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JNU publications for the month of November, 2024

Record 1 of 26

Title: The case for Dalit reparations

Author(s): Thorat, A (Thorat, Amit)

Source: OXFORD REVIEW OF ECONOMIC POLICY **Volume:** 40 **Issue:** 3 **Special Issue:** SI **Pages:** 672-685 **DOI:** 10.1093/oxrep/grae037 **Published Date:** 2024 NOV 22

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Cited Reference Count: 25

Abstract: Research on caste to date has examined the largely contemporary situation of the ex-untouchables and descendants of the caste-enslaved in India, the Dalits, and made policy suggestions. This paper builds an

argument based on historic origins and the evolution of the caste social structure and on how this longest surviving system of oppression continues to have a severe impact on the lives of the descendants. It not only provides a justification for why reparations are owed to this community and are necessary to bridge the social gap, but also looks at the various forms it could take, as a legislated policy of redress for an historic injustice.

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Author Keywords: caste; reparations; varna; untouchable; caste-slavery; Z130

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Record 2 of 26

Title: The burning question: climate and conflict - why does it matter?

Author(s): Lokhande, P (Lokhande, Prachi)

Source: INTERNATIONAL AFFAIRS **Volume:** 100 **Issue:** 6 **Pages:** 2685-2687 **DOI:** 10.1093/ia/iiae253 **Published Date:** 2024 NOV 4

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Record 3 of 26

Title: Understanding Cu⁺² binding with DNA: A molecular dynamics study comparing Cu²⁺ and Mg²⁺ binding to the Dickerson DNA

Author(s): Sharma, A (Sharma, Angad); Yadav, HOS (Yadav, Hari O. S.); Bandyopadhyay, P (Bandyopadhyay, Pradipta)

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Abstract: Cu2+ ions led DNA damage by reactive oxygen species (ROS) is widely known biological phenomena. The ionic radii of Cu2+ and Mg2+ being similar, the binding of Cu2+ ions to DNA is expected to be similar to that of the Mg2+ ions. However, little is known how Cu2+ ions bind in different parts

(phosphate, major and minor grooves) of a double-strand (ds) DNA, especially at atomic level. In the present study, we employ molecular dynamic (MD) simulations to investigate the binding of Cu2+ ions with the Dickerson DNA, a B-type dodecamer double stranded (ds) DNA. The binding characteristics of Cu2+ and Mg2+ ions with this dsDNA are compared to get an insight into the differences and similarities in binding behavior of both ions. Unlike Mg2+ ions, the first hydration shell of Cu2+ is found to be labile, thus it shows both direct and indirect binding with the dsDNA, i.e., binding through displacement of water from the hydration shell or through the hydration shell. Though the binding propensity of Cu2+ ions with dsDNA is observed relatively stronger, the binding order to phosphates, major groove, and minor groove is found qualitatively similar (phosphates > major groove > minor groove) for both ions. The study gives a deep understanding of Cu2+ binding to DNA, which could be helpful in rationalizing the Cu2+ led ROSmediated DNA damage.

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Title: Thermal Degradation Mechanism and Reaction Kinetics of CsPbBr₃ Nanocrystals Using the Coats-Redfern Method

Author(s): Priyanka (Priyanka, Avinash); Rundla, A (Rundla, Avinash); Kumar, B (Kumar, Bheem); Kumar, P (Kumar, Pushpendra); Singh, K (Singh, Kedar)

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Abstract: Cesium lead halide perovskite nanocrystals (NCs) are highly regarded for their potential in solar cells, photodetectors, and X/gamma-ray detectors. However, their moisture sensitivity and thermal instability limit their applications, which entail a thorough understanding of their thermal degradation mechanisms. In this study, we investigate the thermal degradation kinetics of CsPbBr3 NCs spanning temperatures from 25 to 800 degrees C using thermogravimetric analysis (TGA). The Coats-Redfern method was employed to analyze the kinetics across various models, determining key parameters such as the correlation coefficient (R 2), activation energy (E a), and pre-exponential factor (A). Differential thermogravimetric (DTG) analysis revealed six distinct peaks, indicating six major thermal events. Consequently, the weight loss curve was divided into six zones, and kinetic parameters were calculated for each zone using multiple kinetic models. Utilizing the kinetic triplet, we further determined the thermodynamic parameters including enthalpy change (Delta H), entropy change (Delta S), and Gibbs free energy change (Delta G) for each zone. This comprehensive analysis enhances the understanding of the thermal stability and degradation mechanisms of CsPbBr3, paving the way for advanced applications in various fields.

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Title: An electrochemical immunosensor based on a nano-ceria integrated microfluidic chip for interleukin-8 biomarker detection

Author(s): Bhardwaj, H (Bhardwaj, Hema); Hashmi, Z (Hashmi, Zimad); Singh, AK (Singh, Avinash Kumar); Kumar, G (Kumar, Gautam); Lakshmi, GBVS (Lakshmi, G. B. V. S.); Solanki, PR (Solanki, Pratima R.)

