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Record 1 of 42

Title: The Scattered Court, Hindustani Music in Colonial Bengal

Author(s): Datta, P (Datta, Partho)

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Record 2 of 42

Title: Ranking the risks of India's coal phase-down: An analytical hierarchy process approach

Author(s): Pandey, JG (Pandey, Jay Ganesh); Kumar, A (Kumar, Atul)

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Abstract: Phasing down coal is critical to addressing climate change. However, the deep entrenchment of coal in India's techno-economic and socio-political landscape entails severe risks. Coal currently supplies 55 % of India's primary commercial energy, generates nearly 70 % of electricity and sustains around 13 million jobs directly and indirectly. Notwithstanding these dependencies, existing research on coal phase-down in India has primarily focused on its incentives and benefits, specifically using techno-economic assessments. A critical gap lies in systematically analysing the risk associated with coal phase-down, particularly from the perspective of energy justice and policy design. This study examines the major risks of coal phase-down in India and ranks them based on severity using the Analytical Hierarchy Process (AHP) and expert interviews. To accomplish this, the six major risks of coal phase-down in India were examined and ranked based on five criteria: economic, social, technological, political, and climate. The findings reveal that 'loss of livelihoods' is the most severe risk, followed by 'threats to energy security' and 'loss of government revenue'. Though 'technological complexity', 'rising import dependency', and 'creation of stranded assets', emerged as significant risks, they were ranked lower in severity. Theoretically, this study contributes to energy transition scholarship by demonstrating the application of multi-criteria decision-making approaches in risk analysis, offering a replicable framework for assessing transition risks in coal-dependent economies across the Global South. Practically, it equips policymakers with a structured framework to anticipate, prioritise and mitigate transition risks, thereby informing the design of equitable and resilient phase-down strategies.

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Record 3 of 42

Title: Zearalenone and its metabolites provoke contrasting modulatory responses on estrogen and androgen receptors: Insights into the molecular basis of endocrine disruption in live cells

Author(s): Rizvi, S (Rizvi, Sheeba); Chhabra, A (Chhabra, Ayushi); Sagurthi, SR (Sagurthi, Someswar R.); Tyagi, RK (Tyagi, Rakesh K.)

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Abstract: Zearalenone (ZEA) is a non-steroidal mycotoxin enrouted mainly through the consumption of contaminated dietary products. Some traditional studies with ZEA have implied influence on several cellular and endocrine processes. However, detailed advanced insights into the molecular basis of ZEA-induced toxicity under defined live-cell conditions remain unexplored. This study uses molecular docking and cell-based approaches to investigate the interactions between ZEA, its metabolites (a-ZOL, (3-ZOL), steroid receptors ERa/(3, and androgen receptor (AR). The studies were performed with HEK293T and HepG2-derived stable cell lines exposed to 1 mu M of ZEA, a-ZOL, (3-ZOL, and cognate steroids, 17(3-estradiol, and 5a-DHT (10 nM). Fluorescent protein-tagged cytoplasmic-shifted ERa/(3 and AR chimeras enabled visualization of receptor-xenobiotic interactions under live-cell conditions. Key parameters examined included i) receptor subcellular localization, ii) ligand-receptor interactions, iii) transcriptional function, and iv) receptor-chromatin interactions. Competitive reporter-gene assays were also performed with a-ZOL and (3-ZOL (0.1-1.0 mu M) in the presence of 5a-DHT (EC50; 10-10 M). ZEA metabolites promoted i) ERa/(3 and AR nuclear translocation, ii) ERa/(3 transactivation, iii) repression of DHT-induced AR transactivation, and iv) contrasting receptor-chromatin interactions. This study suggests that endocrine disruptions are driven by a complex interplay of agonistic and/or antagonistic effects of ZEA and its metabolites on receptor function, contributing to potential health risks.

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Author(s): Suman, S (Suman, Saket); Srivastava, A (Srivastava, A.)

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Abstract: In this paper, a novel Quantum Dot based Inverted T-shaped TFET (QD-IT-TFET) has been proposed. We have studied the IT-TFET structure with Silicon and Germanium based quantum dot injected into the device. In this IT-TFET structure we have introduced semiconductor quantum dot at interface of source and channel and compare the result with different number of QDs inside the TFET structure. We have chosen the optimize gate thickness of the QD-IT-TFET structure. The dual gate TFET was chosen as it provides flexibility over electrostatics control, reduce ambipolar current; improves ON current, lowers subthreshold slope and increases I-ON/I-OFF ratio. We have performed analysis of Digital and analog parameters for the QD-IT-TFET structure. This novel technique of introducing quantum dots in TFET Ge-QD-IT-TFET shows peak performance in terms of ON current with value of I-ON 3.6 x 10(-5) A mu m(-1), with Subthreshold Swing (SS) having a value of (35.2 mV dec(-1)) and low OFF current of order 10(-18) A mu m(-1). In this study, with the injection of quantum dots in TFET structure we have been able to achieve higher I-ON/I-OFF ratio with the value (10(13)). We compare our results for IT-TFET structures with and without injection of different numbers and types of quantum dots within the device. These attributes for our proposed quantum dot injected TFET makes it a highly promising candidate for extremely-low-power digital and analog AI chip applications.

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Abstract: In rural India, a large portion of the population continues to struggle with poverty, limited access to resources and education, and few job opportunities. This leads to many individuals, including men, women, and children, having to take on daily wage labouring jobs to make ends meet. Women from marginalised communities often find themselves working in fields, brick kilns, construction sites, small factories, or as domestic workers in higher caste households. Unfortunately, the wages earned from these informal jobs are often insufficient for survival, and these women also face discrimination based on caste, class, religion, and gender in the workplace. This creates an undignified and oppressive environment for these women, particularly when they take on paid domestic work, which is often exploitative and rife with abuse in rural areas.This paper seeks to explore the intertwined experiences of paid domestic workers in rural India. It is based on primary research conducted through in-depth, semi-structured interviews with 25 domestic workers during and after the pandemic in the Chandauli district of Uttar Pradesh, representing a rural area. The paper contends that domestic work in rural India remains deeply rooted in caste-based servitude. The organisation of paid domestic work in rural India is influenced by a complex interplay of caste, class, gender, and religious identities. There exists not only a division of labour but also a hierarchy of labourers within domestic work. They not only encounter caste discrimination but also perpetuate discrimination against fellow workers ranked lower in the caste hierarchy.

