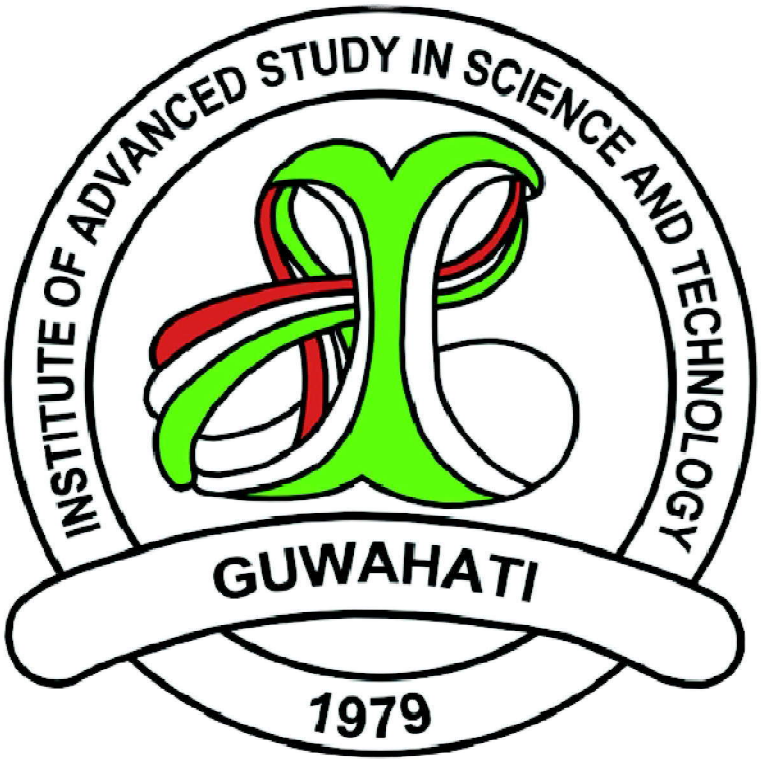
ANNUAL REPORT
2021-2022



Institute of Advanced Study in Science and Technology (IASST)

An Autonomous Institute under Department of Science and Technology Govt. of India

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FOREWORD

It is my extreme privilege and pleasure to present the Annual Report of the Institute of Advanced Study in Science and Technology for the financial year 2021-2022. In recent years, particularly with the implementation of the National Educational Policy, the higher education sector has been experiencing a rapid, dramatic, and positive transformation. Subsequently, public expectations and demands for higher education are escalating. We may expect that the high quality of education will augment the novel scientific ideas and technological marvels, resulting in modern science and technology playing a significant role in addressing the country's pressing societal problems and overall development. IASST, an autonomous research institute under the Department of Science and Technology (DST), Ministry of Science and Technology, Govt. of India, has been thriving continuously in the frontiers areas of cutting edge basic and applied research and creation of trained quality human resources to cater to the scientific and technological requirements of the country. The report presented herein highlights the achievements and progress made over the period, endorsing our commitment to distinction in some of the most challenging times, surpassed by the Covid-19 pandemic.

During the reported period (2021-2022), 85 Ph.D. students, including 43 female and 42 male students, 33 project students, 4 post doc fellows, 18 faculty members, 2 inspire faculty members and 45 administrative staff and 27 contractual staff were employed at IASST. The academic activity of the Institute was well supported by a team of motivated and dedicated scientists, and they have published 111 numbers of research papers in peer-reviewed national and international journals, Books, and book chapters. Despite minimal faculty and the Covid-19 pandemic, the Institute has produced 07 Ph.D. students and trained 21 project students, including Master interns. To augment the academic and research activity, the Institute has signed a Memorandum of Agreement (MoA) with several educational Institutes, and 36 ongoing extramural research projects worth Rupees 6,74,47,766.00 were operational from 2021 to 2022. Further, the faculty members of the Institute have also

filed several patents, and 4 patents are granted during this period, thus showing our obligations to the protection of intellectual property and commitment for self-reliant India (*Atmanirbhar Bharat*). Moreover, several workshops, seminars, virtual talks, key events, and awareness programmes were organized. Important days such as Independence Day, Republic Day, Technology Day, IASST Foundation Day, Science Day, DST Foundation day, virtual lab visit for the school and college students etc. were celebrated with full vigor and enthusiasm under the banner of Azadi Ka Amrit Mahotsav (75 years of India's Independence). The Covid-19 Testing and research laboratory was fully operation during this period, and apart from testing nearly 1.6 lakhs swab samples research work was also undertaken in this center. I take this opportunity to express gratitude to all the Covid warriors, including health and frontline workers, who worked very hard in this challenging situation. On behalf of all the IASST fraternity, I express my heartfelt gratitude to all the speakers, resource persons, faculty, staff and students for their precise time.

The IASST fraternity through their expertise always try to address the challenges like improvement of the weaker and unprivileged section of the society, awareness on sanitation and health care, prevention of gender inequality and pollution. Some of the major academic and administrative achievements during this period include- make functional the Quality Control and Quality Assurance (QA & QC) laboratory for assessing the chemical marker-assisted quality of several spices and herbal medicines, initiation of the process of procurement of several new high-end equipment, construction of a Children Park in the campus, providing electricity connection and allotment of newly constructed apartments inside the campus to the faculty members and officers, augmentation of bio resource center, constructions of medicinal plant garden, and security barrack. During the reporting period the research scholars and faculty members have been bestowed numerous awards and accolades, which are explicitly mentioned in this report.

I express my gratitude and sincere thanks to the funding agency Department of Science and Technology, Govt. of India, Secretary, DST, members of the Governing Council (GC), Scientific Advisory Committee (SAC), Head of the AI division, and the Finance Office of DST, and all the academic and administrative committee members for their guidance and suggestions for the smooth running of the Institute. I also acknowledge the enormous contribution and dedication of faculty members, research scholars, and administrative staff to achieving the mission and vision of the Institute.

(Ashis K. Mukherjee)
Ph.D., D.Sc, FRSB, FWAST
Director

RESEARCH OUTPUT AT A GLANCE

IASST as an autonomous R&D organization by efficiently overcoming the challenges imposed by COVID-19 pandemic and adjusting to the new normal, have shown multifaceted progress during the year 2021-2022. The scientific community of IASST tremendously emphasizes on publishing quality scientific research covering thrust areas of science and technology. The results of scientific research output can be distributed through number of publication of papers in peer-reviewed journals, patents filed, technology transfer and so on. During the period 2021-22, a total number of 111 research papers with a cumulative impact factor of 441.51 were published in peer-reviewed journals collectively from both the life sciences and physical sciences division of IASST, which is quite impressive as compared to the previous year withan increase of 41% (Fig. 1).

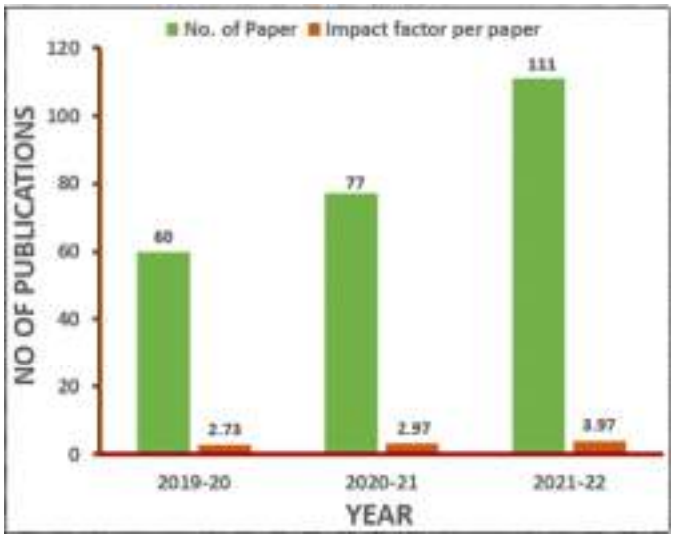


Figure 1 : Number of publications with impact factor for last 3 years.

The researchers of IASST are constantly engagedto resolve real world challenges in order to keep pace with expanding frontiers of knowledge and global developments. IASST's pre-eminent position at the cutting-edge of research is reflected in its remarkable list of research output during the period. In individual division level, the Life Sciences Division of IASST published quality research papers with an average impact factor per paper ranges from 3.60 to 4.22 and similarly for Physical Sciences Division an average impact factor per paper ranges from 3.09 to 3.59 in last 3 years (Fig. 2). The data clearly shows considerable improvement in impact factor per paper in last 3 years.

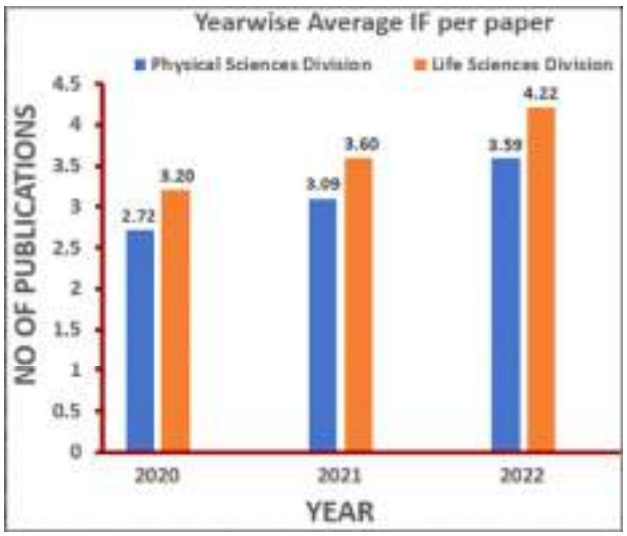


Figure 2 : Year-wise average impact factor (IF) per paper of two divisions of IASST.

RESEARCH OUTPUT AT A GLANCE

IASST as a premier research institute from North-Eastern region of India is always intend to publish quality research in a journal of repute consistently over a significant period of time. As compared to the previous year, the breakthrough progress of IASST research is witnessed in this year when the publication list having impact factor in the range of 5-10 is found to riseconstantly covering all the major research domains (Fig. 3). Apart from that, a publication with impact factor of 19.5 is also added into IASST's research profile during the year 2021. Additionally, there was also significant increase in patent filling and Ph.D. produced during 2021-2022 (Fig. 4).

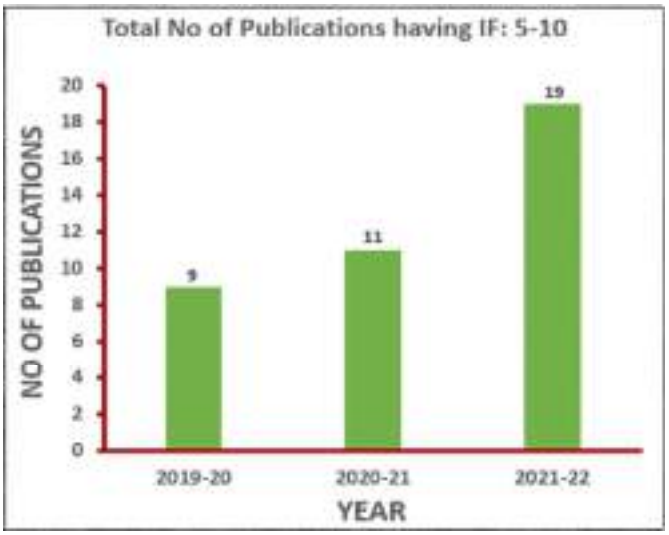


Figure 3 : Year-wise number of publications having impact factor (IF) 5-10.

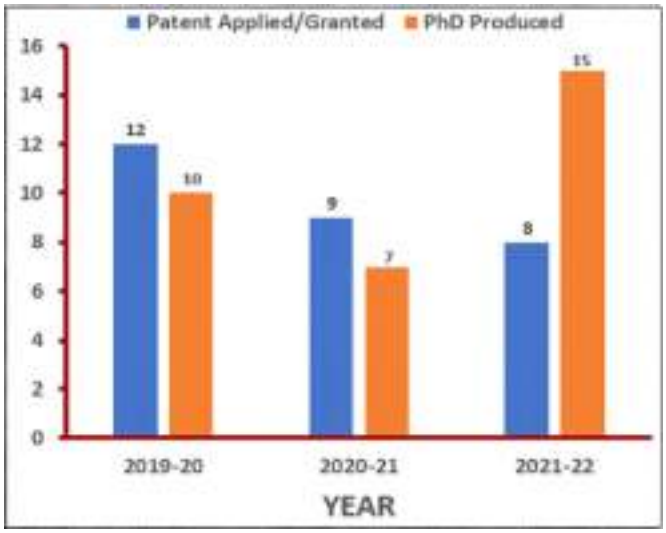


Figure 4 : Last three years number of patent granted / applied and Ph.D. produced.

IASST COMMITTEES

GOVERNING COUNCIL (GC) OF IASST

Chairperson

Dr. Srivari Chandrasekhar,
Secretary, DST, GoI, New Delhi

Member

Dr. Arun Kumar Sarma,
DG, NECTAR, Shillong

Prof. Pulok Kumar Mukherjee
Director, IBSD, Imphal

Prof. Pratap J. Handique,
VC, Gauhati University, Guwahati

Shri Vishvajit Sahay,
AS&FA, DST, GoI, New Delhi

Prof. Tanusri Saha-Dasgupta,
Director, S. N. Bose National
Centre for Basic Sciences, Kolkata

Shri Gyanendra Dev Tripathi,
IAS, Commissioner & Secretary to the Govt. of Assam,
Science & Technology Department, Guwahati

Member Secretary

Prof. Ashis K. Mukherjee,
Director, IASST, Guwahati

SCIENTIFIC ADVISORY COUNCIL (SAC) OF IASST

Chairperson

Prof. Sayed E. Hasnain
IIT Delhi, New Delhi

Member

Prof. Avinash Khare,
VC, Sikkim University, Sikkim

Dr. Arun Sharma,
DG, NECTAR, Shillong

Prof. Pulok Mukherjee,
Director, IBSD, Imphal

Prof. Amalendu Chandra,
IIT, Kanpur

Prof. Parameswar K. Iyer,
IIT, Guwahati

Prof. B.N. Goswami,
Cotton University, Guwahati

Prof. Mahan Maharaj,
TIFR, Mumbai

Prof. Neela Natraj,
IIT Bombay, Mumbai

Prof. Dhruba K. Bhattacharyya,
Tezpur University, Tezpur

Prof. Ashis K. Mukherjee,
Director, IASST, Guwahati

Prof. Heramba Bailung,
IASST, Guwahati

Dr. Rajlakhsmi Devi,
IASST, Guwahati

Member Secretary

Prof. Neelotpal Sen Sarma
IASST, Guwahati

FINANCE COMMITTEE (FC) OF IASST

Chairperson

Prof. Ashis Kr. Mukherjee
Director, IASST, Guwahati

Member

Shri Vishvajit Sahay
AS & FA, DST, Govt. of India

Dr. Manoranjan Mohanty,
Scientist F
Head AI Division, DST, Govt. of India

Prof. Neelotpal Sen Sarma,
IASST, Guwahati

Mr. Ashit Biswas,
Finance and Accounts Officer, NIPER, Guwahati
Up to 30.11.2021

Dr. Diganta Goswami,
FAO (Ad. Charge), IASST

From 01.12.2021 onwards

Member Secretary

Miss Komal Kumari,
FAO, IASST

BUILDING WORKS COMMITTEE (BWC) OF IASST

Chairperson

Prof. A. K. Mukherjee
Director, IASST, Guwahati

Member

Chief Engineer CPWD
Guwahati or his nominee Member

Prof. Anjan Dutta,
Dept. of Civil Engineering, IITG

Dr. Arup Ratan Pal,
Assoc. Prof. II, PSD, IASST

Member

Dr. Diganta Goswami,
Registrar, IASST

INSTITUTIONAL BIOSAFETY COMMITTEE (IBSC)

The current Institutional Biosafety Committee (IBSC) of IASST is registered (Registration No. RS/4219) under RCGM Secretariat, Department of Biotechnology, Ministry of Science & Technology, Govt. of India. The committee is constituted with the following members.

Chairperson

Prof. Ashis K. Mukherjee
Director, IASST, Guwahati

DBT Nominee

Prof. M. C. Kalita,
Department of Biotechnology,
Gauhati University, Guwahati

Outside Expert

Dr. Probodh Borah,
Professor & Head, Department of Animal Biotechnology,
College of Veterinary Science,
Assam Agricultural University, Guwahati

Biosafety Officer

Dr. Pranita Saikia,
Chief Consultant (Pathology & Microbiology),
Department of Microbiology, GNRCH, Dispur

Internal Member

Dr. M. R. Khan,
Associate Professor, Life Sciences Division,
IASST, Guwahati

Dr. Rajlakshmi Devi,
Associate Professor, Life Sciences Division,
IASST, Guwahati

Dr. Jagat Borah,
Associate Professor, Life Sciences Division,
IASST, Guwahati

Member Secretary

Dr. Debajit Thakur,
Associate Professor, Life Sciences Division,
IASST, Guwahati

INSTITUTIONAL ETHICS COMMITTEE (HUMAN STUDIES)

Chairperson

Dr. R.C. Deka, MBBS, MS (ENT)
Distinguished Honorary Professor,
Delhi Pharmaceutical Sciences and Research University

Member

Dr. Ena Dowerah, MBBS, MD (Pathology)
Professor, Guwahati Medical College and Hospital

Dr. Anup Kumar Das, MBBS, MD (Pathology)
Pathologist, Ayursundra Private Healthcare Ltd.

Dr. Krishna Gogoi, MBBS, MD (Microbiology)
Senior Consultant (Microbiologist),
Sri Sankaradeva Nethralaya,

Dr. Gunabhi Ram Sarma,
MBBS, MS (General Surgery)
Retd.Doctor, ESI Hospital

Dr. Bhabesh Das, MD, PhD
Principal, Govt. Ayurvedic College & Hospital,
Guwahati

Prof. M. C. Kalita, PhD
Department of Biotechnology,Gauhati University

Dr. Jagat C. Borah, PhD
Associate Professor, Life Science Division, IASST

Mr. Diganta Gogoi, LLB
Advocate, Guwahati High Court, Guwahati

Prof. Indrani Dutta, Ph.D.
Omeo Kumar Das Institute of Social Change and Development

Ms Sabita Das
Ahom Gaon, Garchuk, Guwahati

Member Secretary

Dr. M.R.Khan, Ph.D.
Associate Professor, Life Science Division,IASST

OTHER OFFICIALS OF IASST

Shri Sunil Kumar,
Joint Secretary, DST, New Delhi Chief
Vigilance Officer, DST, Govt. of India

Prof. D Chowdhury,
PSD, IASST
Vigilance Officer, IASST

Prof. A.K Mukherjee,
Director, IASST, Guwahati
Appellate Authority (RTI), IASST

Dr. Diganta Goswami,
Registrar, IASST Central Public
Information Officer, (CPIO), IASST

Dr. A. Devi,
Assoc. Prof. II, IASST
Chairwomen, ICC, IASST

Dr. Jagat Ch. Borah,
Assoc. Prof. II, LSD, IASST
Nodal Public Grievance Officer, IASST

INSTITUTIONAL MANPOWER (2021-22)

Prof. Ashis Kumar Mukherjee Director

PHYSICAL SCIENCES DIVISION

Basic and Applied Plasma Physics

Prof. Heremba Bailung (on lien)	Professor II & Head (upto Dec.2021)
Prof. Joyanti Chutia	Former Emeritus Scientist
Dr. Subir Biswas	Asstt. Prof.-II
Dr. Kamatshi S.	Asstt. Prof.-II
Dr. Nirab Chandra Adhikary	Technical Officer –B
Rakesh Rushel Khanikar	SRF (DST-INSPIRE)
Ibnul Farid	SRF (DST-INSPIRE)
Bidyut Chutia	SRF (DST-INSPIRE
Palash J. Baruah	SRF (DST INSPIRE)
Parismita Kalita	JRF
Paragjyoti Sut	JRF
Prathana Gogoi	JRF
Dibyajyoti Bora	JRF
Adarsh Thapa	JRF
Punam Talukdar	JRF
Reetesh BorpatraGohain	JRF
Aritra Tarafder	JRF
Deepjyoti Basumatary	JRF
Kaberi Kalita	JRF
Reema	UGC-JRF
Krishna KantaSwargiary	Technician
Binoy Kr. Choudhury	Multi-Tasking Staff

Advanced Material Sciences

Prof. Neelotpal Sen Sarma	Professor I & Head R&D
Prof. Devasish Chowdhury	Professor I
Dr. Arup Ratan Pal	Assoc. Prof.-II & Head SAIC
Dr. Sarathi Kundu	Assoc. Prof.-II
Dr. Munima B. Sahariah	Assoc. Prof.-II
Dr. Biswajit Choudhury	Asstt. Prof.-II
Dr. Anamika Kalita	DST INSPIRE Faculty
Dr. Aditi Saikia	IPDF
Jayanta Sharma Boruah	SRF
Santanu Podder	SRF
Samiran Upadhyay	SRF
Ankita Deb	SRF
Jahnabi Gogoi	SRF
Raktim Jyoti Sarmah	SRF
Trishamoni Kashyap	SRF
Jyotisman Bora	SRF
Gautomi Gogoi	CSIR-SRF
Kabyashree Phukan	CSIR-SRF
Sanu Sarkar	CSIR-SRF
SubhankarPandit	SRF (DST-INSPIRE)
Purbajyoti Bhagowati	SRF (DST-INSPIRE)
Bablu Basumatary	SRF (NFST Fellowship)
Sazzadur Rahman	SRF (DST INSPIRE)
Sanjib Sau	SRF (DST INSPIRE)
Sweety Biswasi	SRF (DST INSPIRE)
Payal Saha	JRF
Kangkan Jyoti Goswami	JRF

Dhrubanka Sarma	JRF
Suvankar Deka	JRF
Manju K. Jaiswal	JRF (DST INSPIRE)
Nasrin Sultana	JRF (DST INSPIRE)
Manash P. Nath	CSIR-JRF
Nur Jalal Mandal	CSIR-JRF
Rahul Sorkar	UGC-JRF
Nikesh Kumar	UGC-JRF
Himadri Nath	UGC-JRF
Shakya Deep Bora	JRF
KhomdramBijoy Kr. Singh	JRF
Sadikul Alom	JRF
Debamoy Pegu	JRF
Saiyad Akhirul Ali	JRF
Bhargab Kakati	Project Fellow
HridoyJyoti Bora	Project Assistant
Babul Ch. Deka	Multi-Tasking Staff

Mathematical and Computational Sciences

Dr. Gautam Choudhury	Assoc. Prof.-II
Dr. (Mrs.) Lipi B. Mahanta	Assoc. Prof.-II
Dr.Santu Das	Asstt. Prof.-II
Elima Hussain	SRF
Snigdha Mahanta	JRF
Silpisikha Goswami	JRF
Devabrat Sharma	JRF
Anjana Begum	JRF
Taibur Rahman	JRF
Ritika Das	JRF
Lokender Singh	JRF
Deva Raj Mahanta	JRF
TapabratThakuria	JRF
Bolin Das	Multi-Tasking Staff

LIFE SCIENCES DIVISION

Traditional and Modern Drug Discovery and Disease Diagnosis

Prof. Ashis K. Mukherjee	Director
Dr. (Mrs.) Rajlakshmi Devi	Head, LSD
Dr. Jagat Ch. Borah	Assoc. Prof.-II
Dr. Suman Kumar Samanta	CSIR Pool Scientist
Dr. Asim Kumar Dutta	Research Scientist
Dr.Yunus Sheikh	Research Associate
Dr. Aparup Patra	Institutional PDF
Sagar Ramrao Barge	SRF
Paramita Choudhury	SRF
Swarnali Bhattacharjee	SRF
Barsha Deka	SRF
Nonibala Gurumayum	SRF
Himangshu Sarma	SRF
Partha Pratim Sarma	SRF
Puspanjali Khound	JRF
Deepsikha Swargiary	JRF
Pranamika Sharma	JRF
Semim Akhtar Ahmed	JRF
Gurumayum Shalini Devi	JRF (DST-INSPIRE)
Devi Basumatary	CSIR-JRF
Neeraj Sarma	Project Scientist-I
Sumi Pait	Project Associate-I
Simanta Bharadwaj	Technical Assistant
Dipu Barman	Technical Assistant
Plabita Baruah	Technical Assistant
Tarun Talukdar	Multi-Tasking Staff
Sabin Kalita	Multi-Tasking Staff
Haren Medhi	Multi-Tasking Staff
Gwhwm Basumatary	Animal Keeper (Outsource)

Biodiversity and Ecosystem Research

Dr. (Mrs.) Arundhuti Devi	Assoc. Prof.-II
Dr. M.R. Khan	Assoc. Prof.-II
Dr. Debajit Thakur	Assoc. Prof.-II
Dr. Rahul Hepat Pralhad	Asstt. Prof.-II (upto 07.09.2021)
Dr. Rajib Borah	DST Inspire Faculty
Dr. Kaushik Bhattacharya	NPDF
Anupam Bhattacharya	Sr. Research Associate
Dr.Rupsikha Patowary	Institutional-PDF
Dr.Kaustavmani Patowary	Project-RA
Madhurankhi Goswami	SRF
Barsha Deka	CSIR-SRF
Chandana Malakar	DBT-SRF
Rictika Das	DST Women Scientist
Manisha Goswami	Women Scientist-A
Dibyajyoti Koiri	JRF
Ria Deb	JRF
Bhaswati Devi	JRF
Nimisha Sarma	JRF
Suprakash Rabha	JRF
Emee Das	JRF
Anusuya Bharadwaj	JRF
Shabiha Nudrat Hazarika	JRF
Monalisa Kalita	JRF
Surajit Basak	JRF

Pranami Bharadwaj	JRF
Aditya Narayan Knowar	JRF
Arun Kumar	DBT-JRF
Juri Saikia	JRF (RGNF)
Bidyarani Devi	CSIR JRF
Chingakham Juliya Devi	CSIR-UGC-JRF
Tomali Sinha	CSIR- JRF
Jinu Medhi	UGC-JRF
Somarani Dash	DBT/CSIR-JRF
Thanil Chingtham	DBT-JRF
Kaushik Paul	Project Assistant
Rajkumari Mazumdar	Technical Assistant
Lakshmi KantaSoud	Multi-Tasking Staff
Srikanta Baishya	Multi-Tasking Staff

Interdisciplinary Research

Prof. Ashis K. Mukherjee	Director
Prof. Neelotpal Sen Sarma	Professor I
Prof. Devasish Chowdhury	Professor I
Dr. (Mrs.) Arundhuti Devi	Assoc. Prof.-II
Dr. (Mrs.) Lipi B. Mahanta	Assoc. Prof.-II
Dr. Kamatshi S.	Asstt. Prof.-II

Administration and Accounts

Dr. Diganta Goswami	Registrar and FAO (i/c till 30/11/2021)
\Komal Kumari	FAO (01/12/2021 onwards)
Rajesh Sharma	PRO
Niranjan Bhagaboty	Technical Officer-B
Rabin Ch. Kalita	Section Officer (Admin.)
Suresh Ch. Sarma	Section Officer (Accounts)
Ramen Mahanta	Superintendent
Dwijendra Deka	Superintendent
Lelin Gogoi	Superintendent
Diganta Das	Assistant
Prabhat Ch. Barma	Assistant
Kumud Baishya	Assistant
Hemanta Sarma	Assistant
Indrajit Sarma	Assistant
Nimai Hazam	Driver
Lachman Thapa	Driver
Lakshmi Kanta Soud	Multi-Tasking Staff
Madhabi Das	Multi-Tasking Staff
Satish Ch. Das	Multi-Tasking Staff
Niren Sarma	Multi-Tasking Staff
Bipul Kr. Das	Multi-Tasking Staff
Pradip Das	Multi-Tasking Staff
Madhu Ram Kalita	Multi-Tasking Staff
Balabhadra Pathak	Multi-Tasking Staff
Dinesh Deka	Multi-Tasking Staff
Munna Basfor	Multi-Tasking Staff

Temporarily Engaged Persons (Contractual Staff)

Dr. Dhruba Sharma	Deputy Registrar (Academic)
Nabajyoti Choudhury	Programme Manager
Dr. Momi Sarma	Veterinary Doctor
Amlesh Medhi	Security Officer
Dr. Anil Kumar	Technical Coordinator
Sanjubi Sharma	Assistant (Account)
Mehjabin Ali	Project Assistant
Nirmali Devi	Hindi Assistant
Pinky Taye	Assistant
Moonmee Deka	Assistant (Accounts)
Rabindra Kalita	Assistant (Accounts)
Ksh. Sharmina Devi	Receptionist
Pranab Talukdar	Driver
Bimal Das	Driver
Prakash Kr. Kachari	Field Supervisor
Madan Kr. Das	MTS
Manindra Deka	MTS
Bijayata Devi	Assistant (Outsource)
Uddipta Deka	Assistant (Outsource)
Pallavi Konwar	Assistant (Outsource)
Prasanta Das	Assistant (Outsource)
Rinki Das	Front Office Assistant (Outsource)
Pompy Kalita	Front Office Assistant (Outsource)
Susmita Kalita	Office Assistant (Outsource)
Tulumani Baishya	Multi-Tasking Staff (Outsource)

Engineering and Estate Management

Montu Deka	Assistant Engineer

Temporarily engaged persons

Md. Mahammad	JE (Civil)
Bikash Jyoti Das	JE (Elect)
Muktaram Kumar	Work Supervisor

Kumud Patgiri	Electrician
Uddipta Deka	Resident Electrician
Dijoraj Roy Choudhury	Plumber
Anima Baishya	MTS
Ajay Baishya	MTS
Kishor Das	Electrical Helper (Outsorce)

Sophisticated Analytical Instrument Centre (SAIC)

Dr. Arup Ratan Pal	Assoc. Prof.-II & Head SAIC
Dr. Nirab Chandra Adhikary	Technical Officer-B
Ms. Juri Pathak	Technical Officer-A
Ms. Julie Bordoloi	Technical Assistant-II
Mr. Subrata Goswami	Technical Assistant-I
Mr. Manomohan Huzuri	Technical Assistant-I
Mr. Dipankar Kalita	Technical Assistant-I

Temporarily engaged persons

Mr. Nayan Talukdar	Technical Officer (Instrumentation)

Knowledge Resource Centre

Dr. Tarini Dev. Goswami	Assistant Librarian & i/c KRC
Ratul Baishya	Multi-Tasking Staff
Sarala Deka	Multi-Tasking Staff

Temporarily engaged person

Subhrajit Sengupta	Professional Assistant

Information Technology Cell

Bijuphukan Bhagabati	Technical Officer-A and i/c IT Cell

Temporarily engaged person

Jayanta Borthakur	Network & System Administrator (up to 15.12.2021)
Debajit Deka	Jr. Network Administrator

IASST Consultants

Dr. Anjali Verma	Consultant Medical Officer

RESEARCH ACTIVITIES

PHYSICAL SCIENCES DIVISION

In IASST, under the umbrella of the Physical Sciences Division (PSD), extensive research is going on in the areas not limited to **Basic and Applied Plasma Physics** including waves and instabilities in multicomponent plasma and dusty plasma, synthesis of nanomaterials by plasma-based processes with the specific aim of material synthesis suitable for advanced electronic, optoelectronic and bioelectronic devices, **Advanced Material Sciences** for developing various sensors particularly soft sensors to estimate controlled variables, development of materials for bio-medical application, polymer nanocomposites and surface nanochemistry for the fabrication of nanoscale electronic devices, organic thin films, and membranes, polymer and polyelectrolytes, functional properties of Heusler alloys and transport properties in low dimensional systems, plasmonics and fluorescent nanomaterials. In IASST, PSD also includes **Mathematical and Computational Sciences**. Here, research is being carried out on Queueing theory, Image Processing and Pattern Recognition, Hydroelasticity, Atmospheric Science and Wave-Structure interaction.

