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Record 1 of 45

Title: LiteWTAKA: Authenticating UAV-GCS and UAV-UAV communication using secure and mechanism based on PUF

Author(s): Kumar, N (Kumar, Naveen); Chaudhary, A (Chaudhary, Ankit)

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Abstract: The adoption of Unmanned Aerial Vehicles (UAVs) or Drone technology is increasing from miliary to civilian domains because of its effectiveness in performing difficult operations. UAV communicates with Ground Control Station (GCS) in presence of open wireless channel which is insecure. The communication is susceptible to various security attacks because of open nature of wireless channel. A number of traditional cryptographic solutions are provided to mitigate these attacks, but there is need of large amount of computational resources. The UAVs are equipped with limited resources, so a lightweight mechanism is required. So, in this paper, a lightweight authentication and key agreement protocol is proposed that makes use of Physical Unclonable Function (PUF) technology along with the hash function and XOR operations to secure the communication. The proposed scheme ensures the robust authentication along with session key update mechanism. The security of proposed mechanism is validated and verified by formal security analysis using Scyther simulation tool, Burrows-Abadi-Needham (BAN) logic and Real-or-Random (ROR) model. The comprehensive analysis demonstrates that the scheme effectively mitigates known security attacks. The efficiency of proposed protocol is demonstrated by performing the experiments and by comparing it with the

state-of-the-art schemes in terms of computation cost, communication cost, energy consumption and security requirements.

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Abstract: The article argues that the production of an oral form is mediated by complex historical processes. Examining a genre of peasant oral ballads of British Assam, the article highlights two important considerations. First, the manner in which the oral-written continuum interacts with a given historical situation produces specificities in the structure of the oral form. Second, the limits in a form thus produced have a bearing on the nature of its textual structure. In this regard, the article argues shows how, on the one hand, the textual structure of the oral ballads enabled historical representation of the emergent disruptive changes under colonialism. And yet, on the other hand, the textual structure also faced limits vis-& agrave;-vis an ideological critique of this historical transformation. The article uses the concept of inverse relations as a way to understand this fundamental tension between what the ballads include and what they leave out.

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Abstract: Synucleinopathies are neurodegenerative disorders marked by the accumulation of misfolded alpha-synuclein and its familial mutants in brain cells. The mechanistic understanding of how alpha-synuclein mutations exacerbate disease remains unsolved. Here, the in vitro aggregation kinetics of alpha-synuclein and its mutants revealed that A30P and a recently discovered A30G variant displayed aggregation kinetics uncharacteristically slower than those of wild-type (WT) and other mutants. We delineated the amyloidogenesis pathway of these variants by characterizing different intermediates through time-dependent CD and AFM analysis. AFM-Raman spectroscopy and proteinase-K digestion further distinguished structural features of these species. We infer that WT and the A30 variants aggregate through a common pathway, albeit with variant-specific rates, yielding kinetically metastable aggregates with structural differences in the order A30P < A30G < WT. These metastable aggregates underwent further rearrangements to form stable fibrils upon vigorous agitation, incubation with osmolytes, or seeding with fibrillar seeds. Addition of the amyloid-modifying compound EGCG to the metastable and the final fibrillar states converted them to beta-sheet-rich small fibrillar and prefibrillar structures, respectively. However, EGCG directed monomers toward amorphous aggregation. We present a viewpoint that A30 mutations that are located outside the canonical amyloid core of alpha-synuclein could augment its toxic gain of function by producing kinetically long-lived prefibrillar species rather than by promoting thermodynamically alternative conformations. These kinetically metastable conformers of varying hierarchy were differentially sensitive to EGCG. Our findings provide significant insights into how alpha-synuclein mutations contribute to synucleinopathies and how amyloid modulators differentially act on intermediates versus mature fibrils.

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Abstract: The untapped hydrological potentiality of Indian roadways, mainly National Highways and Expressways, for sustainable water resource management through harvesting rainwater has been explored in the present study using the Modified Rational Method after dividing the entire road length into 1-km segments. In addition, to determine the prioritized segments of such roadways for installing groundwater recharge facilities or making water reservoirs for non-potable water utilization, the Analytical Hierarchical Process (AHP) has been applied by integrating twelve significant parameters that improve groundwater recharge. The result reveals that 1,45,646 road segments (in km) can produce about 1172 million cubic metres (mcm) of water annually from the entire country with a per kilometre rate of 8.05 million litres. A substantial spatial and temporal distribution has been detected throughout the country since the ability to harvest rainwater is highly dependent on the pattern of rainfall ($r = 0.92$) and the length of roads ($r = 0.90$). The physiographic and climatic zones of India have been also considered for determining the road widths and proportion of total water harvesting capacity, respectively. The prioritize technique has also determined about 58 % of road segments are ideal for the installation of artificial groundwater recharge facilities which could utilise roughly 73 % of the total harvested water. By estimating the water harvesting capability at the district level, the potential for addressing the problem of India's water-stressed districts has also been examined. The whole study effectively portrays the road networks as sustainable water resource sites rather than just as traffic corridors and sources of impervious runoff, nevertheless the accuracy of estimation may be impacted by remotely sensed rainfall data and a lack of road width data.

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Abstract: A possible route to realize fault-tolerant quantum computing is to find unconventional superconductors, where superconductivity coexists with nontrivial band topology. In this work, we report such a possibility in 6R-SnNbSe2 obtained by Sn intercalation into NbSe2. Rietveld refinement confirms a centrosymmetric crystal structure with space group R3m. Structural, electronic, and magnetic measurements confirm the emergence of a superconducting phase with a transition temperature Tc approximate to 4 K. The temperature dependence of the upper critical field Hc2(T) is well described by a two-band model. Temperature-dependent magnetic penetration depth and superfluid density measurements are performed using the tunnel diode oscillator technique. Our analysis implies the mixing of nodal and nodeless order-parameter symmetry in 6R-SnNbSe2. Such results are surprising for a centrosymmetric superconductor but are consistent with theoretical predictions of topological nodal-line features in SnNbSe2. Thus, 6R-SnNbSe2 emerges as an interesting platform for exploring unconventional pairing mechanism in transition metal dichalcogenide superconductors.

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Title: The question of labour and ecology under neoliberalism: narratives of resistance from a trade union movement in central India

Author(s): Agrawal, R (Agrawal, Rashi)

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Abstract: With the ecological crisis posing an existential threat to humans, the question of labour-ecology relations and the discourse on environmental justice assumes an unprecedented urgency. An important perspective is the process of a 'just transition', that is grounded in people's lived experiences and offers a coherent and transformatory political vision. This paper discusses narratives and experiences from a trade union movement in the Global South that sought to articulate one such vision in central India in the 1970s. The central question this paper probes is, firstly, the effect of the changes brought about by neoliberalism on the collective bargaining capacity of the workers, specifically the informal workers in an industrial setting; and, secondly, how they affect the working class movement's worldview of the labour-ecology relation through Chhattisgarh Mukti Morcha (CMM)'s declining strength as a trade union in the region. Through this case study, the paper outlines a broad trajectory of the trade union movement in post-Independence India and the critiques that challenged its model and strategies in an increasingly capitalist and later neoliberal economy, whose implications hold salience far beyond the geographical limits of the movement under discussion.