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Abstract: Carbon (C) storage capacity of sal (Shorea robusta) forests in the western Himalaya is increasingly threatened by rising disturbance intensity, particularly logging. Disturbances significantly influence forest floor respiration (R-ff) by affecting fine root biomass (FRB), soil properties (temperature, moisture, bulk density (BD)), N availability (nitrate and ammonium ions), and microbial biomass carbon (MBC). However, interactive effects of disturbances and seasonal conditions on R-ff and its components (heterotrophic (R-h) and autotrophic (R-a) respiration) remain poorly understood. This study investigated R-h and R-a across three growing seasons using trenching method in sal forests under four disturbance regimes (no disturbance (ND): < 5 % basal area removal, low disturbance (LD): <20 %, moderate disturbance (MD): <50 %, and high disturbance (HD): >50 %). R-ff in HD stands were 13.7 %, 9.2 %, and 10.9 % higher than ND, LD, and MD stands, respectively, due to a substantial increase in R-a, which was 39.2 %, 30.6 %, and 51.1 % higher than in ND, LD, and MD stands. Conversely, R-h was 6.3 %, 3.4 %, and 2.9 % greater in MD stands compared to ND, LD, and HD stands, likely due to enhanced soil organic carbon (SOC), moisture, N availability, and MBC. Model predictions indicated that variations in R-h and R-a contributions were primarily driven by microbial quotient (Qmic, MBC: SOC ratio), N availability, and soil properties, particularly BD, moisture, and temperature, influenced by disturbances and seasonal changes. Path analysis reveals, R-ff and its components are regulated by distinct ecological drivers, with N availability and microbial properties playing key roles. Our findings demonstrated that R-h and R-a respond independently to disturbance regimes across seasons and that increased N availability and moisture reduce the temperature sensitivity of R-ff. These findings enhance understanding of how disturbances, through vegetation and soil bio-physicochemical processes, influence C efflux rates, essential for improving predictions of C balance in forest ecosystems.

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Abstract: This paper investigates the influence of dust polarization force on the excitation of linear dust Coulomb waves (DCWs) in dense, gravitating viscoelastic fluid with high fugacity (f >> 1). The dust polarization force significantly modifies the dispersion properties of DCWs and Jeans instability in the regime of high dust fugacity. In the lowfugacity limit (f << 1), the plasma exhibits typical dust acoustic wave (DAW) characteristics, whereas in dense regions DCWs dominate, introducing viscoelastic effects that alter instability conditions. The properties of DCWs modified by polarization force have been examined for a lunar dusty plasma environment that possesses a high fugacity parameter. The presence of these parameters also modifies the Jeans instability criterion and the critical wavenumber, which set the threshold to make a system gravitationally unstable. The viscoelastic effects stabilize, whereas dust polarization has a destabilizing influence on the growth rate of the Jeans instability in diffuse dust molecular clouds.

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Abstract: Ferrimagnetic spinel materials of formula AB2X4, where A and B are transition metals and X is oxygen or sulfur, hold promise for the realization of multiferroic characteristics. Herein, synthesis of spinel CoMn2O4 is reported and its magnetic, dielectric, and ferroelectric aspects and their correlations are explored. Polycrystalline CoMn2O4 is synthesized by using the conventional solid-state method. The X-ray diffraction and Raman spectroscopy confirm the phase purity of the synthesized compound. The crystal structure is identified with tetragonal symmetry (I41/amd space group). DC magnetization measurements indicate two magnetic transitions: one at temperature T 1 approximate to 186 K, followed by another Yafet-Kittel ferrimagnetic transition at T 2 approximate to 86 K. A frequency-independent anomaly in the temperature-dependent dielectric permittivity is observed near the low magnetic ordering temperature (T 2). This reflects the possibility of the correlation between lattice dynamics and spin ordering in spinel CoMn2O4. A substantial exchange bias is also observed below T 2 approximate to 86 K. The change in dielectric permittivity in the presence of applied magnetic field follows the square of the magnetization dependence, which is consistent with Ginzburg-Landau theory. However, the detailed pyroelectric current measurements reveal the absence of intrinsic ferroelectric order.

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Abstract: Despite the current advancement accomplished in the asymmetric construction of spirocyclic oxindoles fused with three- to six-membered heterocycles, accessing enantioenriched spirooxindoles fused with larger heterocycles has been far less successful. Inspired by the substantial medicinal and biological activities of spirooxindoles, characterized by their unique structural features, the construction of these compounds, especially those incorporating larger heterocycles, is extremely desired. However, this endeavor remains a challenging task due to the complexity of their structures and the need for precise stereoselectivity in synthesis. In this review article, we aim to provide a concise overview of the stereoselective strategies developed for the construction of spirooxindoles featuring larger heterocycles over the past few years. While summarizing the progress achieved so far, we have also explored the reaction mechanisms and examined the challenges encountered during reaction discovery, in order to advance this field further.

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Abstract: Generative AI is redefining precision medicine by enabling the rational design of patient-specific therapeutics and overcoming the inherent inefficiencies of conventional drug discovery workflows, including protracted timelines, high attrition rates, and prohibitive R&D expenditures. Generative models such as Variational Autoencoders (VAEs), Generative Adversarial Networks (GANs), transformer-based architectures, and denoising diffusion models (DDMs) enable de novo molecular generation guided by multi-omics datasets (genomics, transcriptomics, proteomics), facilitating the design of small molecules, peptides, and biologics tailored to individual molecular profiles. These architectures operate in high-dimensional latent chemical spaces, allowing chemical morphing, scaffold hopping, and latent space optimization to enhance potency, selectivity, and ADME/Tox properties. Integration with QSAR models, molecular docking, molecular dynamics simulations, and protein-ligand binding affinity predictors strengthens the accuracy of drug-target interaction profiling. Reinforcement learning (RL) and graph neural network (GNN)-based generative models further optimize lead compounds through iterative reward-driven refinement, while SE(3)-equivariant neural networks enable faithful 3D molecular generation and conformational stability predictions. Despite algorithmic advances, experimental validation remains indispensable to address inter-patient metabolic heterogeneity, polypharmacology, and off-target liabilities. Nevertheless, the convergence of generative AI with multi-omics and high-throughput screening platforms accelerates personalized drug discovery pipelines, establishing a paradigm shift toward precision, scalability, and translational efficiency.

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Abstract: The nanocrystalline CrxCo1-xFe2O4, (where x = 0.1, 0.3, 0.5, and 0.7) ferrite samples were synthesized and characterized to investigate their structural and magnetic properties. Field Emission Scanning Electron Microscopy (FESEM) confirmed nanoscale morphology with nearly spherical particles, with grain size decreasing as Cr content increased. X-ray diffraction (XRD) analysis verified the incorporation of Cr3+ ions into the lattice, resulting in structural modifications. Magnetic measurements revealed a systematic decrease in coercivity, remanence, and saturation magnetization with increasing temperature and Cr content, indicating a transition from ferromagnetic to superparamagnetic behavior at 300

K. Zero-field-cooled (ZFC) and field-cooled (FC) magnetization curves demonstrated magnetic relaxation effects, while field-dependent magnetization (M-H) data highlighted the role of Cr in reducing net magnetization due to weakened superexchange interactions. Raman spectroscopy confirmed the presence of a spinel structure with distinct vibrational modes, showing evidence of cation redistribution and structural distortions. These findings establish Cr substituted CoFe2O4 as a promising material for applications in magnetic storage, spintronics, and biomedical fields, where tunable magnetic and structural properties are essential.