A. Basic and Applied Plasma Physics

Coordinator: Prof. Heremba Bailung

A.1. Basic Plasma

Study of static and dynamical nonlinear structures in basic and dusty plasma has been a subject of interest among the plasma physicists. Currently, we are working on the generation and characterization of a fireball double layer in a dc discharge plasma (Fig. 5a). A double layer (DL) is a narrow localized nonlinear potential structure consisting of two adjacent plasmas (or two oppositely charged layers) which sustain large potential jumps with associated high electric fields. The studies on DLs are significant in astrophysical plasmas. Subsequently these nonlinear structures have found importance in plasma thrusters and in intense ion/electron beam production. The plasma potential measured using emissive probe confirms the formation of a DL near the boundary of the fireball and the background plasma. In dusty plasma (with micron size dust grains), we are working on the characterization of a non-planar (cylindrical) dust acoustic solitary wave (Fig. 5b). These waves are unique stable structures that are capable of travelling long distances without change in their shape or velocity. The dust density perturbation is estimated from the scattered laser intensity profile depicting the evolution of these waves. A detailed characterization of the wave propagation characteristics is being carried out. In nanodusty plasma (nanometer sized dust grains grown in the gas phase plasma), the effect of high dust density (large Havnes parameter) on dust screening process and dust density wave propagation have been carried out. The cyclic behavior of growth process and associated nonlinear wave dynamics have also been investigated.

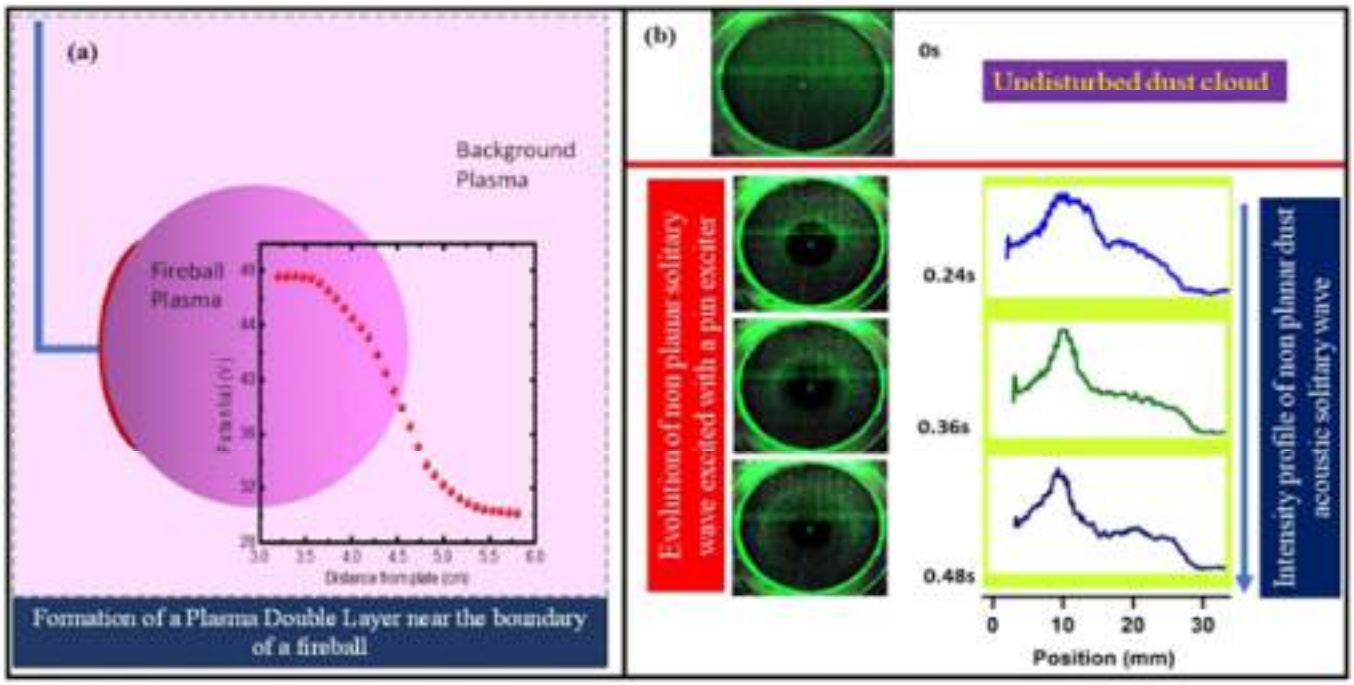


Figure 5 : Study of some non-linear structures in basic and complex plasma – (a) Plasma Double layer, (b) Non planar dust acoustic solitary wave.

A.2. Applied Plasma

Atmospheric pressure plasma is used for nanomaterial fabrication by generating plasma inside and above a liquid medium, also known as Plasma-Liquid interaction. We have developed a novel single-step method to fabricate metal/metal oxide nanocomposites involving the electrode material and the precursor solution as the nanomaterial source using in-liquid plasma (Fig. 6a). The synthesized nanomaterials are utilized as the solar and visible light photocatalyst. Moreover, Plasma-Liquid interaction is also used to treat contaminated water such as the degradation of complex structured toxic organic chemicals. Also, we have designed a plasma electrochemical cell for rapid crystallization and controlled defect engineering of an amorphous material (Fig. 6b).

Fuel cells are electrochemical devices that converts chemical energy into electrical energy. This electrical energy is used in different portable and automobile applications. It is a clean energy source and does not leave any carbon footprints. In the fuel cell laboratory of IASST, Pt/Ag and Pt/Ti electrocatalyst are developed with reduced Pt loading and it can be used in a proton exchange membrane (PEM) fuel cell e.g. Hydrogen Fuel Cell (Fig. 6c).

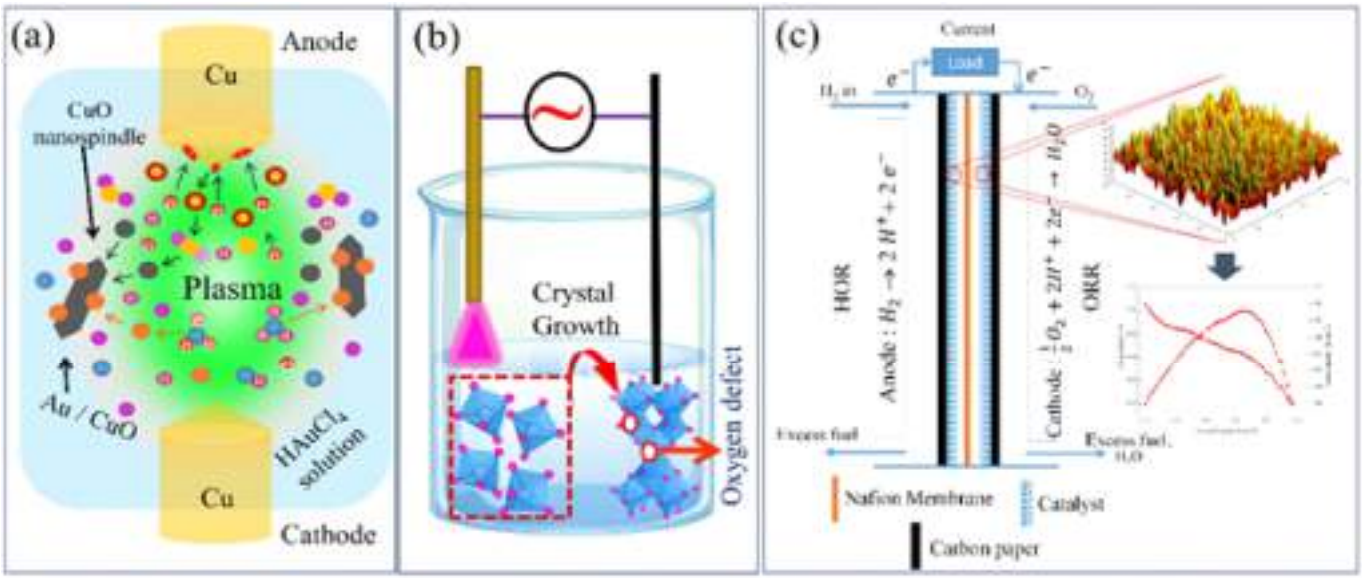


Figure 6 : (a) Synthesis mechanism of the metal/metal oxide nanofabrication using in-liquid plasma, (b) Crystal growth and defect incorporation in an amorphous material using plasma liquid interaction, (c) Schematic diagram of PEM fuel power generation method.

A.3. Nonlinear Waves and Instability in Magnetized Plasma

Nonlinear wave phenomena such as soliton, shock, double layers, rouge wave and wave modulations arise due to the excitations of various electrostatic wave modes in plasma. In a usual electron-ion plasma, ion acoustic waves are produced by the density perturbation of the medium and due to the electrostatic forces generated by electrons and ions. In this work the nonlinear ion acoustic solitary wave in a magnetized plasma with the combined effect of ion collision and trapped electrons distribution is investigated. Using the reductive perturbation technique, the damped modified Schamel Zakarov Kuznetsov (DMSZK) nonlinear wave equation is derived and analyzed numerically. Solitary wave propagation through collisional plasma medium is analyzed for different parameters such as free to trapped electrons temperature ratio, collisional term, positive and negative ion density ratio, and ion mass ratio. Evaluation of solitary wave profile is shown in Fig. 7. It is observed that the increase in free to trapped electron temperature ratio enhances the speed of the solitons towards its direction of propagation where we also observed the formation of fast wave mode. The collisional effect due to ions and neutral particles significantly reduces the amplitude of wave propagation.

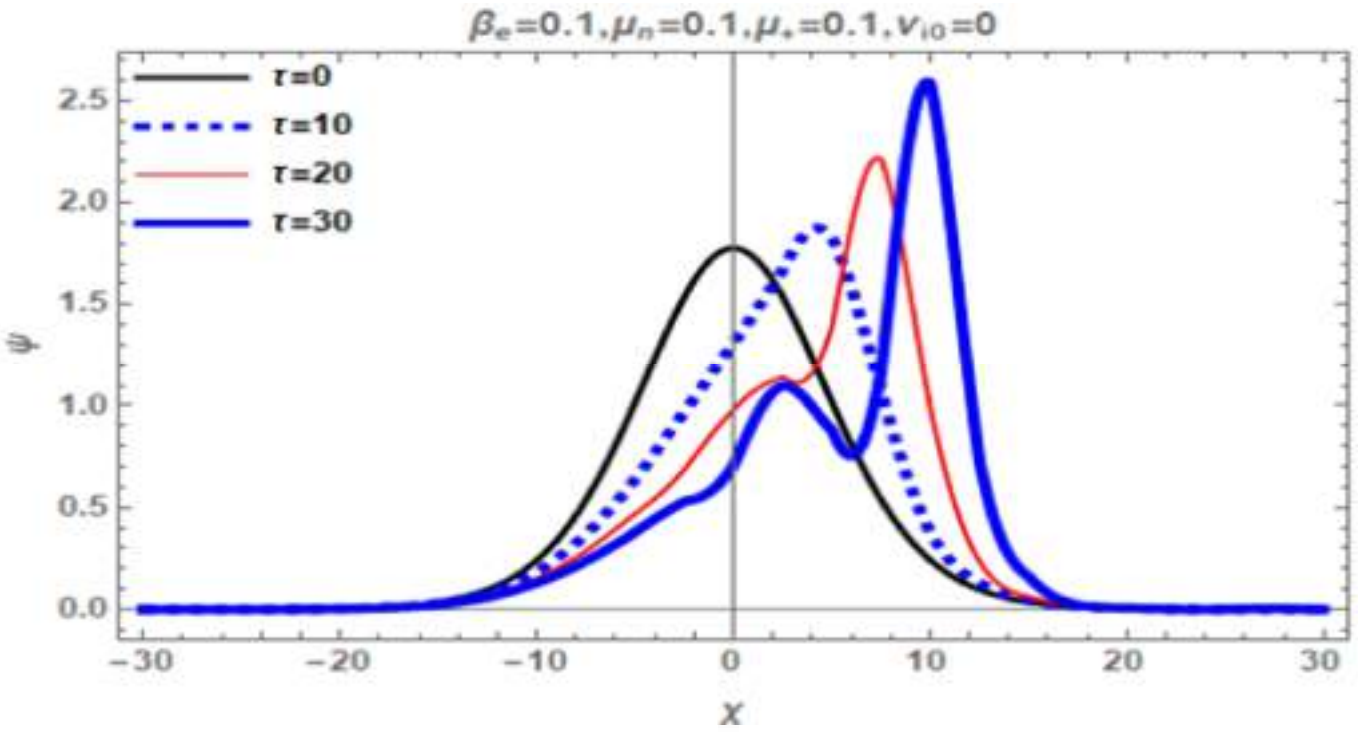


Figure 7 : Evaluation of solitary waves in different time intervals $\tau = 0, 10, 20, 30$ at temperature ratio,$\beta_e = 0.1$; collision frequency, $\nu_{i0} = 0$; negative ion density ratio, $\mu_n = 0.1$; mass ratio of ions,$\mu_+ = 0.1$; cyclotron frequency ratio, $\Omega_B = 0.4$; charge state ratio, $Z_\beta = 1$.

B. Basic Plasma and Plasma Biomedicine

Coordinator: Dr. Subir Biswas

B.1. Uniform Plasma Generation in a Linear Plasma Device

A uniform plasma has been produced in the indigenously designed linear plasma device of IASST by filament assisted DC discharge. Plasma density (n_e) and electron temperature (T_e) have been measured with a cylindrical Langmuir probe fabricated in-house. Diameter and the length of the probe tip are 0.5 mm and 4 mm respectively. The probes were inserted in the plasma through radial ports at the axial positions z = 22, 44, 66 and 88 cm. A L-type bend (bend length 9 cm) was used with the probe holder for the probe inserted from z = 44 cm, so that we can avoid the measurement nearby the mesh grid which is placed at z = 40 cm. Radial profiles of and at various axial positions and various filling gas pressures have been obtained by moving the probe radially through a vacuumfeedthrough. Fig. 8 shows the radial and axial profile of and . It shows both the and are uniform inside the plasma chamber except at the edge.

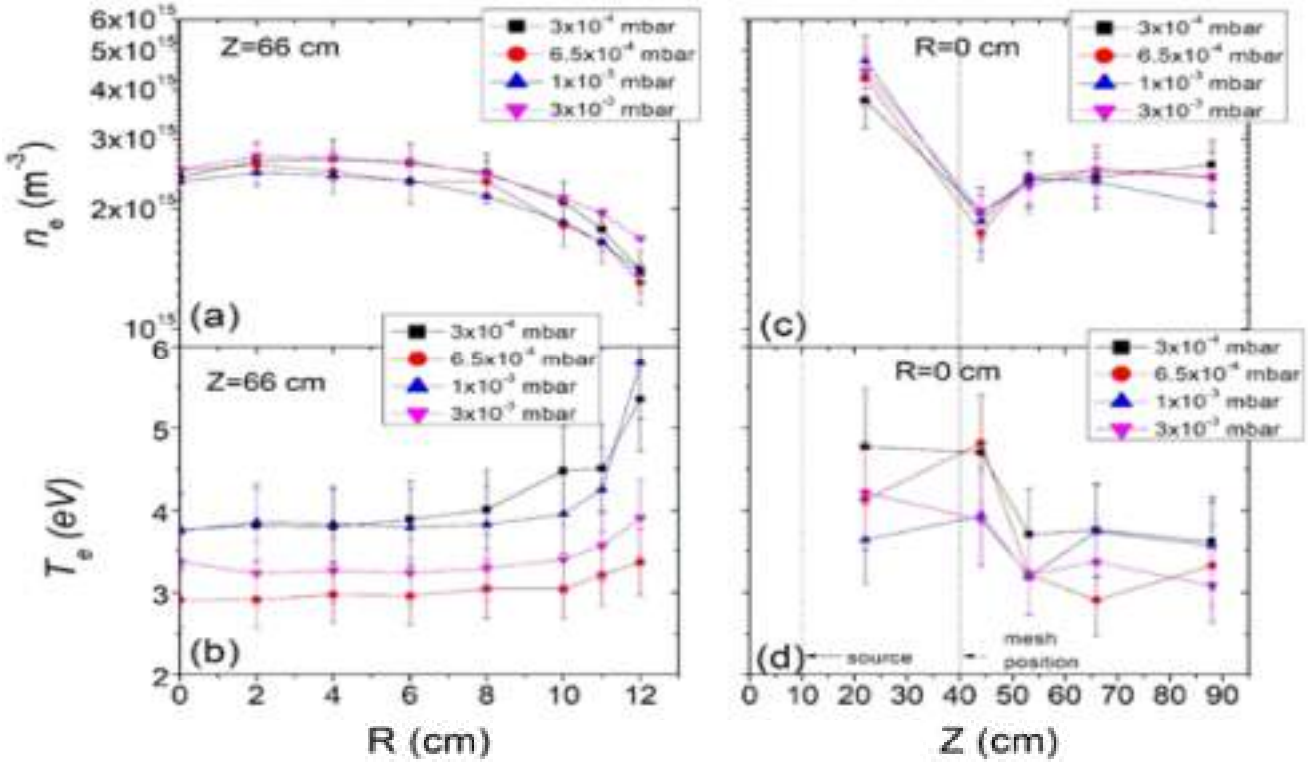


Figure 8 : (a), (b) Radial and (c), (d) Axial profile of n_e and T_e.

B.2. Dielectric Barrier Discharged-Cold Atmospheric Plasma (DBD-CAP) Source for Biomedical Application

Presence of various reactive oxygen and nitrogen species (ROS and RNS) in cold atmospheric plasma (CAP) makes it a promising field of research in biological and medical application such as surface and wound sterilization, antisepsis, bleeding coagulation, wound healing, oncology etc. There are various types of CAP sources, e.g., plasma jets, corona discharge plasma, dielectric barrier discharge (DBD) plasma sources etc. used in the biomedical applications. Here, at IASST, a DBD CAP source is designed for this purpose. The schematic diagram of it is given in Fig. 9. It consists of a cylindrical shape brass electrode of diameter 10 mm with hemispherical tip. The electrode is covered with 1 mm thick borosilicate glass. An aluminum foil is used as a grounded electrode. 20 kV quasi sinusoidal pulse of repetitive frequency 20 kHz will be applied between the electrodes. It will create CAP plasma. The biological sample will be placed on the grounded electrode in multi-hole petri-dishes and CAP plasma interaction with the biological sample will be studied.

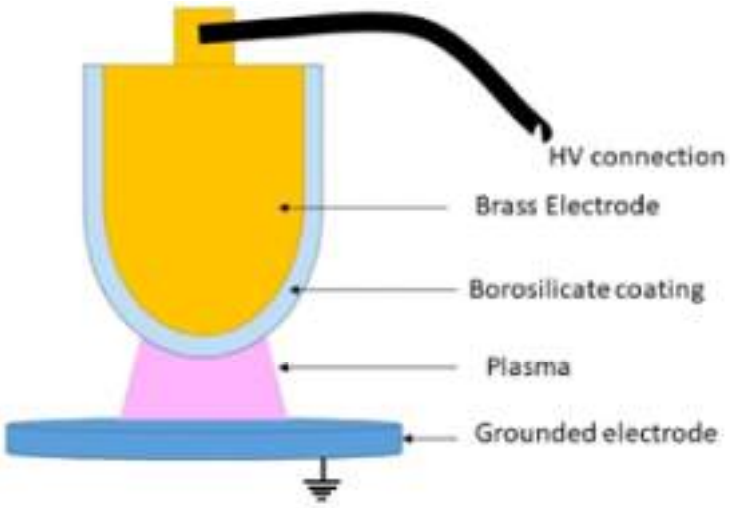


Figure 9 : Schematic of the DBD-CAP source.

Extramural projects

Ongoing projects

Title of the project	Funding Agency, Total fund, Duration, PI/Coordinator, Co-Investigator	Goal
Development of Pt-based ternary Oxygen Reduction Reaction (ORR) catalyst with low Pt loading by simultaneous sputtering method for Proton Exchange Membrane (PEM) fuel cell	Funding Agency: SERB, Govt. of India Total Fund: INR 21.276 Lakhs Duration: January, 2021 – December, 2023 PI: Dr. Joyanti Chutia Co-PI: Dr. Arup Ratan Pal	1. Anode – Cathode electrode catalysts on carbon paper will be prepared by three magnetron plasma sputtering system. 2. Different Pt alloys with two other components from Zr, Ag, TiRu etc. will be prepared as catalysts. 3. Cyclic voltammetry experiments will be carried out to determine electrochemical activity and ECSA of the prepared catalyst. 4. MEA will be fabricated in optimized conditions with Nafion 212 and Pt alloy catalysts electrode. 6. Cell performance of the electrodes will be investigated in a single fuel cell test station.
Application of Dielectric Barrier Discharged Cold Atmospheric Plasma for the treatment of Inflammation	Funding Agency : ICMR, Govt. of India Total Fund: INR 55.38 Lakhs Duration: January, 2021- January, 2024 PI: Dr. Subir Biswas Co-Investigator: Dr. P Manna and Dr. J. Borah	1. Design and develop of dielectric barrier discharged cold atmospheric plasma source for biomedical application. 2. Collection of monocytes and proper cell culture for differentiation of monocyte derived macrophages (MDM). 3. Study the effects of the treatment of the monocytes and the MDM by CAP and evaluating their viabilities. 4. Investigation of the possibilities to drive the polarization of MDM toward M1/M2 phenotypes with the exposure of CAP. 5. Detection of reactive oxygen species (ROS) and reactive nitrogen species (RNS) in the medium of monocyte and MDM; analyse those to investigate their effect on MDM. 6. Final objective is to use CAP plasma source in the treatment of human inflammation
Experimental Investigation of Zonal Flow and Turbulence in Linear Device	Funding Agency : Board of Research in Nuclear Sciences (BRNS) Govt. of India Total Fund: INR 38.65 Lakhs Duration: June, 2021- June, 2024 PI: Dr. Subir Biswas PC: Dr. Malay Bikas Chowdhuri, IPR, Gandhinagar	1. Design and development of a linear magnetized plasma device suitable for zonal flow studies. 2. Production and characterization of plasma in the device. 3. Generation of the zonal flow and control of its flow velocity and shear. 4. Experimental investigation of the zonal flow generation physics.

Title of the project	Funding Agency, Total fund, Duration, PI/Coordinator, Co-Investigator	Goal
	Co-PC : Dr. J. Ghosh, IPR, Gandhinagar	5. Investigation of nonlinear coupling between zonal flow and transport, and quantification of it. 6. Study of energy transfer dynamics between zonal flow and turbulence. Quantitative and qualitative comparison of the results with theory and simulation. 7. Direct laboratory simulation of astrophysical phenomena related to zonal flow (for example, physics of the zone and belt formation in Jovian Planet, terrestrial atmospheric jet stream, Venusian rotating atmosphere, solar tachocline etc.)

In-house Projects

Ongoing Projects

Title of the project	Funding Agency, Total fund, Duration, PI/Coordinator, Co-Investigator	Goal
Studies of Waves-Instabilities in Linear Magnetized Plasma	Funding Agency: DST IASST Total Fund: INR 10 Lakhs Duration: April, 2021- March, 2023 PI: Dr. Subir Biswas Co-PI: Dr. Sarathi Kundu	1. Characterization of plasma 2. External excitation of various low frequency wave modes (e.g, drift wave, ITG-mode etc.) 3. Studies of the wave propagation and experimental verification of the dispersion mode 4. Investigation of non-linear modes coupling of the waves 5. Control and stabilization of the waves

Publications

In Cited Journals

Author (s)	Title	Journal name	Volume & Issue no./page no.	Year of Publication
P. J. Boruah, R. R. Khanikar, and H. Bailung	Novel single-step synthesis and shape transformation of Au/CuO micro/nanocomposites using plasma-liquid interaction	Nanotechnology	32 (24), 245601-245612. https://doi.org/10.1088/1361-6528/abecb9	2021
T. Kashyap, P. J. Boruah, H. Bailung, D. Sanyal, and B. Choudhury	Simultaneous layer exfoliation and defect activation in g-C3N4 nanosheet with air-water interfacial plasma: spectroscopic defect probing with tailored optical properties	Nanoscale Advances	3, 3260-3271. https://doi.org/10.1039/D1NA00098E	2021

Publications

In Cited Journals

Author (s)	Title	Journal name	Volume & Issue no./page no.	Year of Publication
I. Farid, J. Chutia, and H. Bailung	Co-supported low platinum loaded PtTi binary electrocatalysts for Proton Exchange Membrane (PEM) fuel cells	Journal of Chemical Sciences	134, 10. https://doi.org/10.1007/s12039-021-02015-z	2022
B. Chutia, T. Deka, Y. Bailung, S. K. Sharma, and H. Bailung	A nanodusty plasma experiment to create extended dust clouds using reactive argon acetylene plasmas	Physics of Plasmas	28, 063703 https://doi.org/10.1063/5.0037176	2021
B. Chutia, T. Deka, Y. Bailung, D. Sharma, S. K. Sharma, and H. Bailung	Spatiotemporal evolution of a self-excited dust density wave in a nanodusty plasma under strong Havnes effect	Physics of Plasmas	28, 123702. https://doi.org/10.1063/5.0075125	2021
B. Boro, A.N. Dev, B. K. Saikia, and N. C. Adhikary	Nonlinear ion acoustic solitary wave in collisional pair ion plasma with trapped electrons	The European Physical Journal Plus	136 (08), 831. https://doi.org/10.1140/epjp/s13360-021-01820-2	2021
B. Boro, A. N. Dev, R. Sarma, B. K. Saikia, andN. C. Adhikary	Dust-Ion-Acoustic Solitary Wave Structure in Magnetized Plasma with Nonthermally Distributed Electrons and Positrons	Plasma Physics Reports	47 (6) 557-567 https://doi.org/10.1134/S1063780X21060039	2021
A. Singh, S. Thakur, and N. C. Adhikary	Analysis of spatial and temporal rainfall characteristics of the North East region of India	Arabian Journal of Geosciences	14 (885), 1-16. https://doi.org/10.1007/s12517-021-07266-1	2021

Book Chapters

Author's Name	Chapter Title	Book Title	Publisher	Year of Publication
P. J. Boruah, P. Kalita, and H. Bailung	In-Liquid Plasma : A Novel Tool for Nanofabrication	Plasma Science and Technology https://doi.org/10.5772/intechopen.98858	Intech Open, London, UK	2021
R. R. Khanikar, and H. Bailung	Cold Atmospheric Pressure Plasma Technology for Biomedical Application	Plasma Science and Technology https://doi.org/10.5772/intechopen.98858 ISBN 978-1-83969-624-4	Intech Open, London, UK	2021
B. Boro,A. N. Dev, B. K. Saikia, and N. C. Adhikary	IonAcoustic Solitary Wave Propagation in Collisional Magnetized Nonthermal Plasma	Recent Trends in Applied Mathematics ISBN 978-981-15-9816-6	Springer Nature	2021

Conference Presentations

Author	Title	Conference Name	Venue	Year
P. J. Boruah, P. Kalita, R. R. Khanikar, and H. Bailung	A novel approach for the synthesis of metal/metal oxide nanocomposites using plasma-liquid interaction	National Conference on Plasma Science and Technology (PSA-2021)	Department of Physics, Sardar Vallabhbhai National Institute of Technology, Surat, India	20th - 21st December, 2021 via online mode.
P. J. Boruah, P. Kalita, R. R. Khanikar, and H. Bailung	Optical diagnostics of plasma discharge inside liquid during the synthesis of Au/CuO anocomposites	36th National Symposium on Plasma Science & Technology (PLASMA - 2021)	Birla Institute of Technology, Mesra, Jaipur Campus in association with Plasma Science Society of India (PSSI)	13th - 15th December, 2021 via online mode.
P. J. Boruah, P. Kalita, R. R. Khanikar, and H. Bailung	Single-step synthesis of Ag/CuO nanocomposites via in-liquid plasma discharge	International conference on Emerging Trends in Nanomaterials Science and Technology (ICETNMST-2022)	Department of Science and Humanities, National Institute of Technology (NIT), Nagaland, India	27th - 29th January, 2022 via online mode.
P.Kalita, P. J. Boruah, and H. Bailung	Rapid Crystallization of Amorphous TiO2 using Atmospheric Pressure Plasma	36th National Symposium on Plasma Science & Technology (PLASMA - 2021)	Birla Institute of Technology, Mesra, Jaipur Campus in association with Plasma Science Society of India (PSSI)	13th - 15th December, 2021 via online mode.

