Sl. No.	IIT Ropar List of Recent Publications with Abstract Coverage: September, 2023
1.	A comparative study on the impact of transient impulses on the hv cable sheath AP Pandey, AH Kumar, CC Reddy - Power Engineer Journal, 2023 **Abstract** Underground power cables are frequently used for power transmission and distribution. There are several termination and joints of overhead lines and power cables in the whole transmission and distribution-network. Throughout the whole service life of a cable, it undergoes through different transient phenomena, as lightning and switching surges. Large induced voltage in the sheath may cause serious problems like an increase in the circulating current which produces excessive heat and it may start the melting process in the sheath and eventually damage the jacket of the cable. This work aims to study the impact of lightning and switching surges, travelling in the main conductor of the cable, on the sheath of a cross-bonded-power cable. The simulation study presents the profile of transient voltage buildup, in the sheath of a-three-phase 220 KV underground power cable, along its length. The simulation model of the entire cable-network with relevant parameter is made and analysis on the effects of transient is done. The region of-the cable system where impact is more is profound is observed. It is found that for lightning impulse the-voltage profile distortion is to a greater extent in comparison to the switching impulse.
2.	A dynamic hard domain induced self-healable waterborne poly (urethane/acrylic) hybrid dispersion for 3D printable biomedical scaffolds S Morang, JH Rajput,… A Poundarik, B Das… - Materials Advances, 2023 **Abstract** Polyurethane (PU) with its efficient self-healing ability and high mechanical properties is highly anticipated but an arduous challenge to achieve. In this study, to create a win-to-win situation, a new strategy was introduced which is based on the triple synergistic effect of 'dynamic hard domain', 'multiple hierarchical hydrogen bonding', and 'semi-interpenetrating network (IPN) formation'. The dynamic disulfide bond of 2-APDS and multiple hierarchical hydrogen bonding raised from urea and urethane linkages supplement the healing ability, concurrently, polyacrylates and rigid aromatic moiety improve the mechanical properties of SWPUA films. Owing to the judicious molecular engineering and aforementioned tactic, a series of self-healable waterborne PU/polyacrylic (SWPUA) films were prepared by using bis(2-aminophenyl) disulfide (2-APDS) as the 'dynamic hard domain', monoglyceride of castor oil as a chain extender, glycerol ester of citric acid (GECA) as an internal emulsifier and different acrylate monomers with other desired reactants (polyols/diamines and diisocyanate). The resulting films exhibit good mechanical robustness, high thermal stability, and biodegradability. Notably, the maximum healing efficiency of 82.53% can be achieved within 330 s under microwave exposure (800 W) and the cut films were re-processable at 60 °C under a pressure of 60-80 kg cm-2. Most importantly, the MTT and live/dead assay of mouse fibroblast cell lines (L929) treated with SWPUA-2 dispersion (up to 30%) confirmed its biocompatibility. Most interestingly, SWPUA-2 can be employed to prepare SWPUA-2/methacrylate anhydride-modified gelatin (GelMA)/gelatin hybrid ink for the development of 3D printable biomedical scaffolds.
3.	A highly robust deep learning technique for overlap detection using audio fingerprinting A Uikey, AK Bedi, P Chaudhury, … M Saini - Multimedia Tools and Applications, 2023 **Abstract** Due to the proliferation of video-based applications, there is a high demand for automated systems to support various video-based tasks that are free from human intervention, i.e., manual

	tagging. In this paper, we present a novel approach for detecting the presence of overlap between two videos by exploiting their corresponding audio signals, which is a crucial preprocessing step for audio, and further video alignment and synchronisation. Several existing approaches have limitations related to timestamps, overlapping regions, and the length of video clips. For the proposed work, we target the challenging scenario consisting of simultaneously recorded videos in an unconstrained manner by multiple users attending performance events. xOur work is an attempt towards developing a robust framework that not only considers noisy components present in the audio but is also free from the limitations mentioned above. We compare our framework with several other existing approaches. Our proposed framework outperforms other approaches by an average of 13.71% in terms of accuracy.
4.	A NiCu-MoS_2 electrocatalyst for pH-universal hydrogen evolution reaction and Zn-air batteries driven self-power water splitting M Kumar, TC Nagaiah - Journal of Materials Chemistry A, 2023 **Abstract** To accomplish the goal of clean and sustainable energy sources, the development of a trifunctional electrocatalyst is pivotal to promote the sluggish electrocatalytic oxygen evolution, oxygen reduction, and hydrogen evolution reactions, is a boon for future energy storage and conversion devices such as regenerative fuel cells and metal-air batteries. In this study, we reported a mixed-phase (1T and 2H) NiCu-MoS_2 having a microflower like morphology with a large number of active sites. The as-synthesized NiCu-MoS_2 catalyst exhibits excellent pH-universal hydrogen evolution reaction (HER) activity and attained a current density of 10 mA cm^{-2} at only 76, 88, and 81 mV under acidic, neutral, and basic conditions with remarkable stability. Beside the superior oxygen evolution reaction (OER), and comparable oxygen reduction reaction (ORR) activity with the benchmark RuO_2 and Pt/C catalysts, making it a good trifunctional electro-catalyst for overall water splitting and rechargeable Zn-air batteries. The NiCu-MoS_2 based air electrode demonstrates a remarkable power density of 283 mW cm^{-2}, a high energy density, and a superior stability compared to commercial benchmark air cathode. Furthermore, it shows a low cell voltage (1.622 V) in overall water splitting, surpassing most of the previously reported electrocatalysts. Post-stability SEM and XPS studies revealed the morphological stability and generation of the real active sites. More importantly when two Zn-air batteries successfully powered overall self-powered water splitting indicating its huge potential as a trifunctional electro-catalyst for various energy conversion and storage systems.
5.	A novel method for condition monitoring in cable in frequency domain A Das, CC Reddy - Power Engineer Journal, 2023 **Abstract** One of the toilsome tasks in any power cable is to predict the location of the damaged part and short circuited fault. Scanty research is performed on condition monitoring in cable, and methods that are-available either have low accuracy or are extremely difficult to apply in the practical field, Among different methods, the most suited technique is reflectometry. Contrasting the reflectometry technique, a novel-method based on impedance spectroscopy in the frequency domain was used in this paper to identify the damaged part in a cable and also to locate the exact location of the short-circuited fault. The impedance spectroscopy was obtained using the sweep frequency response analysis (SFRA), where only the standing wave ratio is considered. The use of SFRA is an aged old practice for condition monitoring in the transformer. Using the same approach, condition monitoring and location of the short-circuited fault are achieved in this paper. A real-time problem to locate short-circuited fault is mentioned and along with the PSpice simulation for condition monitoring of cable has been discussed in this paper.
6.	A review on the role of soft robotics in medical assistive devices AN Mallick, A Chander, … A Sahani - International Journal of Automation and Smart Technology, 2023

	Abstract The development of soft robotics technology has enabled them to be used for healthcare devices. One of the areas where this technology can play a crucial role is the medical assistive devices for various purposes like rehabilitation. In contrast to commonly used technology utilizing rigid actuators with a limited range of motion simultaneously compromising the safety of their human counterparts, this technology suits well to be used in the same with an added advantage. These soft actuators address the issues like safety, compliance, freedom of motion, biocompatibility, and ease of use. Various technologies like Dielectric Elastomers Actuators (DEA), fluid-based soft actuators, Twisted String Actuators (TSA), Supercoiled Polymer Actuators (SCPA), etc., have been developed to mimic the motion of a living being. The focus of this write-up is concentrated on unconventional and recent approaches to the design and control of soft actuators. In the present study, each technology's working principle and application have been discussed, along with their limitations. Soft actuators with different technologies which can be used in assistive devices, their requirements, and limitations are discussed along with some recent devices and the importance of the material to develop soft robots.
7.	A transformer neural network-based cyberattack detection technique in hybrid power system S Beura, BP Padhy - IEEE 3rd International Conference on Sustainable Energy and Future Electric Transportation (SEFET), 2023 **Abstract** Due to the dynamic evolution of power systems by incorporating renewable sources, it is now more difficult for power networks to regulate frequency and power deviation in the tie-line. Hybrid power systems (HPSs) use different independent generation systems such as wind turbines, solar photovoltaics (PV), diesel engines, fuel cells (FCs), aqua electrolyzers (AE), and energy storage devices such as flywheels and batteries. To create a smart grid, recent advancements in power systems rely heavily on communication networks, offering numerous benefits like complete system accessibility, tracking, control, and protection. However, it makes the system more complicated and susceptible to cyberattacks, which endangers the smooth functioning of the system. It must be successfully discovered to mitigate the attack's impact and return to normalcy rapidly. This work adopts the transformer neural network to sense the presence of false data injection (FDI) attacks in the HPSs. Different parameter metrics like recall, accuracy, precision, and F1-metric are calculated for each classifier technique for the comparison.
8.	An inorganic-organic protective anode interface towards high-performance Al-air battery AP Sinha, TS Thomas, D Mandal - Energy Storage Materials, 2023 **Abstract** Aqueous aluminium-air batteries (AABs) are promising candidates for next-generation energy storage devices owing to their high theoretical voltage and theoretical capacity of 2.98 Ah g^{-1} with additional advantages of aluminium (Al) being abundant, cost-effective, and recyclable. Despite striking advantages, practical application of Al-air batteries is hindered by undesirable self-corrosion and passivation of Al surface, as well as severe hydrogen evolution reaction (HER), thereby reducing anodic efficiency and battery capacity. To address these issues, herein, a dual protective coating comprising LDH-PVA-acetal as an inorganic-organic hybrid material has been developed. This coating forms a stable film over the Al substrate and synergistically suppresses self-corrosion and HER by blocking bulk water molecules from direct contact with the Al anode along with slow diffused release of hydroxide ions. The battery assembled utilizing LDH-PVA-acetal/Al as anode demonstrates an outstanding capacity of 2577 mAh g^{-1} and 2698 mAh g^{-1} with 86.4% and 90.5% anodic utilization @30 mA cm^{-2} and 50 mA cm^{-2}. A waste beverage can coated with LDH-PVA-acetal showed practical applicability towards waste to wealth, thus, demonstrating potential application towards corrosion inhibition in alkaline media

	for other metals as well.
9.	An overview of performance-based seismic design framework for reinforced concrete frame buildings P Kumar, VR Padalu, M Surana - Iranian Journal of Science and Technology, Transactions of Civil Engineering, 2023 **Abstract** Worldover, seismic design of buildings typically follows a prescriptive approach in which designers conform to a series of prescriptive code requirements in terms of both analysis and design procedures. Even though this prescriptive seismic design approach is time-tested and easily understandable by structural designers. In the recent past, performance-based seismic design has started to gain traction among structural designers. The performance-based seismic design allows designers to set performance objectives and design buildings to meet the targeted performance criteria. Due to its flexible nature, performance-based design has proven extremely useful for critical and lifeline buildings like hospitals and tall buildings. With a focus placed on performance objectives, designers utilizing performance-based seismic design are proficient in designing code exceeding buildings efficiently. Despite these cited benefits, performance-based design is still considered an uncommon practice in structural design, particularly in the developing countries. Hence, the present study aims to provide an overview and framework to practice performance-based seismic design. This work identifies and discusses the key differences between the prescriptive- and performance-based seismic design methods and also addresses the significance, application and implementation of performance-based seismic design of buildings. This paper makes an original contribution to the literature through a critical review of how the performance-based design withholds the opportunity to elevate the role of the structural engineers to which they are informed members of the community, where the structures they create not only perform according to design prescriptions, but also perform according to the needs of the owners, engineers, and society.
10.	Analysis and modeling of bipolar resistive switching in 2-D graphene electrode- based memristor K Varshney, MS Yadav, B Rawat, DM Das - IEEE Transactions on Electron Devices, 2023 **Abstract** Two-dimensional graphene has attracted considerable interest as an electrode material for the memristor due to its low-voltage operation and high integration density capability. For emerging graphene-electrode-based memristors, early assessment based on the theoretical study becomes increasingly important to identify performance benefits and guide experimental efforts. However, no accurate physics-based model is available for describing the bipolar resistive switching mechanism. Therefore, in this work, we develop a physics-based numerical modeling framework for the TiN/HfO textsubscript X /graphene (GE)-based memristor using the self-consistent solutions of the continuity equation, Poisson's equation, and Fourier's equation for Joule heating. The simulated set and reset characteristics of the GE-based memristor show the excellent match with the reported experimental results. Using the developed model, we found that the GE-based memristor could allow a lower set/reset voltage (−0.21/0.18 V), lower set/reset sneak current (~ 57/211 nA), and lower set/reset transition time (~ 1.1/0.74 ns) with more distinct multilevel resistance levels than that for the inert electrode (TiN and Pt)-based memristors. Overall, our work provides a physics-based simulation framework to describe the intricate switching dynamics in graphne-electrode-based memristors and highlights their superior performance compared with memristors with inert electrodes.
11.	Analysis of Fisherman Exploitation in Taiwan Distant Water Fishing P Karthikeyan, A Partap, W C-H Chu… - IEEE Technology and Society Magazine, 2023 **Abstract** The analysis of fisherman exploitation in Taiwan's distant water fishing (DWF) industry is a