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Title: Understanding the effects of forest types, vegetation structural diversity, and soil properties on above- and below-ground carbon stock of moist deciduous forest ecosystems in Western Ghats, India

Author(s): Sandra, PR (Sandra, P. R.); Shankar, A (Shankar, Anand); Garkoti, SC (Garkoti, Satish Chandra); Adarsh, CK (Adarsh, C. K.)

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Abstract: The dynamics of tree biomass carbon (Tcs) and soil organic carbon (SOC) stocks vary significantly across forest types, shaped by vegetation structural diversity, soil properties, and nutrient availability. However, the relative influence of these ecological factors on Tcs and SOC stocks across different forest types remains poorly understood. This study examines the influence of forest types on tree diversity {Shannon index (H '), species richness (SR), and probability of interspecific encounter (PIE)}, structural attributes (basal area and density), soil properties {bulk density, pH, and N}, nutrients {P, k, Ca, Mg, Fe, Zn, Mn, and Cu}, and carbon stocks in Western Ghats. Data were collected from 12 stands across two forest types {5 permanent preservation plots (PPP) and 7 teak plantations (TP)} using field-based quadrat sampling and soil analysis (0-100 cm depth). Structural equation modeling (SEM) was employed to disentangle forest types' direct and indirect effects on Tcs and SOC stocks. Results showed significantly higher tree diversity, nutrient enrichment, Tcs, and SOC stock in PPP compared to TP. Tcs ranged from similar to 186-312 Mg C ha(-1), while SOC ranged from similar to 16-84 Mg C ha(-1), jointly contributing 47-54 % of forest C storage. Tree density, H', and soil nutrients (P, K, C/N, and Mn) emerged as major drivers of Tcs and SOC variation, explaining 73-90 % of the observed variance. SEM analysis confirmed structural diversity and soil nutrients as primary drivers influencing C stock, with soil properties having a lesser impact. Overall, the findings highlight that forest types and soil depth modulate the effects of vegetation and soil attributes on C dynamics. This study advances understanding of carbon stock regulation in tropical forests and provides valuable insights for conservation planning and sustainable forest management.

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Abstract: Although prior studies have explored cognition by caste, education, or gender separately, their combined effects on older adults remain unexamined. This study examines cognitive disparities among older adults in India using an intersectional approach across caste, education, and gender. Using data from 31,549 individuals aged 60+ from the 2017-18 Longitudinal Ageing Study in India, we find that disadvantaged groups-especially scheduled caste (SC) and scheduled tribe (ST) individuals-consistently show poorer cognitive outcomes, regardless of literacy or gender. Gender further amplifies inequalities within caste and education. These findings underscore intersectionality as a key framework for identifying the most vulnerable older adults with low cognitive functioning.

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Abstract: Resistance to frontline antimalarials by malaria parasites is a major concern, prompting the search for novel antimalarial compounds targeting new drug targets. One promising target is the single-stranded DNA-binding protein (PfSSB) of Plasmodium falciparum, crucial for DNA replication process in apicoplast, an essential organelle. Using an integrative approach, PPG and 9-HPF are identified, which inhibit the DNA binding property of PfSSB and exhibit antimalarial activity. Computational analyses reveal that both compounds possess strong binding affinity and favorable drug-like properties. Biolayer interferometry assay and the gel retardation assays demonstrate that they have a stronger binding affinity and disrupt PfSSB's ssDNA binding ability. PPG and 9-HPF show antimalarial activity against drug-sensitive P. falciparum (3D7) with IC50 values of 54.95 and 9.13 mu M, respectively, and they can also effectively inhibit artemisinin-resistant P. falciparum (C580Y) with a resistance index of 0.79 and 1.26, respectively. MTT cytotoxicity assays confirm that both compounds are nontoxic, and structural similarity analysis indicates that they are distinct from existing antimalarials, reducing cross-resistance risk. Additionally, virtual screening of 59,807 compounds with similar structures to PPG and 9-HPF identifies candidates with higher affinities for PfSSB. This study identifies PPG and 9-HPF as structurally distinct antimalarials with the potential to combat drug-resistant P. falciparum.

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Title: "I Did Everything I Could": A Qualitative Study of Maternal Narratives of Neonatal Death and Resilience

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Abstract: This study adopts a Husserl's phenomenological approach to explore the lived experiences of bereaved mothers in District Doda, India. In a patriarchal society where women bear primary child-rearing responsibilities, mothers experience a compounded burden of grief after neonatal loss. The study highlights their emotional and psychological struggles, as well as systemic and cultural challenges. Using Lazarus and Folkman's stress and coping theory and Braun & Clarke's reflexive thematic analysis, in-depth interviews were conducted with 12 purposively selected mothers. Six key themes emerged: emotional and psychological impact, health-related behavioural changes, healthcare barriers, gender struggles and lack of support, social and cultural stigma, and coping and resilience. Despite the pain, mothers demonstrated resilience rooted in faith, interpersonal bonds, and emotional adjustment. The study calls for urgent social and mental health support, healthcare reforms, and culturally sensitive interventions to support grieving mothers in rural areas and reframe how maternal bereavement is addressed in policy and practice.

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Abstract: The security and privacy of confidential information, especially in healthcare domains like patient personal data, medical reports, images of the affected body part, etc., are highly desirable. To address the security issues in such domains, we propose a quantum-inspired image encryption scheme, designed for the secure medical data transmission in e-healthcare environments. It integrates a 3-D hyperchaotic map with the novel enhanced quantum representation (NEQR) to achieve high sensitivity and confusion. The grayscale medical image is decomposed into the most significant bit (MSB) and the least significant bit (LSB) planes. The MSBs are encrypted using quantum the gray code scrambling and simulated quantum gates (Hadamard, CNOT, and Rz), while the LSBs are secured using the 3-D hyperchaotic logistic-sine map. The SHA-256 hash function dynamically influences the key generation to increase the key sensitivity. The scheme is implemented using the IBM Qiskit simulator. The experimental results confirm strong cryptographic performance with the entropy values approaching 7.999, NPCR values above 99.6%, and the UACI values approximately 33.5%. Further, it shows the robustness against occlusion, noise, and statistical attacks, making it suitable for privacy-preserving medical image transmission.