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Title: Evaluation of submarine groundwater discharge-driven nutrient and heavy metal fluxes to the Bay of Bengal using a seepage-metric assessment from the Odisha coastal plains, India

Author(s): Nayak, SK (Nayak, Soumya Kanta); Nandimandalam, JR (Nandimandalam, Janardhana Raju)

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Abstract: Submarine groundwater discharge (SGD) is a critical pathway for fresh groundwater loss from coastal aquifers, facilitating the transport of dissolved nutrients, trace metals, and other contaminants from land to ocean. This study quantified seasonal SGD and associated chemical fluxes from the near-shore environment of Odisha coastal plains to the Bay of Bengal using modified Lee-type seepage meters. The study reported high seepage rates with post-monsoon fluxes ranging up to 4247.97 m3 m-2.y-1, placing them among the highest reported globally, while pre-monsoon fluxes were low linked to monsoonal forcing. In contrast, nutrient and heavy metal fluxes were comparatively low, likely modulated by dilution, sediment adsorption, and in-situ biogeochemical transformations within the subterranean estuary, underscoring the need for further investigation. Nutrient fluxes were dominated by total carbon, and dissolved silica, indicating fresh groundwater inputs while boron and strontium were the major trace metal contributors, reflecting conservative saline mixing. These findings provide first-order estimates of SGD and solute fluxes from the tropical monsoonal coast of Odisha, highlighting their potential implications for groundwater sustainability, nutrient cycling, and coastal ecosystem functioning. The study emphasizes the need for isotopic and radon-radium mass balance approaches, coupled with higher-resolution temporal-spatial monitoring, to refine the SGD budgets and assess their role relative to riverine inputs.

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Abstract: Surfen is widely recognized for its anticoagulant properties in clinical applications. Recent interest, however, has shifted toward exploring its potential interactions with DNA, which may pave the way for novel therapeutic strategies, particularly in areas where regulation of DNA structure and function is critical. In view of this, we have investigated surfen's interaction with various DNA topologies, namely double stranded DNA (dsDNA), antiparallel G-quadruplex (AP GQ-DNA), hybrid G-quadruplex (HB GQ-DNA) and triplex DNA (tDNA) through a combination of experimental approaches and molecular dynamics simulations. This integrated strategy provided a comprehensive understanding of surfen's binding preferences and its structural impact on different DNA topologies. Experimental data, including conformational and binding analysis, demonstrated that surfen stabilizes dsDNA more effectively than G-quadruplex and triplex forms through the groove binding mode. Fluorescence intensity, lifetime changes, and competitive drug displacement data support the minor groove binding mode for surfen with dsDNA. These findings are supported by molecular dynamics (MD) simulations, which revealed a higher number of stable hydrogen bonds and a notable decrease in the radius of gyration (Rg) for dsDNA upon surfen binding, indicating compaction and structural stabilization. In contrast, surfen binding to AP and HB G-quadruplexes led to increased RMSD values and fluctuating hydrogen bond profiles, suggesting more transient and less stable interactions. Notably, HB GQ-DNA exhibited a dynamic structural transition during the simulation, implying a possible conversion to a more stable anti-parallel form upon extended drug interaction, also supported by circular dichroism (CD) study. The docking study emphasizes the critical role of DNA groove architecture, surfen shape, and functional group positioning in molecular recognition. These combined results highlight surfen's structural preference for duplex DNA and its potential to selectively stabilize specific DNA conformations, with implications for therapeutic targeting of genomic regions with distinct structural motifs.

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Title: Shape-Aware Diffusivity of DNA Binding Proteins Undergoing Rotation-Coupled Sliding Dynamics along DNA

Author(s): Choudhary, SK (Choudhary, Shrawan Kumar); Keshava, KP (Keshava, Kavana Priyadarshini); Bhattacherjee, A (Bhattacherjee, Arnab)

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Abstract: DNA-binding proteins locate their targets by sliding along DNA in a rotation-coupled manner, synchronizing axial motion with helical rotation. The classical Bagchi-Blainey-Xie (BBX) model provides a hydrodynamic description of this process but treats proteins as spheres with fitted radii. Here we introduce BBXB, a shape-aware generalization that explicitly incorporates molecular anisotropy by deriving translational and rotational frictions from the protein's three-dimensional structure via Happel-Brenner integrals. A single roughness parameter accounts for energy-landscape effects arising from rugged protein-DNA interactions. Applied to the Lac repressor and hOgg1 glycosylase, BBXB reproduces experimental single-molecule diffusion coefficients within a factor of 2, substantially improving on the original BBX model without adjustable radii. Across a panel of 27 structurally diverse DNA-binding proteins (spanning spherical to highly anisotropic shapes), BBXB predictions show a strong linear correlation with SoMo/GRPY hydrodynamic benchmarks (R 2 approximate to 0.99), while remaining systematically lower due to roughness corrections. Heatmap and friction-budget analyses reveal that rotational drag dominates total dissipation and increases with both shape anisotropy and offset distance from the DNA axis. Together, BBXB establishes a predictive and parameter-free hydrodynamic framework that quantitatively links molecular shape to one-dimensional rotation-coupled sliding dynamics of protein-DNA complexes.

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Title: The Mughals and the North-East: Encounter and Assimilation in Medieval India
Author(s): Pachuau, JLK (Pachuau, Joy L. K.)
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Title: Energy Efficient Resource Sharing in Trustworthy Federated Cloud Environment: A Bayesian Game and Double Auction Based Approach

Author(s): Sikarwar, SS (Sikarwar, Sandeep Singh); Kumar, R (Kumar, Rakesh); Ray, BK (Ray, Benay Kumar)

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Abstract: Cloud federation enhances cloud services by enabling resource sharing and cooperation among multiple Cloud Service Providers (CSPs) for improved performance. However, one of the significant challenges for CSPs within the federation is maintaining coordination among heterogeneous CSPs. Additionally, reducing the presence of pernicious CSPs within the federation will allow the federation to deliver services with committed Quality of Service (QoS). Moreover, minimising the energy while migrating virtual machines within the federation will allow an increase in the revenue of CSPs within the federation. This article proposed a Bayesian game-based model for detecting pernicious CSPs within the federation and developed a greedy double-auction-based resource-sharing mechanism. Here, the proposed mechanism ensures that CSPs achieve high satisfaction levels and guarantee a fair, efficient, and energy-aware resource-sharing environment among CSPs in a federation. Simulated results of the proposed Energy, Pernicious, and QoS Greedy Double Auction model (EPQ-GDA) are extensively compared with other competing models. The results demonstrate the effectiveness and superiority of our proposed method over the nearest competitor, with an average improvement in satisfaction of 2.61% for buyer CSPs and 3.67% for seller CSPs, 3.77% over energy, and 14.90% over perniciousness. Further simulated results also show that the EPQ-GDA satisfies important auction properties such as truthfulness, individual rationality, and budget balance.

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Author(s): Singh, NK (Singh, Nitin Kumar); Das, P (Das, Prativa); Singh, P (Singh, Pardeep); Chand, S (Chand, Satish)

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Abstract: The recent rise in meme popularity on social media brings both amusement and challenges, with memes being misused to spread misogynistic and toxic content targeting women online. Existing methods for detecting misogyny tend to focus solely on text or visuals, overlooking the need for analyzing multimodal data that combines both images and text. We propose a deep learning framework, namely, the ViDe framework with CROMA-SA module, for automatic misogyny identification in memes. To improve the generalization capability of the proposed framework, we have incorporated state-of-the-art deep learning frameworks, DeBERTa and ViT, to process the text and images in the memes, respectively. The CROMA-SA module, based on cross-modality encoding, attention based late-fusion, and self attention techniques, is proposed to determine the comprehensive context of the meme. To deal with the complex dataset and their class imbalance problem, a loss function named compound loss is introduced, which enhances the model's ability to learn informative features. To assess the effectiveness and adaptability, we evaluated the proposed ViDe framework on two diversified benchmark datasets: the primary MAMI dataset provided in the SemEval-2022 task 5 and the secondary Hateful Memes dataset. The proposed framework achieved an F1-score of 0.865 and 0.783 on subtasks A and B of the primary dataset, respectively. On the secondary dataset, the proposed framework achieved an AUROC score of 0.814. The experimental findings clearly illustrate that the proposed ViDe framework outperforms existing state-of-the-art multimodal models in both datasets.