	critical undertaking to address and combat labor abuses within this sector. DWF involves fishing activities conducted in waters beyond Taiwan's territorial limits, and it is crucial to ensure fair and ethical treatment of the fishermen involved. The analysis of fisherman exploitation entails a comprehensive examination of various factors contributing to labor abuses. This includes investigating working conditions, working hours, payment practices, living conditions aboard fishing vessels, and overall treatment of the fishermen. Evaluating whether these practices comply with local and international labor standards, human rights principles, and relevant regulations is essential. Human action recognition (HAR) involves the use of computer vision algorithms to automatically identify and classify actions being performed by humans in videos or images. HAR technology can analyze footage from DWF vessels and identify actions indicating labor exploitation or abuse. It is essential to address the issue of exploitation and abuse in Taiwan's DWF industry [1] , [2] . Lewis et al. [16] explored using "AI" and face recognition as both a speech act and a technological tool for monitoring workers or intimidating migrants and protesters. While this concept has been implemented in various systems, our primary focus is developing a system to detect and address long work-hour exploitation.
12.	Applications of statistical signal processing for infrared non-destructive testing and evaluation A Rani, V Arora, G Dua… - Advanced Signal Processing for Industry 4.0, Volume 2, Book Chapter, 2023 **Abstract** Industry 4.0 concepts enabled smart factories equipped with advanced surface and subsurface sensing systems and embedded analysis software to collect and analyze data for better inspection and automatic decision of various industrial components and structures. During Industry 4.0 globalization and in recognition of the progress made in non-destructive inspection for industrial quality control along with the Internet of Things and artificial intelligence, a software concept is under industrial implementation that restructures industrial manufacturing with full automation. Non-destructive evaluation 4.0 (NDE 4.0) has previously been described as A Cyber-Physical Non-Destructive Inspection resulting from the fusion of Industry 4.0 digital technology, whole field remote inspection methods, and decision-making for safety, sustainability, and quality assurance. Because of its quick, remote, noninvasive, full-field, and quantitative evaluation characteristics, active infrared thermography (IRT) has developed into a trusted non-destructive testing and evaluation (NDT&E) approach. Thermal waves are produced inside the test object using active IRT, which uses heat input externally with a specified bandwidth, magnitude, and time period. The quantitative investigation of the subsurface anomalies is aided by these heat stimulus pre-defined properties. A proper processing strategy is additionally needed to enhance the contrast for the evaluation of subsurface information by improving the signal to noise ratio. In this chapter a mathematical model for evaluation of temporal thermal response for the nonperiodic frequency-modulated thermal wave imaging (FMTWI) approach has been introduced. To examine the effectiveness of FMTWI, a brand-new three-dimensional heat diffusion model is presented. The chapter also covers the use of the normalized correlation coefficient (NCC) as a measure of merit in the temporal domain (TD) data processing approach for enhanced analysis of anomalies in a mild steel sample.
13.	Are gross financial inflows expansionary or contractionary? Evidence from emerging economies B Garg, P Sahoo - Finance Research Letters, 2023 **Abstract** This paper put to the test two hypotheses. First, do gross financial inflows lead to an expansionary or contractionary effect in emerging economies? Second, do different financial inflows exhibit diverse impacts on domestic output and if there is any aggregation bias? However, our work ameliorates the existing literature by tackling the problem of slope heterogeneity and cross-correlated errors by adopting dynamic common-correlated predictors. The analysis further identify different regimes in the regression relationships, considering our

	sample includes significant global financial imbalances, global financial crisis, taper tantrum period, etc. We find that all types of gross financial inflows, except gross debt inflows, are expansionary. However, there is evidence of possible aggregation bias in using aggregated gross financial flows. Our findings imply that a distinction between different types of financial inflows is necessary to make informed policy recommendations since policies based on aggregate inflows may be ill-advised. Further, emerging markets should focus on encouraging direct and portfolio equity inflows and improving local financial markets' absorptive capacities in borrower countries to improve welfare gains.
14.	Assessing the suitability of α-SiS nanosheet as an anode material for multivalent metal-ion batteries GA Shaikh, D Cornil…. R Ahuja… - Energy & Fuels, 2023 **Abstract** The search for suitable two-dimensional (2D) anode materials is crucial to drive the progress of multivalent metal-ion batteries capable of delivering exceptional performance, specifically with very fast charging and discharging rates. In this research, we have unveiled novel insights at the density functional theory level, with the workability of 2D puckered silicon monosulfide (α-SiS) as a probable anode material for multivalent metal-ion batteries using Na, Ca, and Al ions. Exploring the stability aspects of both structural and dynamic levels in the α-SiS nanosheet was estimated through the calculation of cohesive energy and non-imaginary phonon frequencies. The α-SiS nanosheet exhibited negative adsorption energies of −1.45, −0.92, and −2.67 eV for Na, Ca, and Al ions, respectively. Additionally, it was observed that the introduction of mono-, di-, and tri-metal atoms to the surface of the α-SiS nanosheet transformed its semiconducting nature into a metallic phase. Minimal activation energies for the active ion migration of Na (0.066 eV), Ca (0.067 eV), and Al (0.18 eV) on the surface of the α-SiS nanosheet suggest high diffusion and optimal charge/discharge functionality. Furthermore, diminished mean operating voltages of 0.44 V (Na), 0.43 V (Ca), and 0.55 V (Al) were attained and improved the theoretical storage performance of 2046.81 mAh/g (Na), 1643.02 mAh/g (Ca), and 2422.76 mAh/g (Al) for the α-SiS nanosheet. The results of this work suggest that the α-SiS nanosheet has the potential to play a crucial role as a hopeful anode material for the creation of budget-friendly, high-functioning metal-ion batteries using Na, Ca, and Al ions.
15.	Atomistic simulation and synthesis of novel sulfonated Polyimide polymer electrolyte membranes with facile proton transport T Tushita, A Husain, N Singh - Chemical Engineering Journal, 2023 **Abstract** Polymer Electrolyte Membrane (PEM) is the most important component of the fuel cell which determines the overall performance of the PEM fuel cell. Currently, the commercially available perfluorinated membranes have limitations at higher temperatures and low humidity operations as experienced in automobile applications. Experimentation to discover alternative PEMs are extensive and time-consuming which often does not improve the proton conductivity of the developed PEM is neither at par with the perfluorinated PEMs nor is there any understanding of the exact nano-scale morphology of the PEM ionomer and behavior of proton transport in them. To this end, two novel hydrocarbon-based PEM belonging to the Sulfonated Polyimide (SPI) class of PEM ionomers- a partially fluorinated SPI and a non-fluorinated SPI have been designed in-silico and their properties compared with commercially available Nafion PFSA ionomers. In the present work, detailed all-atomistic Molecular Dynamics (MD) simulations have been used to investigate the state of nanophase segregation, the morphology of the ionic domains, and dynamics of proton transport with increasing hydration levels (λ = 1, 5, 10 and 15). The diffusion coefficients of hydronium ions and water molecules and corresponding proton conductivity owing to the transport hydronium ions in water channels were calculated. Proton conductivity

	values were highest for non-fluorinated SPI lying within the range 0.03–0.18 $S \cdot cm^{-1}$ for ($\lambda = 1$ to 15). Moreover, NTDA/DSDSA/MDP SPI membrane was synthesized, and proton conductivity was found to be in the range of 0.15–0.28 $S \cdot cm^{-1}$ which is exceptionally well for a PEM. Thus, a good agreement was observed between the proton conductivity values predicted using MD simulations and the values for stable stand-alone SPI PEMs.
16.	Auxetic materials for biomedical and tissue engineering GP Singh, N Sardana - Materials for Biomedical Simulation: Design, Development and Characterization, Book Chapter, 2023 **Abstract** Auxetic metamaterials display a negative Poisson's ratio (NPR) that enables them to behave counterintuitively to the expected material response. While the commonly available materials contract laterally when stretched, auxetic metamaterials expand, and vice versa. Generally, the auxetic properties are attained by structuring a material with micro/macroscopic features. Auxetic metamaterials have numerous biomedical applications; inside the human body, they can be used as stents, disks for spine support, hip implants, bone plates, cardiac patches, and nasopharyngeal swabs. Furthermore, externally the auxetic materials can provide improved performance as shoe inserts and orthopedic braces. The ability to tune the unique properties of an auxetic material via controlling the structuring, and the similarity of their response to the human tissues has led to their increased implementation in biomedical simulation. Auxetic materials are being increasingly used as scaffolds in tissue engineering and in vitro medical devices. The advancement of fabrication techniques has enabled engineers and researchers to construct highly complicated designs which has increased the feasibility of auxetic materials as commercially available technology. Moreover, the advancement of the finite element method (FEM) and molecular dynamics simulations has decreased the resources required for designing auxetic materials due to the ability to quickly and accurately predict their response under various conditions. Auxetic materials being a relatively new field of research, the chapter will introduce the properties and the major designs of auxetic materials. Further, their fabrication techniques commonly used for biomedical engineering, will be discussed. Finally, the applications, particularly in the biomedical field, will be presented.
17.	Bubbles, Drops, and Particles in Non-Newtonian Fluids, Third Edition RP Chhabra, SA Patel - *Bubbles, Drops, and Particles in Non-Newtonian Fluids, Third Edition*, Book Chapter, 2023 **Abstract** The third edition of Bubbles, Drops, and Particles in Non-Newtonian Fluids provides comprehensive coverage of the scientific foundations and the latest advances in particle motion in non-Newtonian mediA Thoroughly updating and expanding its best-selling predecessor, this edition addresses numerical and experimental developments in non-Newtonian particulate systems. It includes a new chapter on heat transfer in non-Newtonian fluids in the free and mixed convection regimes and thus covers forced convection regimes separately in this edition. Salient Features: Demonstrates how dynamic behavior of single particles can yield useful information for modeling transport processes in complex multiphase flows Addresses heat transfer in Generalized Newtonian Fluid (GNF), visco-plastic and visco-elastic fluids throughout the book and outlines potential strategies for heat transfer enhancement Provides a new detailed section on the effect of confinement on heat transfer from bluff-bodies in non-Newtonian fluids Written in a clear and concise manner, this book remains an excellent handbook and reference. It is essential reading for students and researchers interested in exploring particle motion in different types of non-Newtonian systems encountered in disciplines across engineering and the sciences.
18.	Capillarity-driven roaming of coalescing condensate droplets on nanostructured superhydrophobic surfaces

	CW Edmond Lam, K Regulagadda, … GC Pal… - Bulletin of the American Physical Society, 2023 **Abstract** Spontaneous jumping of coalescing condensate microdroplets normally from a surface has been shown to exhibit improved heat transfer efficiency over gravity-driven dropwise condensation. However, as such droplets coalesce, they can as well spontaneously propel in-plane and roam across the surface, despite the length scale of the surface structures being multiple orders of magnitude smaller than the droplets. The lack of a symmetry-breaking surface for tangential motion initiation suggests a different mechanism of roaming from coalescence-induced jumping. In this work, we observe such behaviour with high-speed imaging and show that coalescing condensate droplets roam due to the asymmetry of droplet adhesion, as nucleation occurs stochastically within the nanostructures given sufficient subcooling. This asymmetry drives the generation of tangential in-plane momentum, and initiates the roaming coalescence sequence. This conversion from excess surface energy to kinetic energy is found to be more efficient than droplet jumping. Dewetting after coalescence allows propagation and subsequent roaming, delaying condensate flooding of the nanostructures. Condensate roaming coalesces multiple droplets on the surface, resulting in high surface area renewal rates which ultimately improve heat transfer efficiency over even jumping dropwise condensation.
19.	Chemo-hydrodynamic Kelvin-Helmholtz instability M Mishra, SN Maharana - Bulletin of the American Physical Society, 2023 **Abstract** Hydrodynamic instabilities, such as the Saffman-Taylor or Rayleigh-Taylor Instability, have long been associated with chemical reactions [1]. Recently, we, for the first time, identified the Kelvin-Helmholtz Instability as a Chemo-Hydrodynamic Instability that can be induced by a simple (A+B→C)-type reaction [2]. This reaction alters the viscosity profile of layered fluids within a channel flow. In our study, two viscosity-matched reactants, A and B, flow axially in a layered manner, producing a more viscous product, C, in a two-dimensional channel. When we perturb this flow with a sine wave, intriguingly, a Kelvin-Helmholtz type pattern forms at one front while the other remains stable. This perturbation amplification arises from oscillatory streamlines exhibiting a phase lock system. Moreover, increasing the log-mobility ratio (R_c) intensifies the perturbation amplitude. Furthermore, the location of the interfacial region near the bottom wall results in streamlines developing hump-like structures and becoming out of phase, causing the regular pattern to become irregular. Additionally, at higher Reynolds numbers (Re), we observe the formation of ligament-type waves, resembling patterns seen in earlier experimental observations [3]. In the presentation, we will discuss when the dominance of convection and diffusion affects the flow's stability.
20.	Commensurable analysis of scientific communications published in Reviews in Aquaculture applying scientometric analysis VI Kaur, N Singh,… T Singh… - Indian Journal of Ecology, 2023 **Abstract** This study presents a longitudinal and visualization mapping of scientific communications published in Reviews in Aquaculture during the period 2011-2020, applying scientometric approaches to depict the scientific contributions, collaboration trends, and research hotspots in the subject of aquaculture. Metadata of 412 articles published in was retrieved and downloaded from Reviews in Aquaculture Scopus database. The network graphs were visualized using ' ' and ' ' software. The chronological growth of scientific VOSviewer Gephi communications published in the journal, most productive authors, institutions, and countries vis-à-vis collaboration trends amongst them were scrutinized. The subject facets engulfed by the journal were identified based