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Abstract: Geometric stress concentration due to misalignment is one of the major contributors to accelerated gear failure. Radial and axial misalignment reduces the contact area and increases stress concentration, making it crucial to study their impact on the surface wear of the driver gear. In the present study, the effects of radial, axial, and combined misalignments on the pressure angle, contact ratio, and wear depth of the driver gear were investigated. To simulate wear depth, the tooth profile was discretized into multiple points, and the point-to-point sliding distance was calculated to determine the wear depth. MATLAB is used to simulate. The final wear depth was computed as the sum of the wear depths over several wear cycles, with contact conditions assumed to be constant throughout the cycles. The simulation results were validated by experimental findings. For the experiments, a test setup was developed, and tests were conducted at a constant load of 40 Nm and speed of 1200 rpm. The simulation and experimental results were in close agreement, with a deviation of 10.10 % for dedendum wear depth and 23.52 % for addendum wear depth. Additionally, it was found that misalignment increases the working pressure angle and reduces the contact ratio of the gear pair. Axial misalignment raises the contact pressure, leading to more surface wear. The study also examined how changes in contact ratio due to misalignment affect the meshing period of the number of teeth in contact. The results revealed that increased radial misalignment decreased the contact ratio, causing higher pressure and sliding wear in the single-tooth contact zone. Axial misalignment caused the contact zone to shrink, resulting in increased contact pressure and sliding wear throughout the mesh cycle. The combined radial-axial misalignment further reduced the contact ratio, leading to even higher contact pressure and sliding wear. With increasing radial misalignment (RM), pitch point shifts by 9.62 %, pressure angle reduces by 30.48 %, contact ratio decreases by 27.21 %, and contact pressure drops by 2.26 %. Axial misalignment (AM) increases contact pressure by 41.47 %, and pinion wear depth increases by 81.22 %. This research highlights the significant influence of contact ratio variation on gear wear due to misalignment, a factor often overlooked in existing studies.

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Abstract: Thermal images represents the heat signature of a scene. However, thermal imaging sensors are not only expensive but also require exacting evaluation during manufacturing. Leveraging both visible and infrared (IR) images in deep learning-based computer vision tasks is a recent development. Therefore, many applications necessitate datasets containing paired visible and infrared images. In contrary to the widespread availability of large visible-spectrum image datasets, thermal image datasets are not readily available. The dearth of thermal datasets hinders the efficiency of deep learning algorithms dependent on thermal data. In this study, we introduce an algorithm based on diffusion models for synthesizing synthetic thermal images that closely resemble real thermal data. Our proposed architecture, named ThermalDiff, presents a novel solution to synthesize thermal images by estimating them from their visible image counterparts. We evaluate our architecture on three thermal benchmark datasets and compare it to the Pix2Pix, UNet-GAN, ThermalGAN, and InfraGAN architectures using multiple metrics and report state-of-the-art results across all metrics. We report up to + 14 dB and + 7 dB higher accuracy in PSNR value over the baseline for the VEDAI dataset and KAIST dataset, respectively and comparable result on FLIR dataset. Additionally, we achieve a reduction of one order of magnitude in the FID score across all datasets. Through a demonstration on a pedestrian detection task that exhibits an average mAP improvement of 8% upon augmenting the train set with synthetic thermal data, we validate the effectiveness of samples generated by ThermalDiff.

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Abstract: Disorder can be utilized as an effective parameter to probe the interplay between two long-range orders such as superconductivity and charge density wave. In the present work, we report the experimental evidence for filamentary superconductivity in polycrystalline TiSe1.2S0.8 with superconducting transition Tc similar to 7 K. This is validated from magnetization and magnetotransport measurements. Strain-induced dislocations, substitution defects, and randomly distributed Ti ions (with local moments) are considered as possible sources of disorder. A detailed analysis of the temperature-dependent resistivity evaluates the degree of disorder and the consequent localization effects. These findings are in contrast to the fact that superconductivity has not been established at ambient pressure in TiSe2-xSx system. It is suggested that disorder serves as a stabilizing factor for the superconducting phase due to incommensuration of the charge density wave.

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Abstract: Urban forest plays crucial role in enhancing biodiversity, mitigating climate change, and improving overall urban environments. Despite growing recognition of their role in climate mitigation, limited studies have comprehensively quantified tree diversity, ecosystem carbon pools, and carbon credit potential in semi-arid urban ecosystems like Delhi. This study focusses on quantifying tree diversity, carbon storage, and carbon credit potential in the urban semi-arid forest of Jawaharlal Nehru University, Delhi. The research assessed carbon storage in tree biomass, litter, understory, and soil organic carbon (SOC) including microbial biomass carbon (MBC), to evaluate their contributions to carbon stocks and their economic potential through carbon credits. Tree biomass and carbon stock were estimated using species-specific allometric equations and wood density values. Soil samples were collected from each plot at a depth of 0-30 cm and analyzed for organic carbon using the Walkley-Black method. The monetary value of sequestered carbon was calculated by multiplying the total carbon stock by the prevailing rate in the voluntary carbon market (USD per ton of CO2 equivalent). The study identified 11 dominant tree species with a density of 826 individual's ha-1 and a basal area of 18.01 m2 ha-1. Azadirachta indica and Acacia nilotica exhibited the highest CO2 sequestration potentials at 55.10 Mg CO2 ha-1 and 54.43 Mg CO2 ha-1, correspondingly to economic values of $771.40 and $762.02 ha-1. In contrast, Cassia fistula showed the lowest CO2 sequestration potential at 0.23 Mg CO2 ha-1, with a value of $3.22 ha-1. The SOC pool was the largest contributor, accounting for 43.21 % of total carbon storage, with 149.73 Mg CO2 ha-1, valued at $ 2096.20 ha-1. Understory vegetation, MBC, and litter also contributed significantly, underscoring the importance of both above-and below-ground components in urban carbon dynamics. The findings underscore the potential of urban forest for carbon sequestration and carbon credit generation, advocating the need for strategic urban planning that integrates green infrastructure to support sustainable development in cities like Delhi.

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Abstract: We identified, isolated, and functionally characterized a cyclin-dependent kinase (CDK), PiPho85, from Piriformospora indica. The identified PiPho85 contains TY, PSTAIRE, protein kinase domain, and an ATP binding site which is highly conserved among the Pho85/CDK5 family protein specific for Saccharomyces cerevisiae. In a S. cerevisiae mutant strain (Delta pho85), PiPho85 could regulate the acid phosphatase activity, restore the normal phenotype, confer salt- and drug-tolerance, and enable utilization of non-fermentable sugars. This suggests that PiPho85 complements the Pho85 function. The PiPho85 knock down (Kd) strain was generated by RNA interference (RNAi) and named as Kd-PiPho85-P. indica. The Kd strain was found susceptible to salt, drug and osmolarity stress and showed morphological abnormalities, abnormal-sized hyphae with large knot-like structure. This suggests that PiPho85 plays a regularity role in the physiology of P. indica. Further, Kd-PiPho85 -P. indica colonized plants were found to be susceptible to salt stress and showed less growth than that of wild type (WT) P. indica colonized plants. This suggests that PiPho85 plays a crucial role in conferring resistance to WT P. indica colonized plants during salt stress.

