

NBC

NATIONAL BIOENGINEERING CONFERENCE

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Transdisciplinary approaches in biotechnology and medical engineering research

22nd and 23rd
DECEMBER 2022

HYBRID
MODE

NATIONAL INSTITUTE OF
TECHNOLOGY ROURKELA



souvenir

Organized by: Department of Biotechnology and Medical Engineering

in association with

Department of Mining Engineering, NIT Rourkela

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National Bioengineering Conference

Transdisciplinary approaches in biotechnology and medical engineering research

Chief Guest: Shri PM Prasad

Chairman-cum-Managing Director, Central Coalfields Limited, Ranchi

Guest of Honor: Dr. Srikant Kumar Sahu,
Director, L.V. Prasad Eye Hospital, Bhubaneshwar

Patron: Prof. K. Umamaheshwar Rao

Director, NIT Rourkela

Keynote Speakers

Shri PM Prasad

CMD, Central Coalfields Limited, Ranchi

Ir. Dr. Mohamed Sultan Mohamed Ali

Assoc. Prof., Universiti Teknologi Malaysia

Shri B Veera Reddy

Director (Technical) & Director (Marketing),
Coal India Limited, Kolkata

Prof. Alok Jain

Asst. Prof, Bioengg. and Biotechnology, BIT Mesra

Shri Kalasani Mohan Reddy

Director (Planning & Projects), NLC India
Limited, Chennai

Prof. Singam Jayanthu

Professor, Mining Engineering, NIT Rourkela

Prof. B Ravi

Institute Chair Professor, Mechanical
Engineering, IIT Bombay

Dr. Manisha Agarwal

MD (Radiology), JP Hospital, Rourkela

Dr. Srikant Kumar Sahu

Director, L.V. Prasad Eye Hospital,
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Rourkela

Prof. Singam Jayanthu, Professor, MN, NIT Rourkela



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- Ms. Ch. Jaya Gayatri
- Mr. Yugesh Ramdhun
- Ms. Aishwarya Swain
- Mr. Shreenandan Sahu
- Mr. Sandeep Kumar

PREFACE

Bioengineering conference is an annual event organized by the Department of Biotechnology and Medical Engineering at NIT Rourkela to bring together undergraduates, postgraduates, research scholars, researchers and stakeholders from various industries/organizations working in the area of bioengineering. To encourage Transdisciplinary, Translational, Industry-Oriented Research and Academic (**TTIORA**) activities in line with NEP 2020, this event is being organized in association with Department of Mining Engineering.

The theme of this year's conference is "*Transdisciplinary approaches in biotechnology and medical engineering research*". As we are aware, we are witnessing an important phase of technological development in the history, with a tremendous emphasis on the utility of the computational resources and sophisticated tools for solving problems of transdisciplinary interest in bioengineering. With an ever increasing knowledge and rising bandgap between the technological advancement and the lab-scale innovations there is a need for connecting the bridge between the two; preferably by means of translational innovations in integrating technologies and moving beyond the discipline-specific approaches.

The conference covers all topics in bioengineering, but not limited to, such as – Cell & Molecular Engineering, Tissue Engineering & Biomaterials, Bioprocess Engineering, Environmental & Plant Biotechnology, Biomechanics & Biotransport Engineering, and Medical Electronics & Instrumentation.

Above forty technical papers were received for oral and poster presentation at the conference from various institute/ industries across India and few from Abroad. Various institute or industries represented are; **Institutes outside India** - Department of Pediatrics, Department of Computer Science & Engineering; University of California; Stanford Online High School, Canada; Department of Management and Leadership, Management University of Africa, Nairobi; Radiation Laboratory, University of Notre Dame; and, School of Medicine, University of North Carolina; **Premiere institutes** - School of Medical Science and Technology, IIT Kharagpur; Department of Physics, National Institute of Technology Calicut; Birla Institute of Technology, Mesra; Centre for Materials for Electronics Technology, Panchwati; Dr. B R Ambedkar National Institute of Technology Jalandhar; including National Institute of Technology, Rourkela; **Universities** - Department of Life Sciences, Central University of Jharkhand, Ranchi; Veer Surendra Sai University of Technology, Burla; **Other institutes** - Department of Fish Biotechnology, ICAR-Central Institute of Fisheries Education, Versova; GEC, Sejbarah; Department of Bio–Technology, Koneru Lakshmaiah Education Foundation.

We are very grateful to the sponsors: Central Coalfields Limited (CCL) is the main sponsor for the event (including Conference Dinner) and Neyveli Lignite Corporation Limited (NLC) is the platinum sponsor. The conference is also supported by industries/ organizations – SISCO Research Laboratories, Community Welfare Society, Holmarc Opto-Mechatronics Ltd, and Sanmedico Pharmaceuticals, Rourkela.

Chairman
Prof. Kunal Pal

Convenors
Prof. Ravi Kant Avvari
Prof. Bala Chakravarthy Neelapu
Prof. Singam Jayanthu

NAVEEN PATNAIK
CHIEF MINISTER, ODISHA



LOKASEVA BHAVAN
BHUBANESWAR

M E S S A G E

I am glad to know that the Department of Biotechnology & Medical Engineering and Department of Mining Engineering of NIT Rourkela are organising a National Bioengineering Conference during 22-23 December 2022 on the theme "Trans disciplinary approaches in Biotechnology and Medical Engineering Research". A souvenir is also being brought out in commemoration.

As an emerging science, Bioengineering is coming of age having huge impact in agriculture, medical science and many other fields. It has the potential to change the face of technology applications in different fields providing huge opportunities for our industries and economy. I hope the conference will focus on latest applications in bioengineering and open new opportunities in this sector.

I extend my warm greeting to all the delegates and wish the event all success.

A handwritten signature in black ink, appearing to read "Naveen Patnaik".

(NAVEN PATNAIK)

Phone : { Office : 0674-2531100, 2531500, 2535100 (Fax)
Residence : 0674-2591099, 2590299, 2590833 (Fax)

e-mail : cmo@nic.in | twitter : twitter.com/CMO_Odisha | Facebook : facebook.com/CMO.Odisha



Message

It gives me immense pleasure to know that Department of Biotechnology and Medical Engineering and Department of Mining Engineering of NIT, Rourkela are organising a National Bioengineering Conference on the theme "**Transdisciplinary Approaches in Biotechnology and Medical Engineering Research**" on 22nd and 23rd December, 2022 and a Souvenir is being bought out to mark the occasion.

I think the National Bioengineering Conference-2022 will provide new age knowledge and skills in the fields of Biotechnology and Biomedical Engineering processional and researchers to help them globally compete.

I extend my good wishes to all the students, staff, faculty members, research scholars & organisers and wish the Conference and publication of the Souvenir all success.

(Hemant Sharma)



ODISHA STATE HIGHER EDUCATION COUNCIL (OSHEC)

Pustak Bhawan (2nd floor), A-11, Suka Vihar, Bhubaneswar-751022

oshec.hed@gmail.com

MESSAGE



It gives me immense pleasure to write a few words to express my best wishes for the National Bio Engineering Conference 2022 being organized by the Department of Bio Technology, NIT Rourkela during December 22-23, 2022. We all know the importance of bio engineering and technologies to the achievement of sustainability of human civilization on earth. As history illustrates, successive industrial revolutions as well as evolution of our civilisation have been continuously driven by science and technology innovations starting from the harnessing of thermal power, discovery of electromagnetics, the advancement in smart materials, immense contribution from advancement of electronics, computers, IT and the internet leading to the astounding revolutions in bio sciences and engineering at the sub cellular level. Today, the twenty first century innovations will perhaps be dominated by a coherent interdisciplinarity of physical, chemical, biological and computational technologies to achieve a finer understanding of the living world. It will be these empowered biotechnology tools that will help in making human civilization truly sustainable. It is in this context that the theme of this conference “Interdisciplinary approaches to in Bio engineering research” assumes great significance to all of us. The conference will provide a good platform for young researchers to learn from their learned peers, get inspired with new ideas and contribute to enrich the existing knowledge pool in this field. NIT Rourkela has an excellent history of outstanding research and I am sure, this conference will definitely be enriched by the NIT ecosystem. I take this opportunity to offer my best wishes for the success of the conference and appeal to the organisers to ensure efficient and effective interactions amongst young researchers. With best regards,

Asoka Kumar Das,

Vice Chairman, Odisha State Higher Education Council &
Chairman, Governing Board OUTR



INDIAN SOCIETY OF TECHNICAL EDUCATION ODISHA SECTION



MESSAGE

Prof Pravat Kumar Parhi

15.12.2022

Chairman, ISTE Odisha Section

It is indeed a great pleasure for me to learn that, Department of Biotechnology & Medical Engineering and Department of Mining Engg of NIT Rourkela are organising the National Bio Engineering Conference during 22nd-23rd Dec, 2022. This is really a great opportunity for the researchers, manufacturers, policy makers, regulatory authority, academicians, industries and the stake holders to meet in a common platform and deliberate their thoughts with mutual exchange of ideas.

Our country has made tremendous progress in the field of bio engineering in last one decade and we could face the COVID 19 challenges to develop vaccines and supply throughout the globe within a very short period. Hence, an interdisciplinary and social approach is very much essential for the discourse among the researchers, energy developers , consumers and the policy makers to drive forward for the welfare of the mankind and to meet the challenges in the field of bio engineering for future.

I take this opportunity to convey my warm wishes to the organising committee team and the Institute as a whole who have been instrumental in organising the Conference successfully. Also, I wish that, the conference will meet the objectives and the expectations of the delegates and the stake holders. I wish the Conference, a grand success.



A handwritten signature in blue ink, appearing to read "P K Parhi". Below the signature, the date "15.12.2022" is written in a smaller, handwritten style.

Prof P K Parhi

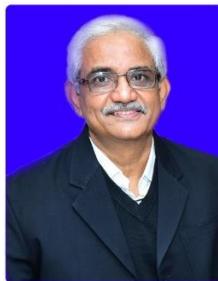


राष्ट्रीय प्रौद्योगिकी संस्थान, राउरकेला

National Institute of Technology Rourkela - 769 008

Prof. K. Umamaheshwar Rao
Director

प्रो: के. उमामहेश्वर राव
निदेशक



MESSAGE

It is extremely gratifying to note that the Department of Biotechnology & Medical Engineering in association with Department of Mining Engineering of our institute is organising the National Bioengineering Conference on "Transdisciplinary approaches in Biotechnology & Medical Engineering Research" during 22 - 23 Dec 2022.

After witnessing the pandemic, we are at an important juncture where the prospects of interdisciplinary research are being applied to best of our knowledge for solving problems in the field of sustainable development.

Organising such technical & scientific conference will go a long way in generating awareness, inspecting the level of alertness and to remind all concerned the importance of such services in the Bioengineering, Biomedical and mining industries.

I am sure that the efforts put in by organisers in this direction would fetch positive results, and open new vistas for better transdisciplinary and translational industry oriented research, academics, and health & safety applications.

I wish the conference a grand success.

K. Umamaheshwar Rao
DIRECTOR
National Institute of Technology
Rourkela - 769008 (ODISHA)



सेन्ट्रल कॉलफील्ड्स लिमिटेड
 (भारत सरकार का एक उपक्रम)
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 ईमेल / email : cmd@centralcoalfields.in, cmd ccl cil@coalindia.in
 वेबसाइट / Website : www.centralcoalfields.in



MESSAGE

With extreme delight, I appreciate the initiative of the Department of Biotechnology & Medical Engineering, in association with Department of Mining Engineering of NIT Rourkela, in organizing a two-day national conference on "Transdisciplinary approaches in Biotechnology & Medical Engineering Research" during 22 - 23 Dec 2022.

The challenges of any mining industry are the upkeep of safety of men, mines, machines and minimizing the adverse impact of mining operations on environment. With loss of natural habitat and increasing global warming, adaptation of sustainable and eco-friendly technologies should be ambitiously planned. There is an increased emphasis on biodiversity management and ecological restoration which are the two key areas in environmental policy. Besides productivity, this will increase safety and environment friendly mining, and I hope all these issues will be deliberated in this event by various experts.

In this context, I feel that the organization of such a collaborative conference with bioengineering and mining industry is praise worthy. The objective, lessons and experience drawn from the conference should be effectively implemented in elevating safety and environmental standards in the field of bioengineering and mining industry.

I wish the conference a huge success.


 (P.M. Prasad)
 17/12/2022

ओम प्रकाश सिंह
अध्यक्ष-सह-प्रबंध निदेशक
Om Prakash Singh
Chairman-cum-Managing Director



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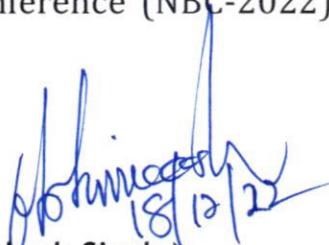


MESSAGE

I am pleased to learn that the Departments of Biotechnology & Medical Engineering and Mining Engineering of NIT Rourkela, are organizing a National Bioengineering Conference (NBC-2022), from 22-23rd Dec 2022 on the theme ***"Transdisciplinary approaches in biotechnology and medical engineering research."***

The NBC-2022 will bring together experts, researchers, scholars and students from all areas of biotechnology and medical engineering for interaction and collaboration and will provide an excellent platform for the dissemination of knowledge through presentations of recent developments and technology to various stakeholders.

On behalf of Mahanadi Coalfields Limited, I convey my best wishes to the Organizing Committee of the National Bioengineering Conference (NBC-2022) and impressive success of the conference.



(Om Prakash Singh)
Chairman-cum-Managing Director

MESSAGE



It gives me immense pleasure to know that Department of Biotechnology & Medical Engineering in association with Department of Mining Engineering of NIT Rourkela is conducting National Bioengineering Conference on “*Trans disciplinary approaches in Biotechnology & Medical Engineering Research*” during 22 - 23 Dec 2022.

I hope this conference will be instrumental in cultivating a positive attitude and continuous improvement amongst industry leaders, practicing mining engineers, regulators, academicians and researchers and will give them an opportunity to deliberate on the most recent innovations, trends, concerns and real challenges encountered and their solutions. I am hopeful that this conference shall be a collaborative platform by opening new avenues to exchange and share experiences and research results amongst the participants on all aspects of the health and environment.