	on co-occurrence of keywords. The findings would be useful for strengthening collaborative research as well as to pay required attention towards the slenderly explored sub-domains in aquaculture.
21.	Corrosion and thermal analysis of 316L stainless steel coated PLA parts fabricated by FDM process for biomedical applications R Kumar, NK Singh, D Mahajan - Protection of Metals and Physical Chemistry of Surfaces, 2023 **Abstract** In the current investigation, the polylactic acid (PLA) samples were fabricated using fused deposition modeling (FDM) at varying parameters. Then, the fabricated samples were coated with 316L stainless steel at different thicknesses (50, 100 and 150 µm) using a low-cost thermal spray method (electric arc spray). Further, tensile, flexural, wear and in vitro tests were performed on the coated samples in order to analyze their mechanical and corrosion behaviour. Finally, the corroded samples were examined by SEM/EDS, differential scanning calorimetry (DSC), and Fourier transform infrared spectroscopy (FTIR) to analyze their microstructure and thermal behaviour. The results showed that among all the samples, sample 2 offered maximum mechanical properties (tensile strength 29.51 MPa, flexural strength 98 MPa), least corrosion rate (0.055 mm/year) and least coefficient of friction (0.11) at optimum parameters. These better results may be attributed to the optimum combination of process parameters such as raster angle (30°), number of top and bottom layer (3) and coating thickness (100 µm).
22.	Cross-linguistic variations in the processing of Ergative Case: Evidence from Punjabi M Gulati, KK Choudhary - Variation in South Asian Languages, Book Chapter, 2023 **Abstract** Deducing processing parity in the face of linguistic variation has been a key ambition for neurolinguists as well as psycholinguists. However, the same has usually been tried only from the languages belonging to nominative-accusative alignment, and then there has been a general tendency to shoehorn ergative-absolutive languages into the mould. However, the handful of studies that have explored ergative case violations suggest that ergative languages seem to behave differently in comparison to the nominative-accusative type of languages. These studies have reported either an N400-P600 (Choudhary et al. 2009; Zawiszewski et al. 2011) or only positivity (Diaz et al. 2011) for ergative case violations. The present study in Punjabi is a replication of an experiment previously conducted in Hindi. The aim is to test if case-based violations are neurophysiologically equivalent in typologically similar language, or if typological variation have a bearing on the processing mechanism. In terms of the ERP component, in contrast to the previously reported N400-P600 pattern in Hindi, we observed only a positivity for both nominative as well as ergative case violations in Punjabi. We argue that this difference in the ERP components might have arisen owing to certain idiosyncratic properties of the language, namely the restricted use of the ergative case in Punjabi. Further, this neurophysiological difference is taken to be suggestive of the fact that ergative case might not be as strong a cue for Punjabi as it is in Hindi.
23.	Decentralized critical area coverage using multi-UAV system with guided explorations during floods A Garg, SS Jha - IEEE 19th International Conference on Automation Science and Engineering (CASE), 2023 **Abstract** During natural disasters, having access to realtime ground information is paramount for disaster response teams to act swiftly and efficiently. To provide immediate assistance, Unmanned Aerial Vehicles (UAVs) can be quickly deployed to assess the situation on the ground. This paper introduces a decentralized multi-UAV control algorithm based on deep reinforcement learning to

	perform the task of real-time data collection from the flooded region autonomously. The decentralized policy allows the UAVs to work independently without any central command and control unit. This relieves the rescue teams from deploying any manpower in managing a centralized control unit to handle the UAVs. In this paper, the objective of the multi-UAV system is to independently distribute themselves to collect critical ground information from the flooded areas. The task is time-sensitive as the UAVs have finite energy and human lives might be at risk. To address this, we propose a decentralized training and execution approach with opportunistic communication. This allows each UAV to make decisions based on local information while also intermittently communicating with other UAVs. To develop optimal control policies, we employ the water flow estimation algorithm called D8 which utilizes surface elevation information to generate directed exploration strategies. We conducted experiments on simulated flood environments inspired by real-world scenarios. Our proposed decentralized multi-UAV model called dec-DQNC8 was compared with other prevalent area coverage techniques from the literature. The results signify the impact of our proposed model as it outperformed other techniques during training and demonstrated optimal performance when evaluated over a test environment.
24.	Deep deterministic policy gradient based multi-UAV control for moving convoy tracking A Garg, SS Jha - Engineering Applications of Artificial Intelligence, 2023 **Abstract** Applications of multiple unmanned aerial vehicles (UAV) involve complex control dynamics for accomplishing any task. This paper employs a multi-UAV system for continuous tracking and end-to-end coverage of a moving convoy of vehicles to provide security and surveillance cover. The coverage is achieved by maintaining the moving convoy within the overlapping Field-of-Views (FoVs) of the UAVs. To learn the controls of the autonomous multi-UAV system, we propose a deep reinforcement learning based multi-agent actor-critic method called GPR-MADDPG. The proposed method makes use of Gaussian Process Regression (GPR) to estimate an unbiased and stable target value of the critic. Further, the kernel function of the GPR model has been adapted to keep the high variance in the convoy trajectory in check. The rewards for training the multi-UAV system are formulated to maximize the end-to-end convoy coverage by optimizing the overlaps between the FoVs along with minimizing the tracking error. Experiments were performed on real-world road trajectories of varying complexities along with varying convoy speeds and the number of UAVs. Further tests were performed using a simulator with a real-world physics engine. The experiments show that the proposed GPR-MADDPG model results in the least amount of overlapping error and accumulates maximum reward as compared to other prevalent approaches in the literature.
25.	Design of porphyrin-based frameworks for efficient visible light-promoted reduction of CO_2 from dilute gas: Combined experimental and theoretical investigation R Das, R Belgamwar, … CM Nagaraja - Journal of Colloid and Interface Science, 2023 **Abstract** The photocatalytic carbon dioxide reduction (CO_2R) coupled with hydrogen evolution reaction (HER) constitutes a promising step for a sustainable generation of syngas ($CO + H_2$), an essential feedstock for the preparation of several commodity chemicals. Herein, visible light/sunlight-promoted catalytic reduction of CO_2 and protons to syngas using rationally designed porphyrin-based 2D porous organic frameworks, POF(Co/Zn) is demonstrated. Indeed, POF(Co) showed superior catalytic performance over the Zn counterpart with CO and H_2 generation rates of 1104 and 3981 μmol $g^{-1}h^{-1}$, respectively. The excellent catalytic performance of Co-based POF is aided by the favorable transfer of photo-excited electrons from Ru-sensitizer to the Co^{II} catalytic site, which is not feasible in the case of POF(Zn), revealed from the theoretical investigation. More importantly, the POF(Co) catalyzes the reduction of CO_2 even from dilute gas (13% CO_2), surpassing most reported framework-based photocatalytic systems. Significantly, the catalytic

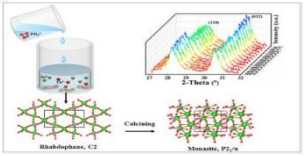
	performance of POF(Co) was increased under natural sunlight conditions suggesting sunlight-promoted enhancement in syngas generation. The in-depth theoretical investigation further unveiled the comprehensive mechanistic pathway of the light-promoted concurrent CO and H_2 generation. This work showcases the advantages of porphyrin-based frameworks for visible light/sunlight-promoted syngas generation by utilizing greenhouse gas (CO_2) and protons under mild eco-friendly conditions.
26.	Dynamic Behaviour of Rock Joint During Shear Wave Propagation: The Influence of Joint Orientation K Saha, R Sebastian - Rock Mechanics and Rock Engineering, 2023 **Abstract** • Shear wave propagation across frictional joints has been studied using Split Shear Plate (SSP) test facility. • The laboratory experiments were conducted to obtain the energy coefficients and transmission amplitude coefficients across joints of various orientations. • Energy transmission, displacement amplitudes and frequency of the waves propagated across joints are presented.
27.	Edge-based material cell meshing for improved accuracy of Laguerre-Fdtd method Y Wang, Y Guo,… R Sharma… - 2023 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting (USNC-URSI), 2023 **Abstract** The unconditionally stable Laguerre-FDTD method is suitable for simulating 3-D multi-scale structures. In this work, a new meshing scheme for treating material cell in Laguerre- FDTD method is proposed to improve the simulation accuracy. This scheme uses linear average calculation of effective material property at edges of a material cell. Numerical results show that the proposed algorithm achieves significant improvement in simulation accuracy over conventional meshing.
28.	Enhancement of incremental forming process formability by using improved clamping and multi-stage deformation strategies N Kumar, R Lingam, A Agrawal - The International Journal of Advanced Manufacturing Technology, 2023 **Abstract** Single point incremental forming is a flexible sheet forming process that does not require a dedicated punch and die for making products for various applications. However, forming parts at steep wall angles, closer to 90°, using this process poses difficulties due to excessive thinning. The motivation behind this study is to overcome the challenges associated with forming parts at steep wall angles using the single point incremental forming process. Controlling the thickness distribution is a significant challenge that needs to be addressed. Excessive thinning leads to disqualification of design criteria, thereby restricting the process' industrial applicability. In the present work, an improved clamping mechanism along with a multi-stage forming approach is employed to address the issue of excessive thinning. Two strategies were evolved; in strategy 1, an improved clamping mechanism was developed for single stage single point incremental forming, while strategy 2 consists of the improved clamping strategy along with a multi-stage forming approach for a single point incremental forming process. The improved clamping was based on the deep drawing process' blank holding type clamping mechanism in both these strategies. The study aimed to compare the formed components' forming depth and thickness distribution using the two strategies. The result revealed that strategy 2 was more effective, resulting in better thickness distribution in the formed component. The thickness distribution improvement resulted from metal flow from the flange region, owing to the improved clamping

	strategy, during the single and multi-stage forming at steep wall angles.
29.	Enhancing efficiency in particle aggregation simulations: Coarse-grained particle modeling in the DEM-PBM coupled framework T De, A Das, … J Kumar - Computer Methods in Applied Mechanics and Engineering, 2023 **Abstract** The computational cost of the discrete element method (DEM)-population balance model (PBM) coupled framework is predominantly attributed to DEM simulations. To overcome this challenge, coarse-grained (CG) particles have been introduced in the DEM-PBM coupled framework. In this study, we proposed a new CG-enabled DEM-PBM coupled framework that builds upon the previous work of Das et al. (Proc. R. Soc. Lond. Ser. A Math. Phys. Eng. Sci. 478 (2261) (2022) 20220076). By incorporating the CG technique, the particle number density is reduced, resulting in fewer collisions compared to the resolved system. To address this issue, a scaling law has been developed to derive the collision frequency of the resolved system from the CG system. The verification of the new scaling law has been demonstrated through various simulation studies. Furthermore, the entire DEM-PBM coupled framework has been modified using the proposed methodology. The efficiency of the CG–DEM–PBM coupled simulation method has been successfully demonstrated through simulations of rotating drum and continuous mixing technology (CMT). Compared to the resolved simulation approach, the newly proposed CG-enabled DEM-PBM coupled framework maintains accuracy in terms of particle size distribution and other essential findings while significantly reducing simulation time.
30.	Enhancing the emission rate of the inherent silicon-vacancy center using optimized multipolar moments in a silicon carbide metasurface V Vashist, M Khokhar, FA Inam, RV Nair - Advanced Quantum Technologies, 2023 **Abstract** Silicon carbide (SiC) hosts various color centers with emission lines from visible to near-infrared, with promising applications in quantum communication. Metasurfaces made using SiC can enhance the emission rate of inherent color centers to achieve on-demand single photon emission with a high emission rate. This is possible by engineering the amplitude and phase of the excited multipolar scattering moments in metasurfaces. The numerical simulations and analytical calculations are used to study the emission rate enhancement from an embedded single silicon vacancy (Vsi) center in SiC metasurface. The optimized metasurface balances multipolar moments at the zero-phonon line wavelength of 862 nm with 40 times field intensity confinement. The confinement provides substantial emission rate enhancement for the Vsi center, making it a bright single photon emitter at 862 nm. The significant emission enhancement offers new insights into the metasurface to achieve on-demand single-photon sources and efficient spin–photon interfaces.
31.	Entanglement boosts quantum synchronization between two oscillators in an optomechanical setup Manju, S Dasgupta, A Biswas - Physics Letters, Section A: General, Atomic and Solid State Physics, 2023 **Abstract** We present an optomechanical model to explore how the entanglement can be associated with quantum synchronization of two mechanical oscillators. As both these entities can be characterized in terms of variances of a set of EPR-like conjugate quadratures, we investigate whether this leads to a specific condition for simultaneous existence of the both. In our model, one of the oscillators makes the cavity, while the other is kept suspended inside the cavity, and the always-on coupling between the two is mediated via the same cavity mode. We show that in presence of amplitude modulation with the same frequency as that of the oscillators, these oscillators get nearly complete quantum synchronized and entangled simultaneously in the