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Abstract: Inequality and climate change are intricately linked, both in terms of the cause and the effect of climate change. The insight that inequality in emissions goes hand in hand with rising socio-economic inequality gives the impression that this is a straightforward, positive relationship, giving rise to the assumption that a mere redistribution of income in favour of the poor and disadvantaged will reverse the climate crisis. Focusing on the Indian context, this article shows that this may be an erroneous assumption. A redistribution of income in favour of those at the lower end of the population may actually lead to higher emissions per capita - the carbon inequality paradox. However, this does not mean that a choice has to be made between emissions and equality. While energy may be required for an egalitarian development, the source of that energy need not be dirty. The authors argue that a green energy transition is vital for any progressive fight against the twin problems of rising emissions and inequality. They propose a green development programme which, as well as promoting this energy transition, encourages socially necessary consumption through state-led expenditure programmes while socially unnecessary expenses of the elite are reined in through aggressive direct and indirect taxes.

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Author(s): Bera, S (Bera, Sonali); Gautam, A (Gautam, Aryan); Pal, G (Pal, Gaurank); Prasad, P (Prasad, Puja)

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Abstract: Five luminescent AIE-active iridium(iii) probes were employed for the rapid and specific identification of antibiotic-sensitive and -resistant pathogenic strains, including ESKAPE bacteria, achieving nearly 100% accuracy even at a low concentration of 105 CFU mL-1. This sensor array demonstrated significant potential for the identification and quantitative detection of mixed infections in urine of clinically relevant bacteria linked to urinary tract infections (UTI).

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Abstract: BackgroundEven with significant strides in technology, medicine, and science, the burden of malnutrition continues to weigh heavily on children, particularly in developing nations like India. This issue of malnutrition is particularly acute in developing and underdeveloped countries, including India. While India has made progress in reducing child malnutrition, severe malnutrition (acute and chronic) remains a critical public health concern, especially in regions like the Aspirational Districts (ADs), which are more resource-deficient regions.MethodThis study used data from the National Family Health Survey-5(NFHS-5) to examine the prevalence and predictors of severe malnutrition among children under five years in both ADs and non-ADs.

Thedescriptive statistics and logistic regression models were used andwe examined how residence in ADs influences the likelihood of severe malnutrition, accounting for socio-economic, demographic, household, and parental factors. The novelty of this study lies in addressing a critical research gap by examining all three severe malnutrition indicators: severe wasting(SW), severe stunting (SS), and severe underweight(SU), simultaneously and comparing their prevalence between ADs and non-ADs. This approach provides crucial evidence on the state of child malnutrition in resource-limited regions.ResultsThe study revealed that children in ADs have increased odds of SS, SW, and SU after accounting for different factors. Children who were male, had low birth weight, were of higher birth order, were anemic, experienced diarrheal episodes, resided in rural areas, had mothers with no education, belonged to poor wealth status, belonged to Scheduled Caste/Tribe families and had no exposure to mass media were more likely to be SS, SW, and SU.ConclusionThese findings are crucial to address regional inequalities in severe malnourishment, and targeted interventions in these resource-limited areas are pertinent. Improving nutrition programs, raising awareness among mothers, and providing socio-economic support, especially in rural areas can reduce the odds of severe malnourishment and contribute to achieving global Sustainable Development Goals related to health, hunger, and poverty.

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Author(s): Balkrishna, A (Balkrishna, Acharya); Joshi, M (Joshi, Monali); Tomer, M (Tomer, Meenu); Nain, P (Nain, Pardeep); Varshney, A (Varshney, Anurag)

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Abstract: BackgroundSeasonal variation influences the biosynthesis and accumulation of phytochemical compounds in plants, thereby affecting the qualitative and quantitative composition of phytochemicals. Investigation of these trends is crucial for ensuring the optimal collection time and consistency of metabolites. Although time specific collections of plant materials have been well-defined in classical Indian ancient literatures, however robust scientific validation has been rather limited.Methods Tinospora cordifolia stems were collected over a period of 24 months (Year 2022 to 2024) for phytochemical investigation. Bioactive constituents were extracted using hydro-methanol as the solvent and characterized by UHPLC-PDA analysis. Quantitative analytical method was validated in accordance with ICH-Q2 (R1) guidelines. Chemical fingerprinting was performed using HPTLC.ResultsUHPLC-PDA analysis of Tinospora cordifolia stems facilitated the identification and quantification of three key bioactive compounds including cordifolioside A, magnoflorine and beta-ecdysone, whereas HPTLC generated a distinct chemical fingerprint for the studied samples. The chromatographic method was found to be suitable, specific, linear, accurate, and robust for quantitative analysis. The concentration of magnoflorine, beta-ecdysone and cordifolioside A were found to be range between 5.0 and 54.5 ng/mg, 5.5 to 28.0 ng/mg and 154.0 to 289.0 ng/mg, respectively. Seasonal variation study revealed that the concentration of these three phytochemical compounds was highest during monsoon (August), lowest in winters (December to February), and moderate in spring and summer (rest of the year). Therefore, monsoon season seems like an appropriate time for the collection of Tinospora cordifolia stems, as advised in classical Indian medicinal text.ConclusionThis study underscores the significance of temporal diversity of phytochemical profiles with response to seasonal variation in herbs. This study also provides a systematic harvesting framework for determining optimal collection period of Tinospora cordifolia in order to maximize the consistency of pharmacological active phytochemical compounds.

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Abstract: We demonstrate that the superconducting properties can be controlled by photo excitation in Bi2Sr2Ca2Cu3O10+delta (Bi-2223). It is realized that steady-state photo excitation converts Cu2+ ions to spinless Cu1+ ions, which lowers the superconducting transition temperature, Tc, by suppressing superfluid density. This enables the achievement of a wide range of Tc under controlled exposure of photo excitation. We observe robust Planckian dissipation in under-and optimally-doped Bi-2223 with photo excitation over a wide range of Tc achieved with photo excitation. Our investigations thus open a window for extensive study of temperature-induced changes in superconducting properties without altering the intrinsic properties of the system through chemical doping, providing a unique platform for future applications.

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Abstract: Background India accounts for over a quarter of the global tuberculosis (TB) burden. Among the most affected are India's Scheduled Tribes (STs) communities, experiencing a disproportionately higher TB prevalence compared to non-STs. Encouragingly, two successive rounds of National Family Health Survey (NFHS) showed the declined trend in overall TB prevalence in India, the rate of decline was markedly slower among STs, signalling that national gains have not translated into equitable progress. This study examines the point prevalence of TB and its determinants among STs and non-STs populations in constitutionally protected Scheduled and Non-Scheduled areas of India. Methods We analysed data from 2,077,924 individuals aged 15 and above from NFHS-5 (2019-2021) in India. Districts were stratified into: (1) Scheduled Area districts (with protections under Schedules V/VI), (2) non-Scheduled districts with > 60% STs, and (3) non-Scheduled districts with < 60% STs. We estimated TB point prevalence per 100,000 among STs and non-STs across these categories and examined associated socio-demographic, environmental, and behavioural factors. Multivariable logistic regression models assessed the adjusted odds of TB. Results STs experienced significantly higher TB prevalence (416/100,000) than non-STs (277/100,000). This disparity persisted across all district categories. STs in Scheduled area districts had the lowest TB prevalence (330 per 100,000), while non-Scheduled districts with > 60% STs populations had the highest prevalence (608 per 100,000). Tribal identity remained an independent risk factor for TB [adjusted odd ratio (aOR) = 1.47; 95% confidence internal (CI) 1.38 -1.56], even after adjusting for covariates. Additional risk factors included older age, male sex, low household wealth, adverse household environments, tobacco and alcohol consumption, and hypertension and diabetes. Conclusions Tribal communities continue to shoulder a disproportionate TB burden, reflecting deep-rooted social and structural inequities. While constitutional protections in Scheduled Areas appear to offer some safeguards, disparities between STs and non-STs remain stark. Our findings serve as evidence and a call to action to ensure that tribal communities are at the forefront of TB control initiatives, so that the burden of TB is no longer borne disproportionately by those already burdened by socio-economic disadvantage.