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Abstract: Thyroid hormone receptor beta (THR(3) is a ligand-modulated transcription factor that regulates thyroid hormone (T3)-mediated genomic actions. It regulates the hypothalamus-pituitary-thyroid axis and various metabolic processes, primarily in the liver and kidney. Research has shown that genetic variations, mainly single nucleotide polymorphism (SNP) in the THRB gene, may be linked to diseases like resistance to thyroid hormone, thyroidrelated cancers, neurological and mental disorders. Despite this revelation, a significant gap remains in understanding the impact of SNPs on THR(3 cellular function and disease etiology. Thus, the present study investigated the disease-associated missense THR(3-SNPs using both in silico analysis and cell-based assays. The study was initiated with computational analysis of disease-associated THR(3 variants to predict the effects of SNPs on receptor conformation, structure, stability, and function. The molecular docking and simulation approach then evaluated the impact of these variants on interactions with T3 and RXR. Following this, an extensive investigation was conducted into the dynamics and functioning of these receptor variants to address the underlying deviations in their cellular functioning by assessing receptor-subcellular localization, response to T3 hormone, transcriptional functions, interaction with heterodimeric partner RXR, and receptor-chromatin interactions encountered in healthy and disease states. The study emphasizes that the structural and conformational integrity of THR(3 is essential for its normal function, and critical deviations are associated with several metabolic/endocrine disease states. A comprehensive analysis of these disease-associated THR(3 variants suggests the prospects of personalized medicine and the development of SNP-based genomic tests. The findings may also facilitate the discovery of novel small-molecule modulators to treat thyroid-related diseases linked to THR(3 dysfunction, improving diagnosis and management of disease conditions.

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Abstract: Motor imagery classification is an essential component of Brain-computer interface systems to interpret and recognize brain signals generated during the visualization of motor imagery tasks by a subject. The objective of this work is to develop a novel DL model to extract discriminative features for better generalization performance to recognize motor imagery tasks. This paper presents a novel Multi-scale spatio-temporal network (MSST-EEGNet) to extract discriminative temporal, spectral, and spatial features for motor imagery task classification. The proposed MSST-EEGNet model includes three modules namely the inception module with dilated convolution, the temporal pyramid pooling module, and the classification module. Multi-scale temporal features along with spatial features are extracted using the inception block with the dilated convolution module. A set of multi-level fine-grained and coarse-grained features are extracted using a temporal pyramid pooling module. Further, categorical cross-entropy in combination with center loss is used as a loss function. Experiments are carried out on three benchmark datasets including the BCI Competition IV-2a dataset, the BCI Competition IV-2b dataset, and the OpenBMI dataset. The evaluation results shows that the proposed MSST-EEGNet model outperforms eight existing DL models in terms of classification accuracy for subject-specific and cross-session settings. It also outperforms eight existing DL models and six existing transfer-learning models for cross-subject setting. For the subject-specific classification the proposed MSST-EEGNet model achieved an accuracy of 0.8426 +/- 0.1061, 0.7779 +/- 0.0938, and 0.7365 +/- 0.1477 on the BCI Competition IV-2a dataset, the BCI Competition IV-2b dataset, and the OpenBMI dataset respectively. For the cross-session setting, the proposed MSST-EEGNet model achieved an accuracy of 0.7709 +/- 0.1098, 0.7524 +/- 0.1017, and 0.6860 +/- 0.0990 on the BCI Competition IV-2a dataset, the BCI Competition IV-2b dataset, and the OpenBMI dataset respectively. For the cross-subject setting, the proposed MSST-EEGNet model achieved an accuracy of 0.7288 +/- 0.0730, 0.8161 +/- 0.963, and 0.7075 +/- 0.0746 on the BCI Competition IV-2a dataset, the BCI Competition IV-2b dataset, and the OpenBMI dataset respectively. Furthermore, a non-parametric Friedman statistical test

demonstrates statistically significant superior performance of the proposed MSST-EEGNet model over the existing models.

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Abstract: The existence of MDR and XDR strains of bacteria is a serious threat to mankind. Therefore, the development of new drug molecules with different modes of action is the need of the hour. Medicinal chemists and chemical biologists around the globe are making continuous efforts to combat this challenging health issue. In this effort, we have designed and efficiently synthesized amino acid glycoconjugates of D-glucose as new glycohybrids. These novel glyconjugates were screened against Staphylococcus aureus and Staphylococcus epidermidis Gram (+) ve and Escherichia coli Gram (-) ve bacterial strains. The antibiofilm properties of these glyconjugates were also studied. Furthermore, these compounds were evaluated for their antifungal property against two fungal strains, namely Candida albicans and Candida parapsilosis. The detailed antimicrobial activity is presented here. The molecular docking of selected active glycoconjugates is carried out with bacterial gyrase and fungal alpha-demethylase and compared with standard drugs novobiocin and fluconazole, respectively, which revealed some interesting molecular interactions.

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Title: Identification of KRAS mutants (G12C, G12D, and G12V) inhibitors

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Abstract: AimTo identify and validate novel small-molecule inhibitors targeting KRAS G12C, G12D, and G12V mutants through a structure-based drug design and experimental approach.MethodsWe employed molecular docking, molecular dynamics (MD) simulations, MM-PBSA binding free energy calculations, and principal component analysis (PCA) to screen and evaluate potential inhibitors targeting the Switch-II pocket of KRAS mutants. Top-ranking compounds were experimentally validated using Bio-Layer Interferometry (BLI) for binding affinity and MTT assays to assess anticancer activity in breast and lung cancer cell lines.ResultsCompound C797-1505 showed strong binding to KRAS G12V (Dissociation constant (KD) = 141 mu M), outperforming the reference Sotorasib (KD = 345 mu M). C190-0346 displayed weak affinity toward KRAS G12C. MTT assays revealed that C797-1505 reduced breast cancer cell viability (Half-maximal Inhibitory Concentration (IC50) = 43.51 mu M), while both compounds demonstrated significant cytotoxicity against lung cancer cells (IC50 = 18.78 mu M and 22.93 mu M, respectively).ConclusionOur integrated computational and experimental strategies successfully identified selective KRAS mutant inhibitors with promising anticancer activity, particularly against G12V and G12C driven tumors. These findings support further development and preclinical evaluation of these compounds as targeted therapeutics.