	steady state. We also show that entanglement always becomes accompanied by quantum synchronization, though the reverse is not necessarily true. Moreover, when entangled, the oscillators exhibits near-complete synchronization. Thus, entanglement delivers a catalytic effect on the quantum synchronization in the specific system we considered. This behaviour can be observed for a large range of relevant parameters.
32.	Evolution of bluetooth classic udio towards bluetooth LE audio: Challenges and road ahead LK Baghel, R Raina, S Kumar - IEEE 17th International Conference on Industrial and Information Systems (ICIIS), 2023 **Abstract** Bluetooth is a short-range, low-power standard for wireless data transmission and is considered as the first choice for short-range audio transmission and related applications. Bluetooth-based wireless audio transmission applications and modern use cases, for example, multi-streaming for better stereo imaging experience, audio broadcasting to a large audience, support for hearing aids, etc., require low latency, low power, and less bandwidth. However, the existing Bluetooth classic (BR/EDR) audio standard is unable to support such requirements. Consequently, the new LE audio is considered as the most viable solution for the next generation of audio applications, which focuses primarily on latency, power efficiency, and efficient bandwidth utilization, which enables doors for multi-streaming, broadcasting, hearing aids, etc. In this paper, we focused on the evolution of LE audio along with the new features, the latest enhancements, and modern architecture. This work presents technical insights on LC3 codec, multi-stream audio, broadcast, and hearing aid. In addition, we discuss the challenges associated with implementing LE audio and possible opportunities created with the advent of LE audio. Later we summarize the challenges and future directions which open several doors for upcoming research in this area.
33.	Exploring deformation mechanics of temperature assisted incremental forming with hybrid heating N Kumar, S Bharrti, … A Agrawal - Journal of Manufacturing Processes, 2023 **Abstract** The single point incremental forming (SPIF) process is a die-less rapid prototyping sheet metal forming method, extensively researched for over two decades. SPIF shows higher formability compared to conventional sheet forming methods. Deformation of materials such as magnesium (Mg) is favored at elevated temperatures due to their poor room temperature formability. Past studies have explored heat-assisted forming techniques to achieve improved formability in SPIF. However, the underlying mechanics of deformation is sparsely explored. The present work explores the mechanism of formability improvement based on thermal gradients for SPIF in hybrid heating. The SPIF experiments are conducted for a combination of local and global heating conditions achieved using tool contact friction and cartridge heaters. The local temperature, stress distributions, and limiting strains are obtained numerically. Fracture-forming limit diagrams (FFL) are developed, and numerical predictions are validated using experimental strain measurements under different forming conditions.
34.	Flow instability in buoyancy-assisted and opposed flows through a vertical pipe in the laminar regime of mixed convection: A numerical study S Gorai, D Samanta, SK Das - Proceedings of the Thermal and Fluids Engineering Summer Conference, 2023 **Abstract** A detailed numerical investigation on laminar mixed convection has been carried out to understand the flow instability in buoyancy-aiding and buoyancy-opposing flows through a vertical pipe subjected to uniform heat flux. Two-dimensional axisymmetric steady simulations are performed with the available commercial software for aiding as well as opposing flows of water through a vertical pipe of length to diameter ratio of 500. The structured grids used for the

	simulation such that; it is uniform in axial and non-uniform in radial direction. The effects of Reynolds number ($100 \leq Re \leq 2300$) and Grashof number ($10^3 \leq Gr \leq 1.19 * 10^7$) on heat transfer and fluid flow are analysed by employing SIMPLE algorithm for solving pressure-velocity coupling and second order UPWIND scheme for solving momentum and various energy equations. The Boussinesq approximation has been considered for the analysis. The Richardson number (Ri) varies from 0.1 to 2.25 for the present range of Re and Gr. Results show that the heat transfer increases in case of buoyancy-assisting flow as compared to buoyancy-opposing flow for same Ri. It is inferred from the velocity profile and skin friction coefficient (C_f) plots that the pressure drop is more in case of opposing flow as that of aiding flow. An increase in heat flux advances the transition from laminar to turbulent in opposing flows whereas it delays in aiding flows. The point of inflection in aiding flows and the flow separation from the wall in opposing flows have been observed with further increase of Ri which ensures the presence of flow instability.
35.	Free convection from a single and a pair of spheres in power-law fluids at very small Grashof numbers P Suri, A Verma, … RP Chabbra - Journal of Non-Newtonian Fluid Mechanics, 2023 **Abstract** Laminar free convection in power-law fluids over the range of vanishingly small Grashof number ($10^{-4} \leq Gr \leq 10$) has been investigated numerically for an isolated sphere and twin spheres for varying centre-to-centre distance (including limiting case of touching spheres). The results of nondimensional total drag (C_D), local Nusselt number (Nu_l), and average Nusselt numbers (Nu) have been examined in detail to understand the momentum and heat transfer characteristics embracing broad ranges of Prandtl number ($0.72 \leq Pr \leq 1000$) and power-law fluid behaviour ($0.1 \leq n \leq 2$ for a single sphere and $0.1 \leq n \leq 1.5$ for a pair of spheres) for both cases. The gradual decrease of Grashof number has a tendency to flip over the effect of the power-law index on the total drag in both cases, i.e., for a single and twin spheres. On the other hand, an increase in Prandtl number delays this effect to higher Grashof number values. Numerous comparisons with the published approximate, numerical and experimental studies have been carried out to affirm the consistency of the present numerical results. An existing definition of the modified Rayleigh number, [Formula presented] captures well the influence of the Grashof and Prandtl numbers and the flow behaviour index on the drag coefficient and mean Nusselt number in both cases studied herein. The behaviour of the twin sphere configurations differs from that of an isolated sphere significantly even at the macroscopic level in terms of the resulting drag and Nusselt number values. Depending upon the separation between the two spheres and the strength of the flow, for the trailing sphere, the drag remains lower while the Nusselt number could be lower or higher than the single sphere and/or than that of the leading sphere over the range of parameters spanned here.
36.	Geo-visualizing the impact of the COVID-19 pandemic on students' learning outcomes: Evidence from grade 5 students S Agarwal, SR Behera - Environment and Planning B: Urban Analytics and City Science, 2023 **Abstract** The COVID-19 pandemic has exerted unprecedented impacts on school education. Despite improvements in school enrolment numbers, students' performance on learning outcomes lagged, especially in low- and middle-income countries. This study visualizes the geographical disparity in student learning outcomes across various Indian districts pre- and post-COVID-19 pandemic. The map visualizes that only a sample of districts in a few Indian states enlarged students' learning outcomes in proportion to the number of children. Furthermore, the effects of the COVID-19 pandemic weaken students' learning outcomes at the district level. This knowledge is essential for the policymakers to implement the most effective monitoring systems and strategies for improving the student's learning outcomes.

37.	Glucose oxidation assisted ammonia production via electrochemical dinitrogen reduction over $CoWO_4$ A Chaturvedi, D Gupta, … TC Nagaiah - Journal of Materials Chemistry A, 2023 **Abstract** The electrochemical N_2 reduction reaction (NRR) at ambient temperature and pressure is an environmental friendly method for N_2 to NH_3 conversion. Nevertheless, the overall energy input can be reduced by replacing the sluggish oxygen evolution reaction (OER) with the more favourable glucose oxidation reaction (GOR) at the counter electrode. Designing an efficient, bifunctional and cost-effective catalyst for NRR and GOR exhibiting impressive performance is crucial yet challenging. Here, we report a facile one step hydrothermal approach for the synthesis of cobalt tungstate ($CoWO_4$) with an urchin-like morphology by simple variation of reaction time for application in glucose assisted NRR. A morphology dependent activity was revealed by $CoWO_4$ (12 h) with a high NH_3 yield rate of 667.86 μg h^{-1} mg_{cat}^{-1} and faradaic Efficiency (F.E.) of 22.34% at −0.35 V vs. reversible hydrogen electrode (RHE) with a TOF (turn over frequency) of 0.67 h^{-1} under alkaline conditions. Notably, the ammonia production was enhanced at 0.27 V lower potential in the presence of glucose under full cell conditions.
38.	Image inpainting via correlated multi-resolution feature projection SS Phutke, S Murala - IEEE Transactions on Visualization and Computer Graphics, 2023 **Abstract** With the advancement in image editing applications, image inpainting is gaining more attention due to its ability to recover corrupted images efficiently. Also, the existing methods for image inpainting either use two-stage coarse-to-fine architectures or single-stage architectures with a deeper network. On the other hand, shallow network architectures lack the quality of results and the methods with remarkable inpainting quality have high complexity in terms of number of parameters or average run time. Despite the improvement in the inpainting quality, these methods still lack the correlated local and global information. In this work, we propose a single-stage multi-resolution generator architecture for image inpainting with moderate complexity and superior outcomes. Here, a multi-kernel non-local (MKNL) attention block is proposed to merge the feature maps from all the resolutions. Further, a feature projection block is proposed to project features of MKNL to respective decoder for effective reconstruction of image. Also, a valid feature fusion block is proposed to merge encoder skip connection features at valid region and respective decoder features at hole region. This ensures that there will not be any redundant feature merging while reconstruction of image. Effectiveness of the proposed architecture is verified on CelebA-HQ [1], [2] and Places2 [3] datasets corrupted with publicly available NVIDIA mask dataset [4]. The detailed ablation study, extensive result analysis, and application of object removal prove the robustness of the proposed method over existing state-of-the-art methods for image inpainting.
39.	Implications of bank competition, financial stability, and gender gap on access to finance: Evidence from Sub-Saharan Africa B Rakshit, S Bardhan - International Journal of Finance & Economics, 2023 **Abstract** Whether bank competition promotes access to finance is highly debated in economic literature and policy circles. Amidst this debate, this paper investigates the implications of bank competition, financial stability, and gender gap on access to finance for 40 Sub-Saharan African countries using 12,504 firm-level observations from the World Bank Enterprise Survey. In addition to structural measures, competition has been measured by three non-structural measures (Lerner index, Boone indicator, and Panzar-Rosse H-statistic). Results obtained through the probit model and probit model with sample selection (PSS) suggest that a higher degree of bank competition positively affects firm's credit availability in the Sub-Saharan African region.

	Results also indicate that firms owned by female entrepreneurs are more likely to report greater difficulties in obtaining formal finance. The findings suggest that policymakers and other stakeholders should direct policy actions that promote competition in the credit market by reducing the cost of credit.
40.	IRPD: in-field radish plant dataset S Singh, D Singh, … MK Saini - Agriculture-Centric Computation: International Conference, 2023 **Abstract** In this study, we present an in-field radish plant dataset (IRPD) for the segmentation and counting of leaves. Precision agriculture requires such a dataset to estimate the development, growth monitoring, health status, and yield potential of plants using computer vision and deep learning algorithms. The dataset consists of 6504 total images, out of which 3252 were captured over ten weeks in an uncontrolled open field environment, and the remaining 3252 were generated using image augmentation. Images were taken from germination through harvesting using different cameras. The total of 1025 images in the dataset are manually annotated for segmentation and leaf count. We present a baseline for leaf count and segmentation using Detectron2 and UNet. We hope that by making this dataset and annotated data available to the public, we can encourage research in this field, where a lack of publicly available in-field datasets is currently a barrier to advancement.
41.	Incorporation of Th^{4+} and Sr^{2+} into Rhabdophane/Monazite by Wet Chemistry: Structure and Phase Stability X Zhao, W Wang,… R Ahuja… - Inorganic Chemistry, 2023 **Abstract** Rhabdophane is an important permeable reactive barrier to enrich radionuclides from groundwater and has been envisaged to host radionuclides in the backend of the nuclear fuel cycle. However, understanding of how An^{4+} and Sr^{2+} precipitate into rhabdophane by wet chemistry has not been resolved. In this work, Th^{4+} and Sr^{2+} incorporation in the rhabdophane/monazite structure as $La_{1-2x}Sr_xTh_xPO_4{\cdot}nH_2O$ solid solutions is successfully achieved in the acid solution at 90 °C. Some specific issues such as lattice occupation of Th^{4+} and Sr^{2+}, precipitation reaction kinetics, and crystal growth affected by starting stoichiometry are discussed in detail, along with investigating the chemical stability of $La_{1-2x}Sr_xTh_xPO_4{\cdot}nH_2O$ precipitations and associated $La_{1-2x}Sr_xTh_xPO_4$ monazite. The results reveal that the excess of Sr^{2+} appears to be a prevailing factor with a suggested initial Sr: Th ≥ 2 to obtain the stability domain of $La_{1-2x}Sr_xTh_xPO_4{\cdot}nH_2O$ (x = 0∼ 0.1). A rapid ion removal associated with a nucleation process has been observed within 8 h, and Th^{4+} can be removed more than 98% after 24 h in 0.01 mol/L solutions. From structural energetics based on density functional theory, the lattice occupation of Th^{4+} and Sr^{2+} is energetically favorable in nonhydrated lattice sites of [LaO_8], although two-thirds of lattice sites are associated with [$LaO_8{\cdot}H_2O$] hydrated sites. Intriguingly, the crystal transformation from rhabdophane to monazite associated with the transformation from [SrO_8] to [SrO_9] polyhedra can greatly improve the leaching stability of Sr^{2+}. 
42.	Influence of chronic administration of morphine and its withdrawal on the behaviour of zebrafish JA Malik, S Nanda, MA Zafar, … JN Agrewala - Journal of Biosciences, 2023 **Abstract**