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Abstract: Mountain rivers in the Himalayas are highly susceptible to geogenic and anthropogenic influences. In this study, fourteen trace/heavy metals (Al, As, B, Ba, Cd, Co, Cr, Cu, Fe, Mn, Mo, Ni, Sr, Zn) were evaluated in the Chandra River, Lahaul-Spiti Region, during June-October 2022 to understand the dynamics of trace metals in the Himalayan waters. Water samples collected along the downstream flow of the Chandra river (Batal to Sangam), a major tributary of the Indus River, were analysed by ICP-OES and evaluated using pollution indices, and PCA analysis combined with PHREEQC speciation modelling. Findings revealed that aluminium (39-44 mu g L-1), arsenic (8-10.1 mu g L-1), and cadmium (3.0-4.0 mu g L-1) often exceeded BIS limits (Al: 30, As: 10, Cd: 3 mu g L-1) in the downstream sites (Sissu and Sangam) under the influence of drainage, recreational, and constructional activities. Upstream sites showed low pollution with heavy metal pollution index (HPI: 4.5 to 7.0), heavy metal evaluation index (HEI: < 4.14), and Nemerow pollution index (NPI: < 1.3), while downstream areas exhibited higher pollution with HPI rising upto 13 to 16.5 and ecological risk index (ERI) increasing from upstream (10-15) to downstream (30-42). Total Hazard Index (THI) values (> 2) and ILCR (> 1.62 x 10(-4)) at Sissu/Sangam exceed acceptable limits, indicating a potential public health risk. Three PCA factors (85.23% variance explained) separated heavy metals (HMs) sources into geogenic, agricultural, and other anthropogenic sources (tourism, traffic originated and erosion). Speciation modelling showed aluminium mainly as Al(OH)(4)(-), iron as Fe(OH)(2)(+) or FeHCO3+, along with zinc (Zn) and cadmium (Cd) as mobile sulfate and chloride complexes, while strontium was mostly SrSO4 (> 85%). Saturation indices (SI) show a distinct hydrogeochemical shift along the Chandra River, moving from strong undersaturation at upstream (Batal) to conditions nearing equilibrium or exhibiting supersaturation at downstream (Sissu and Sangam). Strong metal-anion correlations indicate carbonate and sulfate weathering control metal mobility. The ongoing presence of mobile Cd and Zn in the downstream underscores the need for continued monitoring.

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Abstract: An efficient and green, oxidized carbon nitride-catalyzed, visible-light-driven regioselective ring opening of tosylaziridines from a variety of nucleophiles (OR, Br, N3) is reported. The developed methodology is also applied to epoxides, affording a library of 2-substituted amines-/alcohols in excellent yields (86-95%). Advantages of the developed methodology include regioselectivity, operational simplicity, ambient reaction conditions, and the recyclability of the heterogeneous catalyst up to five times without any substantial change in its morphology and catalytic efficiency.

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Title: Biogenesis of ultra-small anatase TiO₂ using <i>Prosopis cineraria</i> flower extract and its green nanocomposite for electrochemical sensing applications

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Abstract: Plant extracts offer an innovative green approach to synthesizing metal oxide nanoparticles within the fields of nanoscience and nanotechnology. The novelty of this present study lies in the green synthesis of ultra-small titanium dioxide nanoparticles (<2 nm) using Prosopis cineraria flower extract, which has not been previously reported as sustainable bio-reductant. Moreover, researchers explored the integration of (TiO2)(PC) with biologically reduced graphene oxide toward the production of a green "titanium dioxide/biologically reduced graphene oxide" nanocomposites without the need of toxic chemicals or high-temperature treatments. This dual green strategy not only ensures environmental safety but also results in a nanocomposite with outstanding electrochemical properties. Various analytical techniques, such as XRD, FT-IR, and TEM, confirmed the successful synthesis of "(TiO2)(PC)" and its nanocomposites. Electrochemical sensing of p-

aminophenol was investigated on prepared (TiO2)(PC)@bio-reduced GO in the concentration range 5-643.75 <mu>M with a limit of detection 1.2 mu M.

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Abstract: Rauvolfia serpentina (L.) Benth. Ex Kurz is a greatly appreciated medicinal plant, well-known for its therapeutic benefits in traditional medicine, particularly in Ayurveda, where the roots and whole plant are used to treat a variety of ailments. However, studies focusing on R. serpentina seeds are relatively scarce. Hence, the present study provides a novel approach by analysing the seed oil of R. serpentina extracted using the supercritical-carbon dioxide-fluid-extraction (SCFE) technique. The research employed advanced analytical methods including gas-chromatography with flame ionization detector (GC-FID), gas-chromatography-tandem mass spectrometry (GC-MS/MS), and high performance thin layer chromatography (HPTLC) to characterise the chemical composition of the extracted oil. Functional moieties were evaluated by Fourier transform infrared spectroscopy (FT-IR), while proton nuclearmagnetic-resonance (1H NMR) spectroscopy was utilised to identify the phytometabolites as well as to assess the physico-chemical parameters. The anti-microbial potential of the supercritically extracted oil was demonstrated through its activity against Klebsiella pneumoniae. The inhibitory effects on K. pneumoniae were quantified using the broth microdilution method, showing activity at both minimum inhibitory concentrations (MIC50 and MIC90). Furthermore, the oil was found to be non-genotoxic, as demonstrated by the Ames assay, which showed no mutagenic effects against S. typhimurium and E. coli WP2 uvrA. Since previous reports on R. serpentina seeds and their novel contribution in the field of pharmaceutics are rather limited, the present study is of utmost importance. The study may pave the way for future investigations into the therapeutic potentials of R. serpentina seeds. (c) 2025 The Author(s). Published by Elsevier B.V. on behalf of Xi'an Jiaotong University. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

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Author(s): Ghosh, A (Ghosh, Ajit); Chatterjee, Y (Chatterjee, Yajnaseni); Kumar, B (Kumar, Brijesh); Kaur, C (Kaur, Charanpreet); Pareek, A (Pareek, Ashwani); Sopory, SK (Sopory, Sudhir K.); Singla-Pareek, SL (Singla-Pareek, Sneh L.)

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Abstract: Glyoxalase I (GLYI) constitute the first enzyme of the glyoxalase pathway which is a two-step reaction to convert methylglyoxal (MG), an inherent cytotoxin to D-lactate. In plants, multiple members of the glyoxalase pathway genes have been reported. However, not all exhibit glyoxalase activity. OsGLYI-10 is one such member from rice GLYI family which we report here, to lack GLYI enzymatic activity. Instead, OsGLYI-10 shows high structural homology to glutathione-S-transferase (GST) proteins and exhibits GST activity. Further, we found OsGLYI-10 to be highly expressed in seeds, its expression starting at the milk stage, reaching its maximum in the mature seed and finally disappearing after four days of imbibition. Importantly, through molecular docking and site-directed mutagenesis studies, we showed that GLYI activity can be reinstated to some extent via the introduction of a 10 amino acid stretch as well as substitution of certain amino acids in OsGLYI-10. Further increase in GLYI activity could be achieved through the substitution of Met with Tyr at 55th position, restoring 35% activity in OsGLYI-10 relative to a functionally active and highly efficient GLYI, OsGLYI-8 enzyme from rice. Our findings therefore, suggest OsGLYI-10 to be a reminiscent of GLYI enzyme that has diverged in its catalytic function over the course of evolution to adopt newer activities and roles in cellular physiology.