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Abstract: Interleukin-8 (IL8) is an important cytokine that plays a significant role in tumor growth and angiogenesis across various malignant tumors, including oral squamous cell carcinoma (OSCC). It is an important biomarker for oral cancer; therefore, its early and accurate detection in bodily fluid reduces morbidity and mortality rates in cancer patients. The work presents the development of a label-free microfluidic miniaturized electrochemical immunosensor for IL8 biomarker detection at low concentration in saliva samples. A rapid, sensitive and selective biosensing platform was developed for IL8 detection using a nano-ceria integrated microfluidic system. The synthesized nano-ceria particles (8.13 nm) were employed to enhance the electrochemical biosensing signal and sensitivity of the biosensor due to their high catalytic properties and large surface area. For this, microfluidic chip was prepared by Indium tin oxide (ITO) (3 x 4 cm) containing three electrode patterns of working, reference and counter electrode. These electrode patterns were developed using a maskless photolithography technique and a polydimethylsiloxane (PDMS) mold created a 200 mu m wide microchannel which was bound to the susbtrate using plasma treatment. Spectroscopy and microscopy techniques were used to confirm the synthesis of nano-ceria. Furthermore, electrode surface modifications were achieved by immobilization of chemically activated antibodies of IL8, as verified by Fourier transform-infrared spectroscopy (FT-IR). Furthermore, differential pulse voltammetry (DPV) was utilized to investigate electrochemical parameters and conduct biosensing studies. The developed electrochemical microfluidic biosensing platform works for an IL8 antigen in the concentrations ranging from 0.004 to 10 ng mL-1 with a limit of detection (LOD) and limit of quantification (LOQ) of 0.0001 ng mL-1 and 0.0006 ng mL-1, respectively. Moreover, the developed electrochemical biosensing platform was validated using human saliva samples, achieving percentage recovery within an acceptable range.

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Abstract: The jumping of crystals in the presence of external stimuli such as temperature, light, and mechanical forces is observed due to the release of accumulated strain in the crystal. Thermosalience in molecular crystals is generally induced by anisotropic thermal expansion accompanied by phase transformation. However, a thermosalient effect has not been observed in the same crystal at two different temperature zones caused by two distinct mechanisms. Here, we report the bidirectional release of strain leading to jumping by heating and cooling of an organic salt crystal of SQIM. Jumping of the crystals by heating is driven by anisotropic thermal expansion coupled with a change in hydrogen bonding and contraction of the imidazolium cation, whereas jumping of crystals by cooling is attributed to the contraction of inter-layer distance followed by shear-induced phase transformation.

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Abstract: BackgroundThe incomplete immunization has potentially exposed vulnerable children, especially from the socioeconomically disadvantage group, to vaccine preventable diseases. The schemes would maximize social benefit only when the immunization is effectively distributed on an equitable principle.MethodThe empirical study is based on unit level data from India's National Sample Survey: "Social Consumption: Health Survey- NSS 75th Round (2017-18) database. The nationwide survey is designed on the stratified multi-stage sampling method with an objective to make the sample representative. The egalitarian equity principle requires that distribution of vaccine should be based on health needs of children, irrespective of their socioeconomic and regional factors and the principle is broadly based on two aspects - horizontal and vertical equity. The horizontal inequity (HI) is a direct form of injustice, when

children with equal needs of routine immunisation are treated differentially due to their socioeconomic status, while vertical inequity (VI) is indirect form of injustice when children with differential health needs and risks exposure do not receive appropriately unequal but equitable immunisation. Using Indirect Standardisation Method and Erreygers' Corrected Concentration Index, we measure the degree of horizontal and vertical inequities, and then linearly decompose them to identify the major factors contributing towards the respective indices.ConclusionOur findings show that incomplete immunization is significantly concentrated among children belonging to poorer households. After controlling for the confounding effects of need factors, the inequity is still significantly pro-poor (i.e., horizontal inequity). The decomposition reveals that lower education, lower consumption and rural habitation are the major factors driving the corresponding inequity. Further, the differential effect of the needs between all and the target groups (at least based on education), is observed, however, is not statistically significant enough to realize inequity (i.e., no vertical inequity). Overall, the inequity is being induced via non-need factors. We further find that community health services (like anganwadi) have contributed towards reducing the inequity in child immunization significantly. The paper highlights the policy recommendation that the child immunisation program should target factors driving HI and need to align their distribution in terms of risks exposures.