	Morphine is a potent analgesic opiate used to treat chronic pain, mostly in cancer patients. In addition, it is widely used as a drug of abuse. Due to the continuous rise of morphine-associated addiction, there is an urgent need to develop pre-clinical animal models to understand the behavioural pattern of drug dependence and its withdrawal. Recently, the experimental use of zebrafish has attained significance in behavioural neuroscience studies. The literature on zebrafish is conflicting with regard to morphine withdrawal symptoms. Unfortunately, no single model provides comprehensive details to evaluate zebrafish behaviour on opiate exposure. Further, the current models have various limitations, such as short duration, complexity of phenotypes, intricate quantification, and difficulty in studying withdrawal symptoms. Consequently, a firm standardization of the protocol to understand the influence of opiates on physiological and psychological behaviours is required. In this study, we have tried to overcome the shortcomings associated with the existing models and to optimize the protocols involving an array of parameters. We observed that the administration of morphine caused a significant increase in zebrafish behavioural patterns of spiral movements, circular movements, erratic movements, upper transitions, water surface transitions, wall licking, wall licking with upper transitions, wall licking with lower transitions, absolute angle changes, and time spent in the upper compartment. A decline in the freezing bouts and time spent in the lower compartment were noticed. In essence, this study offers a zebrafish model to comprehensively examine changes in behaviour of animals on opiate dependence and its withdrawal. The present study also reported that in zebrafish, the influence of chronic exposure of morphine modulates key gene targets involved in behaviour, neuroinflammation, and autophagy, which directly or indirectly are associated with morphine addiction in a chronic morphine model.
43.	Intelligent Chatbot assistant in agriculture domain R Biswas, N Goel - Agriculture-Centric Computation: International Conference, 2023 **Abstract** Agriculture is known as the economic game changer of India. It is the primary driver of GDP growth because of India's robust agricultural industry, and proper knowledge about agriculture techniques help increase crop yield. So, answering the different types of crop-related queries is essential. We proposed the intelligent chatbot application in the agriculture domain so that farmers can get the correct information about farming practices. Our system is farmer-friendly and capable enough to instantly answer farm-related queries from the knowledge base, such as plant protection, fertilizer uses, government schemes, and many others. We used the agriculture-related data in question-answer format and implemented the pre-trained model of the Sentence-Transformer approach to answer providing. We also deployed the TF-IDF and Bag-of-Words method but achieved a reasonable accuracy rate for the test data in the sentence transformer pre-trained model. With the help of API services, our system also shows the crop's latest mandi (market) rate and current weather information. So, the proposed chatbot system will keep the contribution for farmer's cost savings. Overall, our chatbot system is straightforward and more efficient for the farmer to make better decisions.
44.	Investigation of feature-based and space-filling tool path strategies for formability in incremental sheet metal forming S Bharti, KS Karvaje, … A Agrawal…. - International Journal of Material Forming **Abstract** Incremental sheet metal forming (ISF) is a versatile dieless forming process for manufacturing complex sheet metal components. The toolpath is one of the most critical process parameters, significantly influencing the ISF formability. The conventional toolpath strategies, such as spiral and constant z-slice-based tool paths, do not prove helpful for complex asymmetries in part geometry. The approach to toolpath planning in ISF should consider both material behavior and design complexity. This work compares conventional toolpaths with two strategies, namely feature-based and space-filling fractal tool paths. Material thinning and geometric deviations are

	critical limitations for successful part development. All toolpath strategies were evaluated for material distribution, geometric accuracy, and fracture depth using four carefully designed components with gradually increasing asymmetry. As evident from the results obtained, the material deformation was sensitive to the choice of toolpath strategies. The feature-based tool path captures the part curvatures more uniformly, leading to homogeneous thickness distribution. At the same time, fractal-based strategies lead to lower overall geometric deviation in the region of curved profiles.
45.	Investigating ^{6,7}Li-induced reactions on ^{235,238}U through a collective clusterization approach R Kaur, B Singh,… PP Singh – Physical Review C, 2023 **Abstract** The characteristic cluster structures and low separation energies of weakly bound stable nuclei and their influence on the fusion process remain the subject of interest on experimental as well as theoretical fronts. To understand the fusion the dynamics of weekly bound nuclei, a comparison of fusion cross sections in reactions involving weakly bound projectiles 6,7Li on 235,238U targets was carried out within the collective clusterization approach of the dynamical cluster decay model (DCM) using deformed configuration effects included up to quadrupole deformations (β2i) for two nuclei having optimum orientations θopt. at similar center-of-mass energies (Ec.m.). The fission excitation functions are tuned with respect to the available experimental data using the same neck length parameter (ΔR), the only free parameter in the model. Signatures of fusion enhancement and incomplete fusion (ICF) were observed at below-barrier energies, which is consistent with the experimental results. The plausible segregation of CF (complete fusion) and ICF was also made within the formalism.
46.	k-Shell without decomposition Y Gupta, S Sukhija, SRS Iyengar - International Conference on Computational Collective Intelligence, 2023 **Abstract** Identifying the influential nodes in a network is crucial for super-spreading information and trends. For a long time, such nodes are identified by decomposing the network to determine the k-core. The nodes in k-core are proven to be efficient spreaders. However, the algorithm requires the global information of the network. In this paper, we present a local variant (based on only neighborhood information) of the k-shell decomposition algorithm that can reliably estimate the shell number. The proposed iterative strategy identifies a small subgraph that is sufficient to accurately bind the maximum core number (shell number) of a node. The experimental results on diverse networks validate the efficacy of the proposed method.
47.	Leishmania LPG interacts with LRR5/LRR6 of macrophage TLR4 for parasite invasion and impairs the macrophage functions S Mazumder, A Sinha, … D Pal… - Pathogens and disease, 2023 **Abstract** Visceral leishmaniasis (VL) is a severe form of leishmaniasis, primarily affecting the poor in developing countries. Although several studies have highlighted the importance of toll-like receptors (TLRs) in the pathophysiology of leishmaniasis, the role of specific TLRs and their binding partners involved in Leishmania donovani uptake are still elusive. To investigate the mechanism of L. donovani entry inside the macrophages, we found that the parasite lipophosphoglycan (LPG) interacted with the macrophage TLR4, leading to parasite uptake without any significant alteration of macrophage cell viability. Increased parasite numbers within macrophages markedly inhibited lipopolysachharide-induced pro-inflammatory cytokines gene expression. Silencing of macrophage-TLR4, or inhibition of parasite-LPG, significantly stemmed parasite infection in macrophages. Interestingly, we observed a significant enhancement of macrophage migration, and generation of reactive oxygen species (ROS) in the parasite-infected

	TLR4-silenced macrophages, whereas parasite infection in TLR4-overexpressed macrophages exhibited a notable reduction of macrophage migration and ROS generation. Moreover, mutations in the leucine-rich repeats (LRRs), particularly LRR5 and LRR6, significantly prevented TLR4 interaction with LPG, thus inhibiting cellular parasite entry. All these results suggest that parasite LPG recognition by the LRR5 and LRR6 of macrophage-TLR4 facilitated parasite entry, and impaired macrophage functions. Therefore, targeting LRR5/LRR6 interactions with LPG could provide a novel option to prevent VL.
48.	Limit theorems for a higher order time dependent Markov chain model P Kokoszka, T Kutta, D Singh… - Probability and Mathematical Statistics, 2023 **Abstract** The paper establishes a strong law of large numbers and a central limit theorem for a sequence of dependent Bernoulli random variables modeled as a higher order Markov chain. The model under consideration is motivated by problems in quality control where acceptability of an item depends on the past k acceptability scores. Moreover, the model introduces dependence that may evolve over time and thus advances the theory for models with time invariant dependence. We establish explicit assumptions that incorporate this dynamic dependence and show how it enters into the limits describing long-term behavior of the system.
49.	Location and geographical concentration patterns of Indian manufacturing industries: Evidence from the rural and urban areas S Agarwal, SR Behera - Singapore Economic Review, 2023 **Abstract** This paper explores the spatial distribution and dependence of employment of workers and geographical concentration of 71 manufacturing industries by capturing the neighborhood effects across 637 districts in India, covering 10.54 million establishments using Economic Census (2013) data. Empirical results validate the spatial dependence of employment in rural and urban areas. However, results indicate substantial evidence of rural-urban employment disparity, especially in the northern states of India. Further, empirical results show that the effect of geographical concentration on highly localized industries seems to diverge in rural and urban areas. Besides, results exhibit that the higher employment industry has a low employment-to-establishment ratio (EER) at the establishment level in rural and urban areas. Nevertheless, using cartograms, we find that the spatial concentration of highly employable industries and the EER is highly skewed and asymmetrically concentrated in a few districts of only four to five states in India. Therefore, the results suggest that policymakers could focus mainly on industries with massive potential for employment opportunities at the regional level.
50.	Low profile curved shape bluetooth antenna for IoT applications LK Baghel, R Raina, S Kumar - IEEE 17th International Conference on Industrial and Information Systems (ICIIS), 2023 **Abstract** Bluetooth technology has emerged as the primary choice for wireless data transmission in IoT and related applications. Hence, Bluetooth and related research have received significant research attention, especially antenna design and miniaturization. Indeed significant research efforts have been made in the literature for the development and miniaturization of 2.4 GHz Bluetooth antennas. However, they possess certain limitations; for instance, the nonplanar antennas (external monopole and dipole) are difficult to fabricate, require more space, and are expensive. Similarly, the planar antennas (monopole, inverted F, meander line) proposed in the literature require a large ground area, more keep-out space, possess low bandwidth, low gain, and are difficult to tune. Hence, in this regard, we have proposed a compact & small, easily manufacturable low-cost planar antenna that exploits the curved-shaped structure for better

	impedance matching, tuning, radiation efficiency, and smaller physical size. In particular, the proposed antenna offers a radiation bandwidth of 130 MHz, 1.89 dBi antenna gain, and an omnidirectional radiation pattern. Moreover, the antenna is simulated in Ansys HFSS, designed in Altium PCB design software, and fabricated on 0.8 mm FR4 PCB, which is later validated experimentally and tested in indoor and outdoor environments.
51.	Metal-free photocatalytic transformation of waste polystyrene into valuable chemicals: advancing sustainability through circular economy R Ghalta, R Bal, R Srivastava – Green Chemistry, 2023 **Abstract** The present study offers a metal-free photocatalytic visible-light-driven protocol for addressing the plastic waste crisis. The reaction uses photocatalytic C-H bond activation to deconstruct polystyrene (PS) waste into valuable products under ambient conditions (1 bar O_2, 250 W Hg lamp) in an ethyl acetate/acetonitrile solvent system. The high surface area metal-free photocatalyst was synthesised using flow-assisted exfoliation and demonstrated high selectivity for acetophenone and PS conversion in sunlight. The study presents a promising and sustainable approach to combat plastic pollution by introducing the concept of visible light photocatalysis for polymer deconstruction. The technology offers a simple, reproducible, eco-friendly method that could significantly contribute to a circular economy to produce wealth (chemicals) from waste. Detailed characterisations, control experiments, and scavenging studies have been conducted to propose the mechanism of PS upcycling to acetophenone and benzoic acid. The photocatalytic C-H activation showcased in this study could motivate material scientists and catalysis researchers to create uncomplicated, metal-free photocatalysts that can activate other bonds with high dissociation energy, leading to the formation of crucial synthetic intermediates of industrial significance. This technology represents a crucial step towards more efficient and sustainable methods for combatting plastic pollution, highlighting the potential of green chemistry for creating sustainable solutions to environmental challenges.
52.	'… Miles of the rustling secret corn': nature, cosmic and autonomy in American cosmic horror literature S Gupta, D Ray - Textual Practice, 2023 **Abstract** This paper investigates the autonomy of Nature in American cosmic horror literature. We have divided the American cosmic horror canon into two parts: the Lovecraftian and the post-millennial. The Lovecraftian phase, prefaced by the texts of Lovecraft himself, posits Nature as a corruptible and subservient entity, subdued by the alien cosmic and redeemed only by a rationalist agent/outsider, focusing on the late-twentieth century texts by Stephen King, T. E. D. Klein and Robert R. McCammon. In the post-millennial phase, rather than serving the cosmic, Nature becomes the cosmic, transcending the moulds of rationality and comprehension, becoming inscrutable and 'agential' in the process. Our case studies will include the works of Thomas Ligotti, Michael Wehunt, T. E. Grau and John Langan. While discerning Nature's autonomy, we will also discuss how a 'rational' Nature falls within the ambit of anthropocentrism, whereas an 'irrational' Nature, often mistaken as misanthropic, adopts absolute indifference towards the anthropos.
53.	Noise correlations in phase-locked VECSEL arrays S Kaurseichyak, V Pal, I Sanges… - 2023 Conference on Lasers and Electro-Optics Europe & European Quantum Electronics Conference (CLEO/Europe-EQEC), 2023 **Abstract** Phase-locking of laser arrays was widely investigated in solid state Nd:YAG lasers [1]–[4] and CO 2 gas lasers [5]. Intracavity phase-locking of the laser array provides a methodology of high-quality beam shaping for medical, analytical, and industrial applications. Moreover, this kind of