I would like to extend my heartiest congratulations and best wishes to the organizers and participants for taking this initiative further to promote a learning culture in the industry.

I wish the conference a huge success.

Rakesh Kumar
Digitally signed by Rakesh Kumar
Date: 2022.12.20 11:17:04 +05'30'

RAKESH KUMAR
CHAIRMAN-CUM-MANAGING DIRECTOR

Date : 20.12.2022
Place : NEYVELI

Dr. B. Veera Reddy
Director (Technical)
Coal India Limited



It gives me great pleasure to learn that the Department of Biotechnology and Medical Engineering in association with Department of Mining Engineering, NIT Rourkela are organising National Bioengineering Conference with the Theme ‘Transdisciplinary approaches in biotechnology and medical engineering research’ from the 22nd to 23rd of December, 2022.

Our country is in the process of a major energy transition with its commitment to Paris Agreement, 2016 and further building upon our Hon'ble Prime Minister's Panchamrit pledge (five nectar elements) at COP26 in Glasgow. Coal India aims to accomplish this mainly through measures leading to reducing our carbon footprint and moving towards being a Net Zero Company.

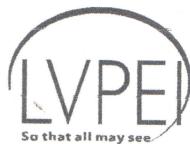
Occupational Health and Safety has always been the backbone of our endeavour to increase production and productivity. Mining being a traditional hazardous industry needs to always look for technological innovations to improve safety such as the application of IoT, Artificial Intelligence and Robotics.

The topics the conference covers these features and I am sure that it will suggest the way to move forward.

I wish the conference and its organisers all the best and am certain that it will be a grand success.



Director (Technical)
Coal India Limited



Hyderabad Eye Institute

(Operating Trust of L V Prasad Eye Institute)

I am privileged to be part of the team that paves the way in solving real-world problems encompassing both life sciences and engineering as featured in National Bioengineering Conference (NBC 2022) organized by the Department of Biotechnology and Medical Engineering in association with Department of Mining Engineering.

We are happy to have our association with NIT Rourkela through MoA on dry eyes research in the mining areas with the Department of Mining Engineering and Department of Biotechnology and Medical Engineering. I believe transdisciplinary approaches in biotechnology and medical engineering research which is the theme of the present conference provide great insight to the mining engineers and health professionals.

Wish you all the best for the future!

Dr. Srikant Kumar Sahu
Head of Campus
Mithu Tulsi Chanrai Campus
L V Prasad Eye Institute
Patia, Bhubaneswar 751 024
+91 94394 88888



VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY

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Website: www.vssut.ac.in

Prof. Banshidhar Majhi, Ph.D. (CSE)

Vice Chancellor

Dtaed: 18 December 2022

M E S S A G E

It gives me immense pleasure to learn that the *Department of Biotechnology and Medical Engineering in association with Department of Mining Engineering, NIT Rourkela* are organising National Bioengineering Conference with the Theme "**Transdisciplinary Approaches in Biotechnology and Medical Engineering Research**" during 22-23 December, 2022.

Today, the whole world is passing through a climate change and this is due to the rate of Carbon emission through Industrialisation and use of other fossils deposits to the atmosphere. Now it has become a challenge to reduce carbon footprints to save the mother earth with a vow to establish net zero emissions enterprises. Our country is in the process of a major energy transition with its commitment to Paris Agreement, 2016 and further building upon our Hon'ble Prime Minister's Panchamrit pledge.

The generation is also struggling through major health issues in human as well as in other animals. Hence, occupational Health and Safety has always been the backbone of our endeavour to increase production and productivity. Use of AI, Machine Learning, IOT, and Robotics are taking front seat for early detection of such health hazards.

The conference theme encompasses all these burning issues and talks by eminent scientists working in these niche areas. I am sure; the conference will bring out few resolutions to get away from these challenging issues.

I wish the conference a grand success and congratulate organising team for the endeavours.

Best wishes,

(Prof. B. Majhi)

ODISHA UNIVERSITY OF TECHNOLOGY AND RESEARCH

(Formerly College of Engineering & Technology, Bhubaneswar)

Techno Campus, Ghatikia, P.O.- Mahalaxmi Vihar

BHUBANESWAR-751029, ODISHA, INDIA

Prof. P.K. Patra
Officer on Special Duty

Ref. No. : 3938 /OUTR

Date : 15th Dec. 2022



MESSAGE

I am happy to know that National Bioengineering Conference is being organised on 22nd and 23rd Dec. 2022 at National Institute of Technology, Rourkela and I am also pleased to note that a Souvenir is being published on this occasion.

The National Bioengineering Conference (NBC 22) covers many topics in bioengineering, but not limited to such as Cell & Molecular Engineering, Tissue Engineering & Biomaterials, Bioprocess Engineering, Environmental & Plant Biotechnology, Biomechanics & Bio transport Engineering, and Medical Electronics of instrumentation, and few applications to mining industries.

Organising such Technical & Scientific conference will go a long way in generating awareness, checking the level of alertness and to remind all concerned the importance of such services in the Bioengineering, Biomedical and mining industries.

I am sure that the efforts put in by organisers in this direction would fetch positive results.

I wish the conference a grand success.



15/12/2022

OFFICER ON SPECIAL DUTY



MESSAGE

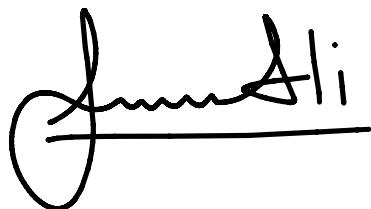
It is a great pleasure for me to participate and deliver a speech as distinguished speaker to the participants in the spirit of knowledge sharing and experience exchange in this event.

This conference represents an important part of National Institute of Technology Rourkela's commitment to provide a platform for all to maintain an active networking and productive collaborative alliances in future. It is my hope, and I am sure it is yours as well, that this NBC 2022 will bring us opportunities to share and to start a good professional relationship and networking, as well as possible research collaboration among all participants, and their institutions in future. I also hope that this conference will continue to be held to ensure continuity in the endeavour for excellence for all the NBC participants, committees, sponsors and all the collaborators involved.

I would like to acknowledge the organizing committee and hardworking team members for their relentless effort in successfully organizing NBC 2022. Special thanks to NIT Rourkela for hosting this conference. To all participants, kindly use this precious opportunity to your fullest and expand your network which may accelerate in building network in your research journey, and I sincerely hope that you will find the conference both valuable and enjoyable.

My very best wishes for an effective, successful, and productive conference.

Yours sincerely,



Mohamed Sultan Mohamed Ali, PhD, P.Eng
Associate Professor
Faculty of Electrical Engineering
Universiti Teknologi Malaysia



KEYNOTE ADDRESSES

**Keynote abstract #1****ENVIRONMENTAL ISSUES AND THEIR MITIGATION IN COAL MINING****P M Prasad**

CMD, CCL Ranchi

Coal in India is the dominant fuel as it is available in abundance and can be mined cheaply. It has potential to provide affordable power to the fastest growing major economy of the world - India. As per IEA India Energy Outlook – 2021 coal will remain mainstay for next 20-25 years. In 2015 the United Nations adopted "**The 2030 Agenda for Sustainable Development**" which provides a blueprint for peace and prosperity for the people and the planet. We recently celebrated the 7th anniversary of the United Nations SDG. At the heart of this agenda are the seventeen Sustainable Development Goals (SDGs) – ending poverty and hunger, ensuring good health and healthy life for all, provision of clean water and sanitation etc. The SDG 7 is about access to affordable, reliable, sustainable and modern energy for all. This sustainable development goal is one of the most important as it enables the achievement of many other sustainable development goals. Energy is the key input in pulling people out of poverty and raising their standard of living. CIL remains committed to promote sustainable development by protecting the environment by integrating project planning and design with pollution prevention/mitigation, natural resource conservation, ecology and biodiversity restoration, waste recycling/proper disposal, climate change mitigation and inclusive growth. The company recognizes the environment is an exhaustible resource.

Eco-friendly Technology has been adopted in a big way. Surface Miners, Continuous Miners, Longwall Miners and highwall miners have been introduced. Surface miners eliminate drilling and blasting, enable selective mining and provide crushed coal. Surface miners have found increasing use in CIL over the years. In FY 22, surface miners produced 312 MT coal (about 52 % of opencast coal production) in CIL. MCL is the leader in CIL as far as use of surface miners is concerned, with surface miners producing over 90 % of the total coal production. Elimination of first mile road transport for mines. The first mile connectivity projects not only reduce air pollution dramatically but also make mine operations safer. Under CIL's flagship 'First Mile Connectivity (FMC) Projects', 44 Projects have been identified for implementation in two phases which will increase the mechanized coal transportation and loading system. FMC Projects will help increase mechanized evacuation from the current 151 MTPA to 622.5 MTPA

The company has ambitious plan to become net zero with installation of 3 GW solar capacity in the next few years. As a result of emphasis on creation of railway infrastructure over the last three years, CIL has substantially increased its rail portfolio as a preferred mode of transport. More than 72% of our coal got transported through non-road mode (conveyor belt, MGR & railways) in the F.Y. 21-22. The multiple advantages of it were reduced traffic congestion, lesser road accidents and reduced impact on air quality post-coal production and before consumption/usage. Water management is a priority. CIL ensures that all mines have dedicated sumps with water harvesting structures and initial settling tanks for the removal of effluent waste. All opencast mines have commissioned effluent treatment plants to treat wastewater, gullies drains to collect runoff water and siltation ponds to settle sediments in mine water. The objective of CIL is to attempt maximum utilization of treated mine water



discharge for community use. In 2021-22, out of 6047 Lcum average mine water discharge, 2592 Lcum of mine water was utilized for own use (industrial & domestic) and 2825 Lcum was utilized for community supply (Domestic & Irrigation). The total utilized mine water was 90 % of total annual discharge and the remaining 10 % of the water was used for groundwater recharge. At regular intervals, the ambient air quality monitoring equipment tracks air pollutants at all locations. Sulphur Dioxide (SO₂), Nitrogen Oxides (NO_x), Particulate Matter (PM) and Suspended Particulate Matter (SPM) are some of the air emission parameters that are monitored. Emissions are within the norms prescribed by the regulatory authorities. We use mobile sprinklers, stationary sprinklers & fog canons on haul roads and other dust- generating sites in all its mines to effectively control dust. The blacktopping of highways, mandatory covering of coal transport vehicles, avenue plantations and afforestation of all unoccupied places are other priority areas. Biodiversity management and ecological restoration are two key priority areas in our environmental policy.

On reclaimed backfilled sites, settled overburden (OB) dumps, areas in and around mines, roadsides, townships, residential areas and suitable vacant spaces, intensive tree planting is undertaken as part of our commitment to maintain improve and conserve biodiversity and ecosystems. Furthermore, conservation strategies are prepared and implemented in line with the environmental clearance (EC) and forest clearance (FC) requirements to safeguard flora and fauna. The Satellite Surveillance study reveals that 76 major OCPs have reclaimed area of 63% and active mining area is limited to only 37 % of the total excavated area. Reclamation of the mined-out areas and the external OB dumps is a major environmental mitigation activity taken up. In all new mines reclamation of mined-out areas are being done as per the Environmental Management Plan and Mine Closure Plan which are approved by MoEF&CC. Concurrent reclamation and rehabilitation of minedout areas (subject to technical feasibility as per geo-mining conditions) are undertaken for gainful land use. Efficient production, pollution free transportation, efficient burning, scientific reclamation of mined out areas, large scale plantation, gasification of coal, adoption of Carbon dioxide capture and sequestration (CCS)and carbon capture, use and storage (CCUS)technologies etc. will result in green coal mining. High Efficiency Low Emission (HELE) power plants together with carbon capture, use and storage (CCUS) can be a pathway for to nearly zero emission from coal fired power plants.

These technologies ensure minimal environmental footprint and optimum coal production, minimizing the risks of contamination of soil, groundwater, minimizes emission of particulate matter and exhaust gases, subsequently increasing environmental and health aspects. We believe that with the implementation of innovative technologies, we could improve mining sector's economic and environmental performance simultaneously.

**Keynote Abstract #2****HEALTH AND SAFETY IN COAL MINES****B Veera Reddy**

Director (Tech), Coal India Ltd

It is indeed a great honor to be with you today at National Conference on “Transdisciplinary Approaches in Biotechnology and Medical Engineering Research” at NIT, Rourkela. The subject chosen for me today “Health and Safety in Coal mines”, is very close to my heart. I have, therefore, great pleasure in sharing with you some of my views on this subject.

Mining, being a traditionally hazardous operation is also a highly regulated industry due to presence of numerous inherent, operational and occupational hazards. Coal Mine Safety Legislation in India is one of the most comprehensive and extensive statutory framework for ensuring occupational health and safety (OHS). The operations in coalmines are regulated by the Mines Act -1952, the Mine Rules –1955, the Coal Mine Regulation-2017 and several other statutes framed there under. We have over the years reduced the accidents in mining through the reduction in the mine to man interface by moving towards safer opencast mining and also by the mechanization of operations of Underground Mines. This has stood us well in our endeavor to reduce the number of fatalities from the hundreds to the lower double digits.

However we cannot rest on our laurels and have to reduce this further to create conditions of ‘Zero Harm Potential’. The mining industry after moving through a long history of Prescriptive Legislation is now moving towards Self-regulation. This is through preparation of Safety Management Plans (SMPs). This all comprehensive document is based on Site-specific risk assessment. The process of risk assessment in mine is a continuous and on-going activity for improving the safety standards of mines. Preparation and implementation of SMPs are being by the teams at individual mines considering the conditions and the risks inherent to that mine only. Occupational Health and Safety has always been the backbone of our endeavour to increase production and productivity. We need to always look for technological innovations to improve safety such as the application of IoT, Artificial Intelligence and Robotics to mining.

**Keynote Abstract #3****CARBON FOOTPRINT-SEQUSTRATION OF CO2 TO OVERCOME CLIMATE CHANGE****K. Mohan Reddy**

Director (Planning & Projects), NLC India Limited

The term “carbon footprint” is often used as shorthand for the amount of carbon being emitted by an activity or organization. The carbon footprint is also an important component of the Ecological Footprint, since it is one competing demand for biologically productive space.

