-quantum cryptography and adaptive, scalable frameworks. Ultimately, the goal is to create mobile networks that are not only faster and more capable but also secure, reliable, and able to protect user privacy in an increasingly connected world.

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Track Classification: Forensic Sciences

Contribution ID: **200** Type: **Poster**

Integration of Artificial Intelligence and 5G Technology for Transformative Healthcare

Abstract
Worldwide Healthcare System faces significant challenges in achieving the triple aim for improving population health, enhancing patient experience and reducing cost in healthcare. The integration of Artificial Intelligence, Machine Learning and 5G technologies scripts a paradigm shift and offers a transformational approach to patient care in Healthcare Industry. The collaboration among these technologies makes the system efficient in telemedicine, remote patient monitoring and understanding of precision medicine towards patient care. ML algorithms access more data, feasible hardware and 5G resources that contribute for the development of AI transformation in medicine. AI provides solution through big data, machine learning and deep learning algorithms that refine massive quantity of health data records, clinical studies to genetic information, analyze faster than humans, decision making, detect and track infectious diseases.AI in healthcare organizations support for better health monitoring and preventive care to compose healthcare operation more efficient with 24/7 patient services. This chapter outlines the recent breakthroughs, roadmap to build reliable, effective and safe AI systems and converse the possible future direction by integrating AI with 5G augmented patient care in healthcare applications.

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Track Classification: Engineering & Technology

Contribution ID: **201** Type: **Poster**

GREEN SYNTHESIS OF ZINC OXIDE NANOPARTICLES USING BIO-DERIVED DEEP EUTECTIC SOLVENTS

Given the drawbacks and risks of traditional chemical techniques, forensic scientists are paying close attention to the development of environmentally friendly methods for latent fingerprint visualization. The green synthesis of zinc oxide (ZnO) nanoparticles using bio-derived deep eutectic solvents (DESs) made from zinc nitrate and lemon peel extract is the main goal of this work. The DES served as a reducing agent, solvent, and stabilizer during the straightforward, economical, and environmentally safe synthesis process. XRD, SEM-EDX, BET, FTIR, and UV-Vis spectroscopy were used to assess the size, shape, and crystallinity of the resultant ZnO nanoparticles. Under UV light, these nanoparticles showed intense fluorescence, which improved the visibility of latent fingerprints on a variety of surfaces. The technique produced consistent nanoparticle size and shape ensured biocompatibility, and minimized environmental impact. This study demonstrates the potential of green-synthesized ZnO nanoparticles as a sustainable and efficient alternative for forensic fingerprint development, supporting future advancements in eco-friendly forensic nanotechnology.
Keywords: Green synthesis, Zinc oxide nanoparticles (ZnO NPs), Deep eutectic solvents (DESs), Latent fingerprint visualization, Fluorescence-based forensic analysis

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Track Classification: Forensic Sciences

Contribution ID: **202** Type: **Oral**

Structure of Stellar Halos Across Dark Matter Models in Milky Way-like Galaxies Using the EAGLE Simulation.

The cold dark matter (CDM) model predicts that galaxies like the Milky Way grow through a series of mergers with smaller satellites, leaving behind extended stellar halos filled with tidal streams and shells. These relics of past mergers act as a fossil record of galaxy assembly. Alternative dark matter models change this picture: warm dark matter (WDM) suppresses the smallest mergers, while self-interacting dark matter (SIDM) produces diffuse halos whose satellites are more easily disrupted. As a result, the structures that survive in the stellar halo can provide a sensitive probe of the underlying dark matter physics.

In this work, we use cosmological simulations with EAGLE galaxy formation physics to compare the merger histories and stellar halos of Milky Way–like galaxies across CDM, WDM, and SIDM scenarios in the action-angle space. We analyze how individual mergers deposit material in action–angle space, and connect these signatures to the timing and mass of the events. Using power spectrum methods, we test whether different dark matter models leave measurable differences in the resulting substructure.

Our preliminary results indicate that in CDM, dense subhalos resist disruption and leave behind a rich variety of long-lived tidal features. In contrast, in SIDM, diffuse satellites are stripped more rapidly, resulting in distinct shell-like patterns. WDM halos, by comparison, appear smoother due to the lack of low-mass accretions. These findings suggest that the detailed imprint of mergers in the stellar halo provides a new way to test the nature of dark matter.