	many-oscillator system is of interest for optimization problems and optical computations. Above mentioned lasers obey class-B laser dynamics due to the large values of their carrier lifetime. These dynamical classes are characterized by strong intensity oscillation and strong response to any system perturbations and noise even after reaching the system's steady state. Semiconductor active elements, such as VCSEL's hetero-structures (vertical cavity surface emitting laser), have an ns carrier lifetime. External cavity VCSEL was shown to be a very low noise laser (RIN∼−140dB/Hz) exhibiting quiet behavior without relaxation oscillations thanks to its low-loss long cavity [6]–[8]. Thus using such a structure as an active medium inside a degenerate cavity provides a class-A laser array. Here we present experimental results of VECSEL laser array development in a degenerate cavity and investigation of the noise characteristics of the free-running (Fig. 1.(b) top) and phase-locked regimes (Fig. 1(b) bottom). The experimental setup is presented in Fig. 1(a). The laser array is created using a metal mask placed very close to the output coupler (holes diameter = 200μm , center-to-center separation = 250μm). Phase-locking is achieved using injection locking between the different lasers created by diffraction from the mask. Diffracted light of each laser creates a coupling channel with its neighbors after reflection on the mirror. Noise correlation between the coupled lasers was investigated for different sets of laser parameters in a wide range of noise frequencies. The influence of phase-locking on the intensity noise correlation between neighboring lasers (Fig. 1. (c)) and spectral synchronization up to single frequency operation was clearly identified.
54.	Novel Al_2CoCrFeNi high-entropy alloy coating produced using suspension high velocity air fuel (SHVAF) spraying A Meghwal, A Anupam,… S Joshi… - Intermettalics, 2023 **Abstract** Metallic coatings of Al_2CoCrFeNi high entropy alloy (HEA) were deposited using the suspension high velocity air fuel spray (SHVAF) process, towards exploring its viability as a bond coat in thermal barrier coatings. The relatively high Al content promoted a BCC + B2 phase-dominated coating structure, leading to enhanced mechanical properties. The oxidized microstructure exhibited a protective Al_2O_3 layer with characteristics comparable to conventional bond coat alloys.
55.	On the dynamics of freezing sessile droplets: Frost halo formation S Kavuri, G Karapetsas, CS Sharma… - Bulletin of the American Physical Society, 2023 **Abstract** The freezing of a supercooled sessile droplet unveils fascinating physics, characterized by the progression of the liquid-ice interface, the formation of a cusp-like morphology at the tip of the droplet and often by the emergence of a frost halo on the underlying substrate. Here, we focus on the latter which has been verified experimentally but has not been theoretically explored. We consider the freezing of a thin volatile sessile droplet on a sub-cooled substrate and develop a comprehensive model based on lubrication theory. It is demonstrated that the vapor that is present in the atmosphere comes into contact with the sub-cooled substrate resulting to considerable condensation near the contact line at early stages of the freezing process, forming a frost halo in the droplet periphery. Liquid volatility also influences the shape of the liquid-ice interface and aspect ratio of the droplet, as it affects the total remaining mass of ice and the thermal profile inside the droplet. The latter is determined by the conductivity of the droplet, the thermal resistance of the substrate, convection to the atmosphere and, crucially, evaporative cooling. We conduct a detailed parametric study and discuss about the effects of ambient conditions, the latent heat of vaporization and melting, and the thermal properties of liquid, ice and the substrate on the frost halo formation and the dynamics of the freezing process in general.
56.	Parametric study on chronological evolution of seismic design provisions for Indian RC shear wall buildings

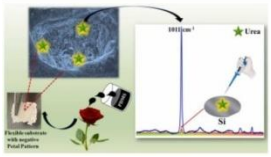
	KKK Reddy, P Haldar, S Mishra - Journal of Vibration Engineering & Technologies, 2023 **Abstract** Purpose This work aims to investigate the effect of revised Indian seismic design guidelines on the seismic performance of RC shear wall buildings. Contribution and Methods Indian design guidelines for RC shear wall buildings have undergone a major revision in 2016, resulting in the modification/removal or introduction of several design and ductile detailing provisions in the latest version followed by amendment-1, 2017 and amendment-2, 2020. An effort has been made to understand independent and compounded effect of these changes in force-based design guidelines in chronological advancement of relevant Indian standards on overall expected performance of RC frame buildings with shear walls. An exhaustive comparison of all relevant design provisions and their effect has been examined by estimating the expected performance of a set of RC frame buildings with shear walls situated in seismic zone IV with varying heights, in deterministic as well as probabilistic terms. Effect of relevant design provisions on the seismic performance and consequent seismic fragility has been evaluated using pushover analysis in conjunction with HAZUS methodology. Conclusion It has been observed that the combined effect of design guidelines in chronological advancement of relevant Indian standards is pronounced in high-rise buildings, whereas mid-rise buildings designed as per BIS (in IS 1893 (Part 1)-2002 Indian Standard Criteria for earthquake resistant design of structures. Part 1: General provisions and buildings (fifth revision), Bureau of Indian Standards, New Delhi, 2002), BIS (in IS 1893 (Part 1)-2016 Indian Standard Criteria for earthquake resistant design of structures. Part 1: General provisions and buildings (fifth revision), Bureau of Indian Standards, New Delhi, 2016), and its amendments exhibit similar seismic performance.
57.	Particle separation using modified Taylor's flow V Kumar, P Jain, RK Upadhyay… - Microfluidics and Nanofluidics, 2023 **Abstract** In this study, the separation of micron-size particles from a liquid slug is achieved by using a passive mechanism through Taylor's flow. We have exploited the recirculation of a fluid along the travelling air–liquid interfaces to align particles in a streamline. Recirculation of concentrated particles is achieved along the centre of the microchannel that aligns with the maximum velocity plane across the channel. The microchannel is fabricated through a four-step manufacturing process to achieve the necessary dimensions and surface chemistry along the side wall of the microchannel. For a flow of liquid, a fully developed flow regime can be witnessed by observing the parabolic velocity profile. The symmetric profile with maximum velocity along the center line of the channel is a depiction of the no-slip boundary at the channel wall. A liquid-repellent solid wall, or a superhydrophobic solid wall, changes the parabolic profile and subsequently, the magnitude and position of maximum velocity changes. Along a channel with one wall of superhydrophobic coating, the profile becomes asymmetric and the shifts location of the maximum velocity from the center of the channel. After introducing a bubble of the same size as the channel width, the bubble also experiences this asymmetry. As famously Taylor flow depicts, the traveling bubble concentrates the particles along a maximum velocity profile which is along the center of the channel towards the wall with slp condition. However, for one wall with slip condition, it facilitates the shift of the stream of particles on the desired side of the center of the channel. This shift is used to guide particles towards one arm of the Y section of the channel located downstream of the flow. To demonstrate this shift in the particle stream, we conducted

	experiments along two different channels: one with no slip condition, and the second with a coating that exhibits slip condition along the wall.
58.	Performance Analysis of Salt Gradient Thermal Storage Device Driven by Waste Heat R Goswami, R Das, S Ganguly - 3rd International Conference on Electrical, Computer, Communications and Mechatronics Engineering (ICECCME), 2023 **Abstract** Generally waste heat is observed as thermal energy source which is produced by every conversion system that has certain efficiency. Mostly, this waste heat is exhausted/dumped to the ambient which causes environmental pollution, potentially energy loss and global warming related issues. Moreover, this waste heat has useful potential and can be further used for different applications after adequate storage. Therefore, a salt gradient thermal storage device (SGTSD) is developed for efficiently storing the recovered waste heat that is generated by the biomass driven engine. The performance of the SGTSD is investigated experimentally through temperature profiles across lower convective region (LCR), non-convective region (NCR) and upper-convective region (UCR), temperature gain, effectiveness of heat exchanger pipe and thermal efficiency. Experimental results showed that calorific value (CV) of syngas varies in the range of 5.31-5.43 MJ/m ^{3} and found very close to the optimum level. The maximum value of waste heat temperature (T WH) is obtained as 396.16 °C at 3 kW and 48 Hz of engine load (W e) and frequency (f), respectively. The effectiveness of heat exchanger pipe is found in the range of 0.75-0.77. The maximum achieved temperature in the LCR is found as 65.42 °C corresponding to 396.16 °C of T WH . Thermal efficiency of about 42.31-47.73% is obtained for the developed SGTSD. The attractive outcomes of this study show that the SGTSD could be an effective thermal storage device for the available waste heat that may help to climate control through useful energy production.
59.	Photochemical Sonogashira coupling reactions: beyond traditional palladium–copper catalysis P Singh, AC Shaikh - Chemical Communications, 2023 **Abstract** Sonogashira coupling is one of the Nobel reactions discovered in 1975 to form a C–C bond using palladium and copper as co-catalysts. Incorporating alkyne functionalities either in macro or micro molecules by using this Sonogashira reaction has already proven its viability and relevance in the sphere of synthetic chemistry. While aiming for sustainable chemistry, in recent years, visible light photoredox catalysts have appeared as an advanced tool in this regard. In this review, we aim to portray a comprehensive summary of modern visible light photo redox catalyzed Sonogashira reaction, which will leave space for the readers to rethink alternative strategies to conduct the Sonogashira reaction. This review briefly describes the implementation of various metal-based nanomaterial photocatalysts, developing either copper or palladium-free photocatalytic methods, and organo-photolytic and bioinspired photocatalysts for the Sonogashira coupling reactions. Besides, this review also gives a concise overview of the mechanistic aspects and highlights selective examples for substrate scope.
60.	Portable sensor array for on-site detection and discrimination of pesticides and herbicides using multivariate analysis Ranbir, G Singh, H Singh,… N Singh - Analytical Chemistry, 2023 **Abstract** Modern agricultural practice relies heavily on pesticides and herbicides to increase crop productivity, and consequently, their residues have a negative impact on the environment and public health. Thus, keeping these issues in account, herein we developed an azodye-based chromogenic sensor array for the detection and discrimination of pesticides and herbicides in food and soil samples, utilizing machine learning approaches such as hierarchical clustering analysis, principal component analysis, linear discriminant analysis (LDA), and partial least

	square regression (PLSR). The azodye-based sensor array was developed in combination with various metal ions owing to their different photophysical properties, which led to distinct patterns toward various pesticides and herbicides. The obtained distinct patterns were recognized and processed through automated multivariate analysis, which enables the selective and sensitive identification and discrimination of various target analytes. Further, the qualitative and quantitative determination of target analytes were performed using LDA and PLSR; the results obtained show a linear correlation with varied concentrations of target analytes with R^2 values from 0.89 to 0.96, the limit of detection from 5.3 to 11.8 ppm with a linear working range from 1 to 30 μM toward analytes under investigation. Further, the developed sensor array was successfully utilized for the discrimination of a binary mixture of pesticide (chlorpyrifos) and herbicide (glyphosate).
61.	Prioritizing Areas Prone to Critical Soil Erosion by Using Multiple Criteria Decision Analysis and GIS Techniques T Prashanth, S Ganguly, M Gummadi - Lecture Notes in Civil Engineering, 2023 **Abstract** In India, due to uneven rainfall distribution and land use changes, soil erosion patterns vary spatially and temporally significantly. Soil erosion refers to the detachment of soil particles on the land surface due to natural geological processes and transport by means of natural geological agents like water, wind, etc. It may accelerate due to poor land management and anthropogenic activities. The eroded soil particles cause sedimentation in reservoirs and reduce the carrying capacity of waterbodies, leading to changes in water quality and alteration of the cross-section of rivers. This study integrates Analytical Hierarchical Process (AHP) and Fuzzy Analytical Hierarchical Process (FAHP) to identify the areas prone to critical soil erosion. The areas prone to soil erosion are identified by integrating drainage density, elevation, ground slope, land use land cover (LULC), rainfall, and soil map. Soil erosion-prone areas obtained using AHP and FAHP are cross-verified by performing river bank shifting analysis using multi-temporal global surface waterbodies data on Google Earth Engine (GEE). River bank shifting analysis calculates the amount of the area (in hectares) prone to soil erosion and deposition at a frequency of every 5 years from 2000–2020, using a Geographic Information System (GIS). This study is aimed to reduce the investments, is weather independent, and prioritizes areas prone to soil erosion temporally and spatially.
62.	Quantum-Classical Protocol for Efficient Characterization of Absorption Lineshape and Fluorescence Quenching upon Aggregation: The Case of Zinc Phthalocyanine Dyes M Aarabi, D Aranda, … SK Meena… - Journal of Chemical Theory and Computation, 2023 **Abstract** A quantum-classical protocol that incorporates Jahn–Teller vibronic coupling effects and cluster analysis of molecular dynamics simulations is reported, providing a tool for simulations of absorption spectra and ultrafast nonadiabatic dynamics in large molecular photosystems undergoing aggregation in solution. Employing zinc phthalocyanine dyes as target systems, we demonstrated that the proposed protocol provided fundamental information on vibronic, electronic couplings and thermal dynamical effects that mostly contribute to the absorption spectra lineshape and the fluorescence quenching processes upon dye aggregation. Decomposing the various effects arising upon dimer formation, the structure–property relations associated with their optical responses have been deciphered at atomistic resolution.
63.	Quasi-one- and quasi-two-dimensional Bose-Fermi mixtures from weak coupling to unitarity P Kaur, S Gautam, SK Adhikari - European Physical Journal Plus, 2023 **Abstract** We study ultracold superfluid Bose-Fermi mixtures in three dimensions, with stronger confinement along one or two directions, using a non-perturbative beyond-mean-field model for