Conference Presentations

Author	Title	Conference Name	Venue	Year
P. Kalita, P. J. Boruah, and H. Bailung	Surface Plasm2on Tenability of Green Synthesized Gold Nanoparticle Using Plasma Liquid Interaction	65th DAE Solid State Physics Symposium	Bhaba Atomic Research Centre (BARC), Mumbai, the Board of Research in Nuclear Science (BRNS), Department of Atomic Energy, India	15th - 19th December, 2021 via online mode.
P. Kalita, P. J. Boruah, and H. Bailung	Synthesis and Shape Transformation of Gold Nanoparticles using Microplasma	International conference on Emerging Trends in Nanomaterials Science and Technology (ICETNMST-2022)	Department of Science and Humanities, National Institute of Technology (NIT), Nagaland, India	27th - 29th January, 2022 via online mode.
B. Chutia	NanoD uPlEx: a new dusty plasma experimental setup to produce xtended dust clouds using reactive argon acetylene plasmas	36th National Symposium on Plasma Science & Technology (PLASMA - 2021)	Birla Institute of Technology, Mesra, Jaipur Campus in association with Plasma Science Society of India (PSSI)	13th -15th December, 2021 via online mode.
B. Chutia, T. Deka, Y. Bailung, S. K. Sharma, and H. Bailung	Evolution of self-excited dust density waves in nanodusty plasmas under strong Havnes effect	36th National Symposium on Plasma Science & Technology (PLASMA - 2021)	Birla Institute of Technology, Mesra, Jaipur Campus in association with Plasma Science Society of India (PSSI)	13th - 15th December, 2021 via online mode.
B. Chutia, S. K. Sharma, and H. Bailung	A nanodusty plasma experiment to produce large extended 3D dusty plasma cloud on-ground laboratory	5th Asia-Pacific Conference on Plasma Physics	Division of Plasma Physics Association of Asia-Pacific Physical Societies	26th Sept - 1st October, 2021 via online mode.
B. Chutia, S. K. Sharma, and H. Bailung	Spontaneous dust density (acoustic) wave in a large volume 3D cloud containing in situ grown carbonaceous nanoparticles	National Conference on Emerging Trends in Physics (NCETP-2021)	Department of Physics, Tezpur University, Assam, India	16th - 17th June, 2021 via online mode.
D. Bora and S. Biswas	Design consideration for a linear agnetized plasma device	36th National Symposium on Plasma Science and Technology, PLASMA 2021	Birla Institute of Technology, Mesra, Jaipur Campus in association with Plasma Science Society of India (PSSI)	13th - 15th December, 2021 via online mode.

Author	Title	Conference Name	Venue	Year
S. Biswas	Studies of Waves-Instabilities in Linear Magnetized Plasma Device	Virtual National Conference on Plasma Science and Applications (PSA-021)	Department of Physics, Sardar Vallabhbhai National Institute of Technology, Surat, India	20th - 21st December, 2021 via online mode.
D. Bora, A. Tarafder and S. Biswas	A linear plasma device for wave-instability study.	National Seminar on "Emerging Priorities in Science and Technology	B. Borooah College, Assam, India, organized by Assam Science Society	24th March, 2022
A. N. Dev, B. Boro and N. C. Adhikary	Study of dust ion acoustic solitary wave with non-maxwilian electron-positron in magnetized plasmas	AMSE-2022 (2nd International Conference on Applied Mathematics in Science and engineering)	Centre for Data Science, Siksha 'O' Anusandhan (Deemed to be University) Bhubaneswar, Odisha,India	24th-26th March, 2022
B. Boro, A. N. Dev and N. C. Adhikary	Influence of collisional effect on ion acoustic solitary wave propagation in trapped electron plasma	AMSE-2022 (2nd International Conference on Applied Mathematics in Science and Engineering)	Centre for Data Science, Siksha 'O' Anusandhan (Deemed to be University) Bhubaneswar, Odisha,India	24th-26th March, 2022

Conference Proceedings

Author(s)	Title	Conference Name	Volume & Issue No/ Page No.	Year of Publication
P. J. Boruah, and H. Bailung	Solar Light-Driven Photocatalytic Activity of CuO Nanospindles Synthesized Via Plasma-Liquid Interaction	Proceedings of 28th National Conference on Condensed Matter Physics https://doi.org/10.1007/978-981-16-5407-7_13	269, 99-106	2021
B. Chutia, S. K. Sharma and H. Bailung	Observation and characterization of cyclic particle growth process in rf discharge of Ar-C2H2 gas mixture	Selected Progresses in Modern Physics: Springer Proceedings in Physics https://doi.org/10.1007/978-981-16-5141-0_24	265, 235-241	2022
P. Kalita, P. J. Boruah, and H. Bailung	Surface plasmon tenability of green synthesized gold nanoparticle using plasma liquid interaction	Proceedings of the DAE Solid State Physics Symposium ISBN: 81-8372-085-08	55, 325-326	2021

Advanced Material Sciences group at IASST, where a dedicated diverse group of scientists work for the development of various types of sensors, optoelectronic, bioelectronics devices, polymer nanocomposites with specific applications, organic thin films, and membranes, functional properties of Heusler alloys, plasmonics and fluorescent nanomaterials. Following are the brief accounts of the activities carried out during the period.

A. Advanced Materials

Coordinator : Prof. N. Sen Sarma

A.1. Reduced Graphene Quantum Dot-based Versatile Platform for Biosensing of L-dopa using Fluorescence Measurements in Aqueous Media and Flexible Electronic Devices

The present work demonstrated a new approach towards selective and sensitive detection of L-dopa in aqueous medium as well as artificial urine. The aqueous method is based on high fluorescence turn-on of reduced graphene quantum dots in the presence of L-dopa with a limit of detection about 1.307μM. This fluorescence turn-on is predominantly governed by aggregated induced emission. In addition, reduced graphene quantum dots treated filter papers develop bright fluorescence in the presence of L-dopa under UV-light irradiation which is helpful for visual detection of L-dopa in aqueous medium and artificial urine. In a completely different approach, electrical measurement based sensing was carried out by investigating the current-voltage characteristics of the reduced graphene quantum dots with polyvinyl alcohol based thin films under ambient conditions. This method has a limit of detection about 13.136 μM. An electronic device was also fabricated to demonstrate the practical applicability of the method as wearable biosensor. This device is air-stable and shows similar electrical properties at extreme bending angles. Development of such a method for the quantitative detection of L-dopa definitely enhances the practical applicability of biosensors in terms of developing versatile and robust platforms and hence will open up research in new directions in the future (Fig. 10).

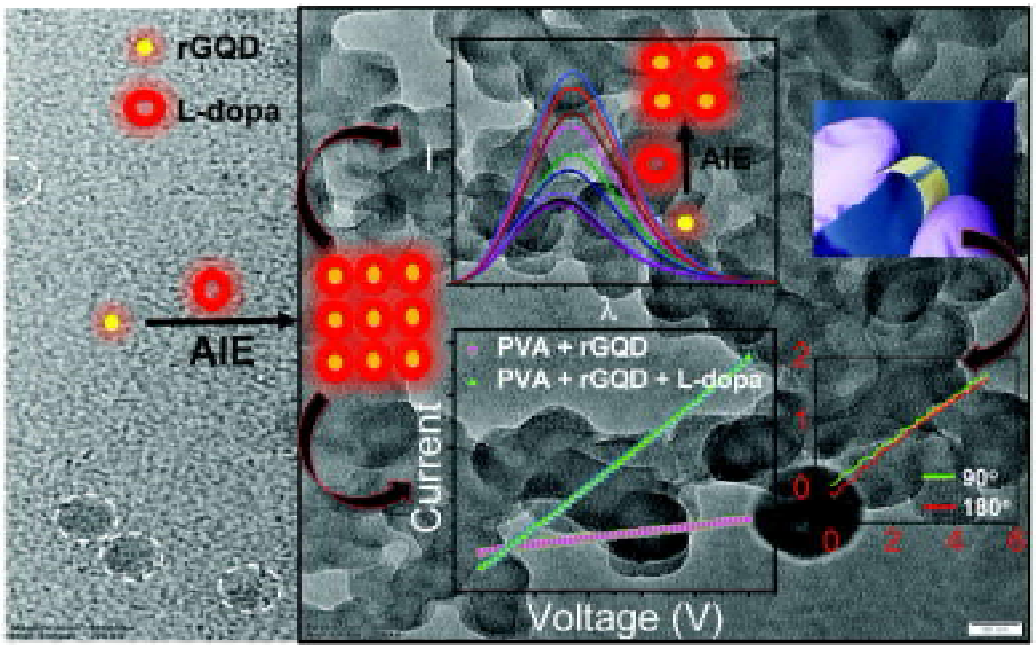


Figure 10 : Aggregation of particles after the interaction in between rGQD and L-dopa that lead to aggregation induced emission. Flexible electronic devices were fabricated for the electrical sensing of L-dopa.

A.2. Silk Fibroin Protein as a Dual Mode Picric Acid Sensor and UV Photoactive Material

Silk Fibroin (SF) protein has been introduced as a chemosensor for PA and photoactive material for developing UV photodetector. It was found that, SF undergoes efficient fluorescence quenching in the presence of nanomolar concentration of PA with a limit of detection (LOD)as low as 0.203 nM which is considerably low compared to the previously reported fluorescence-based picric acid sensors (Fig. 11).

SF is also a suitable material for fabricating portable electronic devices for chemosensing as well as for photodetection. We found that under 360 nm monochromatic LED, the device fabricated from the blended material of SF protein, PA and PVA develops about 7.15 μA photocurrent. Furthermore, we have developed a low-cost electronic circuit for the current work as well as for future research. This is a necessary equipment used in studying the precise on-off characteristics and a controllable power supply to the LED to investigate different optoelectronic properties of devices. Our ongoing and future research focuses on developing fully operating and air-stable optoelectronics devices for long-term usability and also to study the underlying photophysical mechanisms of photoactive materials to enhance the efficacy of the devices.

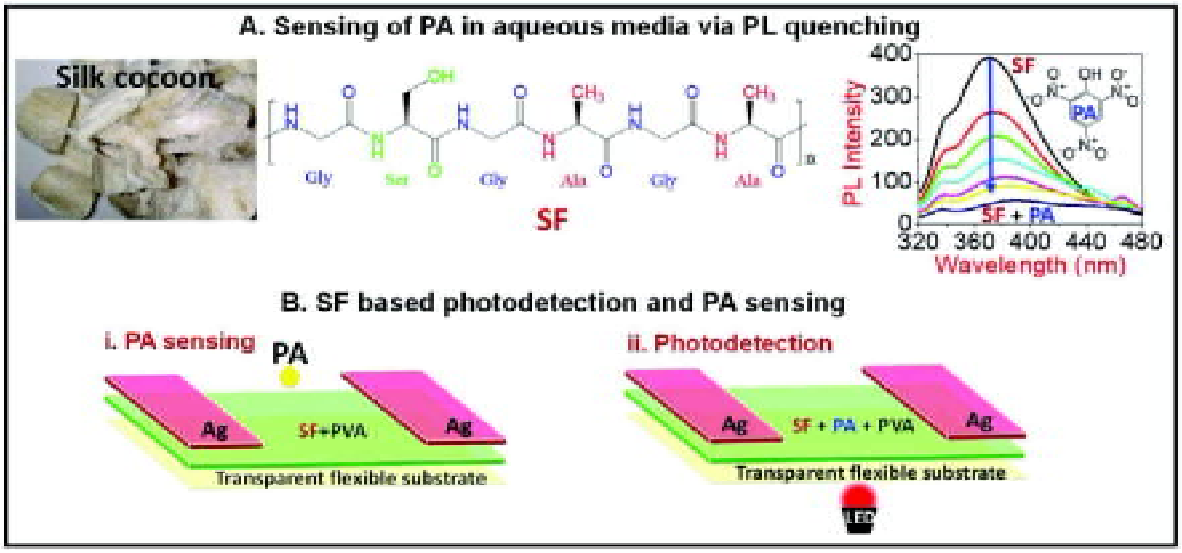


Figure 11: A. Schematic representation of a Sensing of PA in aqueous media using SF as the fluorescence probe, **B.** Device architectures for PA sensing and photo-detection.

B. Material Nanochemistry

Coordinator: Prof. Devasish Chowdhury

Material Nanochemistry laboratory is fully devoted to the development of hybrid nanomaterials with useful properties. The objective of the laboratory is to develop comprehensive bottom-up synthetic strategy to fabricate variety of hybrid biomaterials, carbon-based nanomaterialsandpolymer nanocomposites for diverse applications.

B. 1. Anti-inflammatory activity and internalization pathway of onion peel derived gold nano bioconjugate in RAW 264.7 macrophages

Green synthesis of nanoparticles plays an important role in their efficient therapeutic effects in various biomedical applications. In this work a gold nano bioconjugate (GNBC) from ethyl acetate fraction of onion peel has been prepared and investigated their anti-inflammatory activity in LPS stimulated RAW 264.7 macrophages. Comparative studies were done among GNBC, fractionate alone (OPD), and the standard drug dexamethasone in various anti-

inflammatory assays. It was observed that GNBC showed comparatively good therapeutic efficacy than the fractionate alone (Fig. 12). At the lowest concentration of 10 µg/mL; GNBC and OPD exhibited 70.86% and 91.98% ROS production,10.88 ng/µL, and 20.97 ng/µL nitrite production, 337 pg/mL and 378 pg/mL TNF- ∝ production, 27.1 pg/mL and 30.64 pg/mL IL-6 production, respectively by maintaining a satisfactory cell viability. Moreover, to understand the mechanistic pathway of GNBC in their entry into the macrophages, their localization, and duration; uptake studies have been done where caveolar mediated endocytosis pathway is found to be prominent. Hence, this study will lead to the development of cheap, green-synthesis of nano bio-conjugate and their role in inflammation.

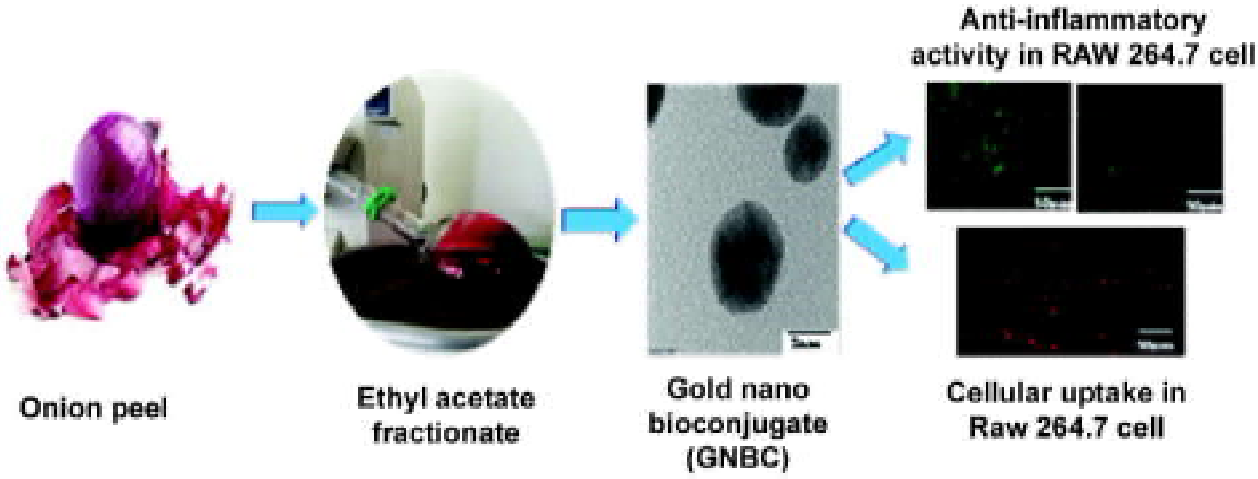


Figure 12: Schematic representation of the protocol employed to develop gold nanobioconjugate.

B. 2. Carbon Dot Based Nucleus targeted fluorescence imaging and detection of nuclear hydrogen peroxide in living cells

Investigation of the intracellular generation of H_2O_2, one of the most important Reactive oxygen species (ROS) is crucial for preventing various diseases since it is closely linked with different physiological and complex cell signaling pathways. Hence detection of the nuclear level of H_2O_2 is very important since it can directly cause oxidative DNA damage which ultimately leads to various diseases. Therefore, in this study, p-Phenylenediamine based carbon quantum dots have been synthesized (B-PPD CD) and integrated with 4-Formylbenzeneboronic acid as a doping agent for the detection of H_2O_2 (Fig. 13). It is shown successfully that the exogenous presence and endogenous generation of H_2O_2 in RAW 264.7 cells can be detected using B-PPD CD. The limit of detection (LOD) is determined to be 0.242 µM.

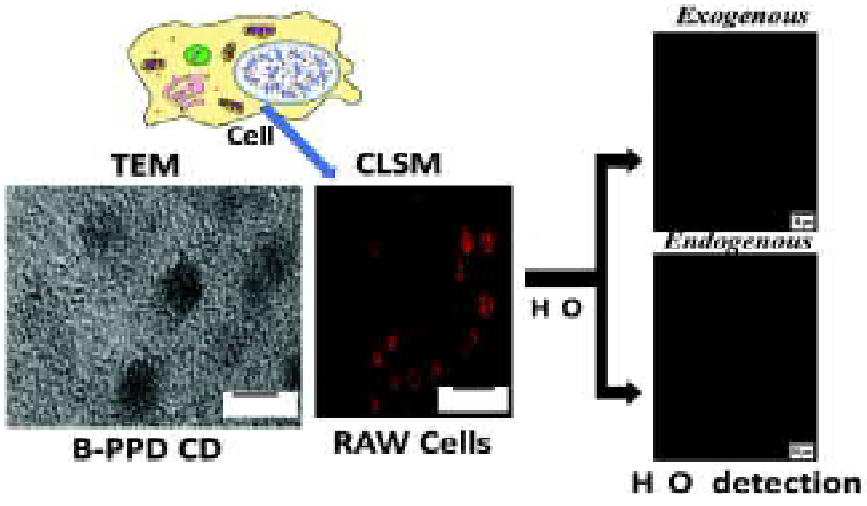


Figure 13: Schematic representation of use of B-PPD CD in H_2O_2 detection.

C. Plasma Based Synthesis of Nanomaterials

Coordinator: Dr. Arup Ratan Pal

C. 1. Photo-induced charge extraction in plasmonic nanomaterial based devices

Our research focus is on plasma based material synthesis processes for preparation of thin films of nanomaterials for various applications. One of the important studies during this year is utilization of interband transition in plasmonic titanium nitride (TiN). The major achievement of this study is the utilization of the interband transition generated charge carriers in plasmonic TiN nanostructures in combination with pyro-phototronic effect of zinc oxide (ZnO). In order to utilize the charge carriers generated from this interband transition, a vertical device has been prepared in the form of ITO/TiN/ZnO/Au film (Fig. 14). The excitonic effect in ZnO has also be exploited to enhance the device performance. The combined effect TiN interband transition and ZnO is also strongly supported from the finite difference time domain simulation study. The pyroelectric effect of non-centrosymmetric ZnO reduces the response time substantially. Importance of this study lies in the utilization of the lesser explored charge carrier generation process due to interband transition of alternative plasmonic materials. Thus this study may open up a new window for various applications of the photo-induced charge carriers extracted from alternative plasmonic metal nanostructures.

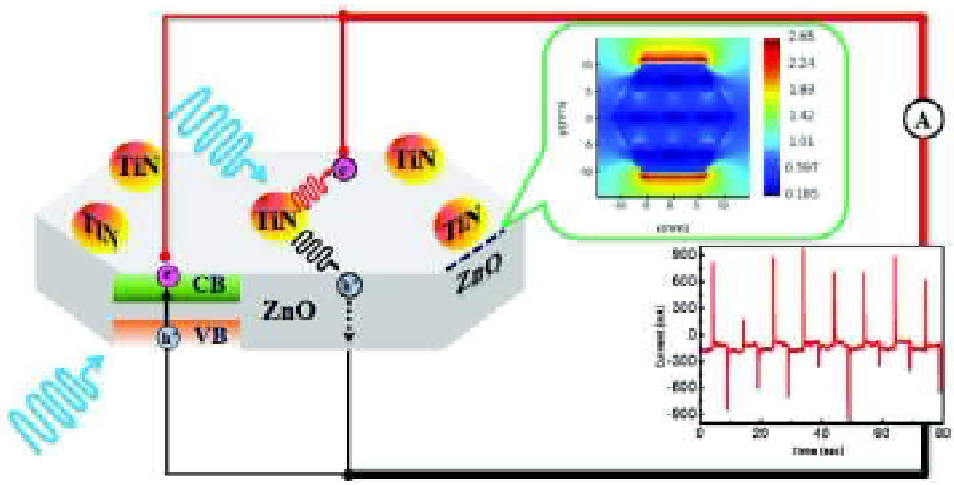


Figure 14: Graphical representation describing the fabricated opto-electronic device.

D. Materials Modelling and Simulation

Coordinator: Dr. Munima B. Sahariah

D. 1. Bonding characteristics of small titanium nitride nanoclusters

Titanium nitride is used as an alternative plasmonic material over noble metals like gold and silver due it's high melting point, hardness and good optical properties in the visible and UV regions. Considering the heavy demand of this material in today's scenario, we have generated the small nanocluster systems of Ti_nN_n, where n=4-10 using ab-initio molecular dynamics (AIMD) simulation (Fig. 15). Later, the electronic properties of these cluster systems are studied using density functional theory (DFT). For a very high isosurface value of 0.75, the 3D plot of electron localization function (ELF) calculation shows irregular distribution of the electron basins. Some of the electron basins lie at the line joining Ti-N and some are present away from the line. To get a clear picture of the mechanism, we have plotted the line profile of the ELF taking different atom pairs, and found that the Ti-N bond in the cluster systems shows a mixed character comprising of covalent and metallic nature. Also, the reason behind the Ti-N

bond in the cluster systems is the excess d-electrons of titanium, which has been confirmed from the density of states (DOS) plot.

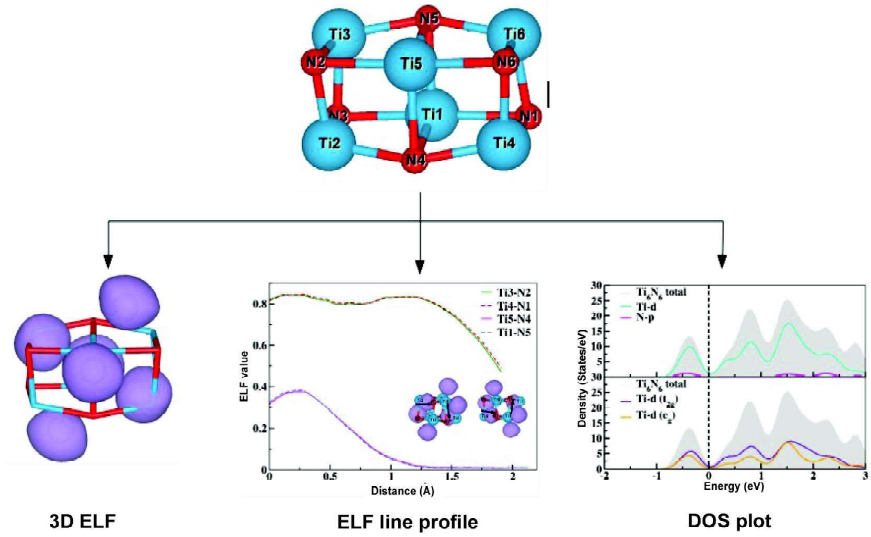


Figure 15: Electron localization function (ELF) plots of Ti_6N_6 and correlation with the Density of States (DOS).

D. 2. Structural stability and electronic properties of Pt_2MnGa

Magnetic systems consisting of multiple components are proven to have easily tunable properties and hence they have the potential to be used in spintronics devices. In the recent years, Heusler alloys have caught the attention of the researchers due to its diverse range of properties. We are currently studying the electronic and magnetic properties of the Heusler alloy Pt_2MnGa. Besides having high ductility, low brittleness and the potential of being used as a shape memory alloy, in a recent experimental study it was reported that Pt_2MnGa also exhibits a non-collinear magnetism, which opens up the possibility of its application in various spintronics devices. This system has been optimized with two different collinear magnetic structures (ferromagnetic and antiferromagnetic) with and without considering the effect of spin orbit coupling. Out of the two magnetic arrangements, ferromagnetic one is found to be most stable in both the cases. The density of states plots are used to justify the obtained stable magnetic state and Bader charge analysis is done to see the charge contribution of each constituent atom (Fig. 16). In future, we are going to explore the non-collinear state of Pt_2MnGa and different properties associated with this state.

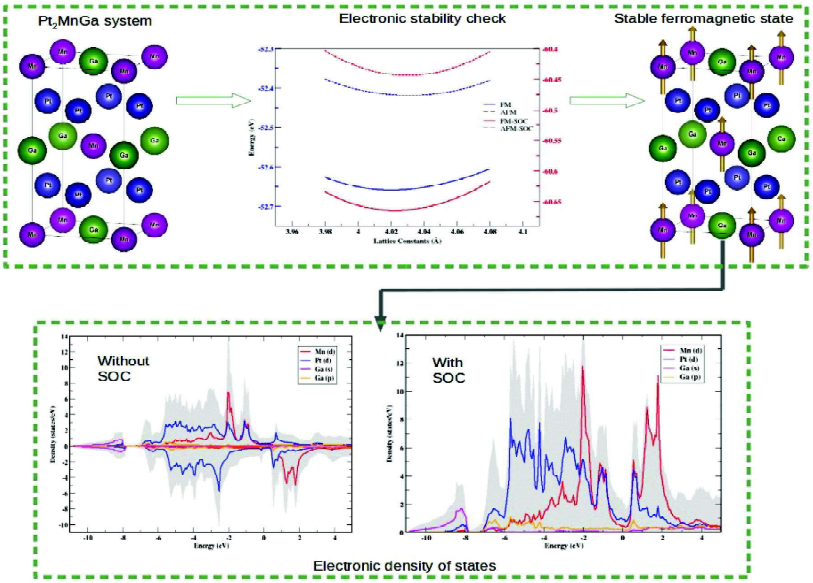


Figure 16: Flow of work for structural stability and electronic structure property of Pt_2MnGa.

E. Soft Materials

Coordinator: Dr. Sarathi Kundu

Structural, optical, electrical and mechanical properties of different soft materials, polymer materials and polymer nanocomposites were explored under diverse physicochemical conditions.

E. 1. Stretchable polymeric film with enhanced electrical and mechanical properties

Stretchable conducting polymeric films were fabricated by blending poly(vinyl alcohol) (PVA) and poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS) in presence of polar organic solvents, e.g., dimethyl sulfoxide (DMSO) and diethylene glycol (DEG) at different concentrations and their structures and superior properties were explored (Fig. 17). X-ray diffraction analysis indicated the emergence of some crystalline domains, which are mostly formed by the PEDOT segments of PEDT:PSS. Raman spectroscopy revealed the transformation from benzoid to quinoid structure of PEDOT in the presence of DMSO or DEG. Nonlinear current - voltage characteristics showed that the maximum current was obtained for 7 and 3 wt% DMSO and DEG doped PVA/PEOT:PSS films respectively and the corresponding current enhancement was around 12 and 38 times in comparison with the untreated film. The charge transport mechanism was illustrated with the Poole - Frenkel effect.Stress - strain behavior exhibited nearly 2.0-3.0 and 2.5-4.5 times stretchability enhancement for 5 and 7 wt% DMSO and DEG doped films respectively.

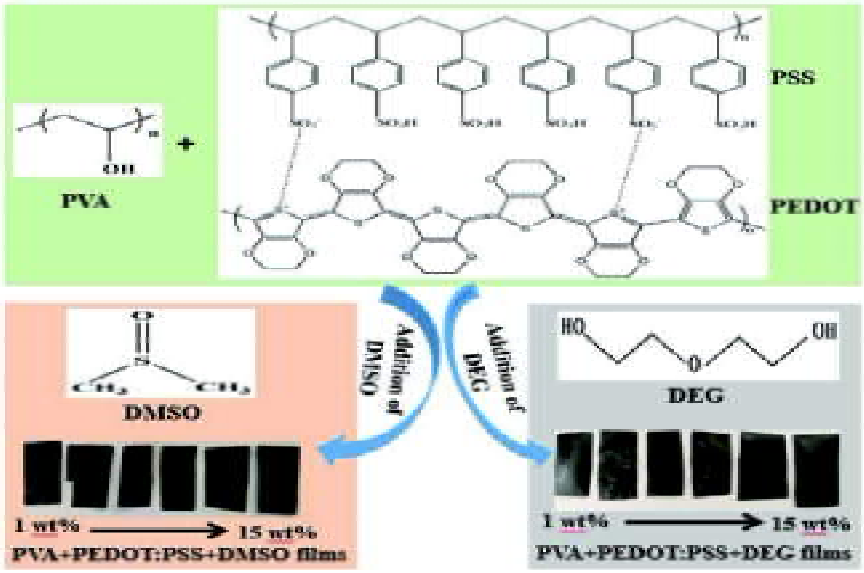


Figure 17: Schematic diagram of the preparation of polymeric films and their photographs.

E. 2. Fluorescence quenching and related interactions among globular proteins (BSA and lysozyme) in presence of titanium di-oxide nanoparticles

Nanoparticles (NPs) are used in various industries and their release in the environment is a matter of concern for both environment and living systems. It is, therefore, necessary to study the protein-NPs systems for better understanding the impacts of NPs on living organisms. The structure, optical properties, and the related conformations of the globular proteins, bovine serum albumin and lysozyme, were explored in the presence of titanium dioxide nanoparticles. In the presence of NPs, the fluorescence quenching of the proteins was observed, and it was found that the mixture of both static and dynamic quenching was present, but the contribution from static was more than dynamic (Fig. 18). Mostly the higher order complex formation and excited state quenching at higher NPs concentration

were responsible for the fluorescence quenching. The interaction was also studied in different pH environments, considering isoelectric points of the respective proteins. With fluorescence quenching, a substantial amount of red-shift of protein emission was also observed in the presence of the quencher. The change in the microenvironment of the tryptophan residues was responsible for such type of shift.