Carbon emissions from burning fossil fuel accumulate in the atmosphere if there is not enough biocapacity dedicated to absorb these emissions. Therefore, when the carbon footprint is reported within the context of the total Ecological Footprint, the tonnes of carbon dioxide emissions are expressed as the amount of productive land area required to sequester those carbon dioxide emissions. This tells us how much biocapacity is necessary to neutralize the emissions from burning fossil fuels.

Measuring the carbon footprint in land area does not imply that carbon sequestration is the sole solution to the carbon dilemma. It just shows how much biocapacity is needed to take care of our untreated carbon waste and avoid a carbon build-up in the atmosphere. Measuring it in this way enables us to address the climate change challenge in a holistic way that does not simply shift the burden from one natural system to another. In fact, the climate problem emerges because the planet does not have enough biocapacity to neutralize all the carbon dioxide from fossil fuel and provide for all other demands. Transitioning to renewable energy is one of the most powerful ways for a country to reduce its Ecological Footprint.

Many countries still have a long way to go on that front. NLC India Limited has been a forerunner in serving the Nation’s Power needs by adoption of enviro-friendly sustainable technologies in the Mining & Power generation sectors for more than 6 decades.

NLCIL a responsible corporate citizen has not only concentrated on the industrial activities but has also scrupulously followed the government’s directions in order to achieve sustainable development. In line with the government policies and to meet the National targets committed National Bioengineering Conference 2022 (NBC -2022) towards reduction of the Carbon emissions, a major stride towards establishing Renewable Energy has been taken up by NLCIL. This paper not only iterates the steps taken by NLCIL to overcome the CO₂ emission, but also portrays the emission control and various CO₂ capture technologies available to overcome the Climate change

**Keynote Abstract #4****COMBINING INTRIGUING COMPUTATIONAL APPROACHES TO DESIGN,
OPTIMIZE AND PREDICT THE BIOACTIVITY OF HIGHLY SELECTIVE AND
POTENT PKM2 MODULATORS****Alok Jain**

Department of Bioengineering and Biotechnology, Birla Institute of Technology Mesra, Ranchi-835215,
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Pyruvate Kinase M2 plays a critical role in cancer metastasis by switching to an inactive dimer that causes the accumulation of glycolytic metabolites, promoting tumorigenesis. Dimeric PKM2 has also been observed to undergo nuclear translocation promoting the transcription of various oncogenes. Researchers have designed various modulators targeting the PKM2 protein. However, these molecules are still at the preclinical stage of drug trials corresponding to the evident dearth of anticancer molecules targeting PKM2 which has gained importance among researchers to design potent modulators for combating tumor metastasis.

In this study, we have attempted to address the persisting dearth of PKM2 modulators using various computational approaches. In the first approach, boronic acid-based potent PKM2 activators were designed using the Scaffold Hopping strategy. MD simulation analysis was thoroughly performed on a few selected compounds which revealed a modulator capable of stabilizing the center of the dimeric interface that promotes PKM2 tetramerization. However, due to the limitations of the poor bioavailability of this compound, we designed a second set of compounds using the link and grow strategy. Novel imidazopyrimidines-based anticancer modulators were designed and the most potent modulator was selected for MD simulations. This molecule demonstrated optimum stabilization of the protein at the dimeric interface, conclusively assisting in the formation of a biologically active tetrameric conformation. In the third approach, knowledge-based drug discovery was employed to design a virtual library of palindromic and non-palindromic PKM2 activators by incorporating the knowledge of functional groups, rings, and any interesting structural feature present in the data set of experimentally known PKM2 activators. Palindromic activators were observed to show promising results in stabilizing the PKM2 protein's tetrameric conformation by substantially interacting with the symmetrical dimeric interface of the homotetrameric protein. Finally, to overcome the existing limitations in synthesis and biological evaluation of potential drug candidates, we have designed an AI-based model by utilizing molecular descriptors and testing various machine-learning algorithms. This model was used for predicting the bioactivity of novel computationally designed PKM2 modulators as potential anticancer molecules to control tumor metastasis.

Keynote Abstract #5**INDIGENOUS DEVELOPMENT OF AFFORDABLE MEDICAL DEVICES:
CHALLENGES AND BEST PRACTICES****Prof. B. Ravi**

Institute Chair Professor, Department of Mechanical Engineering, Biomedical Engineering & Technology
Innovation Centre Indian Institute of Technology Mumbai – 400076

Medical device innovation involves defining an unmet medical need (bedside), developing a novel product (bench), delivering a validated device (business) and deploying it in clinical practice (bedside).

Navigating the ‘valleys of death’ between idea, invention, innovation and impact requires an inter-disciplinary team. They need to have complementary expertise in medicine, biomaterials, design, electronics, mechanical, manufacturing, quality, public health, management and other fields. In the last few years, many R&D labs in academic and government institutes in India have demonstrated their capabilities in medical product development, publication, patent filing and partnering with industry. Still, there are very few examples of market success stories in terms of large scale social impact along with financial sustainability. In this talk, we will examine various challenges and best practices for translating research prototypes into commercially-viable products. These will be illustrated by success stories of novel medical devices such as smart stethoscope, diabetic foot screener, instant splint and prosthetic leg developed at BETIC labs in IIT Bombay and other institutes supported by various stakeholders.

**Keynote Abstract #6****“NECESSITY IS THE MOTHER OF INVENTION”, AN EYE SURGEON’S
PERSPECTIVE****Dr Srikant Sahu**

Director, L.V. Prasad Eye Hospital, Bhubaneshwar

Covid-19 has been very troublesome time for us never the less, it has taught as many lessons as a health care professional. We realized that many patients can't be offered to receive health care professional attention due to fear or immobility post Covid. We realized that certain people leave with it & still need medical attention. Medical equipments & personal are very expensive now-a-days. So we developed a system to address this problem.

We develop a homecare system - which carries Hospital to the door step. We designed a small box which can be carried in a small by eco-friendly electronic e-bike. The instruments are devised to check the anterior segment, intraocular pressure also the posterior segment. There is also a provision to take picture and connect to the ophthalmologist who is situated at the base hospital. This service was inaugurated by the Honorable Chief Minister Mr. Naveen Patnaik. Similarly, since then we were not been able to serve the elderly & in mobile people but also less needy people who can't travel to us.

Thereafter we developed: Advanced Hospital-based community urban eye health screening: A model for elimination of avoidable blindness on a sustainable basis. The program focuses on: Patients were screened by optometrists in the community, and given optical prescription and dispensed glasses to patient and clinical treatment on Real time tele-consultation through skype by Fellow Doctor whoever required medicines - whenever needed. Patients who needed specialized clinical or surgical treatment were referred to the hospital.

- To Evaluate Diseases of the eye, measurement of visual acuity, Anterior segment evaluated by advanced hand held modular slit lamp, Examine the cataract grading, primary Anterior Chamber Depth measure along with intra Intra-Ocular Pressure measurement by applanation tonometry – To monitor IOP to every patient. Take Un dilated Fundus Photo – Screening of Multiple retinal screening and Optic nerve diseases (Example – Retinal Condition like diabetic retinal changes cup to disc ratio for pre glaucoma screening and classification of blind)
- Android mobile phone Eye Smart EMR technology and its usage in eye healthcare System, including eye care finding documentation. One such example is patient demographic data, VA measurement, Anterior & Posterior segment finding
- Door-to-door survey in Slum area.
- Implementation of social marketing strategies to encourage target communities to access eye care services being provided by the hospitals.
- Monitoring and reporting

L. V. Prasad has been in fore front in inventions & encouraged start-up for solution faced in day to life to solve it and also engaged with IIT Hyderabad for a joint program.

**Keynote Abstract #7****IMPLANTABLE PRESSURE SENSOR AND SMART STENT FOR CORONARY
ARTERY DISEASE****Mohamed Sultan Mohamed Ali**

Universiti Teknologi Malaysia

Micromachined pressure sensors are one of the most commercially successful micro-electro-mechanical-systems (MEMS) devices that have been used in broad application areas including automobiles, aviation, consumer electronics and medical. The capacitive transducer, a major type of MEMS pressure sensors, has various advantages including high sensitivity, small temperature drift, low power consumption, and high immunity to packaging stress. In addition, capacitive pressure sensors can be easily applied to battery-less wireless sensing, by integrating them with miniaturized loop antennae to form inductor-capacitor (*LC*) resonators whose resonant frequencies can be inductively interrogated, eliminating the need of external cables for power supply and pressure signal transmission. Combining this feature with smart material for performing a specific task would be highly beneficial in implantable medical devices especially in cardiovascular area. In this talk, nitinol type active stent for non-invasive restenosis treatment, which operates using a radiofrequency (RF) electro-thermo-mechanical actuation technique for wireless revascularization and pressure sensing will be covered. The developed stent is equipped with capacitive pressure sensor for in-artery blood pressure measurement and can provide multiple expansion to restore the blood pressure flow. The device design, working principle, fabrication, and characterization of the nitinol active stent are reported in this work. The achievable wireless sensing and revascularization capabilities eradicate the necessity of reintervention and repeat stenting procedure, whereas real-time wireless monitoring provides rapid indication of in-artery re-narrowing occurrence.

**Keynote Abstract #8****SMART TECHNOLOGIES FOR FATIGUE MONITORING THROUGH
ARTIFICIAL INTELLIGENCE VIS-À-VIS IMPROVEMENT OF SAFETY IN
MINING INDUSTRY****Singam Jayanthu**

Professor, Mining Engineering Department, National Institute of Technology, Rourkela – 769008, Odisha

This paper presents some of the technologies (Artificial Intelligence and Machine learning) used to monitor and assess the fatigue levels of the work personnel working in various capacities as vehicle drivers, hauler/conveyor operators, pump operators, or any moving machinery operators etc both in underground as well as surface mining conditions in the Mining Industry. Although AI/ML algorithms can assist fatigue monitoring, true reasons can only be understood by using studies using technology like biomarkers. Adopting a huge fleet of machinery, with massive capacities of shovels and dumpers became quite common in the Mining Industry. Despite the technologies and methods, the human element plays an important role in maintaining the whole system safely and efficiently. manner. As most of the mining accidents are caused due to the operator's negligence / Heavy earthmoving machinery, there is a need to monitor the operator's efficiency, and alertness while operating the machinery. Drowsiness or sleepiness, and the accompanying physical and mental state of employees is one of the major factors contributing to accidents in the mining industry worldwide.

**Keynote Abstract #9****INTRODUCTION TO MRI: SEQUENCES AND ARTEFACTS IN BRIEF**

Dr. Manisha Agrawal

Consultant Radiologist, Jai Prakash Hospital, Rourkela

Due to the outstanding soft-tissue contrast and spatial resolution of its images, magnetic resonance imaging (MRI) is extensively used in neurological, musculoskeletal, and cardiovascular investigations. MRI is ideally suited for functional and metabolic studies because of its distinctive sensitivity to a variety of physiological and biological characteristics, including flow, chemical composition, and molecular arrangement. When choosing imaging parameters, there is a great deal of latitude; tissue contrast, image resolution, and anatomical coverage can all be tailored for a given application. With no limits on the orientation of the imaging volume, both 2D and 3D images can be created. Here, at Jaiprakash Hospital and Research Centre, MRI is extensively used for diagnostics such as tumor imaging, tissue damage and others.

Artifacts can occur with MRI just like they do with any other imaging technique. These occur as a result of the distortion of one or more of the presumptions that underlie the imaging principles. Multiple types of artefacts frequently appear together in an image. Artefacts are often categorised as patient-related, signal processing-dependent, or hardware (machine)-related, depending on their source. They can result in erroneous diagnoses and have detrimental impacts on the health and outcomes of patients. Particularly for those that mimic pathology, it's critical to recognise these artefacts and have a rudimentary grasp of their origin. Even well-designed protocols used with well-maintained and calibrated devices cannot completely eliminate artefacts, albeit some of them can be prevented by utilising proper scanning methodology. As a result, numerous correction techniques have been created to reduce or get rid of artefacts. In this paper, an overview of the most typical MRI artefacts are presented along with some solutions.



ABSTRACTS

**Abstract #1****SCREENING AND OPTIMIZED PRODUCTION OF BACTERIOCIN LIKE INHIBITORY SUBSTANCES****Kumari Chandrika, Ashish Sachan**

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Worldwide there is an extensive demand for antimicrobial compounds because of the high susceptibility of antibiotics to bactericidal agents. Bacteriocins are microbial proteins with antimicrobial properties that can act as antiviral, antifungal, or antibacterial agents. There are a few more advantages of bacteriocin over antibiotics it has both a narrow and wide range of antibacterial activity. They can both kill (bactericidal) or inhibit the growth (bacterio static) of pathogens. In this study, bacterial colonies were isolated from soil samples and morphologically different colonies were picked up and screened out to check the irresistance activity. The screening was carried out by agar well diffusion method to check the inhibitory activity of the selected bacterial strains against different disease causing multidrug/antibiotic resistance bacteria (*Staphylococcus aureus*, *Vibrio cholerae*, *Pseudomonas aeruginosa*, and *Escherichia coli*). The zone of inhibition caused by isolated bacterial strains on the lawn of the pathogens was measured. Antibiotic susceptibility or sensitivity tests were performed to examine the pathogenic resistivity against the antibiotic discs. Partial purification of crude bacteriocin was carried out by syringe filter or dialysis method. Nutritional and environmental parameters were optimized for enhanced production of bacteriocins. Further on, crude bacteriocin -like proteins were extracted with butanol. Thus, it can be concluded that along with the enhanced production of bacteriocin, partially purified crude bacteriocin protein exhibit a different range of antibacterial activity against above mentioned multi-drug resistant bacterial strains.