	bulk chemical potential valid along the weak-coupling to unitarity crossover. Although bosons are considered to be in a superfluid state, we consider two possibilities for the fermions − spin-polarized degenerate state and superfluid state. Simplified reduced analytic lower-dimensional models are derived along the weak-coupling to unitarity crossover in quasi-one-dimensional (quasi-1D) and quasi-two-dimensional (quasi-2D) settings. The only parameters in these models are the constants of the beyond-mean-field Bose-Bose and Fermi-Fermi Lee-Huang-Yang interactions and the respective universal Bertsch parameter at unitarity. In addition to the numerical results for a fully-trapped system, we also present results for quasi-2D Bose-Fermi mixtures where one of the components is untrapped but localized due to the interaction mediated by the other component. We demonstrate the validity of the reduced quasi-1D and quasi-2D models via a comparison of the numerical solutions for the ground states obtained from the reduced models and the full three-dimensional (3D) model. © 2023, The Author(s), under exclusive licence to Società Italiana di Fisica and Springer-Verlag GmbH Germany, part of Springer Nature.
64.	Rational Approaches and Design Strategies for Fluorogenic Probes for Cancer Detection, Diagnostics, and Biomarker Research G Singh, N Singh - Handbook of Oncobiology: From Basic to Clinical Sciences, Book Chapter, 2023 **Abstract** Cancer, a leading cause of premature death, can be prevented through early diagnosis. Nowadays, extensive research is ongoing for the development of various nanomaterials, which can be utilized for molecular early diagnostics of cancer; results in detection of varied number of tumor biomarkers using various sophisticated imaging techniques. Thus, the early diagnosis of cancer is the most effective approach to reduce the burden on the health care system owing to the cancer mortality and comorbidity rates. However, due to the complex nature of cancerous cells, the early detection remains challenging. It is a well-known fact that during the onset or progression of various cancers, an aberrant cellular biochemical activity is observed. Consequently, a library of fluorogenic probes has been developed to monitor these aberrant biochemical processes, and exhibits promising results over traditional methods. During the last decade, extensive research has been done to explore various design strategies in order to find out the most promising chemical architectures. In this regard, the present chapter provides a detailed description of the rational design ideas explored for the synthesis of various enzyme-activated fluorogenic probes to monitor the aberrant cellular biochemical activity for early detection of cancer.
65.	Recent insights of obesity-induced gut and adipose tissue dysbiosis in type 2 diabetes D Patra, P Ramprasad, S Roy, D Pal… - Frontiers in Molecular Biosciences, 2023 **Abstract** An imbalance I nmicrobial homeostasis, referred to as dysbiosis, is critically associated with the progression of obesity-induced metabolic disorders including type 2 diabetes (T2D). Alteration in gut microbial diversity and the abundance of pathogenic bacteria disrupt metabolic homeostasis and potentiate chronic inflammation, due to intestinal leakage or release of a diverse range of microbial metabolites. The obesity-associated shifts in gut microbial diversity worsen the triglyceride and cholesterol level that regulates adipogenesis, lipolysis, and fatty acid oxidation. Moreover, an intricate interaction of the gut-brain axis coupled with the altered microbiome profile and microbiome-derived metabolites disrupt bidirectional communication for instigating insulin resistance. Furthermore, a distinct microbial community within visceral adipose tissue is associated with its dysfunction in obese T2D individuals. The specific bacterial signature was found in the mesenteric adipose tissue of T2D patients. Recently, it has been shown that in Crohn's disease, the gut derived bacterium Clostridium innocuum translocated to

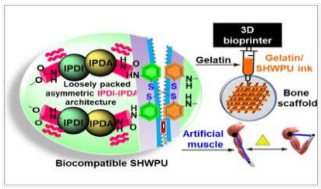
	the mesenteric adipose tissue and modulates its function by inducing M2 macrophage polarization, increasing adipogenesis, and promoting microbial surveillance. Considering these facts, modulation of microbiota in the gut and adipose tissue could serve as one of the contemporary approaches to manage T2D by using prebiotics, probiotics,or faecal microbial transplantation. Altogether, this review consolidates the current knowledge on gut and adipose tissue dysbiosis and its role in the development and progression of obesity-induced T2D. It emphasizes the significance of the gut microbiota and its metabolites as well as the alteration of adipose tissue microbiome profile for promoting adipose tissue dysfunction, and identifying novel therapeutic strategies, providing valuable insights and directions for future research and potential clinical interventions.
66.	Recent progress in the stabilization of low band-gap black-phase iodide perovskite solar cells M Mittal, R Garg, A Jana – Dalton Transactions, 2023 **Abstract** All-inorganic and organic-inorganic hybrid perovskite solar cells (PSCs) have taken a quantum leap owing to their high performance and low-cost solution processability. Their efficiency has been dramatically increased up to ∼26%, matching the conventional inorganic photovoltaics like monocrystalline Si (26.1%), polycrystalline Si (21.6%), CdTe (22.1%), and CIGS (22.3%). Such outstanding performance has been achieved due to their excellent optoelectronic properties, such as a direct bandgap in the visible region, a very high absorption coefficient, a long charge-carrier diffusion length, and ambipolar carrier transport characteristics. $FAPbI_3$ (FA = formamidinium) and $CsPbI_3$ perovskites among the pool of perovskites are recommended for solar cell applications because they meet all the requirements for photovoltaic applications. However, the fundamental problem of these perovskites is that their photoactive black phase is highly unstable under ambient conditions due to small and large sizes of Cs^+ and FA^+ ions, respectively. The instability of the black phase of these perovskites hinders their applications in photovoltaic devices as a high-quality light absorber layer. Several approaches have been employed to prevent the formation of the photo-inactive yellow phase or to enhance the stability of the black phase of perovskites, such as dimensional and compositional engineering, the addition of external additives, and dimensional engineering. This perspective summarizes the various methods for stabilizing the black phase of $CsPbI_3$ and $FAPbI_3$ perovskites at room temperature as well as their application in photovoltaic devices.
67.	Reusable, flexible, facile, and economical SERS substrates based on rose petal replicas for pesticide detection H Sammi, N Sardana - Sensors and Actuators A: Physical, 2023 **Abstract** A facile method for the fabrication of cost-effective, scalable, and flexible surface-enhanced Raman scattering substrate, based on natural rose petal is discussed. In this study, the rose petal is used as a template, PDMS as an elastomer, and nano casting approach is used to create the inverted texture of rose. For the fabrication of SERS substrates, Au Nanoparticles is deposited via a self-assembly approach onto the substrate consisting inverted texture of Rose. Morphological view depicts that Au nanoparticles are spherical in shape, well-distributed, and closely packed from the top to bottom, which helps in enhancing the signal strength through the generation of LSPR and hot spots. SERS measurement reveals that the prepared flexible substrates are able to sense lower concentrations of Rhodamine 6G (organic pollutant) and Urea (pesticide). The limit of detection of urea is 10^{-11} M with an R^2 (linear correlation coefficient) value of 0.99. The substrate has been used for the detection of urea on tomato surface. Furthermore, it is reusable via using a simple drop-casting method and shows good stability ability even after storage of ∼ 4 months. The flexible and structured substrate prepared from natural material may open a new door in the field of facile and fast synthesis of substrates.



68.

[Robust Self-Healable and Three-Dimensional Printable Thermoplastic Elastomeric Waterborne Polyurethane for Artificial Muscle and Biomedical Scaffold Applications]
S Morang, JH Rajput,…A Poundarik… - ACS Applied Polymer Materials, 2023

Abstract
Waterborne polyurethanes (WPUs) with smart attributes like self-healing and shape-memory, reprocessability, and excellent integrated mechanical properties are the key connotations for advanced applications. Congenitally, these properties are associated with conflicting features, which makes it puzzling to optimize these paradoxical properties in a single material. Herein, this study introduces an easy but impactful strategy to answer this dilemma, which is based on the triple synergistic effect of 'dynamic hard domains (2-aminophenyl disulfide, 2-APDS)', 'asymmetric IPDI-IPDA (isophorone diisocyanate-isophorone diamine) architecture', and 'shape memory effect (SME)'. The loosely packed IPDI-IPDA moieties and the SME promote the reversible S–S metathesis reactions, resulting in high healing efficiency as well as mechanical strength, simultaneously. Based on this tactic, a series of robust self-healable WPUs (SHWPUs) was synthesized with good healing efficiency (70.22–79.94%), shape recovery (88.4–97.4%), excellent mechanical strength (16.09–26.23 MPa), high elongation at break (1604–2071%), outstanding toughness (188.3–216.6 MJ m–3), high fracture energy (46.74–66.33 kJ m–2), biocompatibility, and biodegradability. Outstandingly, a SHWPU film could lift a dumbbell of 25 kg, which is 53,648 times heavier than its own weight without any crack. Taking advantage of good shape recoverability, the elastomer was tested for "artificial muscle" contraction. Impressively, the SHWPU-1 film could vertically and successfully lift a 100 g load, which is 251.19 times heavier than its weight under ambient conditions. Moreover, a series of 3D printable gelatin/SHWPU-2 inks were prepared, which possess the potential for bone scaffolds. Additionally, this thermoplastic SHWPU could be reprocessed at 80 °C under 60–80 kg cm–2 pressure. Thus, the SHWPU elastomer exhibited all characteristics of advanced materials with smart attributes and eco-friendly nature.



69.

[Room temperature operated PEDOT: PSS based flexible and disposable NO_2 Gas sensor]
A Beniwal, P Ganguly, R Gond, B Rawat… - IEEE Sensors Letters, 2023

Abstract
This work presents a flexible and disposable nitrogen dioxide (NO2) gas sensor based on Poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS), operating at room temperature (RT). The gas sensing layer, composed of PEDOT:PSS, is deposited on interdigitated electrodes (IDEs) made from graphene-carbon ink, which are screen printed onto a paper substrate using the drop casting method. The Fourier-transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM) analyses are carried out to understand the successful deposition and surface morphology analysis of the sensing layer. The NO2 sensing properties are explored in the range 0.5-50 ppm at RT (27 °C ± 2 °C). The sensor displays significant % response viz., 0.79%-12.97% in the measured range 0.5-50 ppm. Other important sensing characteristics, such as response and recovery times (210 s / 60 s at 0.5 ppm),

	repeatability, and reproducibility along with sensing mechanism are also presented. The findings of this letter suggest that the developed sensor holds promise for various application areas.
70.	RSMA for future generation multiple access: Challenges and opportunities SK Singh, S Bhattacharyya, … B Kumbhani, S Darshi - IEEE 17th International Conference on Industrial and Information Systems (ICIIS), 2023 **Abstract** Currently, the Rate Splitting Multiple Access (RSMA) scheme is gaining widespread attention as the most promising technique for multiple access in next-generation wireless communications. Its standout feature is the ability to support non-orthogonal transmission, making it increasingly popular for its interference-free transmission capabilities in highly diverse scenarios, which has been a critical bottleneck in existing access schemes. RSMA is considered to outperform its counterparts in terms of achievable rate and overall performance. This paper introduces RSMA and its system model along with its advantages over traditional schemes. It demonstrates the superiority in system performance as compared to orthogonal and non-orthogonal multiple access schemes. Additionally, we highlight the implementation challenges of RSMA and discuss future research opportunities in this direction.
71.	Selection methodology for additive manufacturing processes considering design, material, and manufacturability S Goala, P Sarkar - Rapid Prototyping Journal, 2023 **Abstract** Purpose One of the critical reasons for the nonacceptance of additive manufacturing (AM) processes is the lack of understanding and structured knowledge of design for additive manufacturing (DfAM). This paper aims to assist designers to select the appropriate AM technology for product development or redesign. Using the suggestion provided by the design assist tool, the user's design alterations depend on their ability to interpret the suggestion into the design without affecting the design's primary objective. Design/methodology/approach This research reports the development of a tool that evaluates the efficacy values for all seven major standard AM processes by considering design parameters, benchmark standards within the processes and their material efficacies. In this research, the tool provides analytical and visual approaches to suggestion and assistance. Seventeen design parameters and seven benchmarking standards are used to evaluate the proposed product and design quality value. The full factorial design approach has been used to evaluate the DfAM aspects, design quality and design complexity. Findings The outcome is evaluated by the product and design quality value, material suit and material-product-design (MPD) value proposed in this work for a comparative assessment of the AM processes for a design. The higher the MPD value, the better the process. The visual aspect of the evaluation uses spider diagrams, which are evaluated analytically to confirm the results' appropriateness with the proposed methodology. Originality/value The data used in the database is assumed to make the study comprehensive. The output aims to help opt for the best process out of the seven AM techniques for better and optimized manufacturing. This, as per the authors' knowledge, is not available yet.
72.	Separation of nanoplastics from synthetic and industrial wastewater using electrolysis-assisted flotation approach: A green approach for real-time contaminant mitigation