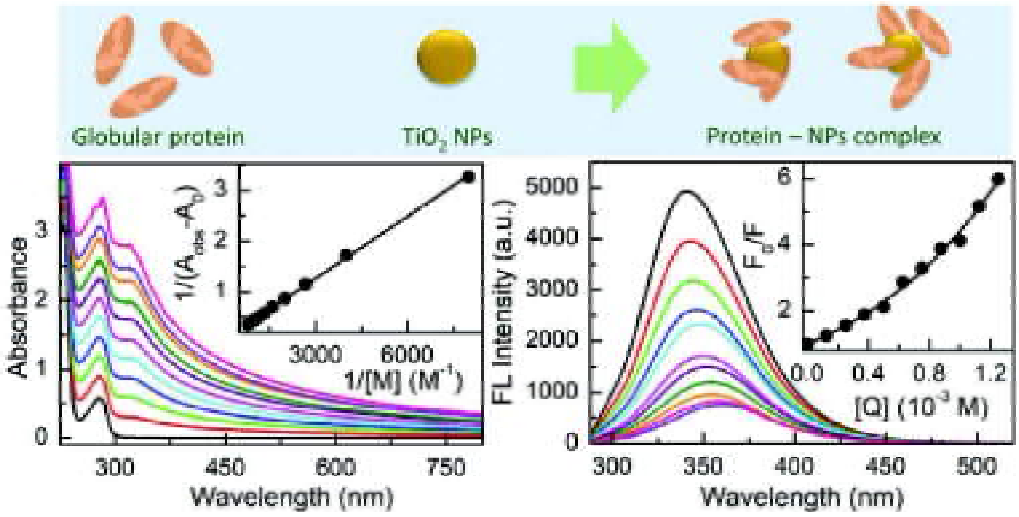


Figure 18: Optical absorption and emission of proteins (BSA, lysozyme) in the presence of TiO_2 NPs.

F. Two-dimensional Materials

Coordinator: Dr. Biswajit Choudhury

F. 1. Intercalated water and electron trapping for hole mediated photocatalysis

A mixed-phase system with intercalated water is found to be effective in photocatalytic water treatment under white light and simulated irradiation. In this regard, WO_3 with an orthorhombic-hexagonal system shows excellent results in the effective methylene blue (MB) removal through an adsorption-photocatalysis combined approach (Fig. 19). The mixed-phase WO_3 nanoribbon adopts a core-shell structure with a crystalline core and amorphous shell. The photogenerated holes play the driving role in activation photocatalysis in WO_3. The charge-transfer dynamics with impedance spectroscopy reveal a reduced charge transfer in the mixed-phase WO_3. The benefits come from the long nanoribbon helping in facile carrier migration in radial and length directions. The interfacial junction with oxygenated defects in the mixed-phase also helps in prolonging the lifetime of photogenerated carriers. The trapping of photogenerated electrons allows the available holes to participate in photocatalysis.

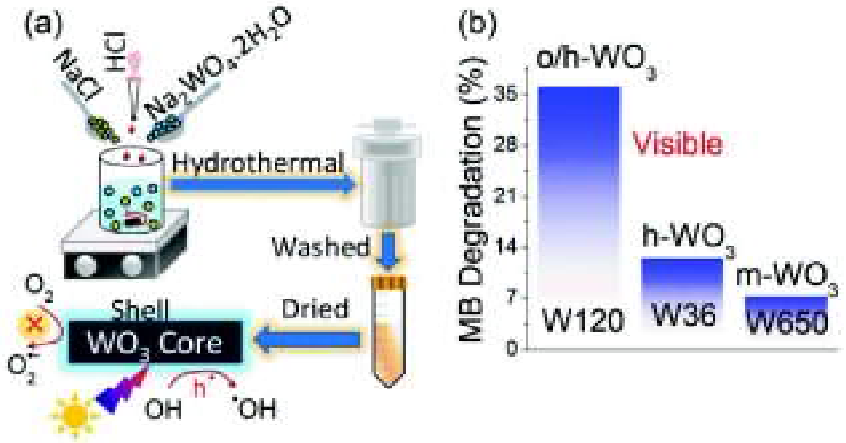


Figure 19: **(a)** Scheme showing hydrothermal synthesis of WO_3 nanoribbons. **(b)** Photocatalytic degradation of methylene blue (MB) under visible light.

G. Metal Organic Frameworks

Coordinator: Dr. Anamika Kalita

G. 1. Active Functional Organic Ligands and Their Derived Framework Materials

Exploring structure of organic ligands and their functional properties in the context of deriving framework materials viz. Metal Organic Frameworks (MOFs) have become the ultimate challenge for synthetic chemist. Pronounced advancement have been bestowed in the development of different framework materials, keeping their associated organic ligands in background. Concentrating on the designed outline, a rigid organic material with tunable features, such as 1,4,5,8-Naphthalene Diimide (NDI), can be functionalized and further incorporation to form supramolecular architecture is our prime focus. NDI based functional organic ligands and their derived frameworks hold incomparable consideration from the scientific community owing to the sheer diversity and vast modular facet with probable applications as efficient material in various interdisciplinary domains. Therefore, our research group mainly focused on development of organic ligands of NDI via simple functionalization with suitable coordinating sites to have possible applications and also interactions with metal sources to build framework units. From the application point of view, the designed functional ligands themselves have applications in the field of electronics engineering, sensor technologies and so on. While for the derived framework material, our research group has showcased applications in the field of accelerating environmental remediation by adsorption and removal of emerging potential pollutants like organic dyes, CO_2 gas etc. (Fig. 20).

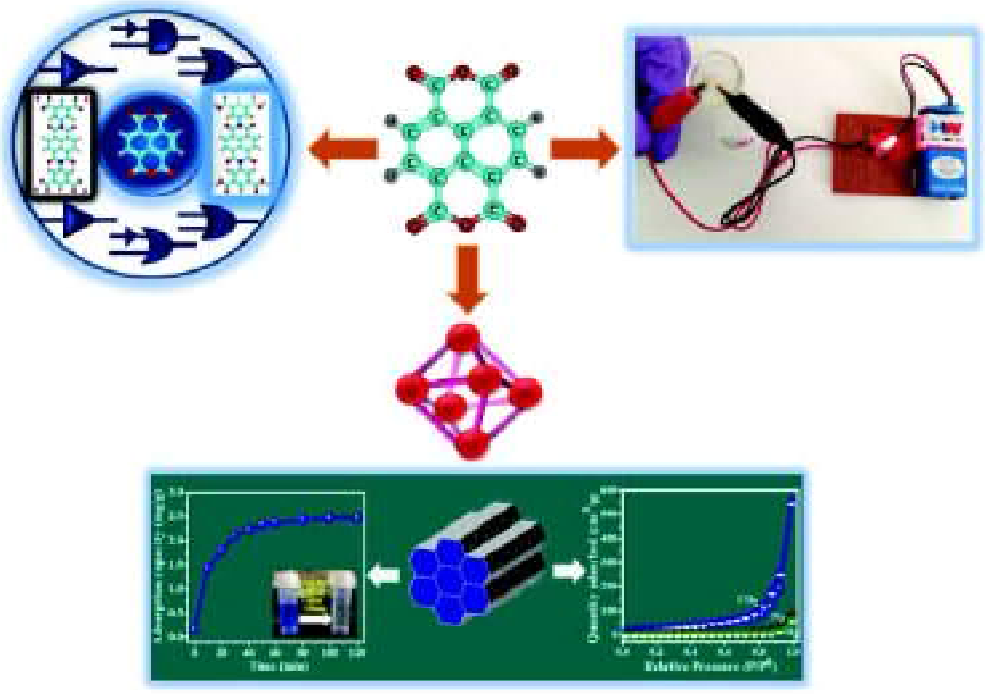


Figure 20: The overall schematic representation of various applications of developed materials.

RESEARCH OUTPUT

Research Projects

Completed projects

Title of the project	Funding Agency, Total fund, Duration, PI/Coordinator, Co-Investigator	Achievement
DST-INSPIRE Faculty Project: Plasmonic Hybrid Nanomaterials based on Carbon Nanomaterials and Metal Oxides for Energy and Environmental Applications	Funding Agency: DST,Govt of India Total Fund: INR 35.00 lakhs Duration: April 01, 2016-March 31, 2022 (No cost extension for one year until March 2022) PI/ Coordinator: Biswajit Choudhury, IASST	Successful exfoliation of layered carbon nitride materials by the use of air-liquid interfacial plasma. Development of plasmonic photocatalyst that works on the entire range of visible region of illumination. Defect induced charge carrier dynamics evaluation with spectroscopic techniques such as positron annihilation spectroscopy and optical spectroscopy. Published 6 Papers and 6 Book Chapters

Extramural Projects

Ongoing projects

Title of the project	Funding Agency, Total fund, Duration, PI/Coordinator, Co-Investigator	Goal
Non-collinear Magnetism in Heusler Materials	Funding Agency : DST, Govt. of India Total fund: INR 25.21.00 Lakhs Duration: 04-02-2020 to 03-02-2023 PI : Dr. Munima B Sahariah	1. Structural stability, bonding characteristics and electronic properties of Mn_2PtSn and Pt_2MnGa heusler alloys. To explore the stable non-collinear magnetic arrangements in these structures
DST-INSPIRE Faculty Project:A facile strategy towards Naphthelene Diimide based Metal Organic Frameworks-Polymer Composite Membrane as Traps for Selective Capture of CO_2	Funding Agency : DST, Govt. of India Total fund: INR 35 Lakhs Duration: 5 Years, PI/Coordinator: Dr. Anamika Kalita Co-Investigator: None	The project aims to design potentially active functional organic ligands and their derived framework materials such as metal organic frameworks (MOFs) employing naphthalene diimide as core entity functionalized with various pendent coordinating groups such as -OH, -COOH, $-NH_2$ are consideredfor structure property relationship for tuning the adsorption behavior towards guest analytes. Investigation of adsorption behavior towards emerging environmental pollutants using as-synthesized framework materials and their derived polymer composites are under progress.

In-House Projects

Ongoing Projects

Title of the project	Funding Agency, Total fund, Duration, PI/Coordinator, Co-Investigator	Achievement
Study of few polyelectrolytes, fluorescent polymers and their uses as sensor	Funding Agency: IASST, DST Total Fund: INR 10.00 Lakhs Duration: April 01, 2021 to March 31, 2023 PI/Coordinator: Prof. Neelotpal Sen Sarma Co-Investigator: Dr. Anamika Kalita	The present work will demonstrate a new approach towards the selective and sensitive detection of L-dopa in aqueous as well as artificial urine. The aqueous method is based on high fluorescence turn-on of reduced graphene quantum dots in the presence of L-dopa with a good limit of detection.
Carbon-based nanocomposite: Synthesis, characterization, properties and applications	Funding Agency: IASST, DST Total Fund: INR 20.00 Lakhs Duration: April 01, 2021 to March 31, 2023, PI/Coordinator : Prof. Devasish Chowdhury Co-nvestigator: Prof. N. Sen Sarma	The aim of the project is to develop carbon based nanomaterials for diverse applications in detection of biomarker, theragnostic application in inflammation and packaging Applications
Study on charge extraction from photoelectric devices using plasmonic materials	Funding Agency: IASST, DST Total Fund: INR 16.65 Lakhs Duration: April 01, 2021 to March 31, 2023 PI/Coordinator: Dr. A. R. Pal Co-Investigator: Prof. H. Bailung	(i) Synthesis of plasmonic light absorbing nanostructures and tuning the plasmon absorption band of the nanostructures by tailoring the properties of the material with optimization of synthesis conditions. (ii) Development of plasmonic photoelectric devices by using the above mentioned light absorbing nanostructures. (iii) Study of the device performance and understanding of device photo-physics.
Structure and morphology of protein-lipid mixed films	Funding Agency: IASST, DST Total fund: INR 17 Lakhs Duration: April 01, 2021 to March 31, 2023 PI/Coordinator: Dr. Sarathi Kundu Co-Investigator: Dr. Subir Biswas	(i) Preparing protein-lipid mixed films of different thicknesses. (ii) Obtaining in-plane and out-of-plane structure and morphology of such thin films by changing physico-chemical parameters. Pattern and assembly formation of proteins and lipids will be observed by using microscopic, spectroscopic and scattering techniques. (iii) Obtaining conformational and optical emission variation from such mixed films to correlate their combined effect.
Two-dimensional graphitic carbon nitride nanosheets loaded with Au@WO_3 metal-semiconductor bi-plasmonic nanocrystals for maximizing the overall water splitting under solar illumination	Funding Agency: IASST, DST Total Fund: INR 16.90 Lakhs Duration: April 01, 2021 to March 31, 2023 PI: Dr. Biswajit Choudhury Co-PI: Dr. A.R. Pal	Designing a layered hybrid photoelectrode that performs overall water splitting in the visible and near infra-red region.

Patents

Inventor(s)	Title	Patent Application Number	Provisional/final Patent grant No.	Issue no. of Patent Office
N.S. Sarma	A Waterborne Thermally Stable Fluorescent Acrylic Based Adhesive and a Green Method of Synthesis of the Adhesive	Patent Application No. 202031001224	Final Patent Grant No. 388151	Indian Patent Office SL. No. 033118915
N. S. Sarma	Polymer Based Sensor Device for Sensing Nitroaromatic Compounds	Patent Application No. 3613/DEL/ 2014	Final Patent Grant No. 336085	Indian Patent Office SL. No. 011122418
A.Konwar, R. Kandimalla,S. Kalita and D. Chowdhury	Hybrid Cotton Patch and A Method for its Fabrication	Patent Application No. 201731001972	Final Patent Grant No. 389637	Indian Patent Office SL.No 033119105
N.C. Talukdar, D. Chowdhury,M. J. Deka and O.K. Medhi	A Process for Preparation of Activated Carbon from Tea Waste	Patent Application No. 201831050065	Final Patent Grant No. 377645	Indian Patent Office SL.No. 033117450
H. Talukdar, S. Kundu	Polyelectrolyte Complex Nanoparticles as Efficient Material for Protein Sensing	Patent Application No. 201831017555	Final Patent Grant No. 390613	Indian Patent Office SL.No 033119240

Publications

In cited journals

Author(s)	Title	Journal Name	Volume & Issue no./page no	Year of Publication
K. J. Goswami, B. Gogoi and N. S. Sarma	Reduced graphene quantum dot based versatile platform for L-dopa sensing: Fluorescence turn-on, filter paper, and air-stable flexible electronic devices	Sensors and Actuators B: Chemical	350, 130892.https://doi.org/10.1016/j.snb.2021.130892	2021

Author(s)	Title	Journal Name	Volume & Issue no./page no	Year of Publication
I. Hazarika, K. J. Goswami, A. A. Hussain, T. Kalita N. S. Sarma, and B. Gogoi	Silk fibroin protein as dual mode picric acid sensor and UV photoactive material.	Journal of Material Science	56(34), 18959-18975.https://doi.org/10.1007/s10853-021-06506-9	2021
B. Kalita, P. Dutta and N.S. Sarma	Riboflavin based conjugated biomolecule for ultrasensitive detection of nitrophenols	RSC Advances	11, 28313-28319 DOI: 10.1039/d1ra04403f	2021
J.S. Boruah, K. Sankaranarayanan and D. Chowdhury	Insight into carbon quantum dot–vesicles interactions: role of functional groups	RSC Advances	12, 4382.DOI: 10.1039/D1RA08809B	2022
K. Phukan, R. Devi and D. Chowdhury	Insight into Anti-inflammatory activity and internalization pathway of onion peel derived gold nano bioconjugate in RAW 264.7 macrophages,	ACS Omega	7, 7606 "7615.DOI: 10.1021/acsomega.1c06131	2022
K. Phukan, R. R. Sarma, S. Das, R. Devi and D. Chowdhury	Carbon Dot Based Nucleus targeted fluorescence imaging and detection of nuclear hydrogen peroxide in living cells	Nanoscale Advances	4, 138.DOI: 10.1039/D1NA00617G	2022
T. Bhattacharjee, M. Islam, G. Majumdar and D. Chowdhury	In-situ generated Carbon dot modified filter paper for Heavy Metals removal in water	Environmental Nanotechnology, Monitoring & Management	16, 100582.DOI: 10.1016/j.enmm.2021.100582	2021
S. Rahman, A. Konwar, G. Majumdar and D.Chowdhury	Guar Gum-Chitosan composite film as excellent material for packaging application	Carbohydrate Polymer Technologies and Applications	2, 100158.DOI: 10.1016/j.carpta.2021.100158	2021
J. S. Boruah, C. Devi, U. Hazarika, P. V. B. Reddy, D. Chowdhury, M.Barthakur and P. Kalita	Green synthesis of gold nanoparticles using an antiepileptic plant extract: in vitro biological and photo-catalytic activities	RSC Advances	11, 28029.DOI: 10.1039/D1RA02669K	2021

Author(s)	Title	Journal Name	Volume & Issue no./page no	Year of Publication
K. Phukan, R. Devi and D. Chowdhury	Green synthesis of gold Nano bio-conjugate from onion peel extract and evaluation of their antioxidant, anti-inflammatory and cytotoxic studies	ACS Omega	6, 17811"17823. DOI: 10.1021/ acsomega. 1c00861	2021
B. Basumatary, S. Podder, S.Thakur, J. Bora, B. Sharma, S. M. Borah, N. Ch. Adhikary, D. S. Patil and A.R. Pal	Synergistic effect of Au interband transition on graphene oxide/ZnO heterostructure: An experimental analysis with FDTD simulation	ACS Omega	7, 7662.https:// doi.org/10.1021/ acsomega.1c06333	2022
S. Podder, J. Bora, S. Thakur, D.Gogoi, B. Basumatary, S. M. Borah, N.C. Adhikary and A.R. Pal	Interband transition in plasmonic titanium nitride and its contribution towards ZnO based pyro-phototronic application	Materials Chemistry and Physics	275, 125290. https://doi.org/ 10.1016/ j.matchemphys. 2021.125290	2022
D. Gogoi, S.Podder, J. Bora, S. Biswasi, and A. R. Pal	A hybrid system for plasmonic and surface polarization induced pyro-phototronic harvesting of light	Optical Materials	122, 111733 .https://doi.org/ 10.1016/j.optmat. 2021.111733	2021
J. Bora, S. Podder, D. Gogoi, B. Basumatary and A. R. Pal	An all metal nitride nanostructure configuration: Study and exploitation in efficient photo-detection	Journal of Alloys and Compounds	879, 160460 https://doi.org/ 10.1016/ j.jallcom.2021. 160460	2021
P. Bhagowati, U. Saikia and M. B. Sahariah	Low-energy structures and electronic properties of small titanium nitride nanoclusters	Nanotechnology	32, 505718DOI: 10.1088/1361-6528/ac291b	2021
P. Saha and M.B. Sahariah	Collinear magnetism and spin-orbit coupling in Mn_2PtSn	Journal of Physics D: Applied Physics	54, 455301https:// doi.org/10.1088/ 1361-6463/ ac1bd4	2021
S. Pandit, and S. Kundu	Effect of Temperature On Re-entrant Condensation of Globular Protein in Presence of Tri-Valent Ions	Journal of Fluorescence	32, 791https:// doi.org/10.1007/ s10895-021-02874-2	2022

Author(s)	Title	Journal Name	Volume & Issue no./page no	Year of Publication
S. Sau, and S. Kundu	Stretchable polymeric film with enhanced electrical and mechanical properties	Colloids and Surfaces A: Physicochem.Eng. Aspects	636, 128130 https://doi.org/ 10.1016/ j.colsurfa.2021.128130	2021
S. Sau, and S. Kundu	Variation in structure and properties of poly(vinyl alcohol) (PVA) film in the presence of silver nanoparticles grown under heat treatment.	Journal of Molecular Structure	1250, 131699https:// doi.org/10.1016/ j.molstruc. 2021.131699	2021
S. Pandit and S. Kundu	Fluorescence quenching and related interactions among globular proteins (BSA and lysozyme) in presence of titanium di-oxide nanoparticles	Colloids and Surfaces A: PhysicochemEng. Aspects	628, 127253https:// doi.org/10.1016/ j.colsurfa. 2021.127253	2021
S. Sarkar, A.C. Bhowal, R. Kandimalla and S. Kundu	Structural and electrical behaviours of PEDOT:PSS thin films in presence of negatively charged gold and silver nanoparticles: A green synthesis approach	Synthetic Metals	279, 116848https:// doi.org/10.1016/ j.synthmet.2021. 116848	2021
S. Sarkar and S. Kundu	Structure and morphology of adsorbed protein (BSA) layer on hydrophilic silicon surface in presence of mono-, di- and tri-valent ions	JCIS Open	3, 100016 https:// doi.org/10.1016/ j.jciso.2021.100016	2021
S. Sau, S. Pandit, and S. Kundu	Crosslinked poly (vinyl alcohol): Structural, optical and mechanical properties	Surfaces and Interfaces	25, 101198https:// doi.org/10.1016/ j.surfin.2021.101198	2021
S. Kundu	Semi-reversible collapse of preformed cobalt stearate Langmuir monolayer on water surface	Journal of Molecular Structure	1238, 130414 https://doi.org/10. 1016/j.molstruc. 2021.130414	2021
S. Sarkar, B. K. Sah and S. Kundu	Modification of polymer thin film-coated metallic layer inside acid solutions	Bulletin of Materials Science	44, 91https://doi. org/10.1007/ s12034-021- 02385-7	2021

Author(s)	Title	Journal Name	Volume & Issue no./page no	Year of Publication
M. Jaiswal, and B. Choudhury	Hydrated Orthorhombic/ Hexagonal Mixed Phase WO3 core-shell nanoribbons for Hole-mediated photocatalysis	ACS Applied Nanomaterials	5, 3599-3610.https://doi.org/10.1021/acsanm.1c04267	2022
T. Kashyap, P.J. Boruah, H. Bailung, D. Sanyal, and B. Choudhury	Simultaneous layer exfoliation and defect activation in g-C3N4 nanosheets with air-water interfacial plasma: spectroscopic defect probing with tailored optical properties	Nanoscale Advances	3, 3260-3271.https://doi.org/10.1039/D1NA00098E	2021
T. Kashyap, S. Biswas, S. Ahmed, D. Kalita, P. Nath, and B. Choudhury	Plasmon activation versus plasmon quenching on the overall photocatalytic performance of Ag/Au bimetal decorated g-C3N4 nanosheets under selective photoexcitation: A mechanistic understanding with experiment and theory	Applied Catalysis B: Environmental	298, 120614. https://doi.org/10.1016/j.apcatb.2021.120614	2021
H.J. Bora, P. Barman, N. S. Sarma and A. Kalita	Film-based electronic volatile acid vapor sensor with ultrahigh sensitivity for real-time analysis.	ACS Appl. Electron. Mater.	3 (6), 2720-2728DOI: 10.1021/acsaelm.1c00292	2021
H. J. Bora, N.S. Sarma and A. Kalita	Selective dual adsorption performance of hexagonal porous metal-organic framework rods towards CO_2 gas and organic dye	New J. Chem.	45 (34), 15280-15284.DOI: 10.1039/D1NJ03105H	2021
H.J. Bora, P. Barman, S. Bordoloi, G. Gogoi, B. Gogoi, N. S. Sarma and A. Kalita	Realization of multi-configurable logic gate behaviour on fluorescence switching signaling of naphthalene diimide congeners	RSC Adv.	11 (56), 35274-35279DOI: 10.1039/D1RA06728A	2021

Book Chapters

Author's Name	Chapter Title	Book Title	Publisher	Year of Publication
J.S. Boruah, S. Majumdar, A. Deb, J. Gogoi and D. Chowdhury	Trending 2D Nanomaterial Composites in Detection and Sensing of Biological Contaminants	2D Nanomaterials for Energy and Environmental Sustainability https://doi.org/10.1007/978-981-16-8538-5	Springer, Nature	2022
A.C. Bhowal and S. Kundu	Gold Nanoparticles: Bulk and Interfacial Study (Chapter 3)	A Book on Selected Topics in Physics Research	Gauhati University Press	2021
B. Choudhury	Composites of Carbon Nanodots for Hydrogen Energy Generation	All-carbon composites and hybrids https://doi.org/10.1039/9781839162718	Royal Society of Chemistry	2021
T. Kashyap, and B. Choudhury	Metal Oxides for Removal of Heavy Metal Ion	Remediation of Heavy Metal Ions https://doi.org/10.1007/978-3-030-80334-6	Springer	2021
M. P. Nath, M. K. Jaiswal, and B.Choudhury	Plasmonic Photocatalyst for Hydrogen Energy Generation	Nanostructured Photocatalysts: From Fundamental to Practical Applications https://doi.org/10.1016/C2019-0-05324-1	Elsevier	2021
H. J. Bora, G. Gogoi, S. Upadhyaya, K. J. Goswami, G.K. Dutta and A. Kalita	Chapter 11: Carbon Nanomaterials for Optical and Electrical Biosensors	Sustainable Nanomaterials for Biosystem Engineering: Impacts, Challenges, and Future Prospects ISBN: 9781774911990	AAP, CRC Press, USA - Taylor and Francis Group	2021
H. J.Bora, N. Sultana, K.J. Goswami, N. S. Sarma, and A. Kalita	Chapter 9: Advanced Functional Membrane for CO_2 Capture	Advanced Functional Membranes: Materials and Applications	Materials Research Forum LLC	2022

Presentation in Conferences/Seminars

Invited Talks

Faculty	Title	Programme Name	Date & Venue
Dr. D. Chowdhury	Polymer Nanocomposites	Short Term Training program on Nanotechnology (Amazing Nano - 2021)	19th - 24th April, 2021
Dr. M. B. Sahariah	Stable bcc-bcc Interface Structure in Cu-Nb Layered System	International Conference on Emerging Trends in Nanomaterials Science & Technology (ICETNMST - 2022)	27th-29th January, 2022 NIT Nagaland (Online mode) 8th March,
Dr. A. Kalita	Experience sharing by Women Entrepreneurs & Scientists	Webinar on "Women in Innovation: Addressing real-world Problems" to celebrate International Women's Day 2022	2022(online mode), Bio-NEST IASST, Guwahati in association with NEATEHUB, Jorhat
Prof. N. S. Sarma	Polymer matrix based nanostructures for targeted drug delivery application	AICTE-ATAL Academy, Govt. of India (Online through CISCO Webex platform).	2nd - 6th August-21 at CIPET, Guwahati

Contributory

Author(s)	Title	Conference Name	Oral/ Poster	Date & Venue
A.Deb and D. Chowdhury	Fabrication of Nano-Bio-Conjugate Film using Aloe vera to detect Hazardous Chemicals found in Cosmetics	Chemical Science Symposium 2021: Leaders in The Field Symposium	Poster	13th-15th December, 2021
A. Deb and D. Chowdhury	Stimuli-Responsive Hybrid Jute Carbon Dot-Cotton Patch Nanocomposite System	7th International Conference on Advanced Nanomaterials & Nanotech-nology, ICANN 2021	Oral	14th-17th December, 2021
J. S.Boruah, P. Kalita, D. Chowdhury and M. Barthakur	Formulation of nanoparticle-based fluorescence dye for detection of excitable cells	5NANO 2021	Oral	29th-30th April, 2021 Organized by Mangalam College of Engineering, Ettumanoor, Kottayam, Kerala
J. S. Boruah, S. Islam, D. Chowdhury, P. Kalita and	Study on the effect of gabapentin conjugated iron oxide nanoparticles on cellular architecture of RBC	ICMFM-2021	Oral	24th-25th June, 2021 Organized by Sai Ram Engineering College, Chennai.