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Author(s): Kumari, K (Kumari, Khushboo); Aggarwal, S (Aggarwal, Soumya); Khan, FM (Khan, Faraz Mohd); Munde, M (Munde, Manoj); Gourinath, S (Gourinath, Samudrala)

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Abstract: Helicobacter pylori deoxyuridine triphosphate nucleotidohydrolase (HpdUTPase) is a key enzyme in the synthesis of the thymidine nucleotide pathway. It catalyzes the hydrolysis of dUTP to dUMP and releases pyrophosphate. This enzyme has been shown to be essential in several pathogenic organisms. Here, we have determined the crystal structures of HpdUTPase in complex with alpha, (3-imido dUTP (non-hydrolyzable substrate analog) and apostate at resolution of 2 & Aring; and 2.5 & Aring; respectively. The flexible c terminal end of HpdUTPase which is not observed in apo-state structure and becomes ordered in the complex structure, suggesting its role in forming active site and substrate interaction. The Isothermal titration calorimetry (ITC) experiments reveal that hydrolysis of dUTP is an exothermic reaction with Km = 35.0 +/- 0.19 mu M and the kcat = 1.20 +/- 0.19 s-1. The ITC studies combined with MD simulations for all other nucleotides (dATP.dGTP, dCTP and dTTP) show that the active site of HpdUTPase strangely can also accommodate dATP. The structural comparison with the host (human) dUTPases reveals critical differences in substrate binding affinity of the active site of HpdUTPase. The detailed study suggests that the dATP binds in the active site of HpdUTPase making the number of preferable hydrogen bonds and shows activity with Km of 47 +/- 2.4 mu M.

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Title: The Reversible Gel to Gel Transition of a Phosphonocarboxylate Functionalized Strandberg-Type Polyoxometalate System

Author(s): Naulakha, P (Naulakha, Pragya); Kaushik, P (Kaushik, Priyanka); Raghavaiah, P (Raghavaiah, Pallepogu); Supriya, S (Supriya, Sabbani)

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Abstract: The Strandberg polyoxometalate (POM) metallogel Na4(H3O)2[(O2CC2H4PO3)2Mo5O15] (1) was synthesized in which the Strandberg cluster is functionalized by phosphonocarboxylate. The POM gel shows reversible sol to gel transition and gel to gel transition. The multiphase visual transitions between three states as a function of temperature and solvent are scarcely reported. The gel is characterized by temperature-dependent and frequency-dependent rheological studies and corresponding xerogels were characterized by FT-IR, PXRD, FE-SEM, EDX, TEM, and 31P NMR techniques. The stabilization of gel or obtaining single crystals from the same reaction mixture can be tuned by choice of counter cation. The single crystals of compound Cs14[(HO2CC2H4PO3)2Mo5O15]3<middle dot>2Cl<middle dot>10H2O (2) are obtained on addition of CsCl to compound 1 reaction mixture. Compound 2 is characterized by single crystal X-ray diffraction. The compound 2 crystallizes in I2/a space group with unit cell parameters of a = 24.2415(16) & Aring;, b = 10.4542(6) & Aring;, c = 42.687(3) & Aring;, alpha = 90 degrees, beta = 94.791 degrees(3), and gamma = 90 degrees.

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Author(s): Jain, M (Jain, Madhavi); Saxena, P (Saxena, Pallavi); Sonwani, S (Sonwani, Saurabh)

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Abstract: In this study, a pre-monsoon dust storm (14 May 2018 +/- 2 days), originating from the Thar Desert (Rajasthan state) that spread to north Indian states-Haryana, Delhi, and Uttar Pradesh is selected. We leverage satellite (MODIS, GPM_IMERG), climate model reanalysis (MERRA-2), and ground monitoring station (CPCB, IMD, AERONET) observations to study the selected dust storm event, and its impact on air quality of northern India against a background reference (25 May 2018 +/- 1 day). We include dust column mass density (DCMD total and PM2.5) datasets, and find 3-5 times higher air column dust loading (maximum 3.9 g/m(2)) during the event, against background dust levels (similar to 0.2-0.6 g/m(2)). NOAA HYSPLIT 72-h forward trajectories show air-mass transport from the Thar Desert towards The Indo-Gangetic Plains (IGP). Aerosol Optical Depth (AOD) > 2 in the affected region indicates a high residence time of dust aerosols. DCMD is used to show the 3-hourly progression of the dust storm (initiation, spread, and gradual dissipation). Moreover, hourly dust loading in the air (DCMD) and particulate matter (PM10 and PM2.5) ground-based observations over Jodhpur (Rajasthan), Rohtak (Haryana), Delhi (NCT of Delhi), and Lucknow (Uttar Pradesh) cities, show severe worsening of the already poor air quality of the region. We employ local spatial correlations to understand the significant statistical associations, variabilities, and feedbacks between-DCMD, AOD, 2 m air temperature, precipitation, and wind speed. The study highlights the use of gridded DCMD datasets, and geospatial techniques, as an innovative proposal for estimating the impact of dust in data-poor regions.
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Title: Enabling sustainable consumer choices with CarbonShunya: India's first solution to measure and mitigate carbon impact of consumer transactions in real-time

Author(s): Nahar, D (Nahar, Devender); Unni, H (Unni, Hrishidev); Verma, P (Verma, Piyush)