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Abstract: Cancer remains one of the leading global health challenges, highlighting the continuous need for innovative therapeutic approaches. In this context, medicinal plants have been recognized as potential candidates for developing bioactive compounds, including flavonoids, which have demonstrated good anticancer properties. Diosmetin, a flavonoid aglycone predominantly found in citrus fruits, has shown potent anticancer properties due to its ability to induce cell cycle arrest, induce apoptosis, and inhibit tumor progression. This study evaluates the anticancer potential of diosmetin across various cancer cell lines such as prostate, skin, liver, lung, and in a murine Ehrlich ascites carcinoma (EAC) model. The cytotoxic effects of diosmetin were assessed by using three independent assays like SRB, MTT, and NRU. Diosmetin exhibited potent antiproliferative effects, with the lung and hepatic cancer cell lines showing the highest sensitivity. Furthermore, in the EAC mouse model, diosmetin significantly reduced tumor growth and promoted cell death. Mechanistic investigations revealed that diosmetin increases reactive oxygen species (ROS) generation in tumor cells. This is further confirmed by co-treatment with N-acetyl cysteine (NAC), a ROS inhibitor. Additionally, diosmetin demonstrated favorable pharmacokinetic and drug-likeness properties, including high gastrointestinal absorption and non-toxicity towards human erythrocytes. These findings suggest that diosmetin holds considerable promise as a potential anticancer agent, warranting further investigation for its therapeutic development.

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Abstract: Academic Abstract
 This paper explores the complex processes of marginalization and demarginalization in India with an emphasis on the experiences of Dalits (Hindi word for oppressed). The caste system in India is characterized by "graded inequality," keeping lower-caste people from achieving economic parity and denying them access to opportunities and resources. Even though the Indian Constitution protects against caste discrimination, it is common and has a wide-ranging influence on people's lives, including their livelihoods, sense of self, education, and health. The paper argues for culturally appropriate frameworks that represent the distinct experiences of oppressed groups in India and criticizes the sluggish advancements in social psychology concerning caste. Highlighting the complex nature of marginalization and the ways in which caste, gender, and socioeconomic issues interact, the paper presents a holistic framework for understanding caste-based marginalization and demarginalization. Drawing insights from the contributions of two iconic social thinkers in India, Gandhi and Ambedkar, the proposed framework combines top-down institutional changes with bottom-up community empowerment efforts to achieve demarginalization. To tackle the cultural and psychological aspects of marginalization, it is essential to incorporate indigenous knowledge and decolonial viewpoints. The paper calls for a comprehensive approach that empowers disadvantaged groups via education, lobbying, and cultural preservation while acknowledging the historical and structural origins of caste-based exclusion. An ongoing effort at demarginalization is critical for creating a more equal society and eliminating long-standing imbalances.
 Public Abstract
 This paper delves into the intricate dynamics of marginalization and demarginalization in the context of India's caste system, particularly focusing on the experiences of Dalits (Hindi word for oppressed). Despite constitutional protections, caste-based discrimination remains pervasive, affecting various aspects of life, including livelihoods, identity, education, and health. The paper presents a comprehensive model to understanding marginalization, highlighting its multifaceted nature and the interplay of caste, gender, and socioeconomic factors. Based on the ideas of two influential personalities in India, Gandhi and Ambedkar, the paper proposes a model that advances a dual strategy for demarginalization, combining top-down institutional reforms with grassroots community empowerment initiatives. It is argued that an integration of indigenous knowledge and decolonial perspectives is crucial for addressing the psychological and cultural dimensions of marginalization. The paper underscores that demarginalization is not a linear process but requires a transformative approach that fosters dignity, equality, and justice. By recognizing the historical and structural roots of caste-based exclusion, the paper advocates for a holistic approach. An ongoing continuous effort is essential for dismantling entrenched inequalities and fostering a more equitable social world.

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Abstract: Tuberculosis (TB) remains a major public health challenge, particularly in high-burden countries such as India, china, Indonesia, etc. In these regions, ongoing transmission and relapse hinder control efforts. This study develops and analyzes a compartmental \documentclass[12pt]{minimal} \usepackage{amsmath} \usepackage{wasysym} \usepackage{amsfonts} \usepackage{amssymb} \usepackage{amsbsy} \usepackage{mathrsfs} \usepackage{upgreek} \setlength{\oddsidemargin}{-69pt} \begin{document}$$SE_1E_2IRB$$\end{document} model that incorporates environmental transmission and relapse pathways. The basic reproduction number \documentclass[12pt]{minimal} \usepackage{amsmath} \usepackage{wasysym} \usepackage{amsfonts} \usepackage{amssymb} \usepackage{amsbsy} \usepackage{mathrsfs} \usepackage{upgreek} \setlength{\oddsidemargin}{-69pt} \begin{document}$$R_0$$\end{document} is derived through the next-generation matrix method. Lyapunov functions is used to establish the global asymptotic stability of the infection-free equilibrium. Bifurcation analysis examines system behavior at the critical threshold \documentclass[12pt]{minimal} \usepackage{amsmath} \usepackage{wasysym} \usepackage{amsfonts} \usepackage{amssymb} \usepackage{amsbsy} \usepackage{mathrsfs} \usepackage{upgreek} \setlength{\oddsidemargin}{-69pt} \begin{document}$$R_0 = 1$$\end{document}. Parameter sensitivity analysis identifies the transmission rate (\documentclass[12pt]{minimal} \usepackage{amsmath} \usepackage{wasysym} \usepackage{amsfonts} \usepackage{amssymb} \usepackage{amsbsy} \usepackage{mathrsfs} \usepackage{upgreek} \setlength{\oddsidemargin}{-69pt} \begin{document}$$\beta$$\end{document}), slow latent reactivation rate (\documentclass[12pt]{minimal} \usepackage{amsmath} \usepackage{wasysym} \usepackage{amsfonts} \usepackage{amssymb} \usepackage{amsbsy} \usepackage{mathrsfs} \usepackage{upgreek} \setlength{\oddsidemargin}{-69pt} \begin{document}$$\rho_2$$\end{document}), and recovery rate (\documentclass[12pt]{minimal} \usepackage{amsmath} \usepackage{wasysym} \usepackage{amsfonts} \usepackage{amssymb} \usepackage{amsbsy} \usepackage{mathrsfs} \usepackage{upgreek} \setlength{\oddsidemargin}{-69pt} \begin{document}$$\gamma$$\end{document}) as key drivers of TB dynamics. An increase in \documentclass[12pt]{minimal} \usepackage{amsmath} \usepackage{wasysym} \usepackage{amsfonts} \usepackage{amssymb} \usepackage{amsbsy} \usepackage{mathrsfs} \usepackage{upgreek} \setlength{\oddsidemargin}{-69pt} \begin{document}$$\beta$$\end{document} or \documentclass[12pt]{minimal} \usepackage{amsmath} \usepackage{wasysym} \usepackage{amsfonts} \usepackage{amssymb} \usepackage{amsbsy} \usepackage{mathrsfs} \usepackage{upgreek} \setlength{\oddsidemargin}{-69pt} \begin{document}$$\rho_2$$\end{document} by 10% raises

\documentclass[12pt]{minimal} \usepackage{amsmath} \usepackage{wasysym} \usepackage{amsfonts} \usepackage{amssymb} \usepackage{amsbsy} \usepackage{mathrsfs} \usepackage{upgreek} \setlength{\oddsidemargin}{-69pt} \begin{document}$$R_0$$\end{document} by 8.9% and 8.8%, respectively, while a 10% improvement in recovery reduces \documentclass[12pt]{minimal} \usepackage{amsmath} \usepackage{wasysym} \usepackage{amsfonts} \usepackage{amssymb} \usepackage{amsbsy} \usepackage{mathrsfs} \usepackage{upgreek} \setlength{\oddsidemargin}{-69pt} \begin{document}$$R_0$$\end{document} by 8.6%.
The impact of vaccination is further analyzed using an optimal control framework for \documentclass[12pt]{minimal} \usepackage{amsmath} \usepackage{wasysym} \usepackage{amsfonts} \usepackage{amssymb} \usepackage{amsbsy} \usepackage{mathrsfs} \usepackage{upgreek} \setlength{\oddsidemargin}{-69pt} \begin{document}$$R_0 = 1.43$$\end{document}, representing sustained transmission in the absence of interventions. Using Pontryagin's Maximum Principle, the optimal timing and intensity of vaccination are determined to minimize infections and maximize recoveries. Vaccination strategies, specifically Bacillus Calmette-Gu & eacute;rin (BCG), reduce the infected population (from 2,504 to 2,316 within 3 years) and substantially increase recoveries (from 2,748 to 199,783). Achieving vaccination coverage of 90% or higher yields near-optimal reductions in infection and substantial gains in population immunity. High-coverage BCG vaccination is a cost-effective strategy that can guide policy toward India's TB elimination and 2030 Sustainable Development Goals and WHO elimination targets.