Abstract #2**PROTOTYPING HARDWARE DEVICE FOR RAPID GENE EXPRESSION MEASUREMENT****Sonalisa Pandey¹, Debasish Sahoo^{1, 2}**

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COVID-19 pandemic has galvanized the community for development of rapid diagnostic tests. Nucleic acid amplification tests (NAATs) are one of the popular techniques that enabled rapid diagnosis of COVID-19 virus mRNA at home. Understanding mRNA expression dynamics in human tissues are crucial for studying human diseases. Recent advances in NAAT technologies have enabled the possibility of measuring mRNA at home. In this paper, we propose prototyping methods of rapid mRNA expression measurement at home. We have successfully developed a prototype that quantifies mRNA as good as RT-PCR. This work will enable anyone in this world to be able to measure gene expression anywhere they want. This will accelerate scientific discovery worldwide.

Abstract #3**OPHTHALMOLOGIC SOUNDINGS IN NEURO-FEEDBACK****Jyotirmaya Satpathy¹, Ahalya Hejmadi², Lidija Weis³**

¹Department of Management and Leadership, Management University of Africa, Nairobi; ²Department of Behavioural Sciences & Psychology, University of Maryland; lobal Campus, Adelphi (USA); ³Ljubljana School of Business, Ljubljana, Slovenia

Business ‘decision - feedback sounding(s)’ thinking has biological basis. A paradigm for business leadership is emerging; a thinking business Leader who understands, develops, creates, engages and inspires. Business Leaders end conventional thinking, understanding how to engage and influence cerebral of others and help activate openness to new ideas. In this, Leader’s actions are transformed from results-orientation to relationship - orientation. Purpose of this monograph is to focus on role of neuro business to understand business leadership strategy. Objective is to display dynamics of neurobiological drivers in understanding behaviour. Aim is to exhibit empirical mosaics in ‘neuro trajectory feedback sounding(s)’ of ‘business’ decision circuit’. As regards methodology, monograph draws from business leadership and neuro business works to evaluate influence of cerebral in shaping communication, decision, negotiation and emotion regulation capacity directly connected with business strategy. Monograph runs experiment to deduce causal knowledge.

Methodology includes neuro – based opinions to imitate thinking of neurobiology in ‘business’ decision research. Based on comprehensive review of literatures, models and prototypes, eye tracking experiment was conducted to measure eye positions (Identifying fixations and saccades) and eye movement (geometry of stimulus). Results indicate that there exists a link between fixations, gaze and business decision -feedback sounding(s) thinking. Study exhibits key findings and explains how neuro apparatuses explore ‘business decision – feedback sounding(s)’ thinking through biological basis in prototyping decision –feedback sounding(s) thinking. Results exhibit monikers to engage in ‘business decision – feedback sounding(s)’ thinking using eye tracking techniques that business leadership decline at processing formation through activation of neuro components. Originality of monograph depicts impact of biological processes as significant element in business strategy. Activation of business decision – feedback sounding(s)’ thinking processes help to interpret decision-making styles and how cerebral response to strategic ‘business decision–feedback sounding(s)’ thinking

Abstract #4**BIOINSPIRED PHYTO FABRICATION OF Ag NANO PARTICLES USING CARICA PAPAYA FLOWEREXTRACT; APPLICATION AS POTENTIAL ANTI BACTERIAL****E. S. Harsha Haridas^{1*}, M. K. Ravi Varma¹, Goutam Kumar Chandra¹,
Susmita Bhattacharya²**

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Plant-based healthcare remedies have a grey history across worldwide since time immemorial. On the other hand nano-biotechnology; the combination of nanotechnology and biotechnology enhances and ensures the sustainable future of our environment to tackle the



hazardous side effects faced from pollution and toxicity. Here we introduce, for the first time, a toxicity-free highly stable Ag nanoparticles fabricated from phenolic content-rich Carica papaya flower extract(CPE). The biosynthesis of Ag NPs was visually confirmed by the appearance of brownish-yellow color and further verified by surface plasmons resonance at around 410nm within 5-10 minutes. The hydrodynamic diameter of the CPE- AgNPs was measured using a dynamic light scattering (DLS) mechanism that utilizes the Brownian movement of colloidal particles under the light. To identify the involvement of bioactive components in the reduction of Ag⁺ to Ag and the formation of Ag NPs was examined using Fourier Transform Infra-Red (FTIR) and Raman spectroscopy. Transmission electron microscopic analysis revealed that CPE-Ag nanoparticles are of the 10-50 nm size range. The high zeta potential values of CPE-Ag (-80 mV) ensure better stability and the energy dispersive spectral study confirmed the elemental composition. CPE-AgNPs were examined about their antibacterial activity against gram positive and gram negative bacterial strains. The larger value of zone of inhibition and smaller value of minimum inhibitory concentration of CPE-Ag NPs against bacterial strains proved the potential ability and applicability of such NPs towards biomedical field as an anti bacterial agent.

Abstract #5

DEVELOPMENT AND CHARACTERIZATION OF SILICA-KERATIN MICROBEADS FOR DRUG DELIVERY AND TISSUE ENGINEERING APPLICATION

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Recent developments in silica composite materials, particularly in nanotechnology approaches to create hybrid materials have been extensively exploited in research and industry. Porous silica-based materials are finding increasing applications as adsorbents, catalysts, medicinal agents, and most recently vaccines in nano medicine. Keratin, another polymer has excellent properties like large surface area, biodegradability, biocompatibility, facile functionalization to specific biological factors and physico-chemical properties which makes it a promising biomaterial for controlled and targeted drug administration. Combining these desirable properties of silica and keratin to form biomaterials is being exploited. Silica is mixed with keratin to form a hydrogel having the potential to form micro-beads which provides extensive cross-linking to enhance the strength of the material. In the current work, silica was obtained using rice husk and keratin was extracted from human hair. Alkaline extraction and acid precipitation was utilised to separate silica having least amount of mineral impurities from rice husk ash which was then used to prepare solution of sodium silicate. To this solution, concentrated HCl was added dropwise for the formation of silica-keratin hydrogel along with gluteraldehyde acting as a cross-linking agent. Keratin used was 5mg/ml to provide strength to the material which was extracted from human hair. For bead formation this silica gel was dropped in chloroform which is a non-polar solution. The beads were further characterized using FESEM for analysing structural morphology, FTIR and EDX spectra. Silica-keratin microbeads have size ranging from 0.5 to 1mm. These naturally



resourced silica-keratin microbeads have immense possibilities for drug delivery system and tissue engineering applications including substance absorption and desorption, kinetic drug component, absorption of oil and as a drying agent.

Abstract #6

DEVELOPMENT OF MOLECULAR MARKERS TO IDENTIFY CLARIASMAGUR X CLARIAS GARIEPINUS HYBRIDS

Amrita Mohanty, Aparna Chaudhari, A. Pavan Kumar, Gireesh Babu P., Dhalongsaih Reang

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Indian catfish *Clarias magur* is listed as endangered and the likely causes are natural habitat destruction, pollution and introduction of exotic species, especially the African catfish, *C. gariepinus*. The latter species is a voracious feeder and due to its fast growth has the potential to become established in the Indian water bodies. Considering its potential threat to the indigenous species, *C. gariepinus* has been banned for culture in India. However, there are incidences of intentional and unintentional occurrence of *C. magur* × *C. gariepinus* hybrids, which, if not managed, pose a risk of extinction of native species. Due to plasticity of morphological characteristics, DNA markers are considered better tools to distinguish between pure and hybrid species.

In this study, molecular markers like RFLP (Restriction fragment length polymorphism) and minisatellites were applied to distinguish pure species of *C. magur*, *C. gariepinus* and hybrids of *C. magur* × *C. gariepinus*. Initially, the pure species of both catfishes were identified by DNA barcoding and a single interspecific fish hybrids was produced (in the previous study) by crossing *C. magur* (dam) × *C. gariepinus* (sire). Mi-450 (*C. magur*), Mi-1300 (*C. gariepinus*) [minisatellite-33.5], S1-800 (*C. magur*), and S1-1000 (*C. gariepinus*) [ITS5.8S-ITS2] can be used to develop SCAR markers. Further, two genes, α tropomyosin and elongation factor 1α (EF-1α), were PCR amplified and sequenced from the genomes of both species. The hybrids showed bands similar to both the parents.

In silico PCR-RFLP was performed with 14 restriction enzymes, but AseI, DraI, MscI, SnaBI produced species-specific patterns. Hence, these fragments could also be developed into SCAR (Sequence characterised amplified regions) markers in future. The ‘ITS1-5.8S-ITS2’ region was also PCR amplified in both species, but sequencing results were obtained only for *C. magur*. The hypervariable minisatellite 33.15 primer generated species specific amplicons, Mi-450 in *magur* and Mi-1300 bp in *C. gariepinus*, which also amplified in the hybrid, but could not be sequenced. It can be concluded that species specific bands obtained by the various methods used in this study, in future can be developed into markers for distinguishing between parental species and the hybrid.

**Abstract #7****DECCELLULARIZED PLANT SCAFFOLDS FOR WOUND HEALING
APPLICATIONS**

Subhash Venkata Sai Varshapally, Borra Om Prakash, Yanamadala Ashwin Vijay Kumar, Anaparthi Shanmukha Priya, Sai Sri Aasritha Pedamallu, Tarun Agarwal

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Wound healing is a complex process which involves various factors such as the healing environment, microbial load, and therapeutic strategy opted. In the last decade, tissue engineered wound patches have undergone a significant advancement, aiming towards faster and scarless healing. In a particular reference, decellularized matrices or scaffolds are the current state of the art materials for the development of wound healing patches. These decellularized matrices could be derived either from animal or a plant source. Even though animal matrices promote faster healing of wounds, they are also associated with limitations such as low shelf life, antigenicity, and immunogenic responses. In this regard, plant-based scaffolds are being explored widely. In our study, we have selected plant waste samples and optimized the protocol for detergent-based decellularization. Further, these decellularized samples were tested for decellularization efficiency, morphological properties, and potential applicability for wound healing. We believe that these decellularized plant scaffolds could efficiently be translated for clinical usage in the near future.

Abstract #8**CALCIUM ALGINATE BEAD-BASED SCAFFOLDS FOR WOUND HEALING
APPLICATIONS**

Gadamsetty Jeevana Lakshmi Kumar, Ganta Ramcharan, Manas Tripurana, Tarun Agarwal, Kanishk Singh

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For scientists, it has been difficult to come up with viable treatment modalities for mending both acute and chronic wounds. Particularly, tissue engineering technologies have made significant contributions to this field. However, multi delivery of therapeutics, such as angiogenic and antibacterial agents, along with their spatiotemporal release is still difficult to regulate. In this context, we propose developing a calcium alginate bead-based scaffolds for wound healing applications. In such a system, each bead would serve as a depot for the drugs and their organization within the scaffold would allow us to control the drug release profile, supporting faster and effective healing process.

**Abstract #9****OPTIMIZATION OF EXTRACTION PROCESS OF KERATIN FROM HUMAN HAIR****Saksham Handa¹, Sunny Mukherjee^{1,2} and Mahesh Kumar Sah^{1*}**¹Department of Biotechnology, Dr. B R Ambedkar National Institute of Technology Jalandhar 144027, Punjab, India;²Department of Biomedical Engineering, Indian Institute of Technology, Hyderabad, Kandi, Sangareddy 502284, Telangana, India.

Naturally derived biomaterials are widely employed in tissue engineering and regenerative medicine in light of their biological role, structural support, excellent biocompatibility, and exemplary biodegradability. In this direction, keratin derived from animal sources and human hair have led to the development of keratin-based biomaterials for use in tissue regeneration. The present research attempt to optimize the extraction process of keratin from human hair. The collected human hair sample was subjected to washing, sterilization, delipidization followed by drying. Alkaline lysis of the sample was performed as a function of different time (2-20 hrs.) and temperature (40°, 60° & 80°C) combinations. The dissolved impurities were removed using centrifugation and dialysis of the crude keratin solution was performed. The purified keratin protein was characterized using FTIR-ATR, UV spectrophotometry, SDS-PAGE and XRD. Protein content per unit mL of solutions was estimated using the Lowry Method. From the results obtained, it was concluded that at high temperature and keeping the sample for prolonged lysis yielded no keratin due to the denaturation of the same. A time-temperature combination of 14 hrs. and 60°C gave the highest yield of about 39 mg/mL, preserving the structural integrity of the protein. The results of the FTIR-ATR study showed that the transmittance peaks were located at 1344, 1544, 1648, and 3314 cm⁻¹. Analyzing the sample using UV spectrophotometry showed that it had a maximum absorbance of 270 nm. Amorphous nature of the keratin was being demonstrated by XRD analysis with a broad peak adjacent to 20°. The SDS-PAGE revealed two bands of 37 and 49 kDa respectively. These findings provide fresh perspective on the process of keratin extraction from human hair, which has significant implications for the usage of keratin as a biomaterial for biomedical application

Abstract #10**EFFECT OF MULTIVALENT INTERACTIONS ON PROTEIN PHASESEPARATION****Sanchari Chakraborty¹, Mithun Biswas²**¹Department of Physics and Astronomy, National Institute of Technology, Rourkela, Odisha-769008, India;²Department of Physics and Astronomy, National Institute of Technology Rourkela, Odisha-769008, India;520PH1001@nitrk.ac.in

Phase separation is a process through which a solution of components spontaneously separates into two phases, a dense phase and a dilute phase, which then coexist. In recent years, there have been studies, both *in vitro* and *in vivo*, suggesting the involvement of phase separation in the formation of biomolecular condensates. Altered protein dynamics in biomolecular condensates is linked to neurodegenerative diseases. Previous studies show that multivalency of proteins, which is proportional to the number of interaction sites present on the protein, is a key determinant for phase separation. In this work, a minimal coarse grained



model representing a protein by a spherical bead with interacting sites on them, has been adopted to study the characteristics of phase separation. The beads are controlled by Brownian dynamics. The effects of varying valency, concentration of species, and Lennard Jones potential well-depth on the interaction of proteins have been studied. Results indicate how minor changes in the simulation parameters lead to modifications in phase change behaviour. This work will help us to understand how these multivalent protein species modulate phase separation within the cellular environment

Abstract #11

**FREE ENERGY CALCULATION OF PROTEIN-PROTEIN ASSOCIATION FROM
READDY SIMULATION**

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Exact calculation of binding free energies, which is the aim of many studies, of protein-protein association is still a formidable work. With increase in computational power, the calculation of free energy change in dimerization reactions become attainable from equilibrium simulations. A prolonged simulation of these type of reactions can have sufficiently many association and dissociation occurrences. Binding free energy of the dimerization reaction can then be obtained from the ratio of the number of frames they are in dimer state to that in the monomer state. In this work, two different simulation methods have been used. Molecular dynamics simulations performed using GROMACS and particle based simulation using ReaDDy. ReaDDy simulation has the ability of including reaction events with the dynamical trajectories of interacting particles. These events can include fusion, fission, decay, dissociation to name a few. Two particles A and B were considered undergoing the dimerization reaction. In GROMACS the dimer is characterized by a cut-off distance between the A and B particle, while in ReaDDy the dimerization reaction was defined with an arbitrary association and dissociation rate. Free energy calculations were performed using both dimer frequencies as well as radial distribution functions (RDFs). We compared the results from both the simulations. The calculations shows agreement between the ReaDDy and GROMACS simulations.