	VS Pawak, C Shekhar, VA Loganathan - Chemical Engineering Research and Design, 2023 **Abstract** Nanoplastics pose a significant global environmental concern, as they can accumulate emerging pollutants and enter the food chain, endangering human health and ecosystems. Wastewater treatment plants (WWTPs) have been identified as the primary source of micro and nanoplastic contamination, necessitating the development of effective removal methods. This study investigates the efficacy of electrolysis-assisted flotation (EF) process for removing nanoplastics from synthetic wastewater, using polystyrene-type nanoparticles synthesized from expanded polystyrene waste (EPS) as representative nanoplastic contaminants. Electrolysis experiments were conducted using parallel aluminium electrodes under low-voltage conditions. The study systematically explores the influence of various process parameters, including electrode spacing, salt concentration, nanoplastics concentration, and applied voltage, on the removal efficiency of nanoplastics. The removal efficiency was evaluated using a turbidity meter and dynamic light scattering technique. The derived count rate (DCR) obtained from dynamic light scattering supplements the nephelometric turbidity units (NTU) and provides a reliable estimate of the nanoplastics sample concentration. Under optimized conditions, with a specified electrolyte concentration and pH of 7.2 ± 0.3, the EF process achieved an impressive removal efficiency of nearly 95 % (94 % per DCR). A notable advantage of the proposed method is forming a foamy layer on top of the reactor when nanoplastics and coagulants are mixed, facilitating easy removal by simple scraping. This study provides valuable insights into developing an eco-friendly and sustainable approach for the large-scale removal of nanoplastics. The results contribute to advancing wastewater treatment strategies and addressing the pressing issue of nanoplastic pollution.
73.	Simulation and experimental energy absorption behavior of ABS-M30i-based three distinct lattice structures fabricated by polymer 3D printer AI Ansari, NA Sheikh, N Kumar - Journal of the Brazilian Society of Mechanical Sciences and Engineering, 2023 **Abstract** The extensive research on three-dimensional (3D) printed structures and their recent, fast improvements in crashworthiness served as inspiration. This study examines the effects of three distinct designs, i.e., the Honeycomb cubical structure, the Pyramidal Cubical Lattice, and the Double Ring Cubical Lattice (SC-DRL) structure fabricated by Acrylonitrile Butadiene Styrene (ABS-M30i) material and variations in the porosity of the structure on the crashworthiness and deformation of 3D-printed cubical structures under axial compression loads that are quasi-static in nature. The energy absorption capabilities of three distinct structures created using the 3D printing technology were assessed in order to determine their crashworthiness. By assessing a number of mechanical parameters, including maximum stress, maximum load, energy absorption capacity, etc, the outcomes demonstrate that the Double Ring Cubical Lattice has the maximum load bearing capability, while the other two structures have other mechanical properties advantages. Initially Finite Element Analysis models assess the deformation caused by compression effectiveness on three different lattices, and mechanical compressive testing then confirms the experimental results. The correlation-based digital image (DIC) approach was used to detect strain on the entire lattice surface. The results reveal that the strain behavior determined from the experimentation was approximate, proving the reliability of the DIC approach and indicating that the strain as well as plastic dissipation energy is not spread equally throughout each layer. Mechanical evaluation outcomes for the three design structures were compatible with the assumptions of the Gibson-Ashby model, and Gibson-Ashby equations were created to forecast the mechanical performance of three different types of lattice structures generated by FDM.
74.	Square Attacks on Reduced-Round FEA-1 and FEA-2

	AK Chauhan, A Kumar, SS Sanadhya - International Symposium on Stabilizing, Safety, and Security of Distributed Systems, 2023 **Abstract** FEA-1 and FEA-2 are the South Korean Format-Preserving Encryption (FPE) standards. In this paper, we discuss the security of FEA-1 and FEA-2 against the square attacks. More specifically, we present a three-round distinguishing attack against FEA-1 and FEA-2. The data complexity of this three-round distinguisher is 2828 plaintexts. We use this three-round distinguisher for key recovery against four rounds of FEA-1. The time complexity of this key recovery attacks is 2137.62137.6, for both 192-bit and 256-bit key sizes. In addition, we extend the three-round distinguisher to a five-round distinguisher for FEA-2 using the tweak schedule. We use this distinguisher to mount six round key recovery attack with complexity 2137.62137.6, for 192-bit and 256-bit key sizes.
75.	Study of EMI Shielding Performance of CNT-filled Epoxy Resin H Gupta, A Chauhan, PK Agnihotri… - 4th International Conference on High Voltage Engineering and Power Systems (ICHVEPS), 2023 **Abstract** With the increased demand for multifunctional carbon-based composite materials in the aeronautical industry, there is a need for developing advanced nanostructured composites with superior electrical and mechanical properties. Carbon nanotubes (CNT) are a viable filler ingredient for polymer-based nanocomposites because of their high aspect ratio and outstanding electrical conductivity. Electrical conductivity is a major factor in the feasibility of CNT-polymer-based nanocomposite for electromagnetic shielding. A material's ability to effectively block an electromagnetic field is measured by its shielding effectiveness (SE). The electromagnetic interference shielding effectiveness (EMI-SE) of CNT-epoxy nanocomposite in X-band (8–12 GHz) frequency is investigated experimentally in this work. The electrical conductivity of the nanocomposite is measured. The study is performed with different filler loading varying from 0.05 wt% to 3 wt%.
76.	Surface roughness characteristics of high–ductile thermo–mechanically treated steel rebar exposed to pitting corrosion and elevated temperature S Chauhan, S Muthulingam - Construction and Building Materials, 2023 **Abstract** Steel surface topography is critically impacted by pitting corrosion and elevated temperature exposure. The impacted surface topology could drastically reduce the mechanical performance of the steel, specifically concerning its fatigue behaviour. This study undertakes experimental investigations, including microstructural examinations, to explore the surface roughness characteristics of thermo–mechanically treated reinforcing bars subjected to pitting corrosion and elevated temperature. Variations in various surface roughness parameters such as amplitude, spacing, spatial and volume are reported. The study revealed that the surface roughness parameters varied significantly with increasing levels of pitting corrosion and exposure to elevated temperatures. Further, the microstructural examinations revealed the formation and growth of particles at rising temperatures that can promote initial fracture propagation at the steel sub–surface.
77.	Surface quality enhancement of warm incremental forming process using solid lubricant with varying etching period N Kumar, RK Upadhyay, A Agrawal - Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, 2023 **Abstract**

	The warm incremental forming process is an effective and flexible approach for forming magnesium alloy (AZ31B) sheets, which usually is difficult to deform at room temperature. However, friction increases drastically at elevated temperatures during the forming process. In order to reduce friction, liquid lubricants are generally applied on the sheet's surface; however, the liquid lubricant usually thins out during the warm incremental forming process. To address this problem, solid lubricants such as graphite and molybdenum disulfide have been used as better alternative lubricants for forming the parts at elevated temperatures. In addition, an increase in surface roughness, either by depositing porous film or by creating micro or nanostructures, can help better the surfaces' lubrication by solid lubricants. In this work, a facile etching method is used to treat a pre-formed sheet and solid lubricants to improve the surface quality and reduce the part's wear during the warm incremental forming process. The combined effect of the type of solid lubricant and etching time is studied in detail. The quality of the magnesium alloy sample and its morphology before and after the forming process has been examined using various characterization tools, including a surface roughness tester, a tribometer, and scanning electron microscopy (SEM). The results reveal that the magnesium alloy sample etched for 5 min and lubricated with graphite powder showed significantly low weight loss and better surface quality. Overall, the results revealed that the etching of samples could be highly beneficial for the warm incremental forming process.
78.	Switched Reluctance Motor Drive-train with Fully Integrated Battery Charger and Instantaneous Zero Charging Torque for Electric Transportation V Shah, S Payami - IEEE Transactions on Transportation Electrification, 2023 **Abstract** The article proposes an integrated converter (IC) with driving and battery charging features for electric vehicles (EVs) drive-train employing a 4-phase switched reluctance motor (SRM). The proposed IC allows flexible control over the DC link during drive mode, i.e., for motoring, it can boost the battery voltage, and during regenerative braking, it can maintain the battery charging profile. When the EV is standstill/idle, the proposed IC is reconfigured as an integrated single-phase battery charger incorporating two stages. The two-stage battery charger is comprehended by reconstructing the IC proposed into a bridgeless boost power factor correction (BB-PFC) circuit cascaded by a buck DC converter. The active inductors for the BB-PFC circuit are realized via the windings of the employed SRM. Moreover, charging operation is performed at appropriate rotor positions, which results in a net-zero charging torque (ZCT) from the phases reconfigured as inductors. The proposed reconfiguration of inductors allows eight novel rotor positions for charging within an electrical cycle to achieve ZCT with a maximum displacement of 3.75° mechanical for rotor in case any deviation from the charging rotor position. The efficacy of the proposed IC is shown by simulation and experimental verification.
79.	Thioacetamide-assisted crystallization of lead-free perovskite solar cells for improved efficiency and stability RS Bobba, N Narwal, … M Kumar… - Solar RRL, 2023 **Abstract** Perovskite solar cells (PSCs) have made great strides in recent years, operating inside the theoretical Scholkely-Quisser efficiency limit with a certified power conversion efficiency (PCE) of 26.1%. However, lead (Pb) toxicity from Pb-based PSCs can harm the environment. As a result, the search for nontoxic and environmentally friendly substances to replace Pb in perovskites is the need of the hour. Tin (Sn) has emerged as the most viable choice to replace Pb, due to its favorable electronic properties and smaller bandgaps of Sn-based perovskites between 1.1 and 1.4 eV, strong charge carrier mobility, and high theoretical efficiency of 32%. Sn vacancies and point defects, on the other hand, are easily produced in Sn perovskites, leading to non-radiative recombination. Furthermore, interfacial flaws and traps impede further performance improvement. In this research, to produce high-quality Pb-free perovskites for high

	performance PSCs, a Lewis-base thioacetamide (TAA) was added to the simple $FASnI_3$ perovskite solution. $FASnI_3$ and TAA additive-based films effectively controlled perovskite film crystallinity and grain size via Lewis acid-base reaction. The champion $FASnI_3$+TAA-based PSC achieved a maximum PCE of 10.67%, while paving a facile way for other compositional perovskite analogues to be integrated into highly efficient and operationally stable PSCs.
80.	Understanding calibration of deep neural networks for medical image classification AS Sambyal, U Niyaz, … DR Bathula - Computer Methods and Programs in Biomedicine, 2023 **Abstract** Background and Objective In the field of medical image analysis, achieving high accuracy is not enough; ensuring well-calibrated predictions is also crucial. Confidence scores of a deep neural network play a pivotal role in explainability by providing insights into the model's certainty, identifying cases that require attention, and establishing trust in its predictions. Consequently, the significance of a well-calibrated model becomes paramount in the medical imaging domain, where accurate and reliable predictions are of utmost importance. While there has been a significant effort towards training modern deep neural networks to achieve high accuracy on medical imaging tasks, model calibration and factors that affect it remain under-explored. Methods To address this, we conducted a comprehensive empirical study that explores model performance and calibration under different training regimes. We considered fully supervised training, which is the prevailing approach in the community, as well as rotation-based self-supervised method with and without transfer learning, across various datasets and architecture sizes. Multiple calibration metrics were employed to gain a holistic understanding of model calibration. Results Our study reveals that factors such as weight distributions and the similarity of learned representations correlate with the calibration trends observed in the models. Notably, models trained using rotation-based self-supervised pretrained regime exhibit significantly better calibration while achieving comparable or even superior performance compared to fully supervised models across different medical imaging datasets. Conclusion These findings shed light on the importance of model calibration in medical image analysis and highlight the benefits of incorporating self-supervised learning approach to improve both performance and calibration.
81.	Underwater image enhancement with phase transfer and attention Md R Khan, A Kulkarni, … S Murala - Proceedings of the International Joint Conference on Neural Networks, 2023 **Abstract** Underwater pictures typically suffer from substantial deterioration due to the refraction and absorption of light by water, including color cast, hazy blur, and limited visibility. Such degradation in visibility eventually reduces the effectiveness of marine applications installed on autonomous underwater vehicles. Hence, an efficient pre-processing step is required for the significant performance of these applications. As a solution, underwater image enhancement (UIE) mainly focuses on enhancing the visibility of degraded images along with restoring crucial details. Existing methods generally utilize (a) complex cascaded architectures, (b) different degradation-prone color spaces, and (c) direct skip connections that pass irrelevant content. In light of this, we propose a lightweight transformer network with 1.7M parameters (1/6th of the existing state-of-the-art method) consisting of the proposed gray-scale attention and phase

	transformer block for UIE. A gray-scale attention block is proposed for the effective extraction of non-contaminated features. Further, a phase transfer block is proposed for effectively restoring the structural information in the outputs by propagating most relevant and undegraded features from the inputs. A comprehensive evaluation of the proposed method on synthetic (EUVP, UIEB) and real-world (UIEB, UCCS) image datasets as well as extensive ablation studies confirm its effectiveness over existing state-of-the-art approaches. The source code is provided at: https://github.com/Mdraqibkhan/UIEPTA.
82.	Water quality index assessment of river Ganga at Haridwar stretch using multivariate statistical technique A Gani, S Pathak, A Hussain… - Molecular Biotechnology, 2023 **Abstract** The Ganges (Ganga) river contributes significant water resources for the ecology and economy, but it frequently encounters severe deterioration due to cumulative impact from upstream natural and anthropogenic variables. Knowledge and understanding of the dynamic behavior of such networks remain a significant challenge, particularly in the context of rising environmental pressures, such as climate change and industrialization, as well as constraints in both process and data understanding across geographies. An interdisciplinary approach is required to be developed to investigate the hydrogeochemical dynamics and anthropogenic sources influencing water quality in major river systems. The present study has been carried out to evaluate the characterization of river water quality in terms of the physico-chemical & bacteriological parameters. Also, the development of a water quality index (WQI) for Domestic (drinking) and Spiritual (bathing) usage is a part of the study. The water quality index has been developed using the Canadian Council of Ministers of the Environmental Water Quality Index (CCME WQI). The river's water quality index score in the present study lies in the range of 38.32 to 79.82, indicating the quality of water from fair to poor for drinking purposes. The highest water quality index value of 79.82 has been observed at Guru Kashnik Ghat, while the lowest WQI value of 38.32 has been observed at Har ki Pauri for drinking purposes. However, the water quality score for bathing purposes ranged from 71.04 to 91.22 thus signifying the quality of the water from fair to good for bathing purposes. The highest water quality index value of 91.22 has been assessed at Guru Kashnik Ghat, while the lowest WQI value of 71.04 has been assessed at Bhimgoda Barrage. The developed water indices assessment in the present study will be beneficial for society to provide a benchmark for the control of water pollution in River Ganga. These findings will support policymakers and stakeholders in addressing water quality issues in a more efficient and effective manner. The study also emphasizes the requirement for ongoing water quality monitoring and evaluation in order to guarantee the long-term well-being of the river and its ecosystems.