Author(s)	Title	Conference Name	Oral/ Poster	Date & Venue
M. Barthakur J. Gogoi and D. Chowdhury	Photo-responsive Azobenzene-clay- carbon dot doped nanocomposites with tunable electrical properties	Chemical Science Symposium 2021: Leaders in The Field Symposium	Poster	13th-15th December, 2021 Organized by JNCASR, Bangalore, India
J. Gogoi and D. Chowdhury	Photo-responsive azobenzene clay nanocomposite doped with carbon dots with tunable electrical properties	7th International Conference on Advanced Nanomaterials and Nanotechnology (ICANN2021)	Oral	14th-17th December, 2021 Organized by IIT Guwahati, India
S. Rahman and D. Chowdhury	Polysaccharide based composite film as an alternative of packaging material	International Conference Sustainable Approaches in Food Engineering and Technology (SAFETy)	Oral	24th-25th June, 2021
S. Rahman and D. Chowdhury	Biopolymer composite film as an alternative of packaging material	Emerging Areas in Science & Technology, (EAST 2021)	Oral	1th-2th June, 2021 Organized by Royal School of Applied & Pure Sciences, The Assam Royal Global University, India
S. Rahman and D. Chowdhury	Guar Gum-Chitosan composite film is an alternative to petroleum-based packaging material	International Conference On Advanced Materials And Mechanical Charac-terization (ICAMMC-2021)	Poster	2th-4th December, 2021
S. Rahman and D. Chowdhury	Guar Gum and Chitosan cross-linked bio-polymer composite film, potentially used for packaging applications.	Chemical Science Symposium 2021: Leaders in The Field Symposium	Poster	13th-15th Dec. 2021 Organized by JNCASR, Bangalore, India
K. Phukan, R. Devi and D. Chowdhury	Detection of Nuclear Hydrogen Peroxide in Living Cells by Carbon Dot Based Nucleus Targeted Fluorescent Imaging	7th International Conference on Advanced Nanomaterials and Nanotechnology (ICANN 2021)	Oral	14th-17th Dec. 2021 Organized by IITGuwahati, India
K. Phukan, R. Devi and D. Chowdhury	Carbon dot based nucleus fluorescence imaging and detection of nuclear hydrogen peroxide in living cells.	International Conference on Emerging Trends in Nanomaterials Science and Technology	Poster	27th-29thJan. 2022 Organized by NIT Nagaland, Nagaland, India (online mode)

Author(s)	Title	Conference Name	Oral/ Poster	Date & Venue
J. Bora, S. Podder and A. R. Pal	Metal Nitride Heterostructure for UV-B Photodetection	65th DAE Solid State Physics Symposium	Poster	15th-19th Dec. 2021 Organized by BARC, Mumbai, India (Online mode)
D. Gogoi and A.R. Pal	Synthesis of polyaniline-crystalline rubrene nanosystem by one-step plasma process: Exploring its applicability in broadband optoelectronics by plasmonic functionalization.	65th DAE Solid State Physics Symposium	Poster	15th-19th December, 2021 Organized by BARC, Mumbai, India (Online mode)
S. Podder, J. Bora and A. R. Pal	Interband transition in plasmonic nanomaterials and its application for UV light harvesting	65th DAE Solid State Physics Symposium	Poster	15th-19th Dec. 2021 Organized by BARC, Mumbai, India (Online mode)
P. Bhagowati	Stability and bonding nature of small titanium nitride nanoclusters from the first principle calculations	International Conference on Emerging Trends in Nanomaterials Science and Technology	Poster	28th Jan., 2022 Org. by NIT Nagaland, Nagaland, India (online mode)
P. Saha	Effect of spin-orbit coupling on electronic and magnetic properties of Mn-Pt-Sn inverse Heusler compound	International Conference on Emerging Trends in Nanomaterials Science and Technology	Poster	28th January, 2022 Organized by NIT Nagaland, Nagaland, India (online mode)
D. Sarma	Defect behavior in CuZr system, a first principles approach	International Conference on Emerging Trends in Nanomaterials Science and Technology	Oral	28th Jan., 2022 Org. by NIT Nagaland, Nagaland, India (online mode)
B. Kakati	Effect of spin-orbit coupling on magnetic and electronic properties of Heusler alloy Pt2MnGa	International Conference on Emerging Trends in Nanomaterials Science and Technology	Poster	28th Jan. 2022 Org by NIT Nagaland, Nagaland, India (online mode)
S. Pandit and S. Kundu	Optical Responses of Globular Protein under Re-entrant Condensation in the Presence of Trivalent Ions and its Temperature Effect	National Conference on Emerging Trends in Physical Sciences (ETPS-2021)	Oral	27th Sept.-1 Oct., 2021 Organized by Department of Physics, ICFAI Science School, ICFAI University,

Author(s)	Title	Conference Name	Oral/ Poster	Date & Venue
				Tripura, India (Online mode)
S. Pandit, S. Kundu and V.K. Aswal	Interactions Among Bovine Serum Albumin (BSA) Molecules in the Presence of Anions	7th Conference on Neutron Scattering (CNS-2021)	Poster	25th-27th Nov, 2021 Organized by BARC, India (Online mode)
S. Pandit and S. Kundu	Fluorescence Emission Enhancement of Copper Nanoclusters (CuNCs) in the Presence of Ascorbic Acid	65th DAE Solid State Physics Symposium (DAE SSPS -2021)	Poster	15th-19th Dec, 2021 Org. by BARC, Mumbai, India (Online mode)
S. Pandit and S. Kundu	Re-entrant Condensation of Globular Protein and Its Fluorescence Behaviour	National seminar on Emerging Priorities in Science and Technology with Special Focus on Rural and Green Technology	Oral	March 24th, 2022 Org.by B. Borooah College & Assam Science Society, India
R. J. Sarmah and S. Kundu	Heteroprotein (bovine serum albumin/lysozyme) complex monolayer at air-water interface	National Conference on Emerging Trends in Physical Sciences (ETPS-2021)	Oral	27th September-1st Oct, 2021 Organized by Department of Physics, ICFAI Science School, ICFAI University, Tripura, India. (Online mode)
R. J. Sarmah and S. Kundu	Bovine Serum Albumin/ Lysozyme (BSA/Lys) Complex Thin Film	65th DAE Solid State Physics Symposium (DAE SSPS -2021)	Poster	15th-19th Dec. 2021 Organized by BARC, Mumbai, India (Online mode)
S. Sau and S. Kundu	Structural, optical and mechanical properties of poly(vinyl alcohol) silver nanocomposite film	National Conference on Emerging Trends in Physical Sciences (ETPS-2021)	Oral	27th Sept.-1st Oct., 2021 Organized by Department of Physics, ICFAI Science School, ICFAI University, Tripura, India (Online mode)
S. Sau and S. Kundu	Heat-induced silver nanoparticles inside poly (vinyl alcohol) film	65th DAE Solid State Physics Symposium (DAE SSPS -2021)	Poster	15th-19th Dec. 2021 Org. by BARC, Mumbai, India (Online mode)

Author(s)	Title	Conference Name	Oral/ Poster	Date & Venue
S. Sarkar and S. Kundu	Out-of-plane structure and in-plane morphology of trivalent salt activated BSA adsorbed film on charged surface	National Conference on Emerging Trends in Physical Sciences (ETPS-2021)	Oral	27th Sept.-1st Oct., 2021 Organized by Department of Physics, ICFAI Science School, ICFAI University, Tripura, India (online mode)
S. Sarkar and S. Kundu	Structure and morphology of protein thin film deposited on cationic polymer surface in presence of yttrium salt	International Conference on Emerging Trends in Nanomaterials Science and Technology (ICETNMST-2022)	Poster	27th-29th Jan., 2022 Org by NIT Nagaland, Nagaland, India (online mode)
T. Kashyap, and B. Choudhury	Plasma exfoliated defect enriched g-C3N4 as a promising photocatalyst	International Conference on Emerging Trends in Nano-materials Science &Techno-logy" (ICETNMST-2022)	Poster	27th-29thJan., 2022 Organized by NIT Nagaland, Nagaland, India (online mode)

Conferences/Workshops/Meetings attended

Faculty/Research Scholar	Conference/Workshop/Exhibitions	Date and Venue
K. J. Goswami and N. S. Sarma	ICETNMST- 2022 (Poster entitled "rGQD based versatile platform for triple mode biosensing of L-dopa: fluorescence turn-on, filter paper, and air-stable flexible electronic devices"	27th-29th January, 2022 NIT Nagaland
N. Sultana and N. S. Sarma	ICETNMST- 2022 (Poster entitled "Facile Synthesis of Reduced Phosphorene and their Biodegradable Polymer Composite for the Detection of Bio-analytes")	27th-29th January, 2022 NIT Nagaland
N. Sultana and N. S. Sarma	NECTAR-2021	21th-22th December, 2021 Cotton University
K. J. Goswami, and N. S. Sarma	Chem Sci 2021 (RSC Publishing Webinars; 15th December, 2021)	15th December, 2021 RSC Publishing Webinars (On-line event)
N. Sultana, and N.S. Sarma	ChemSci2021 (RSC Publishing Webinars; 15th December, 2021)	15th December, 2021 RSC Publishing Webinars (On-line event)

Faculty/Research Scholar	Conference/Workshop/Exhibitions	Date and Venue
S. Upadhyaya, B. Gogoi, and N.S. Sarma	International conference on 'Progress and Challenges in Modern Day Science (PCMDS- 2021)	17th- 18th June, 2021 B. Borooah college, in association with Assam Science Society
N. Sultana, and N.S. Sarma	Emerging areas in science and technology (EAST 2021)	1st-2nd June, 2021 Royal School of Applied & Pure Sciences, The Assam Royal Global University
A. Deb, J. Gogoi and S. Rahman	Chemical Science Symposium 2021: Leaders in The Field Symposium	13th-15th December, 2021 JNCASR, Bangalore
A. Deb, J. Gogoi and K. Phukan	7th International Conference on Advanced Nanomaterials and Nanotechnology, ICANN 2021	14th -17th December2021 IIT Guwahati
J. S. Baruah	5 NANO 2021	29th -30th April, 2021 Mangalam College of Engineering, Ettumanoor, Kottayam, Kerala
J.S. Baruah	ICMFM-2021	24th -25th June, 2021 Sai Ram Engineering College, Chennai, India
S. Rahman	International Conference Sustainable Approaches in Food Engineering and Technology (SAFETy)	24th- 25th June 2021
S. Rahman	Emerging Areas In Science & Technology, (EAST 2021) organized by	1st-2nd June 2021 Royal School of Applied & Pure Sciences, The Assam Royal Global University
S. Rahman	International Conference On Advanced Materials And Mechanical Characterization (ICAMMC-2021)	02nd-04th December 2021
K. Phukan	International Conference on Emerging Trends in Nanomaterials Science and Technology (ICETNMST 2022)	27th -29th January, 2022 NIT Nagaland
D. Gogoi, S. Podder and J. Borah	65th DAE Solid State Physics Symposium	15th-19th, 2021 Organized by: BARC, Mumbai, India (Online mode)

Faculty/Research Scholar	Conference/Workshop/Exhibitions	Date and Venue
S. Pandit	National Conference on Emerging Trends in Physical Sciences (ETPS-2021)	27th September-1st October, 2021 Department of Physics, ICFAI Science School, ICFAI University, Tripura.
S. Pandit	7th Conference on Neutron Scattering (CNS-2021)	25th-27th November, 2021 BARC, Mumbai
S. Pandit	65th DAE Solid State Physics Symposium (DAE SSPS -2021)	15th-19th December, 2021 BARC, Mumbai
S. Pandit	National seminar on Emerging Priorities in Science and Technology with Special Focus on Rural and Green Technology	24th March, 2022 B. Borooah College by Assam Science Society.
S. Pandit	Workshop on Indian Nanoelectronics Users' Program-Idea to Innovation (INUP-i2i 2021)	12th-14th December, Centre for Nanotechnology, IIT Guwahati
R. J. Sarmah	National Conference on Emerging Trends in Physical Sciences (ETPS-2021)	27th September-1st October, 2021 Department of Physics, ICFAI Science School, ICFAI University, Tripura.
R. J. Sarmah	65th DAE Solid State Physics Symposium (DAE SSPS -2021)	15th-19th December, 2021 BARC, Mumbai
Sanjib Sau	National Conference on Emerging Trends in Physical Sciences (ETPS-2021)	27th September-1st October, 2021 Department of Physics, ICFAI Science School, ICFAI University, Tripura.
Sanjib Sau	65th DAE Solid State Physics Symposium (DAE SSPS -2021)	15th-19th December, 2021 BARC, Mumbai
Sanu Sarkar	National Conference on Emerging Trends in Physical Sciences (ETPS-2021)	27th September-1st October, 2021 Department of Physics, ICFAI Science School, ICFAI University, Tripura.
Sanu Sarkar	National Conference on Emerging Trends in Nano-materials Science & Technology (ICETNMST-2022)	27th-29th January, 2022 NIT Nagaland, Nagaland
Dr. A. Kalita	Attended workshop on "Energetic Beam Technology: From Materials Engineering to Diagnostics"	21th-25th June, 2021 Amity Institute of Nanotechnology, (online mode)

Faculty/Research Scholar	Conference/Workshop/Exhibitions	Date and Venue
Dr. A. Kalita	Attended symposium on "Vista Symposium on Artificial-Intelligence and Data-Science Assisted Synthesis"	13th-20th July, 2021.
H. J. Bora	Presented poster on "International Conference on Emerging Trends in Nanomaterials Science and Technology (ICETNMST-2022)"	27th -29th January, 2022 NIT Nagaland
H. J. Bora	Chemical Science Symposium 2021: Leaders in The Field Symposium	13th-15th December, 2021 JNCASR, Bangalore
H. J. Bora	Presented poster on "International Conference on Progress and Challenges in Modern Day Science (PCMDS-2021)"	17th-18th June, 2021 Department of Chemistry, B. Borooah College in Association with Assam Science Society (online mode)
H. J. Bora	Attended symposium on "Vista Symposium on Artificial-Intelligence and Data-Science Assisted Synthesis"	13th-20th July, 2021
H. J. Bora	Attended e-workshop on "3D Printing: Techniques and their Application in Biomedical Devices"	15th July, 2021 North-East Centre for Biological Sciences and Health Care Engineering, IIT Guwahati

Other Activities

M.Sc. / B. Tech projects/Internship/Training Courses Offered at IASST

Name(s) of trainee	Programme and supervisor	Title of work	Duration
A. Baruah	M.Sc./ Prof. Neelotpal Sen Sarma	Silk fibroin decorated reduced graphene oxide nano-composite as a fluorescent turn-on sensor for ultra-sensitive detection of Anti-Parkinson drug L-dopa	2 Months
M. Singh	M.Sc./ Prof. Neelotpal Sen Sarma	Adenanthera Pavonina L. Seeds derived reduced graphene oxide quantum dots as a fluorescent nano-probe for selective detection of picric acid in real samples	2 Months
S. Kakati	B. Tech/ Prof. Neelotpal Sen Sarma	Poly (n-vinylpyrrolidone-co-acrylonitrile-co-methacrylic acid) - zinc oxide nanoparticle composite: synthesis and characterization	6 Months

Name(s) of trainee	Programme and supervisor	Title of work	Duration
R.R. Sarma	M.Sc/ Dr. Devasish Chowdhury	Fluorescence based detection of H_2O_2 in living cells	February 2021 to July 2021
G. R. Nalkar	M.Sc/ Dr. Devasish Chowdhury	Biogenic Carbon Dots as Fluorescence Immunosensor for Detection of Disease Biomarker	October 2021 to January 2022
B. Sharma	M.Sc./ Dr. S. Kundu	Formation of silver nanomaterials from the plant extract	Three Months (Jan. -March. 2022)

Awards/Recognitions/Achievements

Name	Particulars
S. Rahman, DST-Inspire SRF	Received the first prize in oral presentation given in International Conference Sustainable Approaches in Food Engineering and Technology (SAFETy) held on 24th and 25th June 2021.
J. S.Baruah, SRF	Received the third prize in oral presentation given in ICMFM-2021 organized by Sai ram engineering college, Chennai, India during 24th-25th June, 2021
H. J. Bora	Received 2nd Best Poster Award for poster presentation on "International Conference on Progress and Challenges in Modern Day Science (PCMDS-2021)" organized by Department of Chemistry, B. Borooah College in Association with Assam Science Society held on 17th-18th June, 2021.
T. Kashyap	Received 2nd best poster presentation award in the International conference on Emerging Trends in nanomaterials Science (ICETNMST-2022), NIT Nagaland, 27th-29th January 2022
H. J. Bora	Received 1st best poster presentation award in the International conference on Emerging Trends in nanomaterials Science (ICETNMST-2022), NIT Nagaland, 27-29th January 2022
P. Bhagowati	Received 2nd best poster presentation award in the International conference on Emerging Trends in nanomaterials Science (ICETNMST-2022), NIT Nagaland, 27th-29th January 2022

Popular Articles Published in Newspapers/Magazine

Authors Name	Article Title	Newspaper/ Magazine name	Volume & Issue no./page no.	Month/Year of publication
D.Chowdhury	Activated Carbon from Tea waste	Creators, Bio Nest-IASST newsletter	8, pp 6	July 2021
D.Chowdhury	Tea & banana waste used to develop non-toxic activated carbon	DST newsletter	--	June 2021
D.Chowdhury	New biodegradable polymer fabricated using guar gum, and chitosan has high potential for packaging material	DST newsletter	--	May 2021

MATHEMATICAL AND COMPUTATIONAL SCIENCES

A. Stochastic Processes

Coordinator: Dr. Gautam Choudhury

A. 1. Queueing Theory

Queueing theory is a branch of Stochastic Modelling, which falls under the umbrella of the Stochastic Processes. In this context, some important investigations have been made on vacation queueing models related to control operating policy. These models have potential applications in Industrial Engineering, Digital Communication system and Modern Telecommunication systems ensuring a very important research domain in today's world. Vacation models are characterized by the fact that idle time of the server may be utilized for some secondary job and the server remains unavailable during this interval of time occasionally. The time period during which server remains unavailable for actual service in the system is known as vacation period.

First of all, we introduce the notion of "random vacation policy", where we introduce the concept that the maximum number of server vacation is a discrete random variable instead of a fixed number. It is a generalization of 'Single Vacation Policy' as well as 'Multiple Vacation Policy' models. Secondly, we have studied some Unreliable Server Queueing models when the server renders two different kinds of service under repeated service policy. In this context some of our research works have been done in collaboration with Professor S. Dharmaraja., Department of Mathematics, I.I.T. Delhi.

B. AI-based Computer Vision and Pattern Recognition

Coordinator: Dr. Lipi B. Mahanta

B. 1. I HC-Net: A Fully Convolutional Neural Network for Automated Nuclear Segmentation and Ensemble Classification for Allred scoring in Breast Pathology

This study presents a Deep Learning (DL)-based nuclear segmentation and ensemble classification scheme for quantitative evaluation of hormone status namely estrogen or progesterone on IHC specimen. This will mainly assist pathologists in automatic analysis and interpretation of breast cancer prognosis route. The proposed method consists of two major steps i.e., segmentation and classification. Since invasive breast cancer images are associated with numerous stained cells including artifacts like stromal and inflammatory particulars, it is crucial to develop a computerized method for segmenting them. A new segmentation method has been presented based on deep learning network for precisely segmenting out the stained nuclei region from breast tissue images (Fig. 21). Morphological post-processing on segmented results shows the splitting of overlapped nuclei. Finally, to improve individual classifier's results, the ensemble method is used, which integrates the decision of three machine learning (ML) models for final Allred cancer score. Statistical analysis reveals that all three classifiers perform adequately but proposed approach shows the best accuracy (98.24%), best correlation with the manual expert's score (Pearson's correlation coefficient = 0.908) and requires minimum computational time 44s/image (±2.33) compared to state-of-the-art methods. The proposed framework can be used as a reliable alternative to manual methods for automatic Allred scoring and in the prognostic assessment of breast cancer.

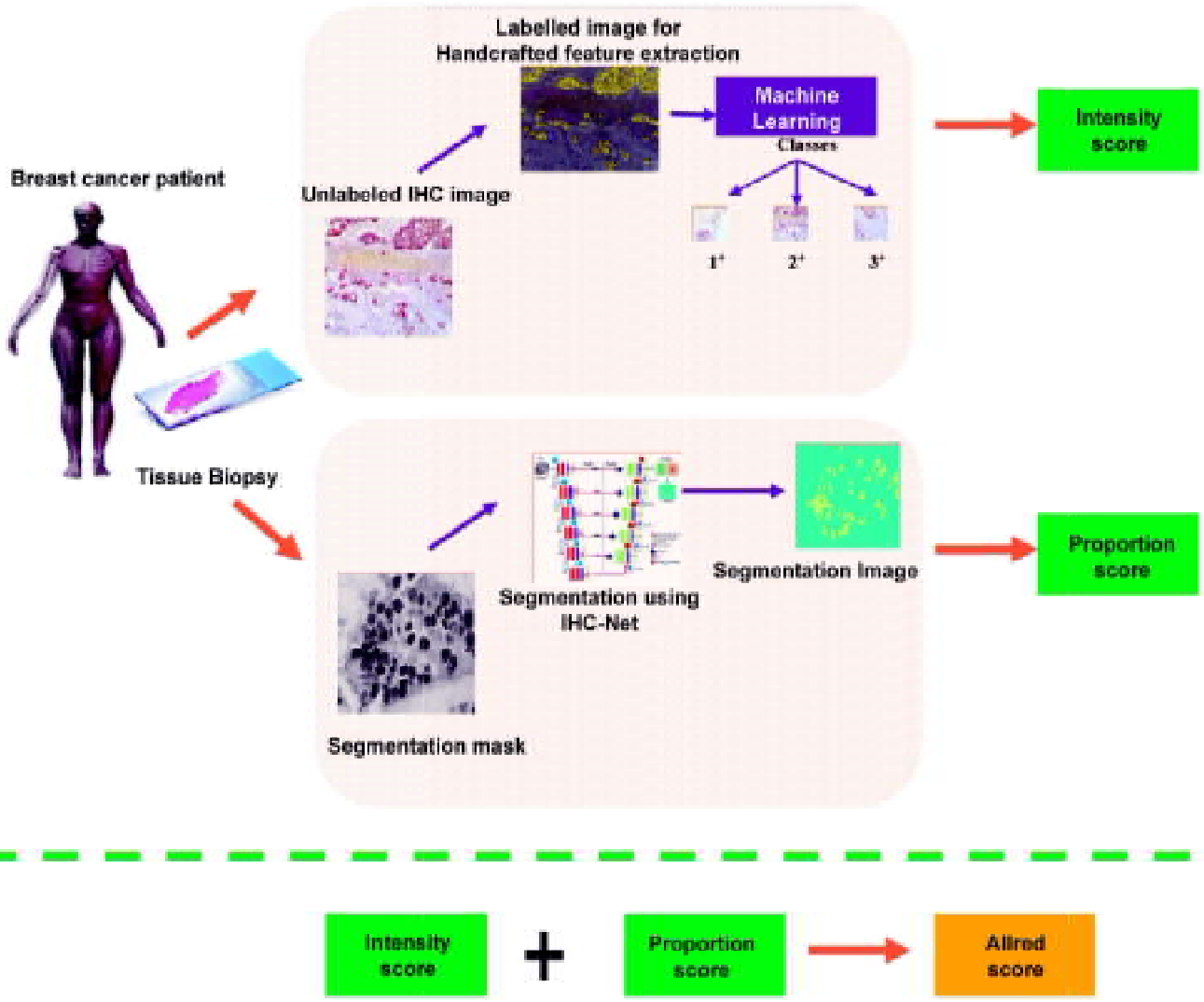


Figure 21 : Work flow of the AI-based Allred scoring system of breast IHC images.

B. 2. Identification and Segmentation of Striation Marks of Bullets Using Deep Learning Architectures

Post-crime, identifying firearm types from remnants of fired bullets is a daunting task for any ballistic expert. The features used for identification are few and almost obliterated due to impact. This creates a solid foundation for applying AI to the process, the first being segmentation and enhancement of the features. However, the bullet's metal surface makes image capturing and analysis more complicated than other common domains. In the present study, an attempt is made to extract one of the defining features of fired bullets, namely striations, using deep learning techniques, which will assist in automated firearm identification (Fig. 22). U-net, a CNN-based semantic segmentation architecture, and two variants (the Inception U-net and Residual U-net architecture) achieve the objectives. The U-net architecture achieved 88% accuracy with a training loss as low as 0.0231 after 700 epochs of training. The Inception U-net architecture and Residual U-net architecture achieved training accuracy of 88.30% and 88.79%, respectively, while their training loss reduced to as low as 0.0194 and 0.0151, respectively, with the same number of epochs. With 10-fold Cross-Validation the accuracy of Residual U-net further enhanced to 89.70%. Supported with statistical analysis, the study establishes that deep learning techniques prove valuable to segment the striation marks from the bullet images and help the ballistic experts identify firearms.

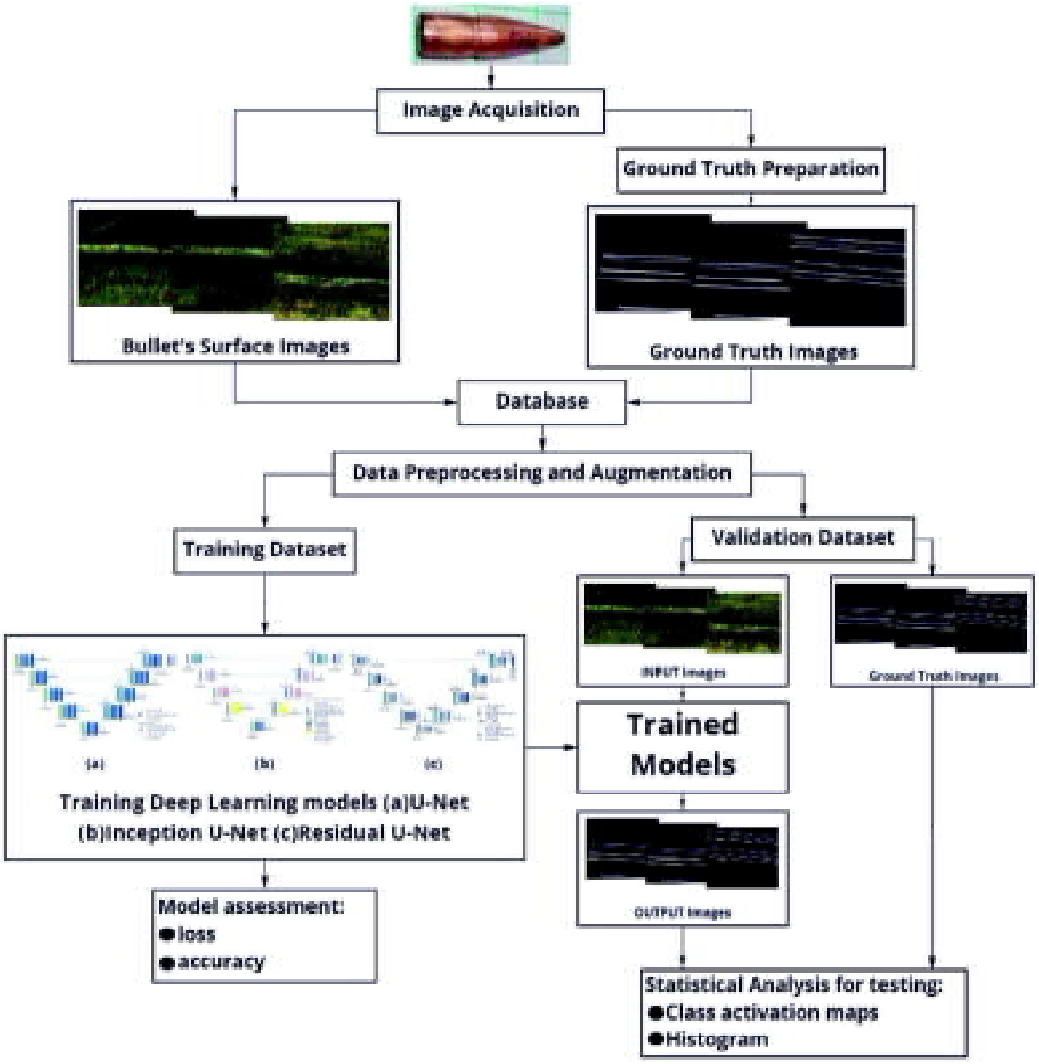


Figure 22 : Work flow of the AI-based identification and segmentation system of striation marks of bullets.

C. Mathematical treatment of Geophysical Fluid flow and Indian Summer Monsoon Rainfall (ISMR) Prediction

Coordinator: Dr. Santu Das

C. 1. Mathematical Modelling of Geophysical Fluid Flow

Due to global warming, the sea-water level is rising continuously and the landscape of sea-ice changes. To meet the demand for the habitable zone, it is pertinent to make use of ocean space to build floating structures. In addition, the study of movement and characteristics of surface ice in the Polar Regions is essential too. In both these cases, the interaction between water waves and floating elastic structures gives rise to a new kind of coupled wave, known as a *hydroelastic* or *flexural-gravity* wave. An introduction of water compressibility makes the problem more complex due to the generation of *acoustic-gravity wave*. Currently, we aim to understand some basic concepts of such waves in a complex system. The presence of a submerged cylinder, which acts as an underwater pipeline, generates *trapped waves* at the vicinity of the cylinder. These waves are quite harmful for the structure and requires attention to mitigate the adverse effect. Within the frequency band of *wave blocking* (a phenomenon where wave energy propagation halts), multiple propagating modes influence those waves (Fig. 23).

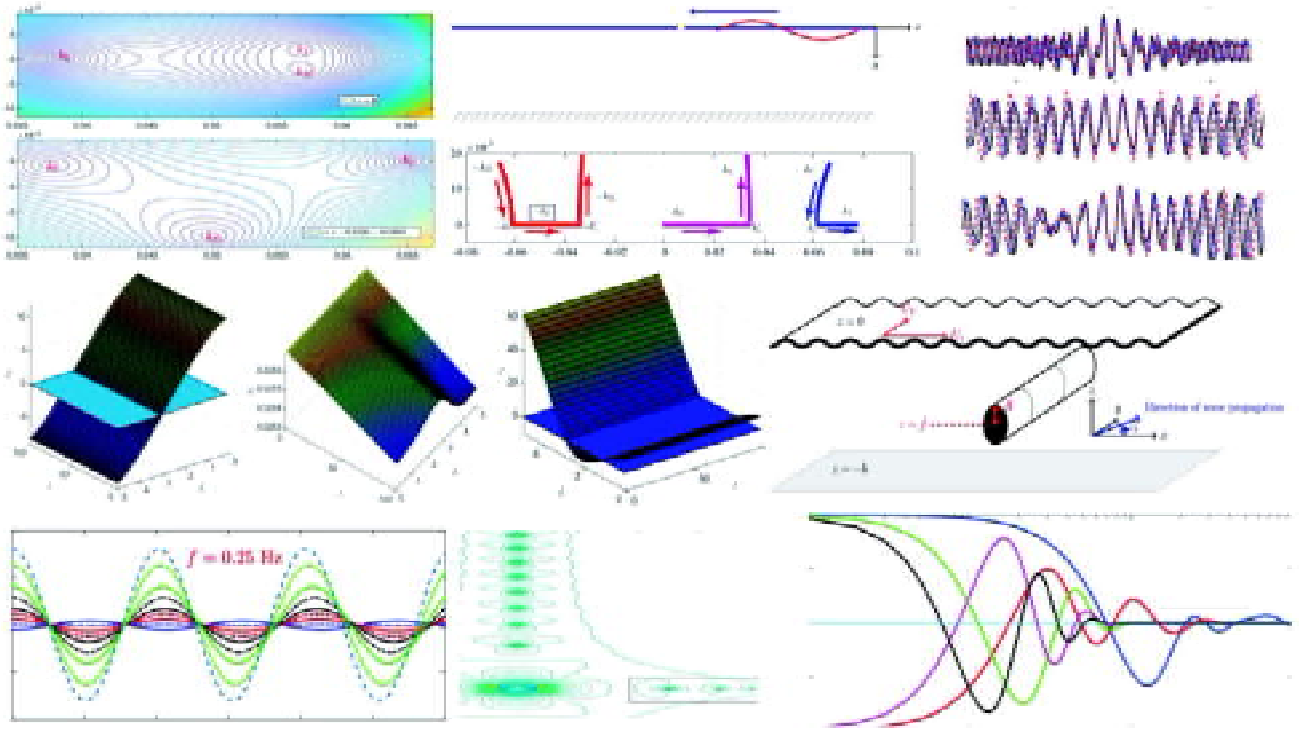


Figure 23 : Schematic of ocean wave flow pattern under various flow conditions.