Abstract #12

**COMPARISON OF ALEXNET AND GOOGLENET CNN MODELS TO
DETECT OBSTRUCTIVE SLEEP APNEA USING SINGLE-CHANNEL
ELECTROCARDIOGRAM**

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Obstructive Sleep apnea (OSA) is a type of sleep disorder caused due to respiratory collapse during sleep. This sleep disorder generally being undiagnosed and neglected. Severe sleep apnea may cause arrhythmia, sudden death, high blood pressure, and other cardiac anomalies. Polysomnography (PSG) is the most popular gold standard used by many researchers to

detect OSA. PSG required a well-equipped sleep laboratory and skilled persons to record multi-channel signals to detect OSA. These two major reasons; first the severity of OSA is neglected and PSG being complex and expensive motivates us to conduct our research using single-channel ECG for the detection of sleep apnea. An automatic detection method of OSA using ECG in CNN takes less computing time as feature engineering does not require. This paper focuses on the automatic detection of OSA using ECG with two different deep convolution neural network architectures AlexNet and GoogLeNet transfer learning in deep convolution neural networks. Apnea-ECG dataset are used for evaluating the proposed model. The state of art using deep learning models is applied on single-channel ECG data. The results show that GoogLeNet performs better than AlexNet transfer learning. The network architecture of GoogLeNet is more complex than AlexNet but it achieves 100 % accuracy whereas AlexNet shows 99.7 % accuracy to detect OSA. The proposed work is applied on physionet sleep apnea online data only but it can be implemented further on the clinical data for its robustness.

Abstract #13

DEVELOPING AN AUTOMATED PROTOCOL FOR THE WRISTBAND EXTRACTION PROCESS USING OPENTRONS

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To better characterize the relationship between complex chemical exposures and disease, our laboratory uses an approach that combines low-cost, polydimethyl siloxane (silicone) wristband samplers that absorb many of the chemicals we are exposed to with untargeted high-resolution mass spectrometry (HRMS) to characterize 1000's of chemicals at a time. In studies with human populations, these wristbands can provide an important measure of our environment: however, there is a need to use this approach in large cohorts to study exposures associated with disease. To facilitate the use of silicone samplers in large scale population studies, the goal of this research project was to establish automated sample preparation methods that improve throughput, robustness, and scalability of analytical methods for silicone wristbands.

Using the Opentron OT2 automated liquid platform, which provides a low-cost and open source framework for automated pipetting, we created two separate workflows that translate the manual wristband preparation method to a fully automated protocol that requires minor intervention by the operator. These protocols include a sequence generation step, which defines the location of all plates and lab ware according to user-specified settings, and a transfer protocol that includes all necessary instrument parameters and instructions for automated solvent extraction of wristband samplers. These protocols were written in Python and uploaded to Github (<https://github.com/teikimm307/wristbandautomated>) for use by others in the research community. Results from this project show it is possible to establish automated and open source methods for preparation of silicone wristband samplers to support profiling of many environmental exposures. Ongoing studies include deployment in



longitudinal cohort studies to investigate the relationship between personal chemical exposure and disease.

Abstract #14

PROTEIN-PROTEIN ASSOCIATION REACTION STUDY ON GB1 PROTEIN DIMERIZATION

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Protein-protein association reaction is key to biological function of cells. To understand the physiological relevance of a protein associated state, conformational modifications leading to the protein aggregation needs to be determined. Several experimental and computational studies have been performed to estimate the mechanisms for protein homo association as well as for hetero association by determining the structural dynamics of the protein. The aggregated states of proteins are found to be crucial in regulating functions such as DNA binding, immune response, enzymatic reactions, signal transduction. However, any redundancy in protein association processes can trigger the formation of pathogenic structures. In this work, we are investigating the protein association reaction forming a homo dimer using Immunoglobulin-binding protein G of the B1 domain of the Streptococcus species as the model system with a computational approach. With the coarse grained molecular dynamic simulations, we use an enhanced sampling technique, called metadynamics that aids in facilitating the system to escape the local free energy minima traps easily. A replica exchange method, called parallel tempering is implemented with metadynamics in order to fasten the process of convergence of the free energy of the system, thereby leading to the formation of a stable conformation of the protein-protein complex.

Abstract #15

DON'T FORGET ABOUT ALZHEIMER'S: CAN NEUROPEPTIDES BE THE NEW THERAPEUTIC APPROACH?

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Alzheimer's disease (AD) is a progressive neurological disorder that involves loss of neurons and ultimately responsible for dementia (loss of memory and thinking abilities). The major histopathologic hallmarks of AD are extracellular amyloid plaques and intracellular neurofibrillary tangles formed due to uncontrolled aggregation of A β and Tau proteins, respectively. The Amyloid Precursor Protein (APP) is sequentially cleaved by β and γ secretase to form A β 1-42 fragment. It has been observed that aggregation of these fragments could injure the neurons and modulate synaptic transmission.

The existing AD therapeutics only provides symptomatic relief. In the recent decade peptide-based therapeutics have also been explored, but they show limitations in crossing the blood-brain barrier. One of the major symptoms of AD is disruption of the sleep-wake cycle, which is regulated by several sleep regulatory neuropeptides. Until today, very few studies have



explored the role of these sleep regulatory neuropeptides in AD. However, the precise cross-talk between A β and neuropeptides is not completely understood.

In the present study, inhibitory potency of a sleep-regulatory neuropeptide for A β aggregation was studied via molecular dynamics simulation which is a powerful tool to investigate the molecular mechanism in a dynamic environment. Our result demonstrated that in presence of neuropeptide A β aggregation significantly reduced compared to A β s in isolation. Further analysis exhibited marked reduction in the number of contacts between A β monomers (prominent interactions like hydrogen bonds are reduced by 60%). The A β aggregates are characterized by β -sheet secondary structure. Our result suggests that β -sheet forming propensity of A β s are reduced by more than 50% in the presence of neuropeptide. Various post-translational modifications (PTMs) in A β have shown to enhance the A β aggregation propensity. Currently, we are investigating the inhibitory effect of neuropeptide on A β -S8 (A β phosphorylated at serine-8 position).

Abstract #16

INTEGRATING DESIGN AND OPTIMIZATION OF POTENTSYMMETRIC ANTICANCERMOLECULES TARGETING PKM2 WITHINSIGHTS ON POST TRANSLATIONALMODIFICATIONS GOVERNINGITS STRUCTURAL DYNAMICS

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In proliferating tumor cells, the M2 isoform of Pyruvate Kinase is expressed as an inactive dimer over the active tetramer, causing a shift from the normal glycolytic pathway to achieve high energy and nutrient uptake. Dimeric PKM2 has also been observed to undergo nuclear translocation promoting transcription of various oncogenes. Researchers have designed various small-molecule activators targeting PKM2 activation, however, these molecules are still at the preclinical stage of drug trials. Also, there has been very limited research on the structural aspects of PKM2's dynamic regulation in dimeric and tetrameric forms governed by Post Translational Modifications (PTMs). In this study, knowledge-based drug discovery was utilized to determine the critical features from experimentally known PKM2 activators and design compounds that would significantly confer a stable structural and functional edge over the known compounds which are still at the preclinical stage. A virtual library of 200 palindromic and non-palindromic activators was designed to target a distinct activator binding site based on the identified critical features. All the virtually designed compounds were observed to confer high-binding affinities ranging from -15.0 to -9.1 kcal/mol to the receptor protein. These activators also demonstrated optimum pharmacokinetic and toxicity profiles. The best activators selected for MD simulations studies were conclusively observed to stabilize the required tetrameric conformation in the dynamic environment. We further performed MD simulation studies with dimeric and tetrameric PKM2 in presence and absence of PTMs to delineate the basis of the structural alterations affecting its functionality in these respective forms. The best designed activators will be monitored to investigate their effect on PKM2 comprising PTMs to unveil their potential in inhibiting tumor progression.

**Abstract #17****DEVELOPMENT OF A FRUGAL ANALYTICAL METHOD FOR SELECTIVE COLORIMETRIC DETECTION OF LEAD: A PROOF OF CONCEPT****Akashlina Basu and Soumen Das**

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Lead ions are known to be a big reason for chronic poisoning, especially in young children. Lead replaces calcium in the body by forming highly stable complexes and deposits in bone tissues. This can result in permanent neurological damage in young children and birth defects in fetuses. Commercial kits for testing lead from water are bulky, costly, and complex to use. Paper microfluidic devices can help in this regard by offering a frugal yet sensitive test for lead ions. In this work, a paper device was designed with hydrophobic boundaries to use a microliter volume of sample for confirmation of lead. For colorimetric estimation, sodium rhodizonate and acetic acid were used for the development of a pink complex on paper. This complex color intensity was analyzed using smartphone photography and Image J software was used for calibration curve estimation. The stability of the device was found to be suitable for real sample analysis. The Limit of Detection of the device was found to be as low as 10 mg/L with satisfactory specificity for lead ions. Thus, a frugal and sensitive sensor for the detection of heavy metal ions was developed

Abstract #18**A REVIEW ON APPLICATION OF QUANTUM GAME THEORETIC ANALYSIS TO REAL-WORLD PROBLEMS****Swati Singh**

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Quantization of various games is there. The significant contribution of quantum game theory counts as the resolution the dilemma that either multiple Nash equilibria calculated or different Pareto and Nash solutions in the theory of games. Overall efficiency increases by incrementing game payoff values.

Abstract #19**GREEN SYNTHESIS OF SILVER NANOPARTICLES FOR NANOBASED BIOASSAY FOR ALKALINE PHOSPHATASE****Vijaya Giramkar¹, Girish Phatak¹, Sushama Sabharwal²**

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Nanoparticles based assays are gaining importance as they offer rapid, sensitive and real-time methods for detection of biomolecules. Hence, considerable attention is being given to nano-based bioassay for detection and estimation of biomolecules. However, due to the widespread applications of alkaline phosphatases (ALP) in medicine, research and industry have a preference to this rapid, nanobased sensitive assay for detecting alkaline phosphatase activity.



Considering all these aspects; the need intended to a detect of alkaline phosphatases, a simple, cost effective nanobioassay using green synthesized silver nanoparticles has been developed for the detection of alkaline phosphatase. The assay is based on the protection conferred by the substrate Adenosine Triphosphate (ATP) (of alkalinephosphatase) against high salt concentration induced aggregation of silvernanoparticles. Green synthesised silver nanoparticles were used for the bioassay. Green syntheses of silver nanoparticles was carried out using a crude protein extract of Arachishypogaea seeds. AgNO₃ solution (0.1mM) was mixed with the crude protein extract (1:1 volume ratio) at room temperature with continuous stirring. The crude protein extracts acts both as a reducing agent in addition to a capping agent. The silver ions converts into silver nanoparticles did not involve use of anyhazardous chemical. The UV visible spectra of the yellow coloured solution of silver nanoparticles be confirmation for the characteristic absorbance at about 420nm. The differential light scanning (DLS)results confirmed the effective size of the nanoparticles to be ~80nm.

Abstract #20

ANALYZING THE PHYTOCHEMICAL POTENTIAL OF OCIMUM FOR WOUND HEALING APPLICATIONS

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Ocimumbasilicum belongs to the family of Lamiaceae, commonly known as Sweet Basilwhich possesses highly aromatic compounds aiding in scar reduction and post-wound healing activity. Studies reveal that the plant also contains health-promoting activities like antiviral, antihypertensive and anti-inflammatory properties. The present study aims to analyze the various phytochemicals and metabolites in the leaves of *O. basilicum*. The crude ethanol leaf extract from the *O. basilicum* was extracted using the Soxhlet apparatus. The extract was analyzed qualitatively for the presence of various phytochemicals. The folinciocalteu and aluminium chloride methods were used to quantify the extract's total amount of phenols and flavonoids. The result shows that the crude leaf extract of *O. basilicum* contains a significant amount of phenols and flavonoids. The leaf extract showed excellent antimicrobial properties in gram-positive and gram-negative bacteria by the well diffusion method. The 2,2-diphenyl-1picrylhydrazyl (DPPH) assay was performed to evaluate the extract's antioxidant activity. The results exhibited good antioxidant ability with an increase in the concentration of the extract. Overall, the crude ethanol leaf extract of *O. basilicum* showed significant antioxidant and antimicrobial activity and contained a good amount of phytochemicals that can potentially aid in wound healing activities. The extract can be incorporated into the biomaterials for wound dressing application.