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Abstract: Among the myriad challenges facing humanity, air pollution and climate change emerge as the most formidable existential threats to our future. Ironically, both these are direct fallouts of human activities such as indiscriminate consumption of consumer products/services and burning of fossil fuels. Purchase of consumer goods in 2024 is projected to be in excess of $22.6 trillion worldwide. How these consumers buy, use or dispose consumer goods will profoundly impact all life on the planet. Therefore, it is an imperative to embed sustainability in every Rupee of consumer spending. Hence a robust digital solution, CarbonShunya, has been developed with the purpose to empower a billion consumers to make sustainable purchase and lifestyle choices. CarbonShunya is India's 1st solution that can measure and mitigate the Greenhouse Gas (GHG) footprint of consumer transactions in real-time. It provides consumers with actionable insights at the point-of-purchase and post-purchase to shape a shift in consumer beliefs, attitudes and behavior. This paper

presents the methodology, assumptions and processes which have been adopted to develop the CarbonShunya life-cycle assessment framework and solution in Indian context. It also presents a case study, using the CarbonShunya framework, to measure and mitigate GHG impacts of monthly consumer expenditure on several categories of products/services across various states of India, based on a primary survey of over 174 000 households. The results from the case-study provide actionable insights and conclusions for policymakers and practitioners. CarbonShunya has cross-cutting applications across sectors so as to enable consuming economies to embrace conserving behaviors.

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Author(s): Gautam, A (Gautam, Aryan); Gupta, A (Gupta, Ajay); Prasad, P (Prasad, Puja); Sasmal, PK (Sasmal, Pijus K.)

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Abstract: Herein, we have reported a series of cationic aggregation-induced emission (AIE) active iridium(III) complexes (Ir1-Ir5) of the type [Ir(C N)(2)(N N)]Cl, wherein C N is a cyclometalating 2-phenylbenzimidazole ligand with varying alkyl chain lengths and N N is a 2,2'-bipyridine ligand attached to bis-polyethylene glycol chains, for the treatment of bacterial infections. The AIE phenomenon of the complexes leveraged for detecting bacteria by fluorescence microscopy imaging that displayed a strong red emission in Gram-positive bacteria. The antibacterial activity of the complexes assessed against Gram-positive methicillin-sensitive S. aureus, methicillin-resistant S. aureus, E. faecium and E. faecalis and Gram-negative E. coli and P. aeruginosa bacteria of clinical interest. The complexes Ir2-Ir4 exerted potent antibacterial activity towards Gram-positive strains with low minimum inhibitory concentrations (MICs) values in the range of 1-9 mu M, which is comparable to clinically approved antibiotic vancomycin. In contrast, these complexes were found to be inactive towards Gram-negative bacterial strains (MICs >100 mu M). The mechanism of antibacterial activity of the complexes implies that ROS generation, membrane depolarization and rupture are responsible for bacterial cell death. Further, the complexes Ir1-Ir3 were found to be low-toxic against human red blood cells and human embryonic kidney (HEK293) cells, indicating their potential for use as antibacterial agents.

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Abstract: BackgroundTuberculosis (TB) is a leading cause of infection related mortality. Isoniazid is one of the frontline drugs for anti-TB therapy. Hepatotoxicity induced by isoniazid is a major cause of drug-discontinuation which may lead to development of resistant TB or increased mortality.PurposeTo characterize pharmacological properties of plant-based prescription medicine, Livogrit Vital (LVV) against isoniazid-induced liver injury (IILI) using HepG2 cells.MethodPhytometabolite characterization of LVV was performed by High-performance liquid chromatography (HPLC). The effects of LVV on cytosafety, IC50 shift, oxidative stress, ER stress, apoptosis, liver injury markers, and accumulation of isoniazid and hydrazine was performed on HepG2 cells induced with isoniazid. Silymarin was used as the positive control.ResultsHPLC based phytometabolite characterization of LVV revealed the presence of several anti-oxidant, anti-apoptotic, and hepatoprotective compounds. In isoniazid-induced HepG2 cells, LVV reduced cytotoxicity of isoniazid and shifted its IC50 value. Treatment with LVV reduced ROS generation and lipid peroxidation; enhanced GSH enzyme levels in isoniazid-induced HepG2 cells. As per the mechanistic evaluation, LVV modulated gene expression level of Caspase-3, FGF21, and IRE-1 alpha. LVV treatment also normalized isoniazid-induced elevated Caspase-3 activity and cPARP1 protein levels, indicating its potentials to regulate liver cell apoptosis. Concomitantly, biomarkers of hepatotoxicity, ALT and GGT, also decreased by LVV treatment. Interestingly, LVV treatment reduced intracellular accumulation of isoniazid and its toxic metabolite hydrazine, in isoniazid-stimulated HepG2 cells.ConclusionTreatment of hepatic cells with the herbo-vitamin medicine, Livogrit Vital, regulates IILI by modulation of oxidative and ER stress, apoptosis, and bioaccumulation of isoniazid and hydrazine. Collectively, Livogrit Vital could well be explored as an adjuvant hepatoprotective agent alongwith anti-TB medicines.