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Abstract: Purpose: With increasing areas of agricultural land succumbing to salinization, raising plants' salt tolerance becomes essential. Okra, a key vegetable crop in India, is significantly affected by high soil salinity at all growth stages. This study evaluates biochar's potential as a sustainable solution to the global soil salinization threat. Methods: Two saline soils (Samchana and Dobh) were collected from Rohtak district, Haryana, India. Okra plants were grown in them for two consecutive seasons, with rice husk biomass (RHBM) and rice husk biochar (RHBC) amendments. Both amendments were applied at 1%, 2.5%, and 5% (w/w) at the start of season 1 (Samc1, Dobh1). No additional amendments were made for season 2 (Samc2, Dobh2). Results: RHBC caused the highest electrical conductivity (EC) and pH reductions, with enhancements in soil properties (soil organic carbon, soil available phosphorus, nutrients) across both seasons. RHBC increased plant height, leaf area, plant biomass, and fruit weight, while RHBM reduced these metrics in Samc1. In Dobh1, RHBC increased plant height, leaf area, and plant biomass, while RHBM reduced these parameters. Improvements continued into season 2 for both soils and treatments, but RHBC consistently outperformed RHBM, with greater Na+ uptake reduction, enhanced salt tolerance index (STI), and integrated biological response (IBRv2). RHBC (5% w/w) emerged as the best application rate amongst all the applied application rates. Conclusion: RHBC was a more effective soil amendment than RHBM, offering sustained improvements in soil quality, plant growth, and salt tolerance across both seasons. Since the feedstock is locally sourced and the production process is highly economical, benefits observed in this study can be transferred to farmers. This can help achieve Sustainable Development Goals (SDGs): zero

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Author(s): Kaur, N (Kaur, Navneet); Kaur, A (Kaur, Amanpreet); Pathak, L (Pathak, Loveena); Vyas, P (Vyas, Pratibha); Singh, S (Singh, Satyendra); Kaur, R (Kaur, Raminder)

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Abstract: Spinel ferrite nanoparticles have attracted considerable attention in biomedical and applied sciences due to their enhanced magnetic properties, structural tunability, and favorable biocompatibility. The present work is directed toward synthesizing titanium-substituted zirconium ferrite nanoparticles [Zr1-xTixFe2O4; 0.0 <= x <= 0.05] by the sol-gel process and assessing them as antibacterial agents. XRD structural investigation indicated a cubic spinel structure, with the average crystallite size decreasing from 23 nm to 17 nm upon doping. FT-IR confirmed the functional groups present in the prepared nanoparticles. The morphology and elemental information using FESEM and EDS confirmed the existence of all elements in the synthesized samples. Antibacterial activity was assessed against Staphylococcus aureus (S. aureus) and Escherichia coli (E. coli) at different concentrations. Results indicated that nanoparticles with x = 0.05 showed maximum antibacterial effectiveness, with 96 % and 98.1 % colony reduction for S. aureus and E. coli, respectively, at 0.4 ppm. Results prove that Ti-doped zirconium ferrite nanoparticles have significant, broad-spectrum antibacterial activity with a potential application in biomedical and environmental sectors.

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Abstract: In this work, the (1-x)(BZT-BCT)-xGd2O3 (x = 0.00, 0.01, 0.03, and 0.05) ceramics are fabricated via the solid-state technique. Investigations were done on its structure, microstructure, dielectric, ferroelectric, and magnetic characteristics. The presence of tetragonal phases was confirmed in Gd-doped samples. The crystallite size obtained is 42-35 nm after Gd doping. The grain size increased considerably as the doping amount increased, as confirmed from SEM images. The system exhibits very modest dielectric characteristics (epsilon r = 560, tan delta = 0.5) at doping for x = 0.03. Its dielectric value decreases with doping measured at low frequency and remains steady in the high-frequency region. Furthermore, the system exhibited very soft ferroelectricity (Pr = 2.2 mu C/cm3, Ec = 0.51 kV/cm) for x = 0.03 and decreased with increasing doping. The Gd-doped sample shows ferromagnetism and the saturation magnetization (Ms) value of 5.3 emu/g and 8.8 emu/g for x = 0.03 and x = 0.05, respectively, measured at 10 K with a 3 T external magnetic field.

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Abstract: Homalomena aromatica is an economically important essential oil-producing plant. The rhizome is a commercial source of essential oil useful for high-grade perfumery and therapeutic applications. It is mainly collected from wild sources. The present study aims to investigate the histochemical localization of oil-secreting idioblasts and the variability in oil composition in commercial samples. The histochemical study revealed that essential oil is synthesised in oil cells and oil cavities distributed in the rhizome tissues. The larger oil cavities (521 +/- 59.4 mu m in size) synthesise essential oil and resin, whereas the smaller oil cells (67.2 +/- 7.4 mu m in size) synthesise only essential oil. The spatial distribution demonstrates that the oil cavities were densely present in the inner ground tissue region, whereas the oil cells were abundant in the cortex ($p < 0.05$). The different grades of commercial rhizome samples, that is, thickness up to 10 mm (narrow rhizomes, NR), 10 to 20 mm (medium-sized rhizomes, MR), and 20 to 30 mm (thick rhizomes, TR) showed variation in essential oil yield and composition, fibre content, and distribution of fibre cells. The study demonstrated that the oil yield is negatively correlated with rhizome thickness, fibre content, and density of fibre cells in tissue. The oil of H. aromatica is dominated by linalool (44.18%-61.4%) followed by terpinene-4-ol (6.45%-13.16%) in the rhizomes of different thicknesses. These major constituents also negatively correlate with rhizome thickness and significantly decrease in the TR samples. The study concludes that the NR grade rhizomes are better for higher oil yield and linalool and terpinene-4-ol content than the TR grade of H. aromatica rhizomes.

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Abstract: A decent assessment of the landslide susceptible zonation (LSZ) mapping is competent in identifying the potential risks for the decision-makers, planners, and executive authorities. The state of Sikkim faced the most common disaster, a landslide, throughout the year, and it increased day by day. After identifying the research gap and objectives, a landslide inventory map of 132 landslides from the study area was prepared. Also, the required data, such as satellite images, DEM, geology, soil, Rainfall, etc., are collected from different sources to prepare causative factors for LSZ mapping. The present study aims to map the LSZ of Sikkim as a regular assessment of changing environmental conditions by comparing AHP (deterministic) and BLR (machine learning) methods. The 132 landslides were classified as training data (70 %, or 92 out of 132) for the trained BLR model, and the remaining 40 were used as testing datasets to measure model accuracy. However, the Analytical Hierarchy Process (AHP) is a deterministic approach, and the weights of each causative factor entirely depend on experts' knowledge. As a result, training datasets are not required to train the AHP model. Also, training and testing datasets were used to check the model's accuracy and validate it for the AHP model. Additionally, 100 non-slide points are taken to compute both model performances. The Area Under the Curve (AUC) of both models shows 82.22 % for BLR and 79.13 % for AHP, and the Seed Area Calculation Index (SCAI) for the very high LSZ class is 0.43 and 0.37, respectively. The BLR represents better results than the deterministic AHP method.