**Abstract #21****ENVIRONMENTAL POLLUTION DUE TO MINE WASTES LEACHATE—AN APPRAISAL****Deepak Mishra¹, Rakhee Das², Singam Jayanthu³**

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This paper presents some issues of the evaluation of existing method of handling mine waste and offers improvements, as well as activities that may be done to address the problem as a whole. This information will be beneficial for mining waste management as well as future environmental activities. Mining and other important industrial activities are critical to a country's economic success. Ore mining is an environmental problem since both depleted deposits and operating mine sites leave a massive quantity of mine waste on the ground, causing environmental harm and posing a hazard to living species and human health. Mining operations generate massive volumes of solid waste, notably overburden and rejects. Mine tailing deposits provide a possible environmental issue due to the leaching of potentially hazardous compounds housed by a range of minerals contained in mine-waste products. The concentration of extract elements is controlled by a variety of geochemical and transfer processes, including mineral solubility, mineral composition, rates of water content, sulfide mineral oxidation, oxygen, and pH. Leachates by mining wastes overburden dumps have the potential to contaminate local water sources, especially ground water. It is critical to understand heavy metal dissolving behaviour in order to forecast long-term reactivity as well as the influence on surface, groundwater, and/or sediment. Due to the lack of valuation to mine operators, these wastes seem to be at high risk of being left in the open, where they might damage the soil sediments and water tables. In this study, the potential dangers of mining waste leachates as well as the ecological elements of mined restoration, are explored with a focus on preserving long-term viable vegetation on hazardous metal mine sites.

Abstract #22**VITAMIN-E ENCAPSULATED NANOEMULSIONS:
FORMULATION, RHEOLOGICAL AND ANTIMICROBIAL ANALYSIS****Veda Prakash¹, Lipika Parida²**

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Vitamin E is an important food ingredient that individuals ingest to help prevent numerous diseases. In food, pharmaceutical, and personal care applications, nano emulsions are widely used as delivery methods for a range of lipophilic active ingredients, such as oil-soluble vitamins. Both high energy and low energy methods are used to create nanoemulsions, however the latter have benefits in terms of low cost, greater energy efficiency, and simplicity of use. In this study, we developed vitamin-E containing nanoemulsions using the emulsion phase inversion (EPI) method and examined the physical and rheological properties of nanoemulsions produced at various stirring times ranging from 30 min to 110 min. The EPI technique consists of mixing an aqueous phase with an organic phase comprising oil and a surfactant. The droplet size, zeta potential and rheology of the



nanoemulsions were all measured. In the particle size test using dynamic light scattering, the droplet size of nanoemulsions was observed to be in the range of 141 nm to 177 nm and to follow a sequence: 110<90<70<50<30 min. At 110min the smallest droplet size 141 nm was obtained with a PDI of 0.234. Zeta potential of formulated nanoemulsions ranged from – 6.5mv to – 14.3 mv. The rheological properties of nanoemulsions revealed nonnewtonian flow behaviour. The antimicrobial test of nanoemulsions was examined with regard to E. Coli and S. aureus, and it was found that the emulsion showed resistance against S. Aureus.

Abstract #23

PIPERLONGUMINE, ITS PHARMACOLOGICAL RELEVANCE AND ANTICANCER POTENTIAL

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Piperlongumine is a naturally occurring biologically active alkaloid/amide phytochemical having high pharmacological relevance. Piperlongumine has several biological activities such as anti-inflammatory, anti-tumoural, anti-metastatic, anti angiogenic, anti-bacterial, anti-fungal, anti-diabetic and cytotoxic properties. Piperlongumine has been reported of showing selective cytotoxicity against multiple cancer cells of different 8piperlongumine through its targeting of multiple molecular mechanisms, such as cell cycl earrest, anti-angiogenesis, anti-invasive and anti metastasis pathways, autophagy pathways, and intrinsic apoptotic pathways in vitro and in vivo. Mechanistically, piperlongumine inhibits cancer growth by resulting in the accumulation of intracellular reactive oxygen species, decreasing glutathione and chromosomal damage, or modulating key regulatory proteins, including PI3K, AKT, mTOR, NF- κ B, STATs, and cyclin D1. Furthermore, combined treatment with piperlongumine potentiates the anticancer activity of conventional chemotherapeutics and overcomes resistance to chemo- and radio- therapy. Nanoformulation of piperlongumine has been associated with increased aqueous solubility and bioavailability and lower toxicity, thus enhancing therapeutic efficacy in both preclinical and clinical settings. This article focuses on the pharmaceutical relevance of piperlongumine, its toxicity, chemopreventive mechanisms, bioavailability and anticancer potential in different cancer cell lines.

Abstract #24

HUMAN MICRORNA MODULATES ITS GUT MICROBIOTA Silvash Prasad Mishra¹, Ravi Kant Avvari²

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MicroRNAs (miRNAs) play a crucial role in diseases, metabolic processes and immune system of the host. MiRNAs can be found in abundance in fecal samples of humans and are also present in extracellular fluid and extracellular vesicles. Some of the target-specific miRNAs in human tend to co-localize with the nucleic acid of the certain intestinal Bacteria and bring about impactful changes on the physiology of those bacteria. They can regulate the



non-coding RNAs in Bacterial species like Escherichia Coli and Fusobacterium Nucleatum by entering into the bacterial cell in the intestine. By repressing the activity of the noncoding RNAs of intestinal bacterial species, human miRNAs bring about the increase or decrease in population of gut microbiota. And hence, the host undergoes dysbiosis and becomes vulnerable to intestinal localization of pathogenic bacteria causing diseases like inflammatory bowel disease. With the usage of Bioinformatics tool, this study has deepened into interaction of human miRNA and bacterial non-coding RNA, and opens up a detailed way of analysis into interaction of host with its gut microbiome and how the interaction is responsible for diseases in host.

Abstract #25

A LOW-COST, PH-SENSITIVE COLORIMETRIC PAPER-BASED DEVICE FOR THE DETECTION OF UREA

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Long-term consumption of adulterated urea milk causes toxic effects on the kidney and gastrointestinal tract. Leakage of urea from agricultural land to water bodies leads to an imbalance in the water ecosystem. Such water intake may lead to serious health complications for humans and animals. Conventional methods of urea testing are costly and infrastructure dependent, making them unsuitable for day-to-day utilization for the masses. Therefore, we developed an affordable and portable paper-based colorimetric sensor to measure urea concentration in an aqueous solution. A laser printer was employed to fabricate paper devices. Experimental results showed that 8 minutes of reaction time is needed for the optimal reaction between urea and urease enzyme in the presence of a pH indicator. Statistical analysis revealed a strong negative correlation ($r = -0.99$) between the magentaintensity of the detection spot and urea concentration. This device exhibits linear behavior for urea concentration range:0 - 41.6 mM, with $R^2 = 0.98$. The sensitivity of the developed device is 2.8 a.u./mM with a limit of detection of 2.92 mM. The proposed device is easy to fabricate and use and has the potential to use as a low cost, disposable urea sensor, especially for initial screening purposes in resource-constrained settings.

Abstract #26

EFFECTS AND CONTROL MEASURES OF WATER POLLUTION IN OPENCAST COAL MINE - A CASE STUDY

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Mining activities often cause adverse impacts due to the pumping of mine water, siltation due to storm water contaminated water from workshops, and domestic wastewater. The impacts on water quality are due to mine seepage and wastewater from other mining activities. There are four main types of mining impacts for water pollution in mining sites i.e. 1. Acid Mine



Drainage 2. Heavy Metal Contamination & Leaching 3. Processing Chemicals Pollution and 4. Erosion and Sedimentation. Mining activities often deplete surface and groundwater supplies whereas groundwater withdrawals may also damage or destroy streamside habitat many miles from the actual mine site.

An opencast coal mine of Central India Coalfields is referred to here as a case study. The rated capacity of the mine is 1.5 MTPA of coal capacity with a project area of 223 ha. Fourteen nos. of coal horizons have been encountered during exploration with estimated balance mineable reserves of 18.48Mte. The monitoring of water quality was conducted by collecting water samples from groundwater, surface water, and mine water discharge/workshop discharge for the mine. The grab sampling method was adopted for the collection of ground water samples from hand-pump, waste water, and surface water samples from different sources of water bodies. The contents of different elements like Calcium, Magnesium, Cadmium, Copper, Arsenic, Lead, Mercury, Zinc, Iron, Manganese, Total Dissolved Solids, Cyanide, Selenium, etc. were assessed. One of the toxic elements i.e. Arsenic content in surface water and effluent water in the mine site is found to be 0.005 and 0.02 mg/L respectively. Some of the control measures also proposed for controlling the water pollution in this proposed opencast mine.

Abstract #27

NEED FOR BIOENGINEERING INNOVATIONS FOR ENVIRONMENTAL SUSTAINABILITY IN MINING INDUSTRY

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This paper presents bioengineering technological innovations and practices used in protecting environmental measures and its sustainability. Applications and advances in biological sciences, marker-assisted breeding of animals and plants using genetic markers are gaining momentum in today's world. Mineral extraction is essential for the mankind, and it is one of the industries associated with large scale excavation and disturbance of natural resources like land, plant and water etc. which will have greater influence on the ecological cycle of the system. Mining sustainability is crucial and necessary. Strategic planning and gradual transition needed for decarbonising the Indian economy towards achieving mission 2070 net zero commitment. There is need to adopt different bio-engineering methods, linking with reclamation procedures in the mining industry leads to sustainability.

Soil bioengineering of mined out land by improving of weathering resilience to restrict soil erosion. Soil bioengineering can also be used for improving the soil health for supporting the growth of vegetation in harsh mining environment contaminated and harsh mining environment.

Artificial soils can be prepared for land reclamation where natural top soil are not available, with the help of bio-engineered soil amendment methods. Genetically engineered plant species can be grown over shorter period of time in various soil conditions. Soil at the



reclamation site and genetically modified plant species can be mutually selected considering suitability parameters.

Abstract #28

HEALTH EFFECTS OF BLASTING OPERATIONS IN UNDERGROUND AND SURFACE EXCAVATIONS

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This paper presents overview of health issues and problems associated with blasting operations in underground and surface excavations. To meet the human needs, mining in both the forms underground and opencast mining is expanding by ever increasing the number of mines to meet the required mineral production. Even though long wall mining, continuous miners in underground mines, surface miners in opencast mines eliminate the drilling and blasting operations to excavate ores, this method of mineral production is minuscule percentage out of the total coal and all other mineral production. Hence irrespective of increasing of mechanisation in both underground and surface mines to get ever increasing demand of mineral production one of the important activity in mining is drilling and blasting operations. Apart from mineral production mining, drilling / blasting has been playing an important role to break the rocks in civil engineering applications such as tunnels and other infrastructure projects whenever there is a need to excavate the rock to pave the way for such infrastructure projects. Both in the mining and infrastructure projects, drilling and blasting is the cheapest method to excavate the rock.

Drilling and Blasting produces some adverse effects on the environment and personal working over there both in the mines and infrastructure projects. Health effects which may pose to the employees of the projects are dust related diseases such as Silicosis, Tuberculosis(TB), pneumoconiosis/coal miner's pneumoconiosis, headache, dizziness, asphyxiation affects due to excessive dust generation during drilling. Post blast dust and noxious fumes generation also cause adverse health problems. If the working personal are not protected by dust masks, noise related diseases such as ear impairment/hearing loss are caused. By continuous exposure to such excessive noise without using ear muffles, and also due to excessive air over pressure, if the blaster/shot firer and similar crew are not protected in proper shelter while blasting, then psychological fear may also happen due ground vibrations, air overpressure (AOP) to the nearby habitants. Therefore, in this paper, various health effects which may occur to the working personal due to drilling and blasting operations are presented based on practical experiences of the authors with more than 35 years of experiences in blasting for underground and surface excavations. By taking the proper safety precautions, control measures, by using necessary personal protective equipment the adverse effects can be minimised.

**Abstract #29****A GREENER APPROACH FOR METAL RECOVERY FROM ORES AND WASTE WITH MICROORGANISMS**

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Both the quantity and variety of metals required for industrial and household applications are higher now than at any time in human history. This need cannot be satisfied through recycling alone; thus, primary metal ore mining will remain an important sector for the foreseeable future. Recovery of metals from ores and waste by employing microorganisms is known as "bio-mining," a biotechnological process. The most important industrial use of bioleaching nowadays is in the processing of low-grade ores, and heap or dump/stockpile bioleaching already accounts for a sizeable fraction of global copper production.

Everything from mining to waste disposal and management can benefit from the inclusion of microorganisms. Some of these uses are already well-established commercially; for example, the biologically aided leaching of copper sulphide ores, uranium ores, and refractory sulphide gold ores. Nickel, cobalt, cadmium, and zinc sulphide leaching can be accomplished using several alternative bioleaching methods. This article provides an assessment of the global production of copper, gold, and other metals via bio-mining and chemical leaching (bio-/hydrometallurgy) in comparison to metal production via pyro-metallurgical processes, and it describes recent advances in bio-mining. In addition to an overview of the several microbially catalysed chemical processes suited for separating metals and specifics of published studies, results of many particular investigations from diverse research programmes are provided.

Abstract #30**Development of IOT Based Hybrid Type Water Treatment Methodology to Reduce the Hexavalent Chromium Concentration in Discharged Mine Water**

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The discharge of heavy metals from mining areas beyond the permissible limit causes serious pollution to the environment by contaminating nearby water sources as well as soil. In this regard chromium discharged from chromite mines poses a major health hazard in perspective of carcinogenic, genotoxic, and non-biodegradable characteristics. Adverse health effects associated with Cr (VI) exposure include occupational asthma, eye irritation and damage, perforated eardrums, respiratory irritation, kidney damage, liver damage, pulmonary congestion and edema, upper abdominal pain, nose irritation and damage, respiratory cancer, skin irritation, and erosion and discoloration of the teeth. Hexavalent chromium [Cr (VI)] is more toxic if inhaled or can enter the human body from drinking water sources. So it is imperative to build apposite treatment strategies for the hexavalent chromium keeping in view regulatory threshold limit (0.05mg/l). In this context, numerous methods such as solvent



extraction, adsorption using clay, activated carbon, biomass etc., electrochemical reduction as well as bioremediation have been successfully experimented worldwide. But the major problems are encountered during selection of appropriate technology in the respect of economic feasibility, efficacy of the system, volume of water to be handled and sustainability. In this paper, we discussed the chemical features and toxicity of Cr(VI) and all the possible methods that had been implemented effectively for eliminating Cr(VI) from contaminated water in mining areas. Accordingly an IOT based hybrid type water treatment procedure by integrating suitable combination of adsorption and biological processes is proposed which is expected to be fruitful for mitigating the harmful effects of the Cr (VI) contamination.