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Abstract: Malaria, an infectious disease caused by Plasmodium falciparum, is becoming increasingly difficult to treat due to the emergence of drug-resistant strains. Recent studies have proposed purine nucleoside phosphorylase from P. falciparum (PfPNP) as a potential target for malaria treatment. In the present study, we designed a virtual library of 400 dipeptides to discover novel anti-malarial peptide inhibitors. A structure-based molecular docking method was employed to virtually screen the designed library against the wild-type structure of PfPNP (PDB: 5ZNC). The best four (Phe-Arg, Arg-His, Trp-Arg and Tyr-Arg) dipeptides, which were then investigated for their binding potential against PfPNP using Molecular Dynamics simulation studies. Parameters such as RMSD, RMSF, Rg, and SASA were analyzed to understand the structural changes, energetics, and overall behavior of PfPNP-dipeptide complexes. The PfPNP demonstrated significant stability upon binding with each of the identified dipeptides with Delta G of over -168 kcal/mol. Additionally, DFT and ADME predictions indicated that the electronic structure, energetics, and pharmacokinetic properties of Phe-Arg, Arg-His, Trp-Arg and Tyr-Arg were favourable for drug development. Our comprehensive computational investigation has identified these four dipeptides as promising candidates. These designed and selected dipeptides may further be modified using peptidomimetic and medicinal chemistry tools to develop a novel class of promising antimalarials.

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Abstract: A facile and highly efficient protocol has been developed for the synthesis of extensively functionalized, fully substituted N-methyl-1,4-dihydropyridines. This approach is a one-pot pseudo-three-constituent cyclo-condensation of aromatic aldehydes with (E)-N-methyl-1-(methylthio)-2-nitroethenamine (NMSM). This reaction presumably entails the Knoevenagel reaction followed by Michael addition and regioselective N-cyclization with removing methanethiol and producing two C & horbar;C bonds and one C & horbar;N bond. The key advantages of this strategy include an optimized reaction time, achieving moderate to excellent yields, a straightforward experimental procedure, and the use of the ionic liquid 1-ethyl-3-methylimidazolium acetate [(EMIM)Ac] as the catalyst. The resulting derivatives were well characterized by IR, 1H NMR, 13C NMR, and HRMS.

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Abstract: Synthesized SnO2 nanoparticles (NPs) demonstrate potential capacity to adsorb toxic azo Congo red dye. The formation of rutile phase SnO2 NPs was confirmed using Powder X-ray diffraction and spherical morphology was corroborated through SEM imaging. TEM analysis confirms average particle size of SnO2 NPs is nearly 3 nm. High azo dye removal efficiency is attributed to large surface area and presence of oxygen vacancies which were substantiated through BET and XPS analysis, respectively. To mitigate the leaching of NPs in treated water, NPs are encapsulated in sodium alginate (SA) matrix, which is proposed as an environmentally friendly, biocompatible, and economic solution. This study specifically focuses on investigating the parameters for the encapsulation of NPs within a sodium alginate matrix using CaCl2 as cross-linker. This work investigates the effect of physical shape of encapsulation, effect of SA and cross-linker (CaCl2) concentration on the feasibility of NP encapsulation and overall adsorption efficiency. Experimental results indicated that the physical form of encapsulation, such as spherical, wire-like, or irregular shape maintained consistent adsorption efficiency, which indicates its versatility. For effective encapsulation of NPs and adsorption, SA and CaCl2 concentration are suggested to be within the range of

0.2-0.3 g and >0.5 M, respectively.

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Author(s): Bar, B (Bar, Biswajit); Swain, R (Swain, Ratnakar); Das, P (Das, Pulakesh); Sahoo, J (Sahoo, Jaykumar); Das, DN (Das, Dipendra Nath)

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Abstract: This study investigates the intricate dynamics of a 60-kilometer section of India's eastern coast, from the Raslupur River mouth to Udaypur Beach in West Bengal. This research thoroughly analyzes littoral changes using synthetic aperture radar (SAR) and optical remote sensing data. Herein, Multi-temporal Landsat series satellite data from 1975 to 2009, Sentinel-1 SAR data from 2019 and Sentinel-2 data from 2015 are used. The investigation yielded extraordinary insights into coastal change metrics, including an annual average rate of change of 1.08 m. Shoreline adjustments were quantified using metrics such as End

Point Rate (EPR), Linear Regression (LR), Net Shoreline Movement (NSM), and Shoreline Change Envelope (SCE). Over the study area, the annual erosion rate varies from 0.62 m to 2.60 m, and Accretion rates range from 0.02 to 5.99 m. Using the Linear Regression Rate (LRR) model, this investigation predicted landward retreat and seaward advancement of the littoral. Shankarpur and Chandapur, in particular, were anticipated to experience landward migration of 36 m (2019 to 2029) and 67.49 m (2019 to 2039), respectively. Phichhaboni, Haripur, Junput, and Bankiput sea coastlines were predicted to experience 67 to 157 m of seaward accretion. Notably, the research highlights the various factors that influence coastal dynamics, such as sea-level rise, cyclones, sediment regime, deforestation, urbanization, and anthropogenic changes such as groundwater exploitation and artificial barriers. This study provides stakeholders, policymakers, and researchers interested in coastal regions' preservation and sustainable development with actionable insights. This manuscript is an exhaustive guide fostering informed decision-making and effective coastal stewardship.