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Abstract: WHO has listed Candida albicans as a fungal pathogen of priority. With the increasing incidence of C. albicans infection and limited treatment strategies, the identification of new drug targets and inhibitor molecules is of global concern. ATP-dependent chromatin remodelling proteins play a crucial role in regulating gene expression. Fun30 from C. albicans (CaFun30) mediates DNA end-resection during DNA double-strand break repair. It also transcriptionally co-regulates the expression of DNA damage response genes and genes involved in white-opaque switching. The gene is not essential for viability; however, the null mutant shows increased sensitivity to genotoxic agents. We hypothesised that the protein could be a potential therapeutic target against C. albicans. The structural model of CaFun30 was generated using homology modelling. Screening of a small molecule library identified 10 potential molecules, of which F1853-0039 was found as the lead inhibitor candidate. In vitro studies showed that the molecule had an MIC in the micromolar range against C. albicans with minimal effect on human THP-1 cells. Finally, coculture experiments showed that the inhibitor molecule prevented the formation of hyphae of C. albicans upon infecting THP-1 cells leading us to conclude that CaFun30 could potentially be developed as a therapeutic target against C. albicans.

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Abstract: Ceria-doped barium titanate (BaTi1-xCexO3) ceramics with dopant concentrations 0 <= x <= 0.02 were synthesized via the solid-state reaction method, and evaluated for their structural, dielectric, and energy storage properties. Computational studies of the partial density of states are in strong agreement with experimental bandgap trends, validating the electronic structure modifications. The Rietveld refinement of X-ray diffraction data confirmed a tetragonal phase and successful Ce incorporation into the BaTiO3 lattice. Microstructural analysis using the Williamson-Hall method revealed the introduction of micro-strain and reduced crystallite size upon Ce doping. Among all the synthesized compositions, BaTi0.9Ce0.1O3 demonstrated superior physical, dielectric, and energy storage properties. Polarization-electric field (P-E) loop analysis revealed that BaTi0.9Ce0.1O3 exhibited the highest saturation polarization, whereas BaTi0.8Ce0.2O3 achieved maximum energy storage efficiency. Oxygen vacancies, induced by charge compensation mechanisms, play a crucial role in modulating both structural distortions and dielectric behaviour. A systematic decrease in the Curie temperature and an increase in dielectric loss were observed with increasing Ce content, attributed to inhibited electron hopping between Ti2+/Ti3+ and Ti4+ sites. The work demonstrates that controlled Ce doping significantly improves BaTiO3's dielectric and energy storage performance, highlighting its promise for high-efficiency capacitors and electronic applications.

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Abstract: Lung cancer is a leading global health concern, ranking as the second-highest cause of cancer-related deaths. Tyrosine kinase inhibitors (TKIs) such sorafenib or regorafenib are considered the second-line drugs to treat advanced lung cancer. At advanced stages of lung cancer, the efficacy of TKIs gets reduced and does not produce prolonged effects. Thus, there is a need to discover new ways to increase the efficacy of TKIs for better outcomes. In the present study, synergistic approaches are utilized to improve the anticancer activity of TKIs. We investigated the synergisitic potential of dammarolic acid (DA) with sorafenib in lung cancer cell lines. DA, a triterpenoid derived from Centella asiatica, has demonstrated various medicinal properties. This study explores the combined effects of DA and sorafenib on lung cancer cells focusing on their synergistic mechanisms. To assess this synergy, the half-maximal inhibitory concentration (IC50) of both agents was measured using the MTT assay on lung cancer cell lines. The Chou-Talalay method was applied to calculate synergy parameters and identify effective minimum concentrations. Following this, minimally effective doses of DA and sorafenib were tested to further evaluate cytotoxicity and synergistic potential. Flow cytometric analyses were conducted to measure reactive oxygen species (ROS), mitochondrial membrane potential (MMP), annexin V binding, and cell cycle distribution. Western blotting evaluated autophagy markers LC3-II and p62. Findings indicate that increasing DA concentrations significantly reduced the IC50 and Dose Reduction Index (DRI) values of sorafenib. The co-treatment elevated ROS, disrupted MMP, and increased lung cancer cell cytotoxicity. Overexpression of p62 and LC3-II suggested autophagic inhibition and late apoptosis, confirmed through ATG5 knockdown experiments. Notably, this combination effectively targeted metastatic lung cancer cells by arresting them in the G0/G1 phase, promoting late-stage apoptosis and inhibiting autophagy in metastatic-prone NSCLC cells.

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Title: Effect of ferromagnetic layer thickness on the static and dynamic magnetic properties of sputter grown thin CoFeB films

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Abstract: Soft magnetic alloy thin films of CoFeB (4:4:2) with different thicknesses (5-20 nm) were deposited by radio-frequency (RF) magnetron sputtering onto Si/SiO2 substrates. The structural, static and dynamic magnetic properties measured were directly related to the thickness of the ferromagnetic CoFeB (tCFB) layer. The XRD patterns reveal the amorphous nature of thin film. The root mean square surface roughness (rho rms) decreases with an increase in film thickness. With the increase of film thickness, the saturation magnetization (MS) and ( ) squareness ratio M increase and the coercivity (HC) decreases. The Gilbert damping (alpha eff) of CoFeB thin film, MS which is determined from the ferromagnetic resonance (FMR) experiment, exhibit direct relation with respect to film thickness. The alpha eff monotonically decreases with the increase of ferromagnetic film thickness. The behavior observed for alpha effand linewidth can be understood on the basis of two magnon scattering (TMS) theory. This process accounts significantly for extrinsic FMR linewidth broadening at lower thicknesses which comes under ultra-thin dimensions. Effective magnetization (Meff) increases with the increase in film thickness and attains a maximum of 11.94 kOe at 20nm thickness.

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Title: MksEF Accessory Proteins Inhibit MksB ATPase Activity and Modulate DNA Substrate Binding

Author(s): Kumari, P (Kumari, Pratibha); Minnu, KCS (Minnu, K. C. Shamila); Biswas, T (Biswas, Teasha); Hegde, V (Hegde, Vinayak); Appaiah, U (Appaiah, Umesh); Prasad, MD (Prasad, M. Dharma); Sharan, K (Sharan, Kunal); Patra, D (Patra, Dhabaleswar); Kumar, R (Kumar, Ravi)

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Abstract: Chromosome organization and segregation are fundamental processes across all domains of life. In bacteria, the mechanisms governing nucleoid organization remain poorly understood. This study investigates the function of an alternative structural maintenance of chromosomes (SMC) complex, MksBEF, in Mycobacterium smegmatis. We show that MksB, the SMC subunit of the complex, binds DNA and plays a crucial role in local chromosome organization, a function distinct from that of other condensins. We successfully reconstituted the MksBEF complex and determined its stoichiometry as MksB(2)E(4)F(2) using gel filtration and ultracentrifugation. Gel shift assays and isothermal titration calorimetry reveal that the accessory proteins MksE and MksF interact with MksB and significantly enhance its DNA-binding affinity-an effect not observed in SMC or MukB-associated accessory proteins. Furthermore, ANS-based fluorescence experiments indicate that DNA binding induces structural rearrangements in both MksB alone and the MksBEF complex. Notably, although MksEF enhances the DNA-binding affinity of MksB, it also markedly suppresses its ATPase activity, a unique regulatory mechanism distinct from other SMC complexes. These findings provide mechanistic insights into how MksE and MksF modulate MksB activity, advancing our understanding of chromosome dynamics in mycobacteria.