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Track Classification: Physical Sciences

Contribution ID: **203** Type: **Oral**

Advancement in Crime Scene Investigation with reference to Luminol test of Blood stains: A review

Blood is a bodily fluid containing Plasma and Blood cells. The plasma is the fluid part of blood, and the Blood cells comprise of Red Blood cells, White Blood cells and platelets which are suspended in the plasma. The human body is constituted around 8-10% by blood. Based on presence or absence of nucleus, blood cells are divided into White Blood Cells (WBC) and Red Blood Cells (RBC) and Platelets. Blood is one of the most significant pieces of evidence in the field of forensics. It can be useful for establishing connection between the suspect, victim and the scene of crime; the blood pattern and blood splatter analysis can be indicative of the mode of crime, movement of suspect or victim and is of vital importance in reconstruction of crime scenes. Bloodstains are not always visible an in obvious areas as the suspect might have cleaned off the scene of crime. But it is difficult to remove traces of spilled blood even if the surface is cleaned. Even if the scene of crime is spotlessly clean, blood stains can be determined and the possible areas containing blood stains can be highlighted by Luminol, a substance having chemiluminescent properties. Luminol reacts with the Iron (Fe) molecule present in hemoglobin molecule of RBCs emitting a faint bluish light. But luminol reacts with other iron containing compounds as well giving false positive results. To enhance the result of luminol, it might be possible to modulate luminol into other derivatives of luminol by using electrochemical and physical methods as well as using nanoparticles for the same. The incorporation of techniques like forming gold nanoparticle hybrids of luminol, alkylation, substitutions of groups in the luminol structure have seen widespread use in detection of health disorders as well as immunoassays. This study reviews various works done on formation of derivatives of luminol which can be used in the field of forensics for better and precise discovery of blood stains at the scene of crimes.

Keywords: Evidence; Forensics; Blood stain patterns; Blood splatter; Luminol; Nanoparticle hybrids; Alkylation; Substitution; Immunoassay.

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Track Classification: Forensic Sciences

Contribution ID: **204** Type: **Poster**

SnipSync: Your Personal, Private, and Powerful Clipboard Cloud

SnipSync redefines clipboard management by transforming it into a robust, high-capacity, and entirely private data archival system that operates exclusively on a local area network (LAN). This LAN-only architecture is its cornerstone, providing absolute data privacy and security by ensuring that your clipboard contents—whether text, images, or files—never travel over the internet. By being completely self-hosted, the system grants you ultimate control over your information and guarantees uninterrupted functionality, even without an internet connection. The core of the system is a central hub, powered by accessible hardware like a Raspberry Pi or a dedicated mini-server, which can be connected to terabytes of storage via external drives or a NAS. This transforms a simple clipboard tool into a powerful, long-term data archive. Every item copied is not just stored but intelligently indexed with metadata such as timestamps and source devices, creating a fully searchable history of your digital activity. To manage this vast repository, SnipSync employs sophisticated storage optimization techniques, including data compression to reduce file sizes and deduplication to ensure that identical items are only stored once, maximizing storage efficiency. The user experience is seamless: a lightweight client application on each of your devices —desktops, laptops, and mobile phones—synchronizes with the central hub in real-time. Copy something on one device, and it is instantly available across all others on the network. This fusion of real-time multi-device clipboard synchronization with a permanent, high-capacity archival solution creates a personal "clipboard cloud" that is secure, scalable, and completely independent, making it an indispensable tool for both individual power-users and security-conscious teams.

Keywords:
LAN-Only,Clipboard Management,High-Capacity,Private Data Archival,Self-Hosted,Data Privacy,Offline Functionality,Mini-Server,Data Deduplication Multi-Device Sync.

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Track Classification: Forensic Sciences

Contribution ID: **205** Type: **Poster**

(-)-Epigallocatechin Gallate: Anticancer potential, Therapeutic challenges and Translational Promises

Green tea, derived from *Camellia sinensis,* is a widely consumed beverage acclaimed for its health benefits, primarily attributed to its abundant polyphenol content, particularly catechins. The predominant bioactive catechin in green tea, (-)-Epigallocatechin-3-gallate (EGCG), is recognized for its antioxidant, anticancer, antidiabetic, and neuroprotective properties. However, (-)-EGCG faces challenges such as poor lipid solubility, low bioavailability (0.2–2%), and instability within the body due to its hydroxyl-rich structure (Almatroodi et al., 2020). However, its efficacy is constrained by factors such as insufficient intestinal absorption, rapid metabolism, and limited tissue accumulation. Recent studies have explored strategies to enhance the bioavailability of (-)-EGCG, including nanoparticle delivery systems, structural modifications, and synergistic combinations with other compounds. This review explores the biochemical characteristics of (-)-EGCG, its health benefits, and the latest advancements aimed at overcoming its pharmacokinetic limitations to improve its therapeutic application.