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Abstract: Astragalin (kaempferol-3-O-beta-D-glucoside) is a naturally occurring flavonoid that has long been utilized as a critical food ingredient and an essential template for developing novel drugs. The main aim of this paper is the method development and quantitative determination of astragalin in the leaf of 42 accessions of Nyctanthes arbor-tristis collected from different regions. Instrumental thin-layer chromatography (TLC) was performed with an optimized liquid-liquid separation and mobile phase comprising ethyl acetate-ethanol-water-acetic acid (10:1.25:0.25:0.25, V/V). Densitometric evaluation was conducted in CAMAG TLC Scanner 4 armed with winCATS software. The RF value of astragalin was 0.57 +/- 0.01, and the linear regression data for the calibration plots showed a satisfactory linearity relationship with R2 = 0.9994. The limits of quantification and detection were 23.76 ng/spot and 72 ng/spot, respectively, and the accuracy of the method was 96.12% to 97.10% recovery. The results revealed that astragalin was found up to 0.25 +/- 0.01% (dry weight sample) in leaf samples of different accessions. The astragalin content showed significant variation in accessions collected from different regions. The dendrogram clustering and principal component analysis depicted the distinctness in plant metabolite contents between the populations. The TLC method could be applied to quantify astragalin in different plant samples.

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Abstract: Open-source software is evolved through the active participation of users. In general, a user request for bug fixing, the addition of new features, and feature enhancements. Due to this, the software repositories are increasing day by day at an enormous rate. Additionally, user distinct requests add uncertainty and irregularity to the reported bug data. The performance of machine learning algorithms drastically gets influenced by the inappropriate handling of uncertainty and irregularity in the bug data. Researchers have used machine learning techniques for assigning priority to the bug without considering the uncertainty and irregularity in reported bug data. In order to capture the uncertainty and irregularity in the reported bug data, the summary entropy-based measure in combination with the severity and summary weight is considered in this study to predict the priority of bugs in the open-source projects. Accordingly, the classifiers are build using these measures for different machine learning techniques, namely, k-nearest neighbor (KNN), na & iuml;ve Bayes (NB), J48, random forest (RF), condensed nearest neighbor (CNN), multinomial logistic regression (MLR), decision tree (DT), deep learning (DL), and neural network (NNet) for bug priority prediction This research aims to systematically analyze the summary entropy-based machine learning classifiers from three aspects: type of machine learning technique considered, estimation of various performance measures: Accuracy, Precision, Recall, and F-measure and through existing model comparison. The experimental analysis is carried out using three open-source projects, namely, Eclipse, Mozilla, and OpenOffice. Out of 145 cases (29 products X 5 priority levels), the J48, RF, DT, CNN, NNet, DL, MLR, and KNN techniques give the maximum F-measure for 46, 35, 28, 11, 15, 4, 3, and 1 cases, respectively. The

result shows that the proposed summary entropy-based approach using different machine learning techniques performs better than without entropy-based approach and also entropy-based approach improves the Accuracy and F-measure as compared with the existing approaches. It can be concluded that the classifier build using summary entropy measure significantly improves the machine learning algorithms' performance with appropriate handling of uncertainty and irregularity. Moreover, the proposed summary entropy-based classifiers outperform the existing models available in the literature for predicting bug priority.

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Abstract: In this work, magnetism was developed in diamagnetic ZnO through co-doping of both nickel and cobalt with composition CoxNi0.1-xZn0.9O (0 <= x <= 0.1). A systematic investigation was conducted to examine the impact of co-doping in ZnO on its microstructural, morphological, and magnetic properties. All the samples exhibited hexagonal wurtzite structure and the crystallite size increases with Co and Ni paired-doped ZnO particles. The structure exhibited a uniform distribution of spherical grains, which were consistent in shape. The elemental color-mapping and EDX analysis provide conclusive evidence of Zn, O, Ni and Co elements. Raman spectra detect the distinctive band of the wurtzite crystal structure, as well as the combined vibration modes of Ni and Co in the doped samples. The vibrating sample magnetometer studies confirmed the transition of ZnO from diamagnetic to ferromagnetic, as a result of different doping concentrations in the studied samples. The dynamic magnetization measurements were investigated by ferromagnetic resonance (FMR) spectroscopy. Various parameters like magnetization, gyromagnetic ratio, Gilbert damping, extrinsic linewidth was derived from field-sweep FMR data. The structural and magnetic results were further validated theoretically by first-principles density functional theory (DFT) calculations. DFT analysis show that localised spin moments from 3d electrons of Co2+ and Ni2+ ions are principally

responsible for the stable long-range magnetic ordering in co-doped ZnO particles. Hence, the development of room temperature ferromagnetism in transparent ZnO can have immense applications in spintronics based quantum computing, and phase-change magnetic memory.