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Abstract: Electrolyte solvation chemistry is a key strategy for enhancing battery performance. Herein, we achieve an ultra-high-rate and long-cycle-life potassium-ion battery (PIB) by introducing a fluorine-free ether, (i.e., cyclopentylmethyl ether (CPME)), into a trimethyl phosphate (TMP)-based electrolyte under non-fluorinated and normal-concentration conditions. We discover that CPME and TMP form intermolecular interactions via electropositive hydrogen (delta H+) and electronegative oxygen (delta O-), which effectively weaken the K+-TMP interaction. This modification enables highly reversible K+ (de-)intercalation within the graphite electrode, not only overcoming the critical challenges of K+-solvent co-intercalation in graphite electrodes but also significantly improving the PIB's rate capability and cycling stability. The newly designed KC8||3,4,9,10-perylenete-tracarboxylic diimide (PTCDI) full cell has sustainable features that can operate stably at 10 C for over 1000 cycles, retaining 84.4 % of its initial capacity. Even at 15 C, it delivers a remarkable capacity of 65.6 mAh g(-1), corresponding to 53.0 % of the capacity at 0.2 C. Furthermore, we propose a molecular interface model to analyze the interfacial behavior of K+-solvent-anion complexes and elucidate the relationship between intermolecular interactions and graphite electrode performance at the molecular level. This work highlights the importance of solvation structure regulation via intermolecular interactions in developing high-performance PIBs, offering new insights into functionalized metal-ion battery design.

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Abstract: Strong microseisms in the Indian Ocean are generally attributed to the intense Southern Ocean processes. This conventional view, however, undermines the role of potential coastal reflections emanating from the adjoining landmasses. Here, we use an array of ocean bottom seismometers to investigate the role of coastal over Southern Ocean processes as triggering mechanisms for microseisms in the Indian Ocean. We apply polarization, power spectral density, correlation analysis along with numerical wave modelling and attenuation analysis to characterise microseisms and their potential sources. Contrary to the prevailing views, coastal reflections appear to dominate the strongest deep Southern Ocean seismic noise in the Indian Ocean. We attribute such anomalous behaviour to the propagation path effects. Interestingly, the strongest secondary microseisms are generated during the simultaneous development of cyclones in the opposite hemispheres. These findings have vital implications for the way we characterize and quantify the seismic noise in the closed ocean systems.

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Abstract: The aza-Piancatelli rearrangement represents a powerful strategy for accessing complex cyclopentenones, starting from furan carbinols. We demonstrate herein the use of a noncanonical furan building block and show that this reaction can be effectively combined with an azaoxyallyl cation-centered process. This integration leads to elusive polycyclic scaffolds bearing multiple contiguous stereocenters. The H-bonding clusters of HFIP serve as the sole promoter, highlighting a rapid, diversity-oriented synthesis of cyclopentanoid architectures.

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Title: 'Doctors do not know about Cystic Fibrosis': Examining structural vulnerability in the management of rare diseases in India

Author(s): Merz, S (Merz, Sibille); Bisht, R (Bisht, Ramila)

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Abstract: Individuals living with rare diseases have conventionally been understood as being particularly vulnerable, which often promotes a negative and stigmatising interpretation of vulnerability. In this article, we embrace the framework of structural (health) vulnerability to gain a deeper understanding of the circumstances and factors contributing to adverse outcomes in the specific context of a Global South country, India, and a particular rare disease, Cystic Fibrosis (CF). By drawing on published materials and preliminary data from an evolving ethnographic research project, we contend that it is crucial to examine global power dynamics and the unequal distribution of resources to contextualize the precarious conditions experienced by Indians living with CF. Epistemologically, this stems from pervasive racialised assumptions ingrained in CF knowledge production, constituting a form of hermeneutic injustice, while economically, India's position in the global bioeconomy restricts access to potentially beneficial treatments derived from advanced clinical research. Moreover, reduced investment in healthcare by the Indian Central Government, notably evident in its rare disease policy, leaves CF patients reliant on philanthropy, which is susceptible to shifting interests and priorities. Therefore, we argue that focusing on structural (health) vulnerability is essential for shedding light on the distinct challenges faced by individuals living with CF in India, as well as in other locations in the Global South.

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Abstract: Recent advances have highlighted the rich low-temperature kinetics of the long-range Ising model (LRIM). This study investigates domain growth in an LRIM with quenched disorder, following a deep low-temperature quench. Specifically, we consider an Ising model with interactions that decay as J(r)similar to r(-(D+sigma)),where D is the spatial dimension and sigma>0 is the power-law exponent. The quenched disorder is introduced via random pinning fields at each lattice site. For nearest-neighbor models, we expect that domain growth during activated dynamics is logarithmic in nature: R(t)similar to(lnt)(alpha), with growth exponent alpha>0. Here, we examine how long-range interactions influence domain growth with disorder in dimensions D= 1 and D=2.In D= 1, logarithmic growth is found to persist for various sigma>0. However, in D= 2, the dynamics is more complex due to the non-trivial interplay between extended interactions, disorder, and thermal fluctuations.

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Van de Graaff R. J., 1933, PHYS REV, V43, P149, DOI [DOI 10.1103/PHYSREV.43.149, 10.1103/PhysRev.43.149]

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Abstract: A gap insulator free modular electrostatic accelerating tube is designed for charged particle acceleration. For many decades, the metal insulator bonded electrostatic accelerating tubes were existing which are expensive. They are also prone to insulator damage due to high voltage discharge and degradation by the impact of beam and secondary electrons. By making them gap insulator free, all such problems go away and one can easily make the electrostatic accelerating tube by placing the electrodes in series, separated under ultra-high vacuum and thus utilizing vacuum as an insulator. The high voltage is coupled to first cylindrical electrode through longitudinal feed using a cylindrical electrode extended through a ceramic bonded stainless steel flange at the entrance of the tube. This electrode acts like a Faraday cage to allow beam entering in the tube. The multi-particle beam dynamics simulation are performed using Travel and TRACK codes to qualify the accelerating tube with smooth focusing. The electrical design studies confirm the field homogeneity of the order of 10-3, which enables linear acceleration of charged particles. This design has high-end applications in construction of low-energy ion beam facilities, electrostatic tandem accelerators and accelerator mass spectrometer systems.

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