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Abstract: PurposeHuman Metapneumovirus (HMPV) and Human Respiratory Syncytial Virus (HRSV) cause severe acute lower respiratory tract infections (ALRTIs), particularly in children, the elderly, and immunocompromised individuals. Despite their clinical significance, effective antiviral therapies remain limited. Both viruses rely on a conserved RNA-dependent RNA polymerase (RdRp) for replication and transcription, making it a promising therapeutic target. In this study, we aimed to identify potent natural inhibitors that target conserved allosteric pockets within the RdRp polyribonucleotidyltransferase (PRNTase) domain of HMPV and HRSV using structure-based computational approaches.MethodsWe screened 100 Traditional Chinese Medicine (TCM)-derived phytochemicals through structure-based virtual screening against conserved RdRp allosteric sites. We then evaluated the top candidates based on their pharmacokinetic and toxicity profiles and conducted molecular dynamics (MD) simulations along with MM/GBSA free energy calculations to analyze the stability, conformational dynamics, and binding energetics of the protein-ligand complexes.ResultsWe identified Tanshinone I, a diterpenoid from Salvia miltiorrhiza (Danshen), as the most potent inhibitor with binding energies of -9.1 kcal/mol (HMPV) and -9.5 kcal/mol (HRSV). It showed stronger binding affinities than FDA-approved antivirals Remdesivir (-8.5 and -8.0 kcal/mol) and Favipiravir (-5.9 and -6.2 kcal/mol), along with favorable pharmacokinetic properties, high bioavailability, and no predicted toxicity. MD simulations confirmed stable protein-ligand interactions with minimal fluctuations, and MM/GBSA analyses supported favorable binding energetics.ConclusionOur findings demonstrate that Tanshinone I acts as a promising dual inhibitor of HMPV and HRSV RdRp. Its high affinity, structural stability, and excellent drug-like properties support its potential as a lead compound for developing TCM-based antiviral therapies. Further in vitro and in vivo investigations are warranted to validate its therapeutic efficacy.

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Abstract: Essential resources like air, water, food, and energy, particularly in transportation and technology sectors, are crucial for human survival and growth. However, challenges such as industrial dye pollution in soil and water, rising atmospheric CO2 levels, and fossil fuel depletion form a complex ecological system and demand urgent action. Innovations in efficient solar energy harnessing, hydrogen production, CO2 conversion to valuable chemicals, and eco-friendly dye degradation methods are critical for achieving sustainability. Multifunctional nanoparticles, especially metal sulfides, have gained attention due to their cost-effectiveness and appropriate band alignment of metal sulfides for solar fuel generation. Among them, silver sulfide (Ag2S)-based nano-materials stand out owing to narrow and tunable bandgaps and broad visible-light absorption. This review critically examines recent progress in Ag2S-based nano-photocatalysts for dual applications: wastewater treatment and energy generation. It focuses on advanced engineering strategies like heterojunction formation and doping to enhance photocatalytic efficiency, stability, and selectivity. Additionally, it discusses the synergistic role of Ag2S nanocomposites in degrading organic pollutants for wastewater remediation and promoting hydrogen evolution/CO2 reduction for clean energy. The potential integration of these nano-photocatalysts into scalable systems aligned with circular economy principles is explored, emphasizing resource recovery, environmental sustainability, and low-carbon technologies. Current challenges, alternative strategies, and future directions are also highlighted to guide the development of next-generation Ag2S-derived photocatalysts for environmental and energy applications for human welfare and the growth of society.

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Abstract: In accordance with human life, agriculture has main role in it, and in addition to that most people are involved in some kind of agricultural activity either in a direct or indirect manner. Moreover, the agricultural sectors acquired a major role in supplying better quality food and thus made the greatest attribution to the growth of populations and economics. But, the disease over the crop has influenced the growth of the corresponding species and thus requires an earlier diagnosis of plant disease by utilizing the most adequate and automatic detection approach for improving the quality of the production of food as well as to reduce the loss in economic. But, there are no techniques in the conventional system for identifying the disease in diverse crops in the agricultural environment. In modern times, deep learning approaches have acquired tremendous enhancement in the identification of image categorization as well as the object detection system. For precise detection of plant disease, an improved classification model is developed. Initially, from the standard publicly available database, the images of the plants are aggregated. The gathered images are segmented using Dilated, Adaptive, and Attention-based Mask Recurrent Convolutional Neural Networks (DAA-MRCNN). Then, it is fed into a hybrid classification phase, where the new model namely Dilated, Adaptive, and Attention-based Multiscale DenseNet termed as (DAA-MDeNet) for classification. The classifier performance is improved by optimizing the parameter in Mask RCNN and Multiscale DenseNet using the hybrid optimization algorithm named African Vulture and Lemur Optimizer (AVLO). When compared with the other model, a superior performance is shown in the proposed model.

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Abstract: The practical application of solid polymer electrolytes (SPEs) is limited by their low ionic conductivity and poor interfacial compatibility with silicon (Si) anodes in high-energy-density, safe lithium-ion batteries (LIBs). Here, we introduce a lithiated covalent organic framework (COF) into a poly(vinylidene fluoride-cohexafluoropropylene) (PVDF-HFP)-based quasi-solid polymer electrolyte (QSPE) containing plasticizers to increase its electrochemical performance. The resulting COF-based QSPE has a high ionic conductivity of 2.99 mS cm-1 and enables Si anodes to deliver a remarkable specific capacity of 1722 mAh g-1 after 500 cycles, along with an excellent rate capability of up to 10 A g-1. Furthermore, we provide new insights into the role of lithiated COFs in modulating the Li+ solvation structure, facilitating ionic migration and promoting desolvation in plasticizer-containing solid electrolytes at the molecular scale. These findings offer valuable guidelines for the rational design of stable Si anodes in solid-state batteries.

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Abstract: Solute Carrier Family 7 Member 11 (SLC7A11), a redox homeostasis and metabolism regulator, is frequently overexpressed and mutated in cancers, contributing to progression and therapy resistance. This study systematically reviewed and meta-analyzed its prognostic value, mutational landscape, role in resistance, and its therapeutic potential. A comprehensive search (2010-2024) across PubMed and ScienceDirect identified 236 studies, alongside TCGA data from 30 cancer types and 128 mutations from GDC. Prognostic and clinicopathological correlations were assessed using hazard ratios (HRs), with fixed/random effects models based on heterogeneity (I-2), and significance tested via Z-tests ($p < 0.05$). Publication bias was evaluated using Begg's and Egger's tests. General linear models explored associations with resistance and pathway alterations. Interestingly, SLC7A11 overexpression was associated with poor prognosis (HR = 1.22), adverse clinicopathological features viz. TNM-stage and therapy resistance like chemoresistance ($p < 0.001$). Mutation analysis revealed diverse alterations and frequent heterozygous deletions, prevalently, missense mutation underscoring its oncogenic role. Moreover, SLC7A11 inhibitors, particularly sulfasalazine and erastin, effectively reversed resistance, in 18 clinical trials (Phase I-III) completed over the last decade. Targeting SLC7A11 presents a promising therapeutic strategy to modulate redox balance, metabolism, and ferroptosis, towards efficient cancer treatments.