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Track Classification: Biological Sciences

Contribution ID: **206** Type: **Oral**

The Role of Online Reviews in Shaping Hotel Booking Behavior

Online reviews play a significant role in shaping hotel bookings, strongly influencing customer preferences and choices. This study examines the impact of reviews on hotel reputation, pricing policies, and consumer decision-making. The discussion centers on three aspects: the ways hotels manage their online image and modify prices, the influence of unfavorable feedback on booking decisions, and the varying effects between independent properties and established hotel chains. Evidence from multiple empirical studies indicates that positive reviews can enhance booking volumes and enable higher pricing, whereas negative reviews discourage potential guests—particularly when the feedback is perceived as authentic or relatable. Independent hotels, which lack the brand strength of larger chains, tend to be more vulnerable to such negative evaluations. The findings stress the importance of proactive reputation management, engaging with customer feedback, and aligning pricing strategies with online perceptions. For hoteliers and marketers, these insights are valuable for strengthening visibility on booking platforms, fostering customer trust, and improving reservation rates. Overall, the study underscores how guest-generated content has become a critical factor in maintaining competitiveness in today's digital hospitality landscape.

Keywords

Hotel bookings, Online reviews, Customer behavior, Pricing strategies, Reputation management

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Track Classification: Mathematical & Data Sciences

Contribution ID: **207** Type: **Poster**

Unlocking natures pharmacy: constituents and potentials of Bael fruit extract

Unlocking Nature's Pharmacy: Constituents and Potentials of Bael Fruit Extract"
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Bael (Aegle marmelos) also known as Bengal quince belonging to the family Rutaceae, is a hardy subtropical tree native to India and Southeast Asia that has been well documented for both medicinal and nutritional purposes in traditional medicine, including Ayurveda, unani, and siddha systems of medicine for the treatment of gastrointestinal disorders, diabetes, cardiovascular disease, and microbial infections. Bael fruit (Aegle marmelos) has also recently gained momentum as a subject of scientific investigation focused on its potential therapeutic use, particularly regarding prevention and treatment of neurodegenerative disorders. The fruit is composed of a variety of bioactive phytochemicals, including flavonoids (quercetin, kaempferol), alkaloids (aegeline, marmeline), tannins, saponins, and essential oils (eugenol). Given its extensively studied phytochemicals, Bael is showing immense potential for therapeutic applications in neuroprotection in both prevention of, and treatment for, neurodegenerative conditions. Notably, oxidative stress plays a significant role in the pathogenesis of neurodegenerative disorders such as Alzheimer's disease, Parkinson's disease, and other forms of cognitive decline, which are characterized by the death of neurons. The fruit abundant in antioxidants, primarily ascorbic acid (vitamin C), polyphenols and flavonoids, prevent the harmful effects of reactive oxygen species (ROS) and free radicals, leading to lipid peroxidation, damage to DNA, and neuronal cell death. Bael extracts have been shown to increase the activity of the natural antioxidant enzymes including superoxide dismutase (SOD) and catalase, which represent the natural antioxidant defence system in the brain. Furthermore, the direct antioxidant effects of Bael are complemented by their effective modulation of pro-inflammatory cytokines (IL-1β, IL-6, TNF-α)
Keywords
Bael (Aegle marmelos), Neurodegenerative disorders, Phytochemicals, Antioxidants, Oxidative stress

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Track Classification: Biological Sciences

Contribution ID: **208** Type: **Poster**

Unravelling Brain Disorders: Drosophila as a Genetic Tool in Neurodegeneration

Unravelling Brain Disorders: Drosophila as a Genetic Tool in Neurodegeneration

Neurodegenerative diseases are a diverse group of progressive, age-associated disorders characterized by improper functioning of neurons, ultimately leading to impaired cognition, movement, and survival. Disorders such as Alzheimer's disease, Parkinson's disease, Huntington's disease, are major public health challenges, yet effective therapies remain limited due to the complexity of their underlying mechanisms. Drosophila melanogaster has become a widely used model system for unravelling the genetic, molecular, and cellular basis of neurodegeneration. Its advantages include a well-mapped nervous system, highly conserved signalling pathways, rapid life cycle, and powerful genetic tools, which allow the creation of transgenic lines that mimic pathological features of human diseases. Studies in Drosophila have successfully replicated key disease phenotypes such as protein aggregation, mitochondrial dysfunction, oxidative stress, synaptic loss, and neuron death, thereby providing valuable platforms to understand pathogenic mechanisms. Moreover, large-scale genetic screens and pharmacological assays in flies have enabled the identification of modifier genes and candidate therapeutic compounds with translational potential. Research using Drosophila has also highlighted the importance of non-neuronal cells, such as glia, in influencing neuronal survival, further expanding our understanding of disease complexity. Collectively, insights gained from Drosophila melanogaster models continue to bridge the gap between basic molecular research and clinical applications, making the fruit fly an indispensable tool in advancing neurodegenerative disease research and therapeutic discovery.
Keywords
Neurodegenerative diseases, Drosophila melanogaster, Protein aggregation, Genetic screens, Therapeutic discovery