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Abstract: Glacial lakes (GLs) are integral components of the cryospheric environment. Due to the persistent melting of glaciers and steady rise in the annual mean temperatures, GLs are expanding across the Himalayan mountains. Since the 1980s, the eastern Himalaya have observed a steady increase (0.031 degrees C/year) in annual mean temperature, causing rapid glacial melting, formation of new GLs and expansion of existing ones. Therefore, to assess the role of the increasing annual mean temperature on the expansion of GLs in the eastern Himalaya, we generated GL inventories for 1987, 2005 and 2018 for Dibang Valley district, Arunachal Pradesh, in the eastern Himalaya. We used Landsat multi-temporal satellite images along with the ASTER Digital Elevation Model V2 (DEM). Using the Segment Mean Shift (SMS) method, the GL inventories were generated. Our results show that there were 509 GLs in 2018, whereas only 484 in 2005 and 469 in 1987. GLs observed a growth rate of 8.52% in number and 11.13% in area between 1987 and 2018. Most of the GLs in the study area were of Moraine-dammed lakes (MDL) (similar to 56%), whereas Ice-dammed lakes (IDL) showed the highest expansion rate between 1987 to 2018. GL hotspots show a concentration of GLs in the eastern and southern sections of Dibang Valley but new GLs are forming in the north-western and eastern sections of the study area. An increase in annual mean temperature enhanced the glacial melt water, leading to the growth of GLs connected with the glaciers.

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Abstract: The changing and diverse nature of the environment presents challenges in predicting natural disasters, which are further exacerbated by human interventions such as road and dam constructions, tunnelling, and hydropower projects in mountainous regions, along with changing climate conditions. Landslides, common in mountainous terrain, pose risks to both travellers and residents. The susceptibility of mountain slopes to landslides increases during the monsoon season from June to September in the study area, as water infiltration saturates rock masses, increasing their weight and reducing friction angles. Additionally, the capacity of the drainage system to carry loads rises during this period. This study uses field-based data and various methodologies along the Bhowali-Lohali section of the National Highway-109 (NH-109) to assess slope stability and suggest landslide risk mitigation measures. A comparative analysis of slope stability was conducted using methods such as kinematic analysis, slope mass rating (SMR), continuous slope mass rating (CSMR), the chart method, and the landslide possibility index (LPI). According to the SMR, three locations (S3, S5, S7) are completely unstable, while only one location (S3) is completely unstable, according to the CSMR. Based on the LPI, two locations (S6, S9) have a very high possibility of failure, and the chart method indicates that four locations (S3, S4, S5, S8) are unstable. The study suggested necessary support systems such as rock bolting, shotcrete, wire meshing, ditch catchment and drainage systems at the suitability with site-specific in instability-prone localities to mitigate the landslide activities.