C. 2. Long lead predictability of Indian Summer Monsoon Rainfall (ISMR) with emphasis on Northeast India Summer Monsoon Season rainfall (NEIR)

The Indian Summer Monsoon Rainfall (ISMR) is essential for the growth and development of the Indian economy. Hence, skilful prediction of the ISMR up to two years in advance is valuable for farmers and policymakers for water resource management and food security planning. While the ISMR is highly predictable at short lead, estimates of the long-lead predictability of ISMR is lacking. However, with a new predictor-discovery method, we unravel that a predictor based on the depth of 20° -isotherm (D20) to be best suited for estimating the potential predictability of ISMR at longer lead (Fig. 24). In addition to ISMR we have also completed a thorough study on the variability and predictability of Northeast India Summer Monsoon Season Rainfall (NEIR). The mesoscale orography over one of the wettest regions of the world makes the Northeast India (NEI) vulnerable to hydrological disasters while sustaining a biodiversity hotspot. Therefore, understanding the drivers and predictability of rainfall variability over the region is key for sustainable development planning and adaptation to increasing disasters in the backdrop of a warming climate.

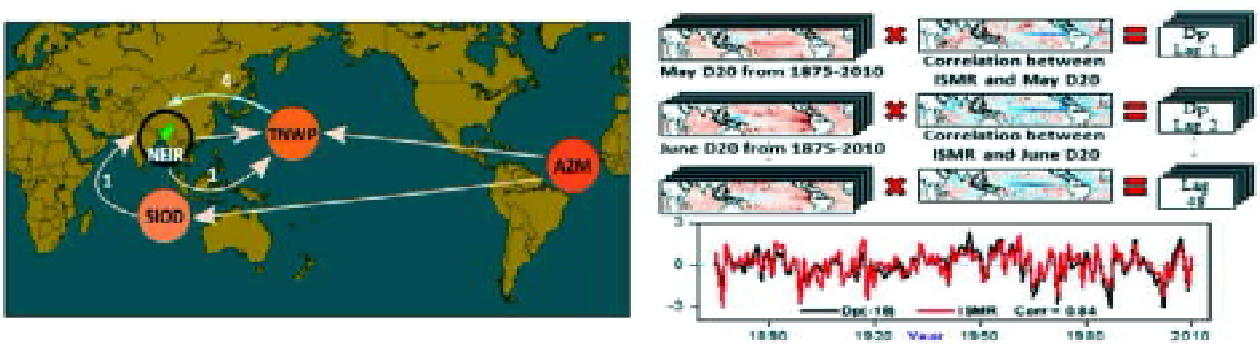


Figure 24 : Mechanism of determining the predictability of ISMR at various lead months and the drivers of the North-East Summer Monsoon Rainfall identified using causality.

RESEARCH OUTPUT

Extramural projects

Ongoing projects

Title of the project	Funding Agency, Total fund, Duration, PI/Coordinator, Co-Investigator	Goal
Computer-assisted automated identification of handloom gamusa: artificial intelligence approach	Funding agency : NECTAR, DST, Govt. of India; INR 15.29 Lakhs; 1 year from October 2021 - September 2022 PI: Dr Lipi B Mahanta Co-PI: Dr Kangkana Bora, Cotton University, Guwahati Co-PI: Dr Chandan Chakrabarty, NITTTR, Kolkata	Development of a classified image database of handloom and Power loom gamusa using a normal digital camera, along with their annotations. Detailed feature study (at microstructural and textural feature level) followed by development of RoI (Region of Interest) segmentation and feature extraction algorithms. Development of Artificial Intelligence-driven models (both Machine and Deep Learning) for automated recognition of handloom and powerloom gamusa. Development of Computer Assisted Handloom Recognizing System and its front-end design through user-friendly GUI.
PM10 and PM2.5 Related Health Effects in North-East India: Source Identification and Cohort Analysis.	Funding Agency : DST, Govt. of India Total Fund : INR 18.4 lakhs Duration : 2019-2022 PI/Coordinator: Dr. Arundhuti Devi Co-Investigator : Dr. Lipi B. Mahanta	The major objective of the proposed project is to study the chemical composition of PM10 and PM2.5 and its temporal and spatial variation in regions of Assam selected critically on the basis of CPCB report, conducting source apportionment modeling with respect to various types of sources of emission and relating the particulate pollutant load in ambient air to most common health problems.

Title of the project	Funding Agency, Total fund, Duration, PI/Coordinator, Co-Investigator	Goal
Cervi Tester: A Smart and Portable Screening Device for AI-Assisted Automated Diagnosis of Cervical Cancer in Low Resource Settings	Funding agency : DST - BDTD programe; INR 33.71 Lakhs; 3 years; PI: Dr Swati Vijay Shinde, Pimpri Chinchwad College of Engineering (PCCOE), Pune. Co-PI: Dr Lipi B Mahanta	To develop an AI based intelligent biomedical screening device that can diagnose the cervical cancer accurately and provides a cost-effective and affordable solution that can be quickly deployed in regions lacking sufficient capital. To facilitate the different tests including Pap Smear and Colposcopy Test for the detection and staging of cervical cancer. To leverage the power of recent technologies like Internet of Things (IOT), Cloud Computing and Artificial Intelligence (AI) for the development of smart biomedical device system. To digitize the microscopic images and transferring these images to cloud using IOT for the further processing using AI algorithms. To propose a novel algorithm for automatic segmentation of cervical cells that accurately distinguishes the affected area. To analyse the existing different machine learning and deep learning algorithms for the classification of cervical cancer images and to propose the new algorithm that can process and classify the cervical cancer images accurately
Flexural-Gravity Waves: A Complete Theoretical Development SPARC/2018-2019/ P751/SL	Funding Agency: MHRD, Govt. of India, Total fund: 70.1 lakhs, Duration: 2019 - 2021. Extended till 30th September 2022. Co-PI/Coordinator: Dr. Santu Das	To develop a mathematical model to study the blocking effect in finite ice-sheet/VLFS. The recently analysed flexural-gravity wave blocking dynamics for floating structures will be studied for submerged flexible horizontal structures. In addition, the effect of elastic ocean bottom, a major influential factor in building railway tracks in polar regions, will be incorporated. An attempt will be made to include non-linearity into the physical problems. All these proposed studies will be backed up by time-domain simulations wherever possible.

In-house Projects

Ongoing Projects

Title of the project	Funding Agency, Total fund, Duration, PI/Coordinator, Co-Investigator	Goal
A comparative study of AI-assisted automated diagnosis of colposcopy and visual inspection (VIA/VILI) images aimed at early screening of cervical cancer for accuracy and feasibility.	IASST; INR 12.14 Lakhs; 2 years from 31.08.21 to 30.8 23 PI: Dr. Lipi B Mahanta Co-PI: Dr. Santu Das	To contribute towards the development of two image databases or repositories: one comprising of healthy and malignant colposcopy images, and another with similar sets of cervix images captured as per visual inspection process. To develop an imaging module that will capture the cervix images and send them to a cloud server for further processing using explainable artificial intelligence (XAI) algorithms. To develop XAI modules that will classify the samples into a low grade or normal or CIN1, high grade or non-invasive cancer or CIN2+ and high grade or suspected invasive cancer or CIN2+ as per the Swede Score standard.

Publications

In Cited Journals

Author(s)	Title	Journal Name	Volume & Issue no./page no	Year of Publication
G. Choudhury, P. Kalita and S. Dharmaraja	Analysis of a model of batch Arrival Single server queue with random vacation Policy	Communications in Statistics Theory and Method	50 (22), 5314 - 5357. https://doi.org/10.1080/03610926.2020.1728329	2021
P. Kalita and G. Choudhury	Analysis of batch arrival Single Server queue With random vacation Policy and two type of general heterogeneous repeated service	International Journal of Operational Research	42 (2) 131 - 162. https://doi.org/10.1504/IJOR.2021.118997	2021
L. B. Mahanta, E. Hussain, N. Das, L. Kakati and M. Chowdhury	IHC-Net: A Fully Convolutional Neural Network for automated nuclear segmentation and	Applied Soft Computing	103, 107136 https://doi.org/10.1016/j.asoc.2021.107136	2021

Author(s)	Title	Journal Name	Volume & Issue no./page no	Year of Publication
	Ensemble classification for Allred scoring in breast pathology			
D. Das and L. B. Mahanta	A comparative assessment of different approaches of segmentation and classification methods on childhood medulloblastoma images.	Journal of Medical and Biological Engineering,	41(3), 379-392 https://doi.org/10.1007/s40846-021-00612-4	2021
M. Kalita, L. B. Mahanta, and A. K. Das	A Review of Automated Digital Clinical System of Breast Cancer Detection using FNAC images	Annals of Oncology Research and Therapy	1:10-5. https://doi.org/10.4103/aort.aort_6_21	2021
S. K. Dutta, S. Saikia, A. Barman, R. Roy, K. Bora, L. B. Mahanta and R. Suresh	Study on enhanced deep learning approaches for value-added identification and segmentation of striation marks in bullets for precise firearm classification	Applied Soft Computing	112, 107789 https://doi.org/10.1016/j.asoc.2021.107789	2021
S. Mishra, S. Saha, S. Das and S. N. Bora	Reflection and damping of linear water waves by a multi-porosity vertical porous structure placed on a step-type raised seabed	Marine Systems and Ocean Technology	16, 142-156 https://doi.org/10.1007/s40868-021-00101-y	2021
S. Das and S. Saha	A transit through the trapping and blocking of flexural-gravity wave: Impact of two-dimensional current and in-plane compression	Physics of Fluids	33, 116603 https://doi.org/10.1063/5.0066115	2021
S. Das	Flexural-gravity wave dissipation under strong compression and ocean current near blocking point	Waves in Random and Complex Media	Online on 21st Feb 2022 https://doi.org/10.1080/17455030.2022.2035847	2022
S. Das and M. H. Meylan	The effect of compressed ice-shelf on acoustic-gravity wave propagation in a compressible ocean having elastic bottom	Wave Motion	110, 102897 https://doi.org/10.1016/j.wavemoti.2022.102897	2022

Author(s)	Title	Journal Name	Volume & Issue no./page no	Year of Publication
S. Boral, S. Das, T. Sahoo and M. H. Meylan	Blocking dynamics of capillary-gravity waves in a two-layer fluid in the presence of surface and interfacial tensions	Mecanica	57, 1307-1335 https://doi.org/10.1007/s11012-022-01495-8	2022
B. Chutia, T. Deka, Y. Bailung, D. Sharma, S. K. Sharma and H. Bailung	Spatiotemporal evolution of a self-excited dust density wave in a nanodusty plasma under strong Havnes effect	Physics of Plasmas	28 (12), 123702 https://doi.org/10.1063/5.0075125	2021

Book Chapters

Author(s) Name	Chapter Title	Book Title	Publisher	Year of Publication
L. B. Mahanta, E. Hussain and K. Bora	AIM and Cervical Cancer-AI-Driven Early Detection of Cervical Cancer with Papsmear Analysis	In: Lidströmer N., Ashrafian H. (eds) Artificial Intelligence in Medicine. https://10.1007/978-3-030-58080-3_253-1	Springer, Cham	2021
D. Das and L. B. Mahanta	AIM in Neurology - Role of AI driven diagnosis of childhood medulloblastoma for better prognosis	In: Lidströmer N., Ashrafian H. (eds) Artificial Intelligence in Medicine. https://10.1007/978-3-030-64573-1_189	Springer, Cham	2022
M. J. Das and L. B. Mahanta	Multiscale Anisotropic Morlet Wavelet for Texture Classification of Interstitial Lung Diseases.	In: Chiplunkar, N., Fukao, T. (eds) Advances in Artificial Intelligence & Data Engineering. Advances in Intelligent Systems and Computing, vol 1133. https://10.1007/978-981-15-3514-7_88	Springer, Singapore	2021

Conference Presentations

Author(s)	Title	Conference Name	Venue	Year of Publication
E. Hussain, L. B. Mahanta, K. A. Borbora, A. K. Shah, D. Subhasini and T. Das	A Study on Effects of different image enhancement techniques on cervical colposcopy images	International conference on Artificial Intelligence and Sustainable Engineering (AISE 2020)	National Institute of Technology (NIT), Goa, India (online)	2021
S. C. Barman, S. Das and T. Sahoo	Sea ice and interfacial deflection within the frequency band of blocking in a stratified ocean	2nd International Workshop in the Mathematics of Sea Ice and Ice Sheets.	University of Southern Queens-land, QLD 4350 Australia (online)	2021
D. Sharma, S. Das, S. K. Saha and B. N. Goswami	Long-lead prediction and predictability of the Indian Summer Monsoon Rainfall	Seventh International Workshop on Monsoons	New Delhi, India (Online)	2022

Conference Proceedings

Author(s)	Title	Conference Name	Volume & Issue No/Page No.	Year of Publication
S. Das and M. H. Meylan	Acoustic-gravity wave generation as a result of bottom oscillation of compressible ocean.	I36th International Workshop on Water Waves and Floating Bodies (IWWWFB-2021)	36, 20-24	2021
S. C. Barman, S. Das and T. Sahoo	Energy identity for flexural-gravity wave scattering due to a crack in a floating ice sheet in two-layer fluid in the context of blocking dynamics	36th International Workshop on Water Waves and Floating Bodies (IWWWFB-2021)	36, 1-4	2021

Invited Talks

Faculty	Title	Programme Name	Date and Venue
Dr. L. B. Mahanta	Gender policy, processes, procedures, practices	First GSAT training on GATI framework and Methodology	24th December, 2021 Chandraprabha Saikiani Centre for Women Studies, Tezpur University 13th -17th December 2021 (online),
Dr. S. Das	Introduction to water compressibility and its effect on hydroelastic wave	Short-term course on "Non-linear problems in hydroelasticity"	Dept. of Ocean Engineering and Naval Architecture, IIT Kharagpur, Kharagpur - 721302, India

Conferences/Workshops/Seminars/Meetings Attended

Faculty/Research Scholar	Conference/Workshop/Exhibitions	Date and Venue
Dr. L. B. Mahanta	Conclave on Transforming Meghalaya State through Science and Technology Interventions	9th-10th April, 2021, Shillong NECTAR, Govt. India
Dr. L. B. Mahanta	Workshop on Artificial Intelligence (AI) For Government Officers	15th- 25th June, 2021(online) CDAC, Govt. Of India
Dr. L. B. Mahanta	Brain Storming Conclave on Atmanirbhar North East through S&T Interventions in	21th - 22th December, 2021 Cotton University, Guwahati
Dr. L. B. Mahanta	First GSAT training on GATI framework and Methodology	24th December, 2021, Chandraprabha Saikiani Centre for Women Studies, Tezpur University
Dr. S. Das	36th International Workshop on Water Waves and Floating Bodies (IWWWFB-2021)	25th-28th April, 2021 (online) Seoul National University (South Korea)
Dr. S. Das	2nd International Workshop in the Mathematics of Sea Ice and Ice Sheets	10th-12th November, 2021 (online) University of Southern Queensland, QLD 4350 Australia
Dr. S. Das	Short-term course on "Non-linear problems in hydroelasticity"	13th-17th December 2021 (online), Dept. of Ocean Engineering and Naval Architecture, IIT Kharagpur, Kharagpur - 721302, India
Dr. S. Das	2nd International Workshop on Numerical and Analytical Techniques in Engineering Problems-2022	19th-21st January, 2022 (online) Department of Mathematics, SRM Institute of Science and Technology, Kattankulathur - 603203, India
D. Sharma	Webinar based training program on "Open Source GIS"	20th-24th September, 2021 (Online) National Remote Sensing Centre and India Space Research Organization, Department of Space, Government of India.
D. Sharma	Webinar based training program on "Bhuvan Overview"	06th-08th October, 2021 (Online) National Remote Sensing Centre and India Space Research Organisation, Department of Space, Government of India

Faculty/Research Scholar	Conference/Workshop/Exhibitions	Date and Venue
D. Sharma	Joint ICTP-IUGG Workshop on Data Assimilation and Inverse Problems in Geophysical Sciences.	18th-29th October, 2021 (Online) Italy ICTP-IUGG
R. Das	Short-term course on "Non-linear problems in hydroelasticity"	13th-17th December 2021 (online), Dept. of Ocean Engineering and Naval Architecture, IIT Kharagpur, Kharagpur - 721302, India
R. Das	2nd International Workshop on Numerical and Analytical Techniques in Engineering Problems-2022	19th-21st January, 2022 (online) Department of Mathematics, SRM Institute of Science and Technology, Kattankulathur - 603203, India
L. Singh	Short-term course on "Non-linear problems in hydroelasticity"	13th-17th December 2021 (online), Dept. of Ocean Engineering and Naval Architecture, IIT Kharagpur, Kharagpur - 721302, India
L. Singh	2nd International Workshop on Numerical and Analytical Techniques in Engineering Problems-2022	19th-21st January, 2022 (online) Department of Mathematics, SRM Institute of Science and Technology, Kattankulathur - 603203, India

LIFE SCIENCES DIVISION

The Scientists of Life Sciences Division (LSD) of IASST pursuing research in two different major fields viz.**Traditional and Modern Drug Discovery and Disease Diagnosis, and Biodiversity and Ecosystem Research. As a premier institute, IASST is taking a leading role in both the research** fields. Extensive research is being carried out on exploration of natural resources, for example, traditional medicinal plants and snake venom for drug discovery against cardiovascular disease, neurological disorders, snakebite and scorpion sting along with the improvement of treatment of snakebite, scorpion sting and quality assessment of commercial snake and scorpion antivenom. In developing countries, the majority of people rely on traditional medicines; however, many of these practices have not been rigorously and systematically studied or reported. The past research in this institute has already provided scientific validation for some traditional claims about the therapeutic effect of some herbs and formulations against diabetes and other metabolic syndromes. Apart from that, in depth research is going on in the field of environmental pollution, basically focuses on monitoring and remediation of industrial pollutants such as petroleum wastes, heavy metals, dyes etc. A group has undertake research on exploration of Gut microbiota for better health.Traditional ethnic foods and beverages rich in prebiotic and potential probiotic microbes of the north east India are being studied for their marketability as functional foods for better health. Microbial biotechnology research group is focusing on the application and functioning of indigenous beneficial rhizobacteria and endophytes associated with Tea plants as an alternative to the chemical inputs for growth promotion and fungal disease suppression in commercial tea plantation.

A. Drug Discovery from Natural Resources

Coordinator: Prof. Ashis K. Mukherjee

A. 1. The application of laboratory-based analytical tools and techniques for the quality assessment and improvement of commercial antivenoms used in the treatment of snakebite envenomation

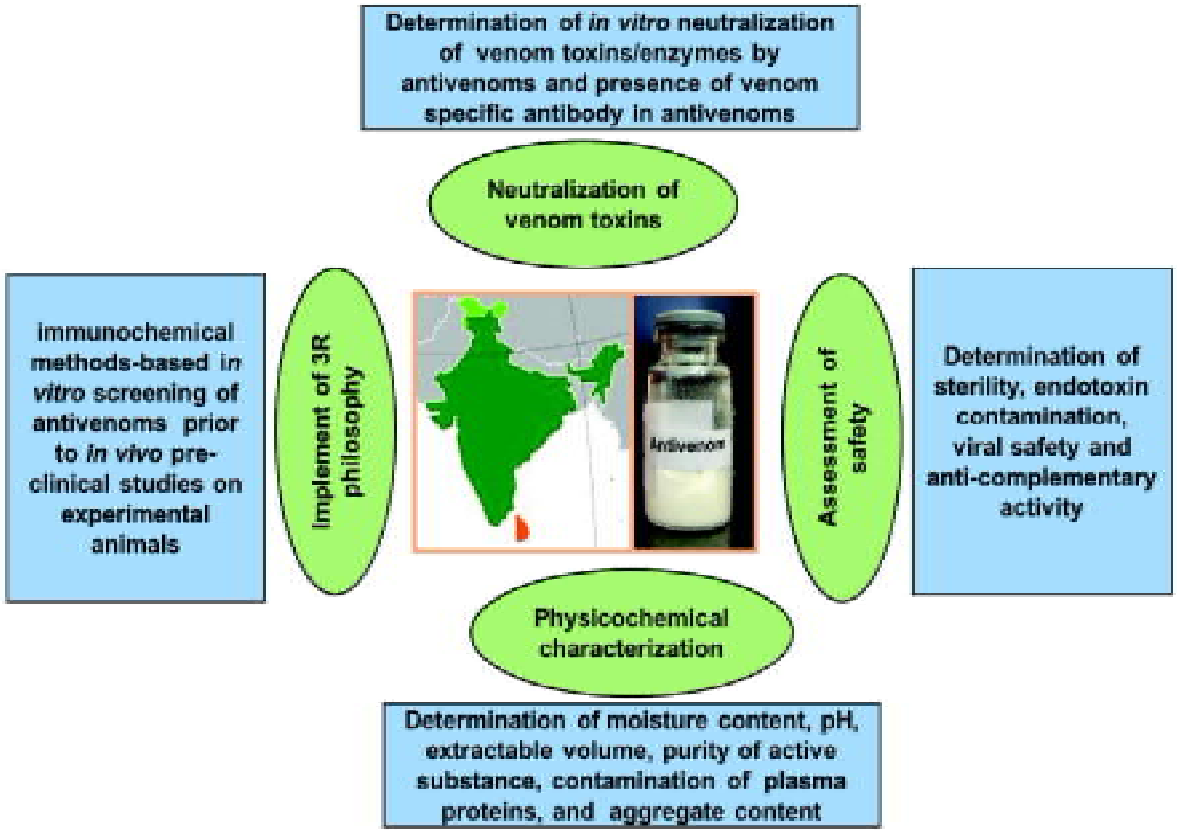


Figure 25 : Quality and safety assessment of commercial polyvalent antivenoms.

Snake envenomation is a severe problem in developing countries particularly in tropical and subtropical regions. Antivenom is the only choice of available treatment against snakebite envenomation and successful therapy depends upon the efficacy, quality and safety parameters of the antivenom, which can be determined by the physicochemical characteristics of formulations, purity of the immunoglobulin fragments and antibodies, presence of protein aggregates, endotoxin burden, preservative load, and batch to batch variation, as well as on the ability to neutralize the venom toxins against which the antivenom is designed. Therefore, following the suggestion of the World Health Organization commercial anti snake antivenoms from India and Sri Lanka, and anti-scorpion antivenoms from India were independently assessed by laboratory-based analytical techniques such as size-exclusion chromatography, SDS-PAGE, mass spectrometry, dynamic light scattering, immunological profiling, determination of venom specific antibodies by spectrofluorometric analysis, and neutralization of venom enzymatic activities. The analysis showed variation in the immunoglobulin content, and safety parameters (Fig. 25). Presence of very low venom specific antibodies in

commercial antivenom is the major concern for effective therapy against snakebite. The protocols standardized by us could be highly beneficial to the national regulatory agencies and antivenom manufacturing companies.

A. 2. Proteomic analysis of venom proteome composition Indian monocle *Naja kaouthia* (NK) venom from Assam and assessment of NK venom neutralization potency of commercial polyvalent antivenoms

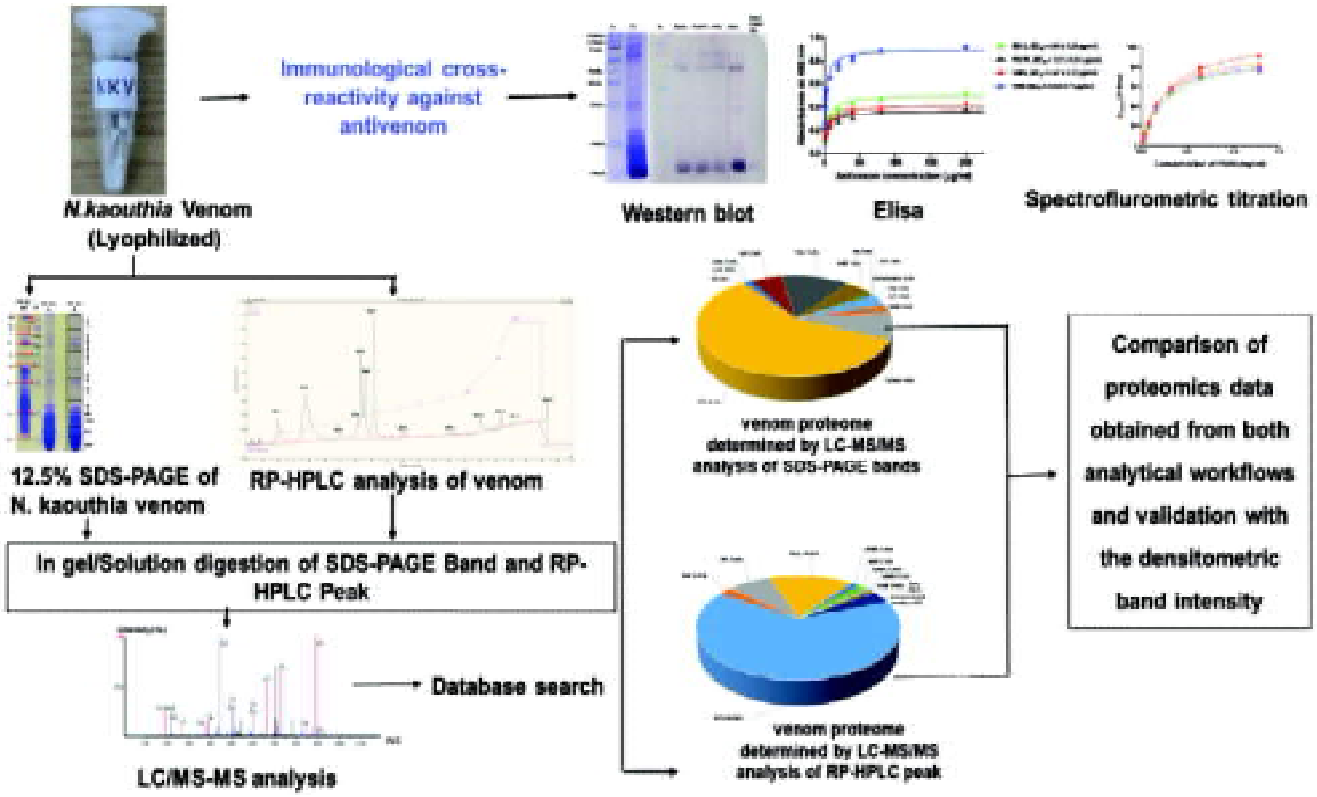


Figure 26 : Proteomics characterization of *Naja kaouthia* venom from North-East India and immunological profiling against commercial anti venom.

Snakebite is a severe problem for the tropical countries like India. The Indian monocled cobra (*Naja kaouthia*) is venomous species of snakes found in the North East India (NEI) and eastern India responsible for large number of fatalities. The venom proteome composition of *Naja kaouthia* from Assam was determined by two different analytical workflows-(i) 1D SDS-PAGE coupled to label-free quantification, and (ii) RP-HPLC followed by SDS-PAGE coupled to quantification based on area under RP-HPLC curve (Fig. 26). The proteomics data obtained from both the strategy was compared to determine their appropriateness. Proteomic analyses from both workflows identified 32 proteins (toxins) distributed over 10-14 snake venom protein families in NkV, thus suggesting the integrity of both the methods for venom proteome analysis. Proteomics analysis by both the workflows showed that three finger toxins (3FTx) (58.5-64.2%) and phospholipase A_2 (PLA_2) (13.13- 16.0%) were found to be the most abundant non-enzymatic and enzymatic proteins, respectively of Assam NkV. Immuno-cross-reactivity studies suggested the poor efficacy of the commercial polyvalent antivenoms in recognizing the most abundant low molecular weight (<15 kDa) toxins. Spectrofluorometric titration ascertains the presence of low venom-specific antibodies in commercial PAVs, which is a major concern for successful therapy against NK envenomation.

B. Natural Resource Management and Sustainable Development

Coordinator: Dr. Arundhuti Devi

B. 1. Impact of processing method on selected trace elements content of green tea: Does CTC green tea infusion possess risk towards human health?

The environmental contaminants enter the human body through the food systems. Among the different contaminants, the accumulation of trace elements in the human body through the consumption of tea (*Camellia sinensis L.*) infusion (hot water extract of tea) has received global attention. This study reported the content of selected metals, viz. Cd, Cr, Cu, Fe, Ni, Pb and Zn as well as non-carcinogenic risks of orthodox green tea and CTC (crush, tear and curl) green tea in India (Fig. 27). Results revealed that significantly higher amount of Cr (1.26-10.48 mg kg^{-1}), Cu (13.40-22.73 mg kg^{-1}), Fe (54.14-99.65 mg kg^{-1}), Ni (3.43-7.09 mg kg^{-1}), and Zn (25.04-38.04 mg kg^{-1}) in CTC green tea than orthodox one. However, no definite trend was observed for Pb and Cd, with overall contents ranged from 6.68 to 23.32 µg kg^{-1} and 0.04 to 0.13 mg kg^{-1}, respectively. The extraction of the elements in tea infusion was higher for CTC green tea. The hazard quotient and hazard index values of all studied metals were less than unity, confirming no significant health effect for consumers assuming drinking upto 750 mL tea infusion prepared from 10 g day^{-1} $person^{-1}$.