Abstract #31

EFFECT OF DRAG ON THE DRUG DELIVERY VEHICLES

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Drug delivery vehicles play a significant role in the treatment of tumors. The drug delivery vehicles are transported through blood vessels. Nanoparticles are widely used as drug carriers because of their size and shape. Excellent literature is available on the use of spherical particles as drug carriers. Many researchers used different shape nanoparticles in their studies like cylindrical, triangular, disks, ellipsoids, rods, and stars. The particle size and shape influence the behavior of particles movements inside the blood vessel, and when the fluid flow over a particle, the particle experience the drag force. So it is essential to study the drag coefficient on the particle. Many experiment are conducted by considering different size spherical particles flowing in the different fluids. The results show that the drag coefficient is a function of the Reynolds number and size of the particle. But when the particle shape is not spherical, the shape of the particle has equal importance with the size. The shape is also responsible for resistance experienced by the particle due to fluid flow. The present experimental results can be used to postulate the behavior of drug delivery nanoparticles by considering the non-dimensional factor-like diameter ratio and Reynolds number for drug delivery nanoparticles.

Abstract #32

GREEN GYP-RECYCLING OF GYPSUM WASTE FROM HEALTHCARE SECTOR: A POTENTIAL ENVIRONMENTAL AND INDUSTRIAL SOLUTION

Varun Khandelwal

Indian Institute of Technology, Jodhpur

The objective is to recycle the huge amount of gypsum waste produced from healthcare sector into a new reusable product with less negative environmental impacts. As per literature review each dental college produces approximately 100 kg of gypsum waste annually and there are approximately 300 dental colleges also adding around 3 lakh private dental clinics in India. So there is huge amount of gypsum waste generated, which is used as landfills. Such gypsum waste when acted upon by sulfa-genic bacteria produces hydrogen sulphide gas



which has long term effects on human body. Another harmful gas produce is methane which is also considered as a greenhouse gas. Hence, recycling gypsum waste can solve the problem.

Gypsum waste after disinfection, grounded to fine powder and heated in autoclave to convert calcium sulphate dehydrate to calcium sulphate hemihydrate. After the physical heat treatment modifiers can be added as per requirement. The tested samples of recycled Gypsum waste has the same mechanical properties as compared to virgin gypsum. The innovative concept can help us to build ‘Resource Efficient Economy’

Abstract #33

USE OF LEAVES AS BIOINDICATOR TO ASSESS SEASONAL VARIATION OF AIR POLLUTION BASED ON COMPOSITE PROXY MEASURE (APTI) IN MINING SITES AROUND BRAJRAJNAGAR OF JHARSUGUDA DISTRICT, ODISHA, INDIA

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Plants improve air quality by absorbing air pollutants on leaf surfaces. In turn they get affected negatively by the accumulation of these pollutants. These negative impacts make them indicators of pollution levels of that area. The present study provide an assessment of the use of biochemical parameters of trees as indicators (bioindicators) of air pollution and used for the seasonal variation of air quality in that area. Here different biochemical parameters of leaf like pH, relative water content, total chlorophyll and ascorbic acid of 7 different plants located near a mining area of were analyzed during winter, summer and post monsoon season. Study area selected was Brajrajnagar which is close to underground and open cast coal mining areas of Mahanadi Coalfields Limited (MCL). Plants selected are *Azadirachta indica*, *Buchanania lanzan*, *Butea monosperma*, *Calotropis gigantea*, *Holarrhena pubescens*, *Lantana Camara* and *Ziziphus jujuba*. Their air pollution tolerance index (APTI) values were computed as a measure of air pollution levels of that area. It was found that the pollution level mining sites is more during summer and winter seasons compared to post monsoon season. It is observed that in the post monsoon seasons, the atmosphere is relatively clean due to the precipitation effect of rain. In different studies, the values of SPM, SO₂ and NO₂ are found to be less as compare to winter and summer. The overall pollution level during winter season is more compared to that of summer season. Developing green belts near mining areas will be more effective in order to counter air pollution and its negative impacts.

**Abstract #34****APIGENIN AS PHYTOMEDICINE IN COLON CANCER: TARGET IDENTIFICATION AND VALIDATION****Arindam Sain, Dipshikha Khamrai, Debdut Naskar**

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Apigenin, a natural flavonoid has shown early promise in colon cancer (CC) by virtue of its anti-oxidant and anti-inflammatory properties. However, the molecular mechanisms of apigenin in CC is still pending. In the current study, we aimed to delineate the mode of action of apigenin in CC.

PharmMapper, Swiss Target Prediction, and STITCH were utilised to get the targets of apigenin whereas the CC-related targets were obtained through the Online Mendelian Inheritance in Man (OMIM), GeneCards, Therapeutic Target Database (TTD), and GenCLIP3 databases. The overlapping targets of apigenin and CC were identified and further subjected to Gene Ontology, KEGG, and Reactome pathway enrichment analyses to explore the relevant biological processes and enriched pathways. Protein-protein interaction (PPI) network was constructed via Cytoscape and MCODE algorithm was applied on the PPI to identify the hub targets. Finally, molecular docking was employed to validate the interactions between apigenin and the targets.

The Venn diagram revealed 49 CC-associated targets for apigenin and MCODE further identified the top-ranked highly interconnected region within the PPI network. MCODE genes are linked to several biological processes (e.g., cell death, oxidative stress) and enriched in different signalling pathways (e.g., gastric cancer, colorectal cancer) relevant to CC. AutoDock Vina analyses of the protein-ligand interactions revealed top 3 targets of apigenin to which apigenin binds with good binding affinities. Transcripts level expression of the key targets were checked through webserver and their relation to the overall survival of CC patients also investigated to aid in the future clinical application of apigenin.

This study successfully identified 3 key targets of apigenin in CC (Matrix metalloproteinase-9, Heat shock protein HSP 90-alpha, Prostaglandin G/H synthase 2) and provides novel insights into apigenin action in CC, subjected to further *in vitro* and *in vivo* validation.

Abstract #35**DNA VACCINES TO COMBAT COVID-19****Ashutosh Rath¹, Sampratikshya Das², Isha Biswas¹**

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The epidemic evolution in India is quite complex owing to high population density and regional variability. The explosive spread of omicron variant has already started to threaten the current Covid-19 treatments. We are looking at DNA Vaccines which seems promising for rapidly immunizing populations, especially in resource-limited settings. DNA Vaccines elicits both humoral and cellular immune responses while showing relevant advantages regarding producibility, stability, and storage. DNA vaccines are based on bacterial plasmids



that encode vaccine antigens driven by efficient eukaryotic promoters. DNA vaccines are safe, easy, affordable to produce & are stable at room temperature too. India recently approved world's first DNA Covid vaccine Zydus Cadila as well. DNA vaccines use small, circular DNA molecules, called plasmids, to introduce a gene from a bacterium or virus to trigger an immune response. ZyCoV-D uses plasmids that contain genetic information, to deliver the jab between two layers of the skin. The plasmid enters the cell nucleus after crossing the nuclear membrane & cytoplasm. Enzymes in the nucleus convert the viral or bacterial gene that the plasmid carries into messenger RNA (mRNA) by process of transcription and this mRNA moves back to cytoplasm. In cytoplasm, translation occurs & this mRNA is converted to viral protein. The immune system of host human body will identify the viral protein as a foreign body and elicits an immune response. DNA Vaccination will cause this immune cells to form and these memory immune cells will provide continued immunity against noble coronavirus and mutated omicron strain. The great advantage of DNA vaccine development is the short time required from the design to clinical trials. Therefore, it may be soon possible to test together, in the same vaccine, different variants of antigens that cover circulating mutations just like OMICRON emerged off late. This would represent a major step forward in vaccine development against rapidly emerging threats such as the current SARS-CoV-2 pandemic.

Abstract #36

TISSUE ENGINEERING SCAFFOLDING APPROACHES AND RECENT ADVANCEMENTS IN BIOMATERIALS FOR 3D SCAFFOLDS: A REVIEW

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Effective tactics for customizing bioinspired biocompatible structures have been assessed, considering the benefits and drawbacks of biomaterials used during the fabrication of 3D implant materials for tissue engineering. Bioengineering and the regenerative medicine domain have made significant investments in the regeneration and redevelopment of pathologically modified cells/tissues such as cartilaginous, skeletal, skin, vascular grafts, nerve cells and joint capsules, and several others over the last couple of decades. 3-dimensional constructed scaffolds and hydrogels, either alone or in combination with biologically active compounds, genes, and cells, can facilitate the creation of operational engineered tissues and provide mechanical stability during *in vivo* transplantation. naturally produced and synthetic polymers, biocompatible and biodegradable inorganic materials, and corresponding hybrids, and decellularized tissue have been recognized as scaffolding biomaterials. We provide a comprehensive overview of the current advancements in the innovation of single - stranded (metal, ceramic, and polymer) and composite-type scaffolds that, in terms of mechanical assistance, encourage simultaneous tissue regeneration and produce biomolecules (cell growth, cytokines, biocompatible ions, genome, drugs, antibiotics, and so on) or tissue with therapeutic or promoting healing effects. The article concentrates briefly on various 3D bioprinting structures and the barriers they face. *In vitro* and *in vivo* effects stimulated by conceptual and biotechnological bifunctional biomaterials are proposed methodology on their implementation in hard and soft tissue engineering. The



article describes the long-term prospects for biocompatible scaffold advancement, which could lay the foundations for their successful execution in clinical therapy.

Abstract #37

COVID-19 PREDICTIVE ANALYSIS USING MACHINE LEARNING

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The COVID-19 outbreak has been a pandemic since 11 March 2020. A total of about 5.3 million deaths worldwide pertaining to COVID-19 was reported as of December 2021. One of the limiting factors in effectively controlling the outbreaks of COVID-19 has been the unavailability of fast and reliable COVID-19 tests. In the absence of a cure, the only way to deal with COVID-19 has been to test in large numbers and contain the virus before it spreads in the community. Traditional tests like RT-PCR (slow and accurate) and Rapid Antigen (fast and less accurate) leave a gap. We need tests that are fast and accurate. Also, testing facilities get quickly overwhelmed during a high number of infections. In this situation it is beneficial if other supplemental tests can be done for COVID, which can decrease the workload on the traditional COVID tests. We use data released by Brazil's government in 2020, consisting of hospitalization records of COVID-19 patients, to find correlation between COVID-19 positivity and various medical tests. We report that a high correlation is found between the various parameters of blood test (CBC) and COVID-19 positivity. Further, a machine learning model is trained on this dataset, resulting in a F1 score of 82.29%. The findings indicate that the above-mentioned tests are suitable for augmenting traditional covid tests, especially when the traditional medical infrastructure is over-burdened

Abstract #38

CATARACT DISEASE DETECTION AND CLASSIFICATION USING RETINAL IMAGE MODEL

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Cataract is one of the leading causes of blindness, especially among the elderly. According to WHO/NPCB surveys, India has approximately 12 million blind persons, with cataract accounting for 80.1 percent of those cases. Therefore detecting a cataract in the early stage is a very important as well as difficult task. There are different types of image models currently being used by researchers for problems related to eye. The utilization of five different imaging modalities specifically for automated cataract detection is presented. More focus is given to the retinal images for the cause of cataract detection as it is considered better for extraction of features like lesion, blood vessels, optic disc, fovea, and macula. Detecting these features accurately can solve many problems related to eye disease including automatic cataract detection and grading. In this paper we explore the potential of different retinal imaging methodologies currently employed by many of the researchers along with their advantages and disadvantages. Through the research an automated approach for segmenting retinal images has been developed. The segmentation is achieved by an iterative region



expanding approach that merges the contents of numerous binary images produced by vessel width dependent morphological filters. Finally experimental results and evaluation of the proposed work is shown which gives promising results.

Abstract #39

ESTIMATION OF FETAL ANS RESPONSE TO LABOR USING SPECTRAL ANALYSIS

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In obstetrics, the fetal heart rate and its variability in response to the labor stress is recorded using cardiotocography (CTG). Due to the contraction of uterine muscles the fetus experiences uteroplacental insufficiency and when prolonged results in fetal distress. In order to compensate for this stress fetal autonomic nervous system results in fetal heart rate variability (FHRV). The change in the fetal heart rate (FHR) is controlled by the sympathetic and parasympathetic activation of the vagus nerve.

The present study focusses on the spectral analysis of the FHR traces that categorizes the frequencies responsible for long and short term FHRV. Low and high frequency bands provide clinically significant information about the balance between sympathetic and parasympathetic nervous systems in fetus known as Sympatho-vagal balance (SVB). An algorithm is developed in MATLAB to perform spectral analysis of FHR signal and derive the SVB parameter.

Mathematically, SVB is calculated by dividing power of low-frequency (LF) components with the power of the high-frequency components present in FHR signal. The spectral domain parameters that are taken into consideration include low frequency and high frequency band widths, standard deviations and SVB. The values of LF and HF bandwidths are 0.05–0.2 Hz and 0.2–1Hz respectively. The values of SVB parameter was found to be within 2-7. Low frequency components are associated with sympathetic activity while high frequency components are associated with respiratory activity and vagal stimulation.

As the clinical interpretation of the FHR signal by obstetric staff during labor assess only fetal cardiac activity such analysis can help the diagnosis and understand the fetal neuronal health also. Hence spectral domain analysis of FHRV on a beat-to-beat basis can show promising results in the fetal surveillance and overall assessment of fetus health during intrapartum.

Abstract #40

MEDICAL DEVICE DEVELOPMENT POST COVID ERA

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The COVID-19 pandemic has indeed caused a rapid decline in the economic growth of the world by rendering a lot of people jobless. During the pandemic, the management of critical patients in Intensive Care Units (ICUs) was the major challenge, faced by the health care



professionals. Recently contactless or contact free services have brought a lot of opportunities in the health care industry post pandemic period which includes telemedicine, telecommuting and mobile transactions. As direct person-to-person contact is avoided, purchasing behaviours of people have also seen a lot of transition. Thus the pandemic has accelerated the digitalization of various applications in many fields in medicine which includes self-diagnosis app services, digital tracking of confirmed cases etc., As far as recent developments in medical device development is concerned, many biomedical applications of advanced Information and Communication Technologies (ICTs) such as Artificial Intelligence (AI), Internet of Things (IoTs), 3D Printing, Smart Sensors, Robots and Drones have provided contactless services. Despite these advancements the challenges that are faced by the medical device manufacturing industry are regulatory complications, high health care costs, and slow expensive R&D.