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Track Classification: Biological Sciences

Contribution ID: **209** Type: **Poster**

Hair Analysis for Pesticide Biomonitoring: Advances in Exposure Assessment and Forensic Applications

Aim: Pesticide exposure poses major health risks due to persistence in the environment, toxicity, and rising cases of self-harm. This review evaluates hair as a non-invasive matrix for pesticide biomonitoring, focusing on commonly detected pesticides, general extraction and analytical techniques, and recent improvements that enhance sensitivity and accuracy.

Methods: A systematic search was conducted in PubMed, Scopus, and Web of Science for studies reporting pesticide detection in human hair. Thirty studies were included after screening. Information was summarized on pesticide types, sample preparation, analytical techniques (GC–MS and LC–MS), and overall performance indicators. Methods were compared broadly on their sensitivity, recovery, and reliability.

Results: Hair has been successfully used to detect a range of pesticides, most often organophosphates, pyrethroids, organochlorines, and neonicotinoids. Extraction methods included simple solvent extraction, QuEChERS, and SPE. Analytical detection mainly relied on GC–MS for stable compounds and LC–MS for more polar pesticides. Many studies reported good sensitivity and acceptable recovery, although results varied due to differences in protocols. Overall, hair proved useful both in environmental exposure assessment and in forensic contexts.

Conclusions: Hair offers a practical and non-invasive option for pesticide biomonitoring. While results across studies are promising, standardization of methods is needed to improve comparability. Advances in eco-friendly extraction and modern MS technologies continue to improve reliability and broaden applicability.

Keywords: Pesticide, Biomonitoring, Hair, GC–MS, LC–MS, Sensitivity, Toxicology, Extraction

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Track Classification: Forensic Sciences

Contribution ID: **210** Type: **Oral**

Parallel Oral Presentations

Wednesday 17 September 2025 12:15 (45 minutes)

Contribution ID: **211** Type: **Oral**

Parallel Oral Presentations

Wednesday 17 September 2025 14:00 (2 hours)

Contribution ID: **212** Type: **Poster**

Poster Presentations

Wednesday 17 September 2025 16:00 (1 hour)

Contribution ID: **213** Type: **Oral**

Carbon Footprints and Renewable Energy: A Comprehensive Review of Pathways for Sustainable Power Systems

The accelerating accumulation of atmospheric carbon dioxide from conventional fossil fuel electricity generation has created unprecedented pressure for energy sector decarbonization. Environmental impact quantification through CO_2-equivalent measurements serves as a fundamental tool for evaluating power generation sustainability across production, delivery, and consumption phases. This comprehensive analysis investigates the complex dynamics between emission profiles and clean energy technologies, emphasizing transformation pathways toward environmentally responsible electrical systems. Our investigation utilizes systematic meta-analysis combined with comprehensive lifecycle impact evaluation to examine emission characteristics of photovoltaic, wind turbine, hydroelectric, bioenergy, and geothermal installations. The assessment spans material sourcing, manufacturing, deployment, operational phases, maintenance activities, and decommissioning processes to establish complete environmental accounting. Sophisticated analytical frameworks, including stochastic modeling and uncertainty quantification, address variability in emission coefficients and technology-specific parameters.

Results demonstrate substantial disparities in carbon intensity among clean energy options, with wind and nuclear technologies achieving 4-48 gCO_2eq/kWh compared to photovoltaic systems at 18-180 gCO_2eq/kWh, contrasted against conventional thermal generation at 820-1,050 gCO_2eq/kWh. Manufacturing stages, logistics networks, and resource extraction emerge as dominant emission sources within renewable technology lifecycles. Infrastructure integration complexities, encompassing storage infrastructure and ancillary services, are evaluated regarding their emission consequences. This analysis presents breakthrough approaches for emission minimization, incorporating multi-technology renewable configurations, carbon-neutral manufacturing utilizing clean electricity, regionalized supply networks, and materials recovery strategies for equipment components. Intelligent grid infrastructure and responsive load management systems demonstrate potential for 15-35% system-wide emission reductions through enhanced renewable utilization and minimized energy waste. Next-generation innovations including tandem photovoltaic architectures, floating wind installations, and synthetic fuel production are evaluated for decarbonization impact and deployment feasibility. The investigation analyzes governance structures, carbon valuation systems, and policy instruments that expedite clean energy adoption while managing variability through storage