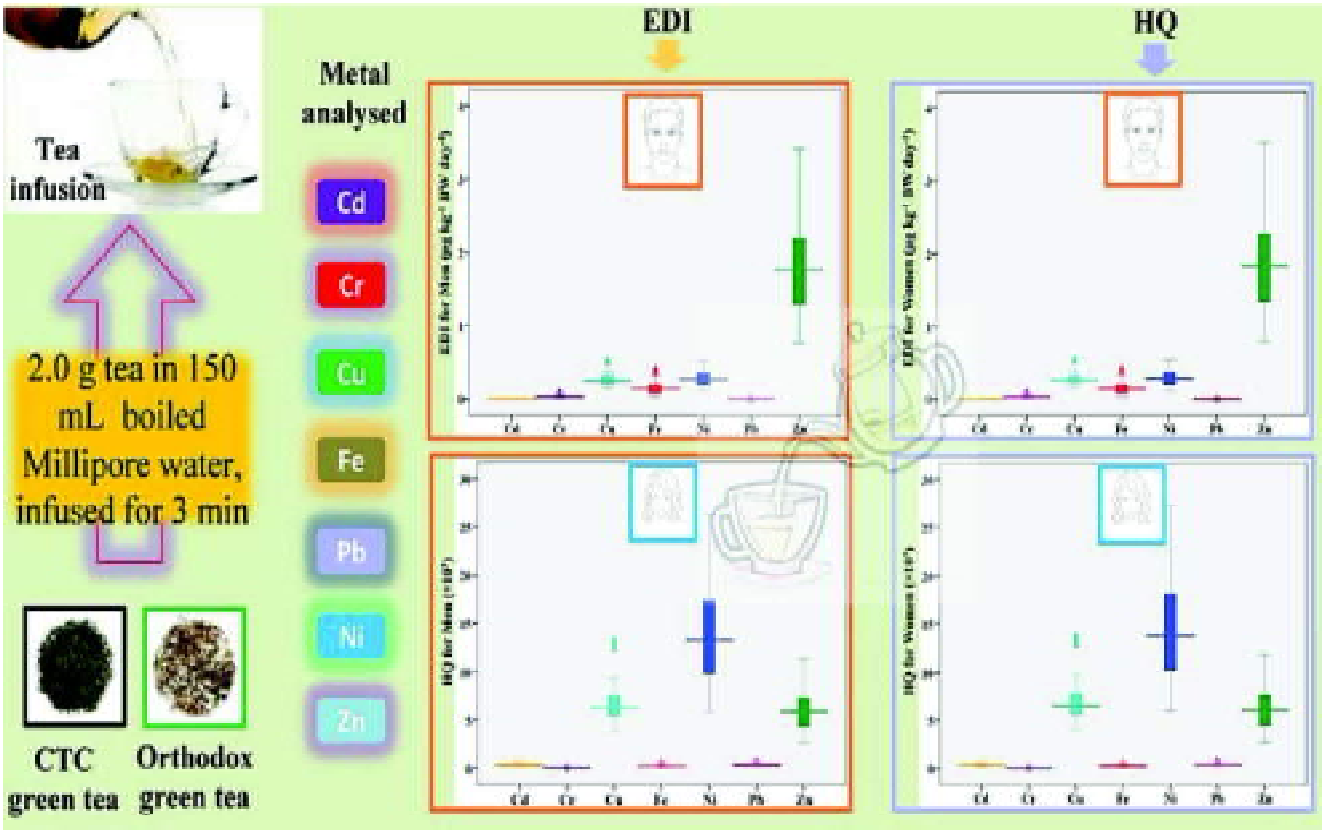


Figure 27 : Graphical Representation of Health risk analysis of CTC green tea and Orthodox green tea.

B.2. Total organic carbon, heavy metal content and metal bioaccumulation in a freshwater wetland of Indo-Burmese province, India

This study attempts to assess the spatio-temporal distribution of Total Organic Carbon (TOC) and heavy metals in one of the Ramsar wetlands of Indo-Burmese province, Deepor Beel. Water samples were collected from 10 sampling points during the pre monsoon, monsoon and post monsoon season of 2016 and 2017. The general water

parameters such as low DO, high BOD and high fluoride imply the wetland water's deteriorated quality (Fig. 28). The mean TOC of water was estimated to be 2.4 ± 0.33 ppm, which is the first report from Deepor Beel. The computed heavy metal indices revealed that most of the water samples were highly contaminated by metals. The metal concentration recorded in the selected macrophytes and fish species were far above the concentration of the respective metal in the water samples. Metal distribution in plant samples disclosed that *Euryale ferox* showed better accumulation ability than *Hydrilla verticillata* and *Eichhornia crassipes*. Among the fish species, the highest metal accumulation was recorded in *Xenentodon cancila* (zinc, iron, manganese and nickel) and *Channa punctatus* (lead and cadmium). In the fish samples, metal accumulation was found to be higher in the organs (particularly in the kidney) than in the muscles. Bioconcentration factor revealed a high metal accumulation in the submerged type plants and surface feeder fishes.

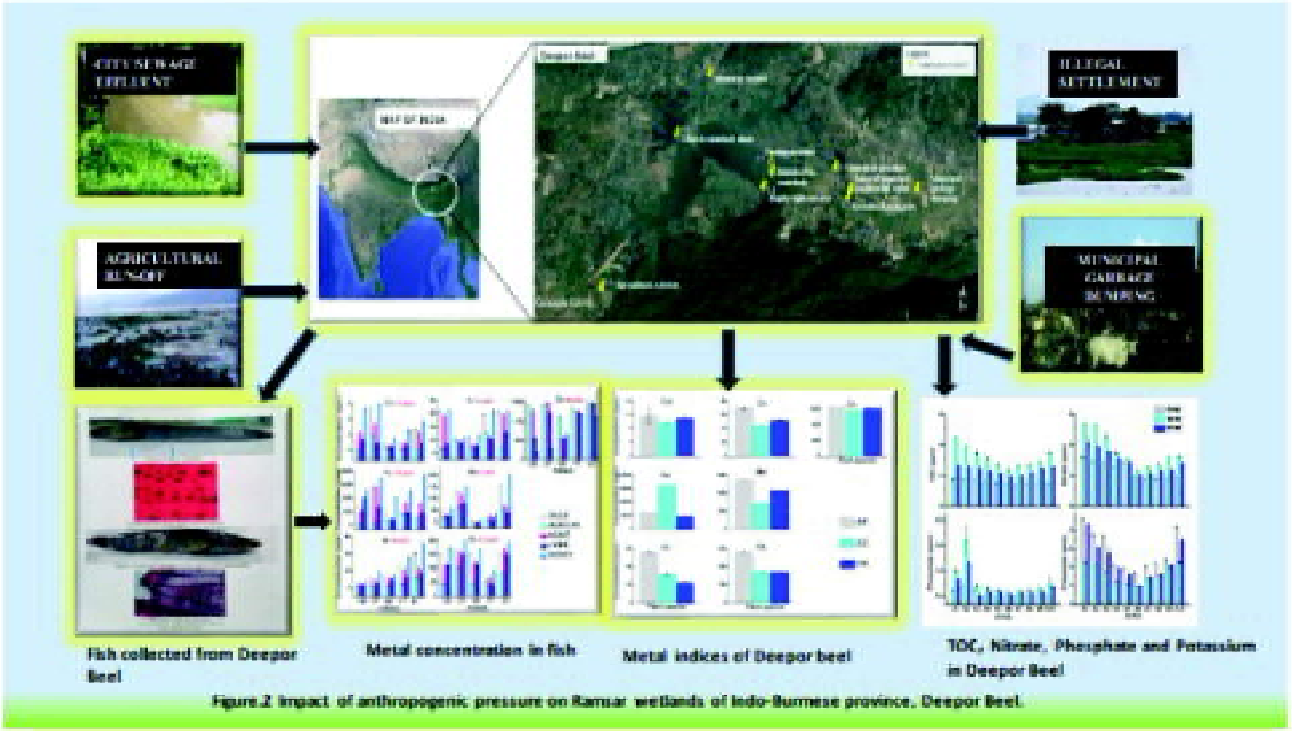


Figure 28 : Impact of anthropogenic pressure on Ramsar wetlands of Indo-Burmese province, Deepor Beel.

C. Understanding the role of traditional fermented food and beverages on gut microbiome and health

Coordinator: Dr. Mojibur Rohman Khan

Our research is focused on understanding the gut microbiome of the ethnic communities of north-east of India and development of functional foods and next generation probiotics for better gut health.

C.1. Development of functional foods based on the ethnic foods of the north-east India

The north east India is home to more than 300 ethnic groups with diverse food habits comprising of fermented /non-fermented food and beverages. The indigenous fermented food and beverages, which include bamboo shoot, fish, soybean, meat, milk, leafy vegetables, mustard green, cereals, fruits, and alcoholic beverages, constitute indispensable part of dietary culture of the region. The fermented food and beverages are good sources of nutrients, prebiotics and probiotic microorganisms important for gut health. The growing preference among consumers about healthy diets such as functional food and beverages has led to a surge in the market demand of such products. Various traditional

fermented food products of the north-east India are being studied for production of functional food (Fig. 29). Some of these promising items are being characterized for their nutritional and safety assessment, optimization of production processes including value addition and development of next generation probiotics.

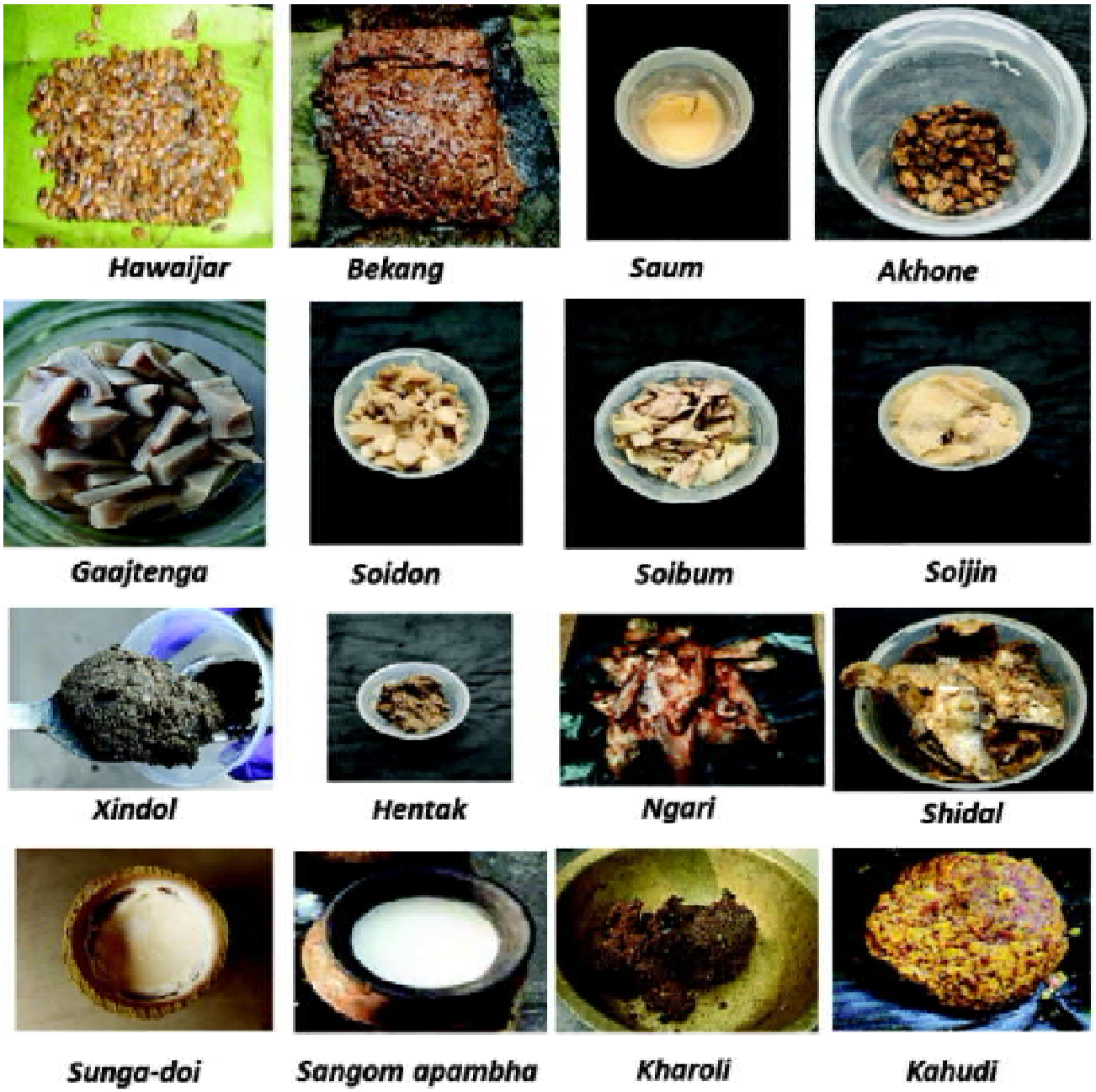


Figure29 : Ethnic fermented foods collected from various region of the north-east India.

C.2. Development of a method for preparation of soy yoghurt with improved shelf life and functional metabolites, pinitol and myo-inositol

A process has been developed in our laboratory for production of soy yoghurt with enhanced shelf life and enriched with pinitol and myo-inositol (Fig. 30). The soy yoghurt prepared by this method using our starter culture had shelf life up to 40 days at ambient temperature. Notably, the product showed stability of functional compounds like pinitol and myo-inositol. Pinitol has anti-diabetic property and myo-inositol is an effective dietary supplement against polycystic ovary syndrome (PCOS). An Indian patent has been filed for this invention (Patent Application No. 202231004797 dated 28-01-2022).

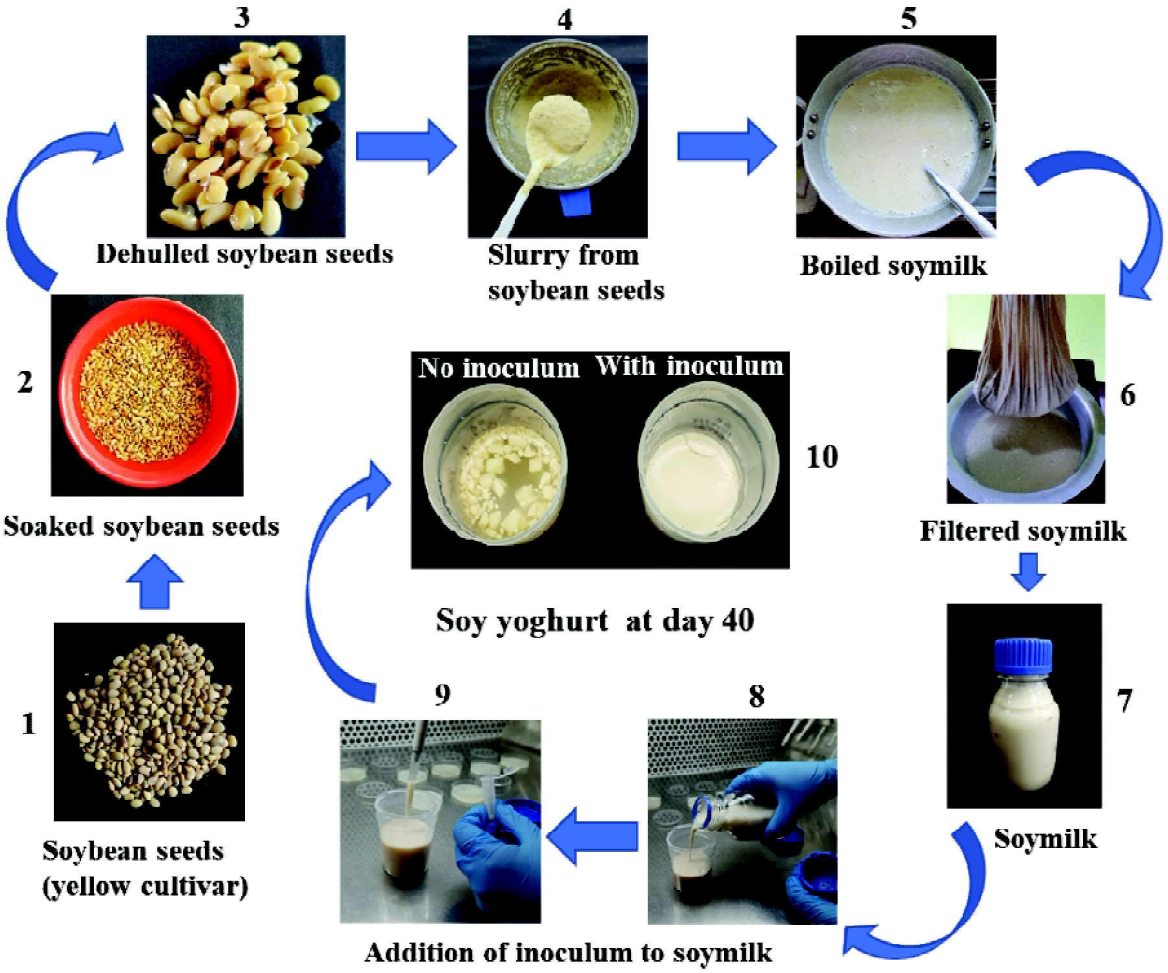


Figure 30 : Preparation of soy yoghurt with enhanced shelf life and functional metabolites.

D. Tea-microbe interactions

Coordinator: Dr. Debajit Thakur

D.1. Culturable bacterial flora associated with commercial Tea (*Camellia sinensis*) plantation and utilization for growth promotion and disease suppression

We are focusing on the application and functioning of indigenous beneficial rhizobacteria and endophytes prevalent in Tea for growth promotion and disease suppression. Diversity of culturable endophytic bacteria (EnB) and rhizobacteria, *in-vitro* Plant Growth Promoting (PGP) traits, and applicability of potent isolates as bioinoculant for growth promotion have been assessed in the present study (Fig. 31). A total of 146 EnB and 217 rhizobacteria were isolated, where these isolates were identified to be as members of phyla Proteobacteria, Firmicutes, Actinobacteria, and Pseudomonads. The diversity of these isolates was established by 16S r RNA gene sequencing, ARDRA and BOX-PCR. The diversity analysis revealed that genus Bacillus was most predominant in both rhizobacteria and endophytes. These isolates revealed PGP traits such as phosphate solubilization, nitrogen fixation, production of ammonia, siderophore, ACC deaminase, phytohormone IAA and antifungal traits. *In-vivo* PGP experiment suggested sturdy efficacy of potent EnB strains as growth promoters in tea clones grown in nursery condition. Further, 50 rhizobacterial isolates exhibited potential antagonistic activity against tea fungal pathogens and produced extracellular chitinase enzyme and showed the presence of chitinase gene. The present studies established that rhizobacteria and endophytic bacteria associated with Tea plant could be a rich reservoir for potential plant growth promoters and fungal disease biocontrol agents.

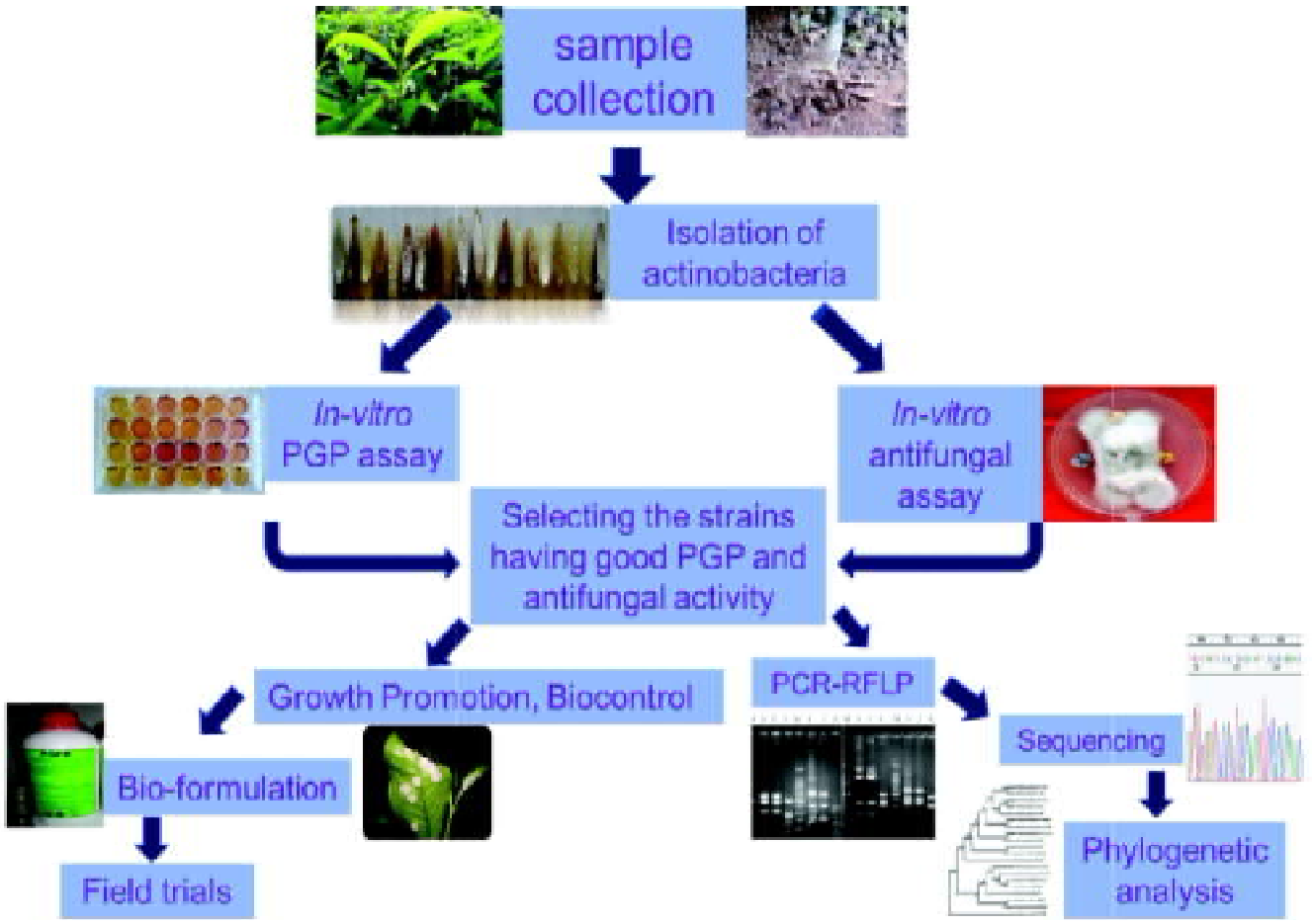


Figure 31 : Exploration of Tea rhizobacteria and endophytes for the production of plant growth promoting substances and microbial biocontrol of tea fungal pathogens.

D.2. Antimicrobial Metabolites Producing and Plant Growth Promoting Microbial Database (AMPPPMD)

AMPPPMD is a collection of bacterial and actinobacterial accessions from microorganisms prevalent in protected forest ecosystems and microorganisms associated with Tea (*Camellia spp.*) plants grown in commercial Tea estates and other natural ecological niches of Northeast India. With an ever-growing number of microbial accessions being submitted, it facilitates the analysis of their morphological and biochemical parameters, bioactive extracellular metabolites production, antagonistic activities along with sequence analysis and alignment search within available accessions using BLAST. The database enables us to search and data mine for microbes with their taxonomic information. AMPPPMD is equipped with various visualization tools for instant comparison in geospatial and taxonomic distribution of the microbes.

This microbial database is developed by the Bioinformatics Centre and Microbial Biotechnology Laboratory Research Group of IASST under the supervision of Dr. D. Thakur, Life Sciences Division. The database is inaugurated by Prof. Ashis K. Mukherjee, Director, IASST on 28th February, 2022. Online URL of the database is https://ampad.in.

E. Seri Biotechnology

Coordinator: Dr. Rajiv Borah

E.1. Aligned Endemic *(Antheraea assama)* Silk Functionalized Conducting Scaffold for Accelerated Axonal Growth

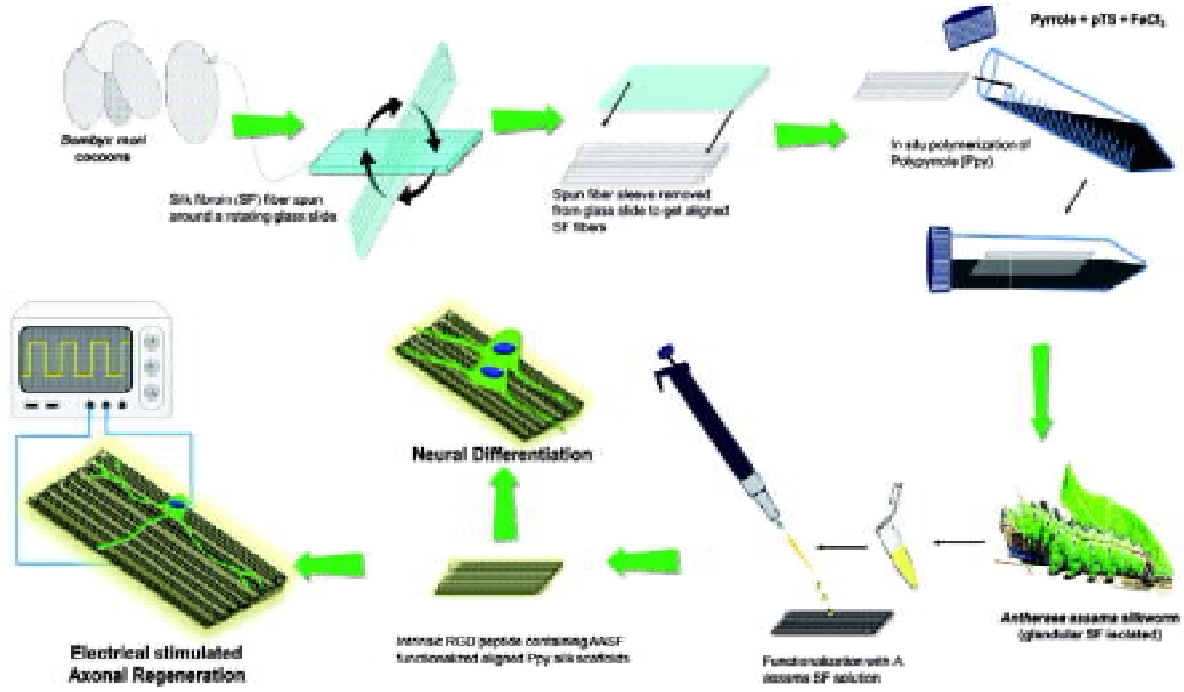


Figure 32 : Scheme illustrating the fabrication of highly conductive PPy:Silk based aligned scaffolds with higher charge storage capacity and lower charge transfer resistance and its efficacy evaluation in terms of electrically stimulated neural regeneration.

Electroconductive biomaterials (ECBs) hold a great potential in electrically stimulated axonal regeneration. However, the charge-transfer behaviour of ECBs during electrical stimulation (ES) of cells is often an ignored domain, which is essential to evoke a functional response in excitable tissues through membrane depolarization. We report aligned microfibrous scaffold of *(Bombyx mori)* (B M) silk fibroin uniformly coated with an electrically conductive polymer, polypyrrole nanoparticles (PPy NPs), which was then functionalized with RGD (arginine-glycine-aspartate) rich Indian origin non-mulberry *(Antheraea assama)* silk fibroin (AASF) to improve cellular adhesion and cellular fate (Fig. 32). The PPy:Silk based aligned scaffolds demonstrated sufficient charge storage capacity (CSC) and lower electrochemical charge transfer resistance (R_{ct}), when assessed their electrochemical performance in neutral electrolyte-Na_2SO_4; dulbecco's modified eagle's medium (DMEM, serum free) and neurobasal media, indicating their electrically stimulated axonal regeneration ability under low stimulation potential within the safe limit for living tissues. The aligned scaffolds can be utilized as a suitable substrate for neural applications mimicking microstructure of nerve tissues with facilitated neural differentiation and electrically stimulated axonal growth.

Research Outputs

Extramural Projects

Ongoing Projects

Title of the Project	Funding Agency, Total fund, Duration, PI/Coordinator	Goal
Studies on signal transduction mechanism(s) of Indian cobra (*Naja naja*) and Russell's Viper (*Daboia russelii*) venoms neurotrophin molecules in cultured neuronal cells and their functional significance	Funding Agency-DST, SERB, Govt. of India Total Fund- INR. 73.47 lakhs Duration-January 2021 to March 2023 PI- Prof. A K Mukherjee Co- PI: Dr. Robin Doley (Professor Tezpur University)	To study the biochemical and pharmacological properties of neurotrophin molecules purified from Indian cobra (Naja naja) and Russell's viper (Daboia russelii) venomsTo study the cobra/ Russell's viper venom neurotrophin molecules-induced downstream signalingmechanism in cultured neuron cells. To study the differential expression of intracellular and membrane proteins by functional proteomics analysis of Cobra/ Russell's viper venom neurotrophins-treated cultured neuronal cells.To study the microRNA expression profile in Cobra/Russell's viper venom neurotrophins-treated cultured neuronal cells.
Recommendation for the further improvement of the polyvalent antivenom manufactured by Premium Serum and Vaccines Pvt. Ltd.	Funding Agency : Premium Serum and Vaccines Pvt. Ltd. Pune, Maharashtra Total Fund- INR 1.50 lakhs Duration-July 21 to Sept. '21, PI- Prof. A K Mukherjee	Improvement in the purity of the antivenom minimization of complement activation properties by the anivenom. Improvement in the content of venom specific antibodies
Engineered Bioremediation Approaches for Onsite Remediation of crude oil Contaminated Soil	Funding Agency : DBT, Govt. of India Total Fund : INR. 59.05 lakhs Duration : 2019-2023 PI/Coordinator : Dr. Arundhuti Devi	Implementation of on-site bioremediation of soil contaminated with hydrocarbons originating from crude oil. A better understanding of the physical chemical and biological mechanisms is of utmost significance to synergistically deploy them for transforming pollutants into less toxic and harmful by-products that can be incorporated in to the environment. Phyto-bioremediation using rhizopheric and endophytic microorganisms to degrade them into less toxic form is another way of treating these pollutants. Development of integrated physico-bio-chemical approach for elimination of PAHs can be a suitable scientific solution for implementation at field.
PM10 and PM2.5 Related Health Effects in North-East India: Source Identification and Cohort Analysis.	Funding Agency : DBT, Govt. of India Total Fund : INR18.4 lakhs Duration : 2019-2022 PI/Coordinator: Dr. Arundhuti Devi, Co-Investigator : Dr. Lipi B. Mahanta	The major objective of the proposed project is to study the chemical composition of PM10 and PM2.5 and its temporal and spatial variation in regions of Assam selected critically on the basis of CPCB report, conducting source apportionment modeling with respect to various types of sources of emission and relating the particulate pollutant load in ambient air to most common health problems.