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Abstract: Bilayer manganites, archetypal quasi-two-dimensional materials with natural spin valve geometries and anisotropic properties, offer unique technological prospectives. Detailed bulk magnetization study of La1.4Sr1.6 Mn2O7 over a wide temperature range reveals the following. The compound exhibits a series of transitions from paramagnetic to 2D ferromagnetic (FM) at 361 K and Quasi-2D FM to 3D FM at 101 K. There are intermediate transitions at 236 K, 278 K and 300 K which are weak but sensitive to magnetic field strength. Strong thermomagnetic irreversibility in magnetization exists and precludes the existence of a spin glass state. Spin-wave analysis confirms the presence of strong uniaxial anisotropy and the existence of gap in the spin wave spectrum. Griffiths phase analysis confirms the presence of short-range antiferromagnetic clusters in the paramagnetic region. Furthermore, the compound exhibits a notable magnetocaloric effect across a broad temperature range. Based on these observations, T-H phase diagram has been constructed.

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Abstract: In this article, the effects of increasing the Fe concentration in La2Co2-xFexO6 (x = 1.10, 1.15, 1.20, 1.25, and 1.30) nanoparticles were systematically investigated. The Rietveld refinement analysis of La2Co2-xFexO6 compositions confirmed the orthorhombic structure. A clear increase in the lattice parameters and unit cell volume was observed, accompanied by enhanced distortion of the Fe-O2-Co bond angle with increasing Fe content. Room-temperature magnetic hysteresis indicates weak ferromagnetic behavior, with both coercivity and remanent magnetization increasing as the Fe content increases. The N & egrave;el temperature of La2CoFeO6 (similar to 270 K [1]) was tuned toward higher temperatures with small increments in the Fe concentration. For composition, x = 1.10, a magnetic transition near similar to 300 K was observed, along with a large exchange bias (EB) effect at 2 K under zero-field cooling conditions. The magnitude of the EB progressively decreases as Fe concentration increases toward the end-member LaFeO3, which is known to be an antiferromagnetic insulator. This reduction is due to decreasing competition between the antiferromagnetic and ferromagnetic interactions caused by increased homogeneity in the oxidation states of the Fe/Co B-site ions, as confirmed by X-ray photoelectron spectroscopy studies. The observed near-room-temperature magnetic transition and significant EB suggest the promising potential of these materials for spintronic applications.

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Abstract: A series of furfuryl appended novel spirooxindoles have been synthesized via 3-component 1, 3-dipolar cycloaddition reaction of isatin, furfurylamine and substituted nitrostyrene. The reported route incorporates Triethylamine (TEA) as a mild and effective organocatalyst for the synthesis of spiroadducts along with additional advantages such as high atom economy, operational simplicity and high stereo-and regioselectivity. The synthesized spiroadducts have been characterized by NMR, FT-IR, HRMS and SC-XRD. In Silico studies revealed that these molecules could effectively bind to TUBB gene which plays a significant role in tubulin formation. Further, molecular docking and molecular dynamics and simulation studies were carried out to validate their pharmacokinetic profile. DFT Studies were carried to analyze some global descriptor parameters like HOMO-LUMO energy gap, chemical potential (mu), electronegativity (chi), hardness (eta), electrophilicity index (omega).

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Abstract: This study attempts to reconstruct the glacial history of the Upper Changme Khangpu Basin (CKB), an eastern tributary of the River Tista in the Eastern Himalaya, using radiocarbon (14C) method, supplemented by sedimentological and mineralogical analyzes. Despite being a monsoon-dominated glaciated region, the upper reaches of the basin still contain exceptionally well-preserved glacial landforms of the recent geological past. However, there remains a critical gap in understanding due to the lack of chronological studies to clarify and correlate the roles of climate and glacial interactions in an environment where intense monsoonal precipitation rapidly alters the landscape and glacier dynamics. In order to reconstruct the past glacier fluctuations and associated palaeoclimatic conditions, this study has employed a multi-proxy approach, integrating geomorphic feature mapping, sedimentological analysis, Accelerator Mass Spectrometry (AMS) 14C dating, alongside the Schmidt Hammer rebound data for relative age determination. The results have yielded a well-defined glacial chronology for the Late Quaternary in the CKB, identifying four distinct glacial advances of varying magnitudes. The extensive glacial phase (Phase-II) resulted in the blockage of the ablation valley, forming a similar to 700 m-long proglacial lake. Subsequent glacial recession seems to have intensified the paraglacial processes which progressively reshaped and modified the earlier landforms. A new dataset of 14C ages (3.5 ka to 31.4 ka cal BP) indicates climatic oscillations during the intervening period. Post-glacial climatic shifts, particularly between 14.29 ka and 3.5 ka cal BP, show a regional correlation with climatic patterns observed in the Eastern Himalayas. Our finding underscores the need to further refine this enquiry to develop a robust glacial chronology of the basin using multiple modern geochronological techniques.

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Abstract: Plant diseases must be detected early and accurately because of the growing risk to global food security posed by phytopathogens, climate change and intensive farming methods. Integrating nanotechnology into biosensor development provides transformative potential to address this crisis by facilitating rapid, accurate, and fielddeployable detection of phytopathogens. Advanced functional nanomaterials enable the design of highperformance, quicker reaction time, portable, greater sensitivity and point-of-care biosensors that function as intelligent constituents within complex adaptive agricultural systems can act as a better diagnosis tool. These biosensors can interact dynamically with their environment and provide real-time disease surveillance and informed decision-making, contributing to resilient and sustainable farming. This review comprehensively analyses various phytopathogens and functional nanomaterial-based biosensors for plant pathogen monitoring, considering the One Health approach that recognizes the interconnectedness of plant, human, and environmental health. It highlights various biosensing strategies, including electrical, electrochemical, chemiresistive and optical modules, that overcome the limitations of conventional diagnostics in terms of sensitivity, specificity, and scalability. It further explores the integration of biosensing with advanced technologies such as complex physics tools like artificial intelligence, machine learning, network analysis, Internet of Things, and cloud computing. As adaptive nodes in intelligent and complex agricultural ecosystems, nano biosensors represent a promising frontier for early pathogen detection, minimizing crop losses, and enhancing global agricultural resilience.

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Abstract: Weathering is a key exogenic process that supplies sediments to rivers and drives global biogeochemical cycles. This study quantifies the impact of water availability on rock weathering using U-series isotopes from two granite weathering profiles in the climatically distinct Himalayan regions: the humid Lesser Himalaya and the semi-arid Higher Himalaya. The humid conditions in the Lesser Himalaya have accelerated weathering rates by up to 3.5 times compared to the semi-arid Higher Himalaya, with at least a twofold increase in element flux. The similar to 60 ka weathering record in the Higher Himalaya corresponds to the deglaciation period, and due to low residence time, the profile here is thinner and weathering intensity is less than that of the Lesser Himalayan weathering profile. The metagenomics-based study on the Lesser Himalayan weathering profile provides further insights into biogenic mediation in weathering. Microbes disintegrate primary minerals in fresh rock to utilize mineral-bound nutrients and reprecipitate secondary carbonate in the soil. In contrast, in the nutrient-depleted, highly weathered zone, microbes rely on carbon sources, produce organic acids, and disintegrate K-feldspar to release potassium for plant uptake. Additionally, they capture soil CO2 and convert it into bicarbonates, highlighting the importance of quantifying biological carbon capture. The datasets produced in this study represent granite weathering fluxes across the climate gradient in the Himalaya. Further, by providing the first in-situ U-series-based weathering timescales, the research bridges a critical gap in understanding weathering dynamics in one of the world's most tectonically active mountain belts.

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Abstract: In the Internet of Vehicles (IoV) era, connected vehicles are leveraging intelligent sensors to share sensitive and real-time information to enhance road safety, driving comfort, and traffic efficiency. Despite these advancements and benefits, security and privacy vulnerabilities remain a crucial challenge. This article proposes an enhanced trust-enabled Delegated Proof of Stake (DPoS) consensus-based consortium blockchain to address these challenges effectively for information sharing. The proposed consensus approach focuses on miner selection based on trust scores derived from vehicle transaction history analyses. The trust score calculation employs entropy information and binomial distribution, where the entropy measures the uncertainty in a vehicle's behavior, and the binomial distribution assesses the success rate of its transactions. This model ensures traceable and anonymous vehicle-to-vehicle information sharing, preventing unauthorized information transfer and improving overall system reliability. By leveraging the enhanced trust-based DPoS consensus mechanism of consortium blockchains, the proposed scheme leads to overcoming the challenges of vehicular ad hoc networks, along with fostering economic interest through enhanced traffic safety and energy conservation. The experimental results validate the proposed model, revealing significant improvements in terms of detection of malicious vehicles, communication latency, security, and efficiency of IoV applications.