Keywords: Renewable energy, carbon footprint, lifecycle assessment, sustainable power systems, carbon intensity, grid integration, climate change mitigation

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Track Classification: Engineering & Technology

Contribution ID: **214** Type: **Oral**

Smart Agriculture: Integrating IoT and Remote Sensing for Crop Management

Agriculture is undergoing a digital transformation with the integration of IoT and remote sensing technologies. This paper proposes a smart farming model that monitors soil health, irrigation needs, and pest activity through IoT-enabled sensors and satellite imagery. Machine learning algorithms are used to predict crop yields and optimize resource use. Field experiments show up to 30% reduction in water consumption and 20% yield improvement.

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Presenter: REDDY, Sharath Reddy

Track Classification: Engineering & Technology

Contribution ID: **215** Type: **Oral**

Mix Design and Strength of Coral Shell Powder Concrete

The large scale production and use of Portland cement and acquisition of aggregates from dredging and quarrying has a dramatic impact on the environment on its degradation. Waste like coral shell is considered to be a material which could be used as binder and as partial replacement of cement. Coral Shell Powder (CSP) exhibits pozzolanic properties in mortar and concrete. The CSP mixture provides 10 per cent replacement of cement and as a result a higher compressive strength of 40.54 N/mm2 than the nominal strength 30.00 N/mm2 of the concrete is achieved. The paper presents the mix design of CSP concrete and details about the experimental investigation conducted on this concrete involving its testing for the evaluation of mechanical strength.

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Track Classification: Engineering & Technology

Contribution ID: **216** Type: **Oral**

An experimental study on self- curing concrete using GGBS slag and poly ethelene glycol

During construction curing plays a major role in the development of concrete properties. Curing is frequently used to describe the process by which hydraulic cement concrete matures. The role of curing is to reduce water evaporation from the concrete and maintain satisfactory moisture content, especially during early ages, for continuation of the hydration process that is necessary for the development of cement microstructure. This will lead to a better-quality cement paste and concrete and will help to achieve the desired properties. However, good curing is not practical in many cases, it was found that the benefit of using self-curing agents is to reduce water evaporation from concrete, thus increasing its water retention capacity compared with that of conventional concrete and that water-soluble polymers might have this potential. Construction industry use lot of water in the name of curing. The curing period may depend on the properties required of the concrete. The investigation of this study the mechanical characteristics of concrete such as compressive strength, split tensile strength and flexural strength by varying the different percentage of GGBS from 0% to 30% by weight of cement for M25 grade concrete using self-curing technique by using polyethylene glycol 400. To identify the effect of polyethylene glycol (PEG) along with the GGBS on strength characteristics of self-curing concrete and also to evaluate influence of poly ethylene glycol and GGBS on mechanical properties which are experimentally investigated.

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Track Classification: Engineering & Technology

Contribution ID: **217** Type: **Oral**

PARTIAL REPLACEMENT OF FINE AGGREGATE BY SEA SAND IN GPCC

In construction industry, concrete is the most important material for construction. Concrete is composed of cement, coarse aggregate, fine aggregate and water. In this project we are going to use geopolymer cement which is the combination of flyash and GGBS which is rich in silica and alumina.
The use of the cement in concrete give high early strength and better durability. Common river sand, which is most commonly used fine aggregate, is expensive due to the excessive cost transportation from natural sources and also large scale depletion of the resources creates environmental problems. To solve this problem we are going to use sea sand as a replacement in a effective manner.
The scope of this paper is to study the properties of GPC by using sea sand as a fine aggregate in various proportions. Water scarcity problem is also reduced here since no water is added to concrete and no curing is required.
The test result shows that the use of geo-polymer concrete shows increase in compressive strength by 24.56%,42.80%,50.40%,53.44%,56.5% for the following mix ratios as compared with conventional concrete. The test result shows that the use of geo-polymer concrete shows increase in split tensile strength by 35.50%,26.93%,31.73%,31.8%,27.35% as compared with conventional concrete. The test result shows the use of geo-polymer concrete shows increase in flexural strength by 35.46%,26.17%,26.23%,24.32%,22.78% as compared with conventional concrete.

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