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Abstract: The potency of frontline antimalarial drug artemisinin (ART) derivatives is triggered by heme-induced cleavage of the endoperoxide bond to form reactive heme-ART alkoxy radicals and covalent heme-ART adducts, which are highly toxic to the parasite. ART-resistant (ART-R) parasites with mutations in the Plasmodium falciparum Kelch-containing protein Kelch13 (PfKekch13) exhibit impaired hemoglobin uptake, reduced yield of hemoglobin-derived heme, and thus decreased ART activation. However, any direct involvement of PfKelch13 in heme-mediated ART activation has not been reported. Here, we show that the purified recombinant PfKelch13 wild-type (WT) protein displays measurable binding affinity for iron and heme, the main effectors for ART activation. The heme-binding property is also exhibited by the native PfKelch13 protein from parasite culture. The two ART-R recombinant PfKelch13 mutants (C580Y and R539T) display weaker heme binding affinities compared to the ART-sensitive WT and A578S mutant proteins, which further translates into reduced yield of heme-ART derivatives when ART is incubated with the heme molecules bound to the mutant PfKelch13 proteins. In conclusion, this study provides the first evidence for ART activation via the heme-binding propensity of PfKelch13. This mechanism may contribute to the modulation of ART-R levels in malaria parasites through a novel function of PfKelch13.
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Abstract: The dependability of nodes in an Industrial Wireless Sensor Network (IWSN) is vital for precise decision-making and the overall functioning of the network. Unreliable nodes have the potential to result in incorrect data, which can undermine the reliability of monitoring and control systems. Inaccurate decision-making in IWSNs can result in operational failures, safety risks, inadequate resource utilization, elevated energy consumption, and susceptibility to security vulnerabilities. Trust models tackle these challenges by recognizing and reducing the impact of unreliable nodes, improving the precision of data, and strengthening the security of the IWSNs. To overcome these challenges, this research work introduces a "Novel approach for Trust Utilization and Reliability Enhancement" (NATURE) in IWSNs. The unique approach employed in proposed NATURE model is distinguished by its multi-level clustered model, which improves attack mitigation, reduces communication overhead, and enhances overall network efficiency. This model is particularly effective in industrial environments where the network structure and the nature of data traffic are highly dynamic. The use of a multifactor trust estimation framework allows NATURE to assess the trustworthiness of SNs based on a comprehensive set of criteria, including behavior patterns, energy consumption, and communication reliability. By operating on multiple levels, NATURE can dynamically adjust trust functions to accurately distinguish between trustworthy and faulty SNs, thereby improving network reliability. Moreover, NATURE employs the temporal decay factor to prioritize recent node behaviors, ensuring that obsolete actions have minimal impact. Additionally, it uses the dynamic adjustment factor to balance the influence of negative interactions, encouraging reliable and responsive trust evaluations. Additionally, NATURE integrates a dynamically adjustable logical time window to enhance monitoring precision and adaptability, outperforming fixed-length windows in anomaly detection. NATURE integrates an Optimal Lead Node Election Algorithm (OLNEA) to improve cluster leader selection process. OLNEA considers network density, link quality, and Lead Node (LN), battery life, ensuring competent data aggregation and load balancing. By periodically selecting robust LNs and seamlessly switching to alternatives, NATURE promotes reliability and mitigates the impact of low LN battery levels. Additionally, NATURE employs a trust-based attacks detection algorithm to fortify IWSN security. This algorithm employs keen methods to verify data integrity, monitor energy levels, and ensure message authenticity, effectively safeguarding the IWSN from malevolent attacks and ensuring the safe transmission of data. Experimental results highlight NATURE's exceptional performance across significant metrics when

compared to existing trust schemes. In a WSN of 500 SNs with 30% being malicious, NATURE detects malicious behavior with a 97% accuracy, outperforming other models. Even with 50% malicious SNs, NATURE maintains a high detection accuracy of 91%, again surpassing alternative approaches. Additionally, NATURE significantly reduces energy consumption while achieving efficient throughput rates, underscoring its effectiveness in challenging network conditions.

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World Weather Attribution, 2024, Climate change made the deadly heatwaves that hit millions of highly vulnerable people across Asia more frequent and extreme

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Abstract: In the summer of 2024, there were higher temperatures than usual in several parts of India. Temperatures in Delhi, a huge city with millions of residents, broke several previous records. Low-income households have dwellings that do not offer much protection from the heat, and individuals struggle to access basic amenities, such as water. With accumulating evidence on consequent impacts for mortality and morbidity, governance structures are seeking to respond in a timely and efficient manner. There is a need to recognise that heat-related illnesses and deaths are not best addressed merely as an acute disaster but as public health and economic challenges that require planned responses. Responses that are sustainable and equitable combine long-term structural efforts at resilience building with emergency preparedness and prove to be most effective in averting the largely preventable deaths, morbidities, and economic shocks arising from heat-related health risks among exposed and vulnerable communities. Joint action on climate and health enhances achievement of multiple developmental goals with multistakeholder participation. Diverse sectors, including medical care, surveillance, risk communication, disaster preparedness, livelihoods and jobs, and adaptation and urban planning, are needed to raise public awareness and engagement, induce behavioural change, and focus resources for the much-needed structural changes in urban planning and health systems that can save lives and avert damages. To reduce heat-related health risks, vulnerability, inequity, and climate action in the Indian context must be urgently addressed.

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Abstract: Intelligent Transportation Systems (ITS) dwell on Vehicular Ad-hoc NETworks (VANETs) for message dissemination to achieve the goal of traffic safety and efficiency. VANETs achieve communication among vehicles and roadside units via wireless communication. Hence, security and privacy are significant concerns to be addressed for an effective application of secure VANETs in any ITS. Researchers have addressed these issues with trust management-based schemes or cryptography-based schemes. While these schemes can secure VANETs, they have various limitations presenting hindrances in their deployment. In this context, we have proposed a Blockchain-assisted Trust Computation with a Conditional Privacy-preserving Authentication (BTC2PA) scheme for connected vehicles. The BTC2PA scheme uses a blockchain (Ethereum) assisted PKI infrastructure with digital signatures to achieve authentication for secure communication. Furthermore, it integrates a trust score computation scheme based on a reward and punishment mechanism to provide resistance against internal attacks. The feasibility and validity of the proposed BTC2PA scheme have been studied by implementation work in Rinkeby (Ethereum test network) and extensive simulations using NS-3. The results obtained show that the proposed BTC2PA scheme meets the security and privacy requirements while significantly improving the performance metrics such as communication, storage, computation cost, and end-to-end delay when compared to existing schemes.

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