Abstract #41

THE MINE WATER ANALYSIS OF COAL BEARING STRATA OF SUTUNGA COALFIELD OF EAST JAINTIA HILLS OF MEGHALAYA, NORTHEAST INDIA

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The mine water of coal bearing strata of Sutunga coalfield of East Jaintia Hills of Meghalaya studied in detail. Altogether 15 water samples of different coal mines were analysed and found that the water is highly acidic. The other parameters studied were conductivity and TDS. The heavy metals present are Pb, Cu, Fe, Cd, Ca, Mg, Selenium etc. which shows that the water is unsafe for drinking and other domestic uses. The coal belongs to the Lakadong Sandstone Member of Shella Formation of Jaintia Group of Eocene age. The studied sample collected from the 5 different mines of the area where the water were released from the rat-home mining.

Abstract #42

ALUMINUM OXIDE NANOPARTICLE-INDUCED FREE RADICALS AND CAUSED OXIDATIVE STRESS IN *DROSOPHILA MELANOGASTER*

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Nanoparticles (NPs) are of great scientific interest due to their wide application in medicine. Besides their wide application, the toxicity of these nanoparticles cannot be neglected. We have taken *Drosophila melanogaster* as a model organism to study the toxicity of aluminum oxide (Al_2O_3) NPs. Different concentrations of Al_2O_3 NPs (50, 100, 200, and 400 $\mu\text{g/mL}$) were fed to the first instar larvae. The toxic properties were examined in the late 3rd instar larvae and adults by measuring several histological, biochemicals, and behavioral parameters. The results achieved after treatment suggest that different concentrations of NPs increase abnormal larval behavior. The DAPI staining of the larval gut suggests DNA damage in the treated larvae. DCFDA staining showed internal ROS formation. The antioxidants enzymes such as superoxide dismutase (SOD) and catalase (CAT) were found to be increased, while



decreased glutathione peroxidase (GPx) activity was observed. The elevated ROS level and decreased SOD and CAT were also observed in adults hatched from the treated pupa. From all the above results, we did not observe any phenotypic defect in the treated flies. Hence, we have suggesting that the Al₂O₃ NPs have cytotoxic effects without genotoxic effects.

Abstract #43

STRUCTURAL MODIFICATION OF GHOST GRASSHOPPER (*AULARCHES MILIARIS*) WING AND ITS BACTERICIDAL ACTIVITY

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Antibacterial resistance has become a global threat due to the high mutation rate in the genetic materials of the different bacterial strains. To solve this problem antibacterial surface of the insect wing is emerging as a novel material for developing nanostructured materials for medical devices. The biochemical interaction between the bacteria and the wing's nanostructure leads to the bacteria's adherence at the surface, followed by its death. The bactericidal activity is caused by cell deformation or membrane lysis at the wing's surface. The roughness of the surface, nano-architecture, and chemical organisation are crucial factors that prevent bacterial colonisation on the wing's surface. Insects have better-adapted wing structures, which helps them avoid microbial infections and tolerate environmental stress. Insects, specifically grasshoppers, show well-adapted structural modifications in their wing pattern. The bacteria's morphology change was observed under the scanning electron microscope, and cell death has confirmed by DAPI/PI staining visualised under a confocal laser scanning microscope. The nanostructure present on the surface was visualised under a scanning electron microscope. The chemical composition, crystallographic structure, and hydrophobicity of the surface were studied by using FTIR, XRD, Raman Spectroscopy, and Drop Shape Analyzer. This work gives a basic idea about designing surfaces by mimicking the wing's surface for medical applications.

Abstract #44

**A TOXICITY ASSESSMENT OF DIETARY SALT SODIUM CHLORIDE (NaCl)
BY USING *DROSOPHILA MELANOGASTER* AS A MODEL ORGANISM**

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Salt at higher concentrations causes a deleterious effect on our physiological system. The effect of salt is quite controversial. Thus, a thorough investigation is needed to check the toxic effect of salt using a model organism. *Drosophila melanogaster*, a well-studied model, is chosen to study the toxicity of salt. *Drosophila* can sense and tolerate different concentrations of salt. It can maintain osmoregulation and a healthy developmental cycle in a wide range of salt concentrations. However, the physiological adaptation that occurs to adjust to different salt concentrations is not well known. We have used four different concentrations



(50 μ M, 200 μ M, 400 μ M and 800 μ M) of salt (NaCl) in the standard diet. Various histological and behavioral experiments were carried out to know the effect of different salt concentrations. The 50 μ M salt diet shows the most physiological and behavioral abnormalities out of all four concentrations. In 50 μ M treated flies, salt causes fat accumulation in the gut and testes. The larval locomotion slows down. The thermal sensitivity is decreased in the larva. There is an increase in body weight of both larva and adult. Due to salt stress, reactive oxygen species accumulate, and DNA damage are observed within the gut and hemolymph. Salt affects the eclosion of the pupa. Actin, the cytoskeletal protein, is found to be disrupted in both testes and ovaries. In adult flies, geotaxis behavior is also affected. We also observed some phenotypic abnormalities in the wing and eye of *Drosophila*. The current study reveals physiological and behavioral defects within the flies after treatment with salt.



BIO-IDEA PITCH

A bio-innovate competition where participating teams will have to propose new startup or design plans, which will address the problems related to the mentioned topics or relevant topics in the field of bioengineering. Teams need to analyze their innovative start-up plan by discussing the solution it provides, product usability, impact on the allied industry, future growth, revenue model, and market strategy

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The poster features a central graphic of a glowing yellow lightbulb on the left, with two blue butterflies flying around the text. The text "BIO IDEA PITCH" is written in large, bold, sans-serif letters, with "BIO" in pink, "IDEA" in teal, and "PITCH" in black. Above the text is the NBC logo (2022) and the QNETSYS logo. Below the text is a box containing "CASH PRIZE WORTH ₹6000/-". The background has a textured, light-colored paper-like appearance.

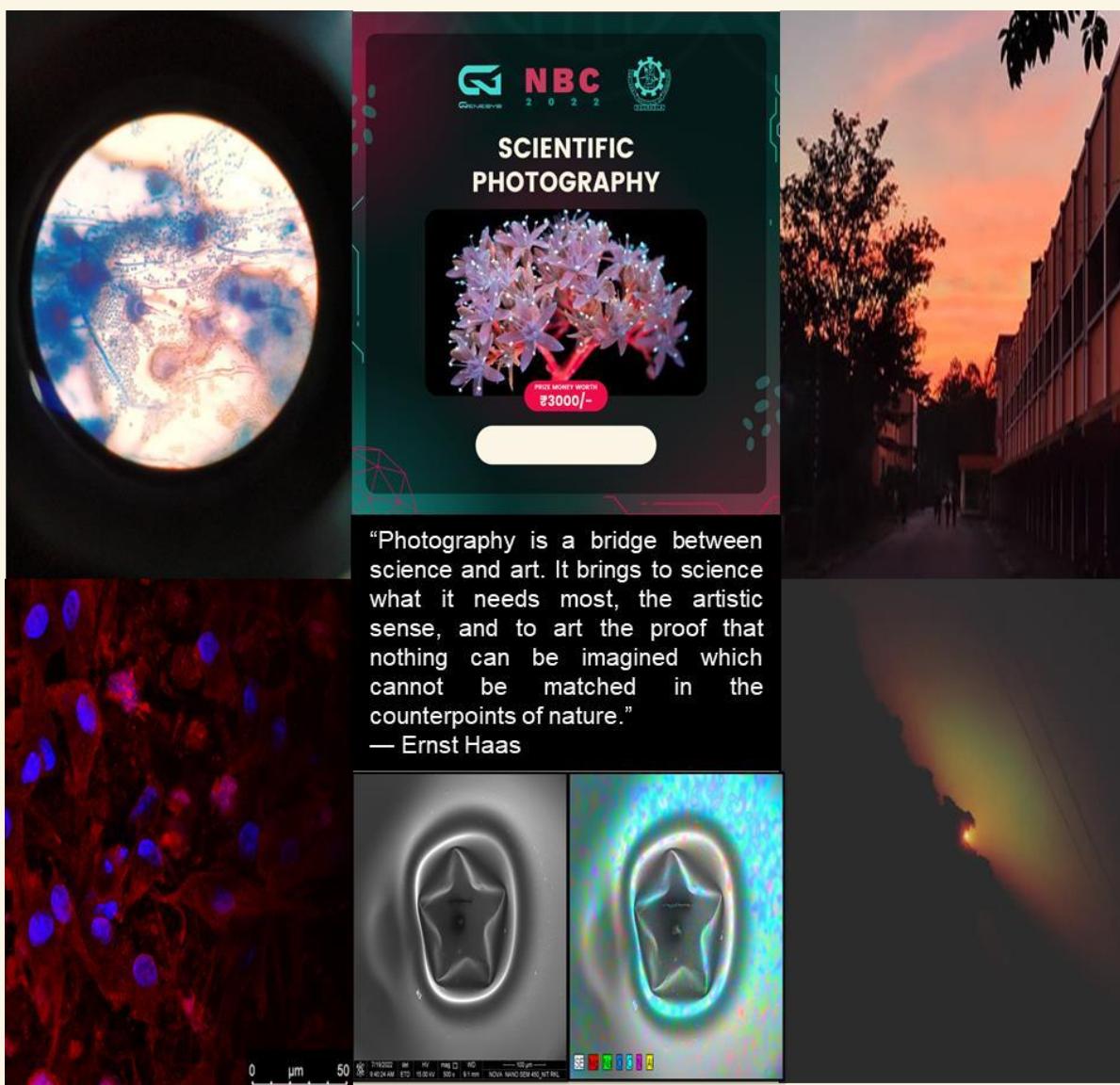
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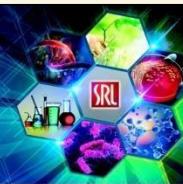
The National Bioengineering Conference 2022 in collaboration with **Genesys** presents to you The Scientific Photography Competition 2022. This competition provides a platform to showcase participants' photographic abilities by capturing the ecosystems, scientific studies, technology, and more. The following are some pictures that have been submitted by participants.





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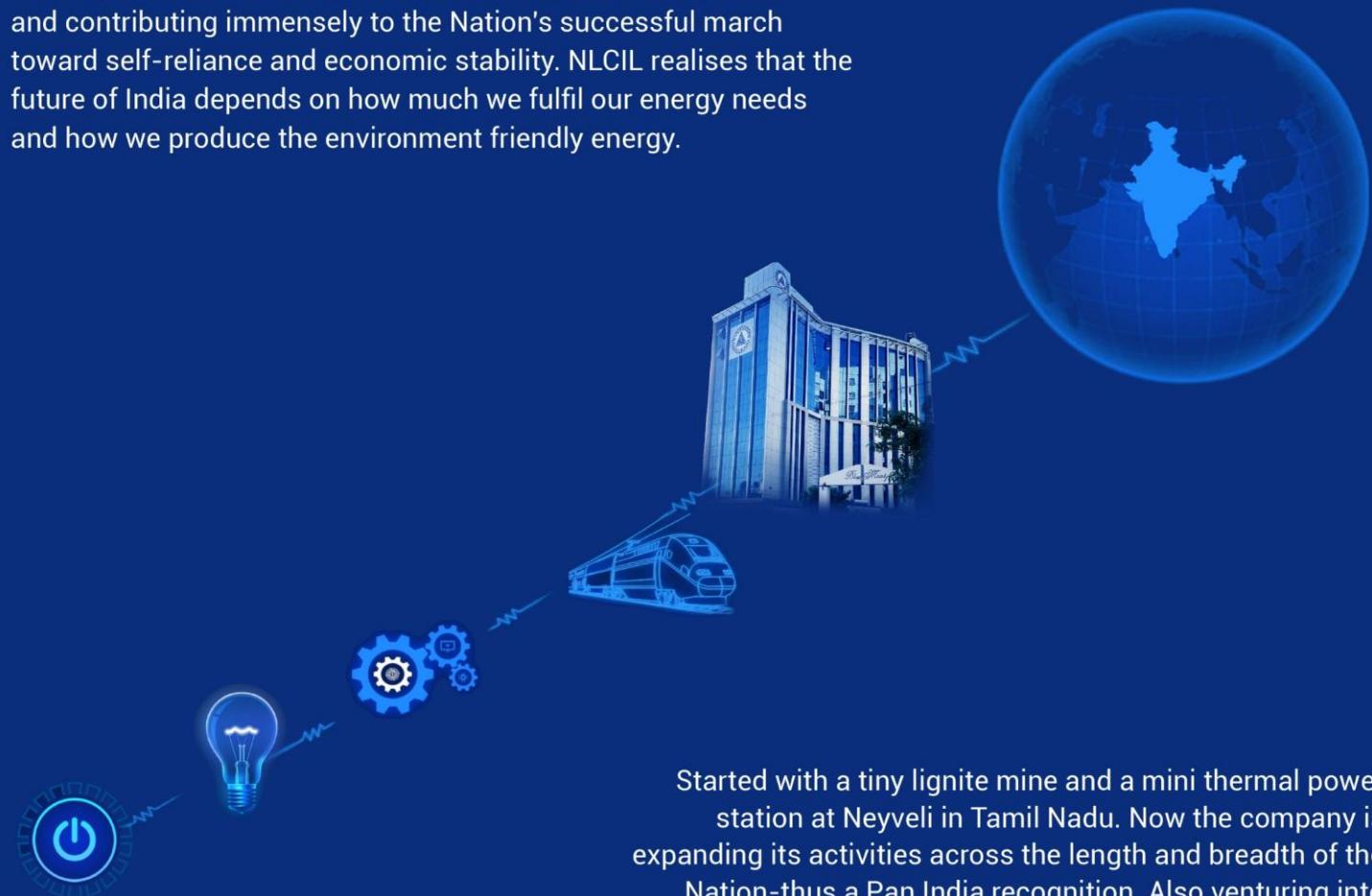
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