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Abstract: Thyroid hormones are central to regulating metabolism, growth, and development, yet their complex interactions with socioeconomic, metabolic, and genetic factors remain understudied in diverse populations. We compared thyroid profiles - free triiodothyronine (FT3), free thyroxine (FT4), and thyroid-stimulating hormone (TSH) in Indian adolescents with anthropometric traits, metabolic markers, and socioeconomic status (SES). We observed that adolescents from higher SES backgrounds exhibited greater metabolic dysregulation, altered thyroid profiles, and abnormalities in lipid and adipokine levels. Subclinical (16.1%) and clinical hypothyroidism (1.1%) were found to be prevalent in this population but were not associated with obesity. Instead, they showed links with dyslipidemia and altered adipokine profiles. To investigate the genetic basis of thyroid traits, we conducted an exome-wide association study (ExWAS, N = 4324), and a two-staged genome-wide association study (GWAS, N = 4854). The ExWAS revealed two novel loci for TSH (GYS2 and CEP162) and fifteen novel loci for FT4, including ZNF467, P3H3, CRLF3, SPATA2L, MEFV, THNSL2, COL27A1, COL28A1, IGSF3, ZNF732, MOG, GABBR1, HPF1, LOC440563, and SPEG. The GWAS identified novel associations at near-genome-wide significance for TSH (ACTL7B) and FT4 (LINC00648, YTHDC1, and C2CD4B). We also replicated established associations in FOXE1 and IGFBP5. Our findings suggest that SES, metabolic health, and genetics jointly influence thyroid function in Indian adolescents. The identification of population-specific loci emphasizes the importance of ancestry-informed genetic studies and supports the development of precision interventions to enhance pediatric thyroid health.

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Abstract: Glaciers worldwide, including those in the Himalaya, are retreating under climate change, often leading to the formation and expansion of glacial lakes and an increased risk of Glacial Lake Outburst Floods (GLOFs). This study examines the evolution of the proglacial Bhilangana Lake (similar to 0.37 km(2); similar to 4750 m asl) and the associated glacier changes, including thinning and retreat, between 1968 and 2025 using satellite imagery, field measurements and hydrodynamic modelling. Results show lake expansion from similar to 0.12 km(2) in 2001 to similar to 0.37 km(2) in 2025, with an estimated volume of similar to 10.7 x 10(6) m(3), indicating exponential growth over time. A potential GLOF could release peak discharge of 3645 m(3)/s, with average flow velocity similar to 12 m/s, inundating similar to 6.8 km(2) and threatening hydropower projects, settlements and infrastructure downstream. Rising mean, maximum and minimum air temperatures at rates of 0.028, 0.052 and 0.05 degrees C/year, respectively, are identified as the primary drivers of lake expansion and accelerated melt, particularly in July-August. The zero-degree isotherm is shifting to higher elevations, and bias-corrected ERA5 data show good agreement at such altitudes, making it reliable for climate change analysis. Several over-deepening sites were also mapped as potential future lakes, with CMIP6

projections (similar to 0.8 degrees C/decade) indicating substantial glacial and hydrological changes, further elevating GLOF risk by the century's end.

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Abstract: 4-Ethyl phenyl sulfate (4-EPS), a gut microbiota-derived metabolite, is identified in ailments like chronic kidney disease (CKD) and numerous neurodegenerative conditions like autism spectrum disorders (ASD). This study is a novel attempt to comprehend the interaction of 4-ethyl phenyl sulfate (4-EPS) with human serum albumin (HSA). This interaction was examined using spectroscopic techniques like circular dichroism (CD), Fourier transform infrared (FTIR), UV-vis absorption, fluorescence spectroscopy, and molecular docking studies. The conformation investigation through FTIR and CD confirmed the alteration in the secondary structure of HSA due to the binding of 4-EPS. Fluorescence spectroscopy revealed the formation of a complex between HSA and 4-EPS upon interaction via static quenching. The spontaneity of the binding process was indicated by the negative Delta G value. Absorption spectroscopy demonstrated that in the presence of 4-EPS (2-48 mu M), the absorbance of HSA progressively declined as a result of the formation of the 4-EPS-HSA complex. Contact angle measurements showed the involvement of hydrophobic interactions between HSA and 4-EPS. Molecular modeling was performed, followed by optimization using the DFT approach. Molecular docking study revealed moderate binding between the metabolite and HSA. It was further confirmed that hydrophobic interaction and hydrogen bonds were the main forces responsible for stabilizing the 4-EPS-HSA complex.

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Abstract: Owing to its ever-growing range of pharmacological advantages, sulforaphane, an isothiocyanate from cruciferous vegetables such as broccoli, is becoming increasingly popular. This review aims to provide a thorough understanding and a current update on the application of sulforaphane in cancer treatment. Sulforaphane interacts with many signaling molecules that control various pathways in malignant cells, including angiogenesis, apoptosis, cell cycle arrest, metastasis, and inflammation pathways. This review examines the effects of this isothiocyanate on inflammatory mediators, caspases, MMPs, cytokines, and the proteins Bax and Bcl-2. Furthermore, the advantages of nanotechnology and synergistic effects in sulforaphane applications are also reviewed. As per evidence, sulforaphane is a shining example of how ethno-pharmacological expertise can be used to create modern medications.

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Abstract: Mountain regions show rapid environmental changes under anthropogenic warming. The rates of these changes are often stratified by elevation, leading to elevation-dependent climate change (EDCC). In this Review, we examine evidence of systematic change in the elevation profiles of air temperature and precipitation (including snow). On a global scale, differences between mountain and lowland trends for temperature, precipitation and snowfall are 0.21 degrees C century-1 (enhanced mountain warming), -11.5 mm century-1 (enhanced mountain drying) and -25.6 mm century-1 (enhanced mountain snow loss), respectively, for 1980-2020, based on averaging available gridded datasets. Regional analyses sometimes show opposite trend patterns. This EDCC is primarily driven by changes in surface albedo, specific humidity and atmospheric aerosol concentrations. Throughout the twenty-first century, most models predict that enhanced warming in mountain regions will continue (at 0.13 degrees C century-1), but precipitation changes are less certain. Superimposed upon these global trends, EDCC patterns can vary substantially between mountain regions. Patterns in the Rockies and the Tibetan Plateau are more consistent with the global mean than other regions. In situ mountain observations are skewed towards low elevations, and understanding of EDCC is biased towards mid-latitudes. Efforts to address this uneven data distribution and to increase the spatial and temporal resolution of models of mountain processes are urgently needed to understand the impacts of EDCC on ecological and hydrological systems.

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Abstract: The Afromontane region harbors ancient grasslands with high levels of endemism, now under threat from land-use change, biological invasions and encroachment, and climate warming. As part of an international Plant Functional Traits Course we collected comprehensive trait data in five sites along an elevation gradient from 2,000-2,800 m a.s.l. and in a climate warming experiment at 3,064 m a.s.l. in the Maloti-Drakensberg, South Africa. We sampled 24,405 aboveground and 94 root trait measurements from 171 vascular plant taxa paired with 11 other datasets reflecting vegetation and structure, leaf and ecosystem carbon and water fluxes, leaf hyperspectral reflectance, and microclimatic and environmental data. Our data provide the first recorded trait data for 47 vascular plant species and more than double the trait data coverage from the Maloti-Drakensberg (106% increase). This study offers insights into plant and ecosystem functioning, provides a baseline for assessing impacts of environmental change, builds local competence, and aligns with similar data from China, Svalbard, Peru, and Norway.

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