Title of the Project	Funding Agency, Total fund, Duration, PI/Coordinator	Goal
ST/SC Community Development Program in IASST	Funding Agency-Dept of Science & Technology (under SEED division) Total Fund : INR 13.99 lakhs Duration: 03 years (11th November, 2020-10th November, 2023) Coordinator: Prof. Ashis Kumar Mukherjee PIs: Dr. Mojibur. R. Khan (component-I) Dr. Dhruba Sharma (component-II)	Documentation of indigenous traditional knowledge (ITK) associated with various ethnic fermented foods, traditional herbs and edible insects and protection of their IPR.To develop method of production of fermented functional foods, beverages with improved quality, safety and health benefits.To develop method of production of herbs and edible insects of nutrition and health benefits.To identify beneficial functional ingredients of heritage foods and beverages.To train SC-ST people to adopt improved method of production and to develop commercialization strategy for marketing heritage food and beverage.
Exploration and conservation of antimicrobial metabolites producing Actinobacteria prevalent in protected forest ecosystems of North East India to develop an antimicrobial metabolites producing actinobacterial database (AMPAD) for utilization against human and microbial pathogens, agro-protective and production system.	Funding Agency : DBT, Govt. of India Total Fund: INR 74.15 lakhs; Duration : 2019-2022; PI: Dr. Debajit Thakur Collaboration with University of Agricultural Sciences, Dharwad, Maharashtra	The project work aims to explore actinobacteria with antimicrobial potential in the soil of protected forest ecosystems and biodiversity hotspots of North-East India. With a contrasting environment existing in the ecosystems, the study hypothesizes that these pristine natural habitats harbour actinobacterial diversity possessing unique and efficient antimicrobial capability. These precious actinobacterial isolates having antimicrobial activity against methicillin resistant *Staphylococcus aureus* (MRSA), multi drug resistant clinical pathogens, plant pathogens and plant growth promoting actinobacteria need to be preserved and utilized in a systematic way to develop a Web-based curated "Antimicrobial Metabolites Producing Actinobacterial Database (AMPAD)" at IASST, Guwahati, Assam.
Understanding the mechanisms of resistance to sucking pest, *Helopeltis theivora* and development of microbe-based bioformulation against major tea pests	Funding Agency -DBT, Govt. of India Total Fund: INR 27.446 lakhs Duration:2019-2022; PI: Dr. Debajit Thakur Collaboration with TTRI-TRA, Jorhat Assam and Calcutta University, Kolkata	In this project work aims to identify the Actinobacterial extracellular metabolites effective against tea pests as well as development of bioformulations for sustainable management of three major pests of tea viz. tea looper (*Hyposidra talaca*), tea mosquito bug (*Helopeltis theivora*) and red spider mite (*Oligonychus coffeae*) in commercial tea estates of Assam.
Development of layered double hydroxide (LDH) nanoclays for topical delivery of RNAi for sustained protection of economically important plants against pest attack	Funding Agency : DBT, Govt. of India Total Fund : INR 41.9 Lakhs PI/Coordinator : Dr. Rajiv Borah Co-Investigator : Dr. Avishek Dey, IIT Guwahati	To develop LDH nanoclays for optimum and efficient loading/delivery of dsRNA to induce RNAi in mustard aphid to reduce loss in crop yield.

Title of the Project	Funding Agency, Total fund, Duration, PI/Coordinator	Goal
Development of hybrid electroactive biomaterials for peripheral nerve regeneration	Funding Agency: DST, Govt. of India Total Fund: INR 35 Lakhs PI/Coordinator: Dr. Rajiv Borah Co-Investigator: NA	To develop of aligned/microchanneled structured silk based electroconductive scaffolds mimicking the microstructure of peripheral nerve for accelerated axonal growth.

In-house Projects

Ongoing Projects

Title of the Project	Funding Agency, Total fund, Duration, PI/Coordinator	Goal
Phytochemical characterization, assessment of storage stability, and biomedical application of some edible mushrooms grown in Assam, North -East India.	Funding Agency : IASST, DST. Total Fund : INR 24 Lakhs Duration : April, 2021 to March, 2023 PI- Prof. A K Mukherjee Co-PI: Dr. J C Borah and Dr. M R Khan	Phytochemical analysis including enzymes and nutrient contents of selected edible mushrooms grown in Assam. Toxins present in poisonous mushrooms wildly grown in rural /tribal areas of Assam. Exploration of therapeutic potential /medicinal properties of mushrooms grown in Assam. Effect of different drying methods and storage conditions on phytochemical constituents and medicinal properties of mushrooms.
Feasibility of greener and environmentally compatible techniques for the removal of cationic dyes and heavy metals from waste water	Funding Agency : IASST, DST Total Fund- INR 20 Lakhs Duration : April, 2021 to March, 2023 PI/Coordinator: Dr. Arundhuti Devi	To evaluate the feasibility of Biomaterials and modified biomaterials as low cost adsorbents and their characterization. Using Biomaterials and modified biomaterials for purifying water contaminated with Cationic dyes and toxic heavy metals (As, Cu, Cr, Co, Cd, Ni and Pb) in batch adsorption process and studies of sorption isotherms, kinetics and thermodynamics. Preparation of biomaterials beads and using them in dynamic adsorption of the metal ions through fixed bed studies.
Continuation of Bioinformatics Infrastructure Facility	Funding agency : IASST in-house project Total Fund : INR. 16.26 lakh Duration; 3 years (2020-23) PI/Coordinator: Dr. Debajit Thakur	The centre regularly provides training and bioinformatics services (sequence analysis, docking study, molecular dynamics simulations) to the researchers of IASST. Presently, the softwares, journals available in the centre are extensively used by researchers, scientists of IASST. Centre is regularly organizing seminars, workshops and training programmes from time to time to spread latest knowledge on Bioinformatics among the students, teachers and scientists of the entire North east as a whole.
Exploration of endophytic bacterial community prevalent in Tea (*Camellia sinensis*) for utilizing biotic and abiotic stress mamagement	Funding agency-IASST, DST Total Fund : INR 11 lakh Duration : 2021-2023 PI/Coordinator : Dr. Debajit Thakur	Endophytes are widely recognized to a symbiotic relationship within the host plant and produces a wide range of compounds including growth hormones, iron-chelating siderophores, antibiotics, biocidal volatiles, lytic enzymes, and detoxification enzymes useful for plants for their growth, protection to environmental

Title of the Project	Funding Agency, Total fund, Duration, PI/Coordinator	Goal
		conditions, and sustainability. Thus, development of microbe-based bioformulations of plant growth-promoting microorganisms (PGPM) for mitigation and adaptation strategies to reduce the impact of drought and biocontrol of major tea fungal pathogens and pests, may allow a reduction in the use of chemical inputs, while increasing the yield.

Publications

In cited journals

Author(s)	Title	Journal Name	Volume & Issue no./page no/DOI	Year of Publication
U. Puzari, P. A. Fernandes and A. K. Mukherjee	Pharmacological re-assessment of traditional medicinal plants-derived inhibitors as antidotes against snakebite envenoming: A critical review	Journal of Ethnopharmacology	292, 115208. https://doi.org/10.1016/j.jep.2022.115208	2022
B. Das, A. Patra, U. Puzari, P. Deb and A. K. Mukherjee	*(In vitro)* laboratory analyses of commercial anti-scorpion (Mesobuthus tamulus) antivenoms reveal their quality and safety but the prevalence of a low proportion of venom-specific antibodies	Toxicon	215, 37-48. https://doi.org/10.1016/j.toxicon.2022.06.001	2022
S. Das, M.J. Bhattacharjee, A. K. Mukherjee and M. R. Khan	Recent advances in understanding of multifaceted changes in the vaginal microenvironment: Implications in vaginal health and therapeutics.	Critical Reviews in Microbiology	1-17. https://doi.org/10.1080/1040841X.2022.2049696	2022
J. Baruah, P. Bardhan, A. K. Mukherjee, R. C. Deka, M. Mandal and E. Kalita	Integrated pretreatment of banana agrowastes: Structural characterization and enhancement of enzymatic hydrolysis of cellulose obtained from banana peduncle	International Journal of Biological Macromolecules	201, 298-307. https://doi.org/10.1016/j.ijbiomac.2021.12.179	2022
A. K. Mukherjee and D.J. Chattopadhyay	Potential clinical applications of phytopharmaceuticals for the in-patient management of coagulopathies in COVID-	Phytotherapy Research	36(5), 1884-1913. https://doi.org/10.1002/ptr.7408	2022

Author(s)	Title	Journal Name	Volume & Issue no./page no/DOI	Year of Publication
A. K. Mukherjee, A. Chanda, I. Mukherjee and P. Kumar	19. Characterization of lipopeptide biosurfactant produced by a carbazole-degrading bacterium Roseomonas cervicalis: The role of biosurfactant in carbazole solubilisation	Journal of Applied Microbiology	132(2), 1062-1078. https://doi.org/10.1111/jam.15258	2021
B. Kalita, A. J. Saviola, S. P. Samuel and A. K. Mukherjee	State-of-the-art review-A review on snake venom-derived antithrombotics: Potential therapeutics for COVID-19-associated thrombosis?	International Journal of Biological Macromolecules	192, 1040-1057. https://doi.org/10.1016/j.ijbiomac.2021.10.015	2021
U. Puzari, P. A. Fernandes and A. K. Mukherjee	Advances in the Therapeutic Application of Small-Molecule Inhibitors and Repurposed Drugs against Snakebite: Miniperspective	Journal of Medicinal Chemistry	64(19), 13938-13979. https://doi.org/10.1021/acs.jmedchem.1c00266	2021
T. Islam, D. Madhubala, R. Mukhopadhyay and A. K. Mukherjee	Transcriptomic and functional proteomics analyses to unveil the common and unique pathway (s) of neurito-genesis induced by Russell's viper venom nerve growth factor in rat pheochro-mocytoma neuronal cells	Expert Review of Proteomics	18(6), 463-481. https://doi.org/10.1080/14789450.2021.1941892	2021
B. Kalita, A. J. Saviola and A. K. Mukherjee	From venom to drugs: a review and critical analysis of Indian snake venom toxins envisaged as anticancer drug prototypes	Drug Discovery Today	26(4), 993-1005. https://doi.org/10.1016/j.drudis.2020.12.021	2021
A. Patra, and A. K. Mukherjee	Assessment of snakebite burdens, clinical features of envenomation, and strategies to improve snakebite management in Vietnam	Acta Tropica	216, 105833. https://doi.org/10.1016/j.actatropica.2021.105833	2021
H. Kakati, A. Patra, B. Kalita, A. Chanda,	A comparison of two different analytical workflows to determine the	International Journal of Biological Macromolecules	208, 275-287. https://doi.org/10.1016/	2022

Author(s)	Title	Journal Name	Volume & Issue no./page no/DOI	Year of Publication
S. Rapole and A. K. Mukherjee	venom proteome composition of Naja kaouthia from North-East India and immunological profiling of venom against commercial antivenoms.		j.ijbiomac.2022 .03.095	
A. Patra, D. Banerjee, S. Dasgupta and A. K. Mukherjee	The *(in vitro)* laboratory tests and mass spectrometry-assisted quality assessment of commercial polyvalent antivenom raised against the 'Big Four' venomous snakes of India.	Toxicon	192, 15-31. https://doi.org/ 10.1016/ j.toxicon.2020 .12.015	2021
A. Patra, B. Kalita, M. V. Khadilkar, N. C. Salvi, P. V. Shelke and A. K. Mukherjee	Assessment of quality and pre-clinical efficacy of a newly developed polyvalent antivenom against the medically important snakes of Sri Lanka.	Scientific Reports	11, 18238. https://doi.org/ 10.1038/s41598-021-97501-2	2021
A. Patra, M. Herrera, J. M. Gutiérrez and A. K. Mukherjee	The application of laboratory-based analytical tools and techniques for the quality assessment and improvement of commercial antivenoms used in the treatment of snakebite envenomation.	Drug Testing and Analysis	13(8), 1471-1489. https://doi.org/ 10.1002/dta.3108	2021
H. Deka, T. Barman P. P. Sarmah A. Devi, P. Tamuli and T. Karak	Impact of processing method on selected trace elements content of green tea: Does CTC green tea infusion possess risk towards human health ?	Food Chemistry: X	12, 100173. https://doi.org/ 10.1016/ j.fochx.2021. 100173	2021
S. Kalita, K. Sejal, H. P. Sarma and A. Devi	Total organic carbon, heavy metal content and metal bioaccumulation in a freshwater wetland of Indo-Burmese province , India.	International Journal of Environmental Analytical Chemistry	1-15. https://doi.org/ 10.1080/ 03067319.2021 .1928104	2021
K. Sharma, M. Goswami, M. Shadab,	Treatment of paper mill effluent via electrochemical reaction and assessment of antibac-terial	Chemical Papers	75, 3921-3929. https://doi.org/ 10.1007/s11696-	2021

Author(s)	Title	Journal Name	Volume & Issue no./page no/DOI	Year of Publication
N. S. Sarma and A. Devi	activity of ZnO nanopa-rticles in in- vitro conditions.		021-01612-z	
S. Sharma, A. Devi and K. G. Bhattacharyya	Photocatalytic Degradation of Methylene Blue in Aqueous Solution with Silver-Kaolinite-Titania Nanocomposite under Visible Light Irradiation	Journal of Nanostructures	12(2): 426-445. DOI: 10.22052/ JNS.2022.02.018	2022
A. Kumar, T. Joishy, S. Das, M. C. Kalita, A. K. Mukherjee and M. R. Khan	A Potential Probiotic Lacto-bacillus plantarum JBC5 Improves Longevity and Healthy Aging by Modu-lating Antioxidative, Innate Immunity & Serotonin-Signaling Pathways in Caenorhabditis elegans.	Antioxidants	11(2):268. https://doi.org/ 10.3390/ antiox11020268	2022
T. Joishy, A. Jha, M. Oudah, S. Das, A. Adak, D. Deb and M. R. Khan	Human Gut Microbes Associated with Systolic Blood Pressure	International Journal of Hypertension	2022, 2923941. https://doi.org/ 10.1155/2022/ 2923941	2022
R. Patowary, K. Patowary, M. C. Kalita, S. Deka, S. S. Lam and H. Sarma	Green production of noncytotoxic rhamnolipid from jackfruit waste: Process and prospects	Biomass conversion and Biorefinery	382 https://doi.org/ 10.1007/s13399-022-02427-y	2022
R. Patowary, K. Patowary M. C. Kalita, S. Deka, J. M. Borah, S. J. Joshi, M. Zhang, W. Peng, G. Sharma, J. Rinklebe and H. Sarma	Biodegradation of hazardous naphthalene and cleaner production of rhamnolipids-Green approaches of pollution mitigation.	Environmental Research	209, 112875. https://doi.org/ 10.1016/ j.envres.2022.112875	2022
H. Sarma, R. P. Hazarika, V. Kumar, A. Roy, S. Pandit and R. Prasad	Microplastics in marine and aquatic habitats: Sources, impact, and sustainable remediation approaches.	Environmental Sustainability	5, 39-49. https://doi.org/ 10.1007/s42398-022-00219-8	2022

Author(s)	Title	Journal Name	Volume & Issue no./page no/DOI	Year of Publication
B. Bhaskar, A. Adak, and M. R. Khan	Fractions of traditionally brewed rice beverage relieve anxiety and improve spatial memory in mice	Journal of Ethnic Foods	8, 13. https://doi.org/10.1186/s42779-021-00090-8	2021
S. N. Hazarika, K. Saikia, A. Borah and D. Thakur	Prospecting endophytic bacteria endowed with plant growth promoting potential isolated from *Camellia sinensis*.	Frontiers in Microbiology	12. https://doi.org/10.3389/fmicb.2021.738058	2021
J. Dutta and D. Thakur	Diversity of culturable bacteria endowed with antifungal metabolites biosynthetic characteristics associated with tea rhizosphere soil of Assam, India.	BMC Microbiology	21, 216. https://doi.org/10.1186/s12866-021-02278-z	2021
A. Bhattacharya, S. Champramary, T. Tripathi, D. Thakur, I. Ioshikhes, S. K. Singh and S. Nandi	Identification of the conserved long non-coding RNAs in myogenesis.	BMC Genomics	22, 336. https://doi.org/10.1186/s12864-021-07615-0	2021
J. Upadhyay T. M. Das, R. Borah, K. Paul K. and K. Acharjya	Ternary nanocomposites of rGO:RuO2:Pani based flexible electrode for supercapacitor applications	Solid State Communications	334-335, 114382. https://doi.org/10.1016/j.ssc.2021.114	2021

Patents

Inventor(s)	Title	Patent Application No.	Provisional/Final Patent grant No.	Issue number of Patent Office
A. Devi, K. Sharma and N. S. Sarma	Synthesis of ZnO Nanoparticle and its application for the treatment of wastewater contaminated by hydrocarbons	201931005321	Patent No.: 374741	033117087

Book Chapters

Author(s) Name	Chapter Title	Book Title	Publisher	Year of Publication
A. K. Mukherjee		The 'Big Four' Snakes of India: Venom Composition, Pharmacological Properties and Treatment of Envenomation https://doi.org/10.1007/978-981-16-2896-2	Springer Singapore	2021
A. K. Mukherjee, B. Kalita, S. Dutta, A. Patra, C. R. Maiti and D. Punde	Snake envenomation: Therapy and challenges in India	In: Handbook of Venoms and Toxins of Reptiles https://doi.org/10.1201/9780429054204	CRC Press	2022
S. N. Hazarika, P. Bharadwaj, A. N. Konwar and D. Thakur	Cloning and Heterologous Expression of Natural Products from Actinobacteria	Actinobacteria	Springer Singapore	2022
R. Das and D. Thakur	Recent Developments in Nanotechnological Interventions for Pesticide Remediation	Emerging Nanomaterials for Advanced Technologies	Springer Cham	2022
R. Mazumdar and D. Thakur	Therapeutic Applications of Nanotechnology in the Prevention of Infectious Diseases.	Emerging Nanomaterials for Advanced Technologies	Springer, Singapore	2022
P. Sarmah, A. Dey, M. M. Borah and R. Borah	Nanocarrier mediated non-transformative gene silencing in management of insect pests in plants	Research Trends in Science & Technology	AkiNik Publications, New Delhi	2022
J. M. Das, J. Upadhyay and R. Borah	Progress in silk based biomaterials for peripheral nerve regeneration	Emerging Trends in Material Science and Technology: Synthesis, Application and Characterization	Apple Academic Press, USA	2022

Conference Presentations

Author(s)	Title	Conference Name	Venue	Year of Publication
D. Koiri and A. Devi	Using Long-Term Monitoring Data, Characterising Seasonal Fluctuations and Spatial Distribution of Ambient PM10 and PM2.5 Concentrations of some Highly Polluted Area of Assam	National seminar on "Emerging Priorities in Science and Technology with special focus on Rural and Green Technology	B. Borooah College, Guwahati, Assam	2022
R. Patowary and A. Devi	Bioaugmentation approach for efficient removal of crude oil from oil contaminated soil	National seminar on "Emerging Priorities in Science and Technology with special focus on Rural and Green Technology	B. Borooah College, Guwahati, Assam	2022
B. Devi and A. Devi	Schiff base fluorescent sensors for detection of fluoride ions in aqueous media	National seminar on "Emerging Priorities in Science and Technology with special focus on Rural and Green Technology	B. Borooah College, Guwahati, Assam	2022
R. Das and D. Thakur	Assessment of Organophosphate tolerant Tea rhizospheric Actinobacteria for PGP and fungal disease control	International Conference on Advances in Biotechnology and Applied Microbiology(ICABAM)	School of Life Science and Technology, IIMT University, Meerut, UP,	2022
J. M. Das, J. Upadhyay and R. Borah	Conductive aligned rGO : PPy : Silk microfibrous scaffolds for neural tissue engineering applications	National seminar on "Emerging Priorities in Science and Technology with Special Focus on Rural and Green Technology" under 66th Annual Technical Session of Assam Science Society-2022	B. Borooah College, Guwahati, Assam	2022
P. Sarmah, A. Dey and R. Borah	Synthesis and characterization of Mg-Al-NO3 based colloidal nanoclays as gene delivery vehicle	National seminar on "Emerging Priorities in Science and Technology with Special Focus on Rural and Green Technology" under 66th Annual Technical Session of Assam Science Society-2022	B. Borooah College, Guwahati, Assam	2022

Author(s)	Title	Conference Name	Venue	Year of Publication
J. M. Das and R. Borah	Mechanically robust multi-lumen electroconductive bioactive construct for nerve regeneration	International Conference on Emerging Trends in Nanomaterials Science & Technology (ICETNMST–2022)	NIT Nagaland	2022
P. Sarmah, A. Dey and R. Borah	Mg-Al-NO3 layered double hydroxides nanoclays gene delivery for agricultural applications	International Conference on Emerging Trends in Nanomaterials Science & Technology (ICETNMST–2022)	NIT Nagaland	2022
S. Basak, R. Borah and D. Thakur	Titanium dioxide nanoparticle based immune booster to combat viral infection in muga silkworm, *Antheraea Asamensis* helfer	International Conference on Emerging Trends in Nanomaterials Science & Technology (ICETNMST–2022)	NIT Nagaland	2022
S. Basak, R. Borah and D. Thakur	Characterization of Cypovirus responsible for viral infection in Muga silkworm [Antheraea assamensis Helfer] and disease prevention by visible light activated TiO2 nanoparticles	National seminar on "Emerging Priorities in Science and Technology with Special Focus on Rural and Green Technology" under 66th Annual Technical Session of Assam Science Society-2022	B. Borooah College, Guwahati, Assam	2022

Conferences/Workshops/Seminars/Meetings Attended

Faculty/Research Scholar	Conference/Workshop/Exhibitions	Date and Venue
S. N. Hazarika	National Workshop on "Microbial Biotechnology in Agriculture and Industry" organized by DBT - North East Centre for Agricultural Biotechnology and funded by Department of Biotechnology, Government of India	26th April-1st May, 2021, AAU Jorhat, Assam
R. Das	National Workshop on "Microbial Biotechnology in Agriculture and Industry" organized by DBT - North East Centre for Agricultural Biotechnology and funded by Department of Biotechnology, Government of India	26th April-1st May, 2021, AAU, Jorhat, Assam

Faculty/Research Scholar	Conference/Workshop/Exhibitions	Date and Venue
P. Bharadwaj	National Workshop on "Microbial Biotechnology in Agriculture and Industry" organized by DBT - North East Centre for Agricultural Biotechnology and funded by Department of Biotechnology, Government of India	26th April-1st May, 2021, AAU, Jorhat, Assam
P. Bharadwaj	International Conference cum Workshop on "Translational Sciences in Drug Discovery and Development" organized by Dept. of Bioinformatics, Pondicherry University and Indian Science Congress Association (ISCA)	25th-27th August, 2021 (Virtual)
A. N. Konwar	International Conference cum Workshop on "Translational Sciences in Drug Discovery and Development" organized by Dept. of Bioinformatics, Pondicherry University and Indian Science Congress Association (ISCA)	25th-27th August, 2021 (Virtual)
S. N. Hazarika	15th National Seminar cum Workshop on "Genomics and Bioinformatics in High Throughput Era" organized by Bioinformatics Center, University of North Bengal, India	26th-27th March, 2022(Virtual)
R. Das, and D. Thakur	International Conference on Advances in Biotechnology and Applied Microbiology (ICABAM) organized by School of Life Science and Technology, IIMT University, Meerut, UP, India	30th-31st March, 2022 (Online)
Dr. R. Borah	National Conference on Emerging Trends in Physics 2021	16th-17th June, 2021; Department of Physics, Tezpur University
Dr. R. Borah	6th Tissue Engineering and Regenerative Medicine International Society (TERMIS) World Congress, 2021	15th-19th November, 2021; Maastricht, Netherlands
Dr. R. Borah	International Conference on Emerging Trends in Nanomaterials Science & Technology (ICETNMST-2022)	27th-29th January, 2022; NIT Nagaland

Contribution to World Database

Author	Title	Database	Accession Number
M. J. Bhattacharjee, S. Das, T. Joishy, A. Bhattacharya and M. R. Khan	16S ribosomal RNA gene, partial sequence	NCBI	OL762329, OL762330, OL762331, OL762332, OL762333, OL762344, OL762345, OL762346, OL762347, OL762348, OL762349, OL762350, OL762334, OL762335, OL762336, OL762354, OL762355, OL762356, OL762357, OL762361, OL762362, OL762363, OL762365, OL762377, OL762396, OL762397, OL762394, OL762389, OL762388, OL762387, OL762386, OL762385, OL762383, OL762382, OL762377, OL762369, OL762370, OL762373, OM049264, OM049265, OM049267, OM049270, OM049273, OM049277, OM049278, OM049294, OM049286, OM049287, OM049288, OM049300, OM049302, OM049307, OM049328, OM049329, OM049331, OM049342, OM049343, OM049344, OM049345, OM049346, OM049347, OM049348, OM049350, OM049352, OM049354, OM049359, OM049363, OM049365, OM049374, OM049383
S. N. Hazarika and D. Thakur	16S rRNA gene of endophytic bacteria isolated from *(Camellia sinensis)*	NCBI	MW898446-MW898449; MW898680-MW898687; MW905606-MW905624; MZ008002-MZ008004; OK483055- OK483133
J. Devi and D. Thakur	Endophytic bacteria/ chitinase gene	NCBI	ON005009
J. Saikia and D. Thakur	Endophytic actino-bacteria bacteria associated with Orchi-daceae/16S rRNA	NCBI	OM746936; OM776921; OM773537; OM674666; OM648298; OM773535; OM674397; MK140996; OM773478; OM674281; OM674281; OM674576; MK140994; OM772762; OM674455; OM672679; OM680925; OM735460; OM735535; OM753114; MK140993; OM753111; OM674459; OM648299; MH493677; OM746929; OM672245; OM672243; OM691429; MK140995; OM674577
R. Mazumdar and D. Thakur	Cultured Prokaryotic 16S rRNA / Actino-bacteria isolated from forest rhizos-phere soil	NCBI	OL630089
R. Mazumdar and D. Thakur	PKS-II biosyn-thetic gene isolated from actinobacteria.	BankIT - NCBI	OL752576- OL752578

Invited Talks

Faculty	Title	Programme Name	Date and Venue
Prof. A. K. Mukherjee	Reimagine Ethnopharmacology	International Webinar Series organized by Institute of Bioresources and Sustainable Development (IBSD), jointly with Society for Ethnopharmacology (SFE), India and International Society for Ethnopharmacology (ISE).	20th February 2021 at Switzerland (Virtual).
Prof. A. K. Mukherjee	Dr. Pratul C. Goswami Memorial Lecture	Department of Biochemistry, Guwahati Medical College and Hospital.	11th March 2021 at Guwahati, Assam.
Prof. A. K. Mukherjee	Faculty Induction Programme	Teaching Learning Center Tezpur University.	24th August 2021 at Tezpur, Assam.
Prof. A. K. Mukherjee	75th Year of India's Independence Series	Institute of Advanced Study in Science and Technology.	26th August 2021 at Guwahati, Assam, India.
Prof. A. K. Mukherjee	8th International Congress of the Society for Ethnopharmacology, India (SFEC 2021)	Bharati Vidyapeeth Deemed to be University-Poona College of Pharmacy, Pune in association with all Pharmacy institutions -Pune region & Society for Ethnopharmacology, India (SFE-India)	27th-29th August 2021, Pune, Maharashtra, India
Prof. A. K. Mukherjee	Plenary lectureat National Conference on Computational and Biochemical Drug Discovery [NCCBDD-2021]	Indian Institute of Technology BHU.	11th to 12th September 2021 at Varanasi
Prof. A. K. Mukherjee	Annual Meeting of Proteomics	13th Annual Meeting of Proteomics Society of India and International Conference	21st to 23rd October 2021 at CCMB Hyderabad
Prof. A. K. Mukherjee	Vigyan Utsav: The Festival of Science	R&D Infrastructure under Azadi Ka Amrit Mahotsav, Assam Science and Technology Environmental Council	8th November 2021 at ASTEC, Guwahati
Prof. A. K. Mukherjee	8th Convention Society for Ethnopharmacology	Ethnopharmacologyfor wellness: Tradition to Translation, Society for Ethnopharmacology, Indian Institute of Chemical Biology	10th December 2021, Kolkata

Faculty	Title	Programme Name	Date and Venue
Prof. A. K. Mukherjee	In Vitro Laboratory-based Quality Assasement of Commercial Antivenom for Improvement of In-patient Management of Snakebite Victim	Advances in Basic and Translational Research in Biology (ABTRiB) Organized by Department of Molecular Biology and Biotechnology (MBBT).	11th to 12th March 2022, Tezpur University
Dr. M. R. Khan	Microbiome, Food & Health	Indian Association of Medical Microbiologists annual meeting MICROCON 2021	22nd December 2021 at Radisson blue, Guwahati
Dr. R. Borah	Electroactive biomaterials for accelerated nerve repair	International Online Conference on Materials Science and Technology (ICMT-2021), Organized by Mahatma Gandhi University, Kottayam, Kerala, India	12th-14th November, 2021 (Virtual)
Dr. M. R. Khan	Gut feeling on Darwinism: Microbiome and health	National Science Day	28th March at Sualkuchi college, Assam

TRADITIONAL AND MODERN DRUG DISCOVERY AND DISEASE DIAGNOSIS

A. Sustainable Utilization of Natural Resources

Coordinator: Dr. (Mrs) Rajlakshmi Devi

The research group at IASST working on Traditional Knowledge Based Drug Discovery has been focusing on the traditional medicinal plants from Northeastern Region of India (NER) with its application on metabolic syndrome. Based on the traditional knowledge the research group selected few medicinal plants from NER such as *Musa balbisiana*, *Clerodendrum glandulosum*, *Oryza sativa*, *Garcinia pedunculata* etc for development of novel therapeutics against metabolic syndrome (Fig. 33). *Musa balbisiana*- an endemic species of banana from NER has been extensively explored in terms of its phytoconstituents from the ripe pulp of the fruit and extraction of the fiber from the pseudostem after harvesting and make people aware how to convert this waste material into wealth by making different household appliances. This had also generated entrepreneurship and economic upliftment especially among the SC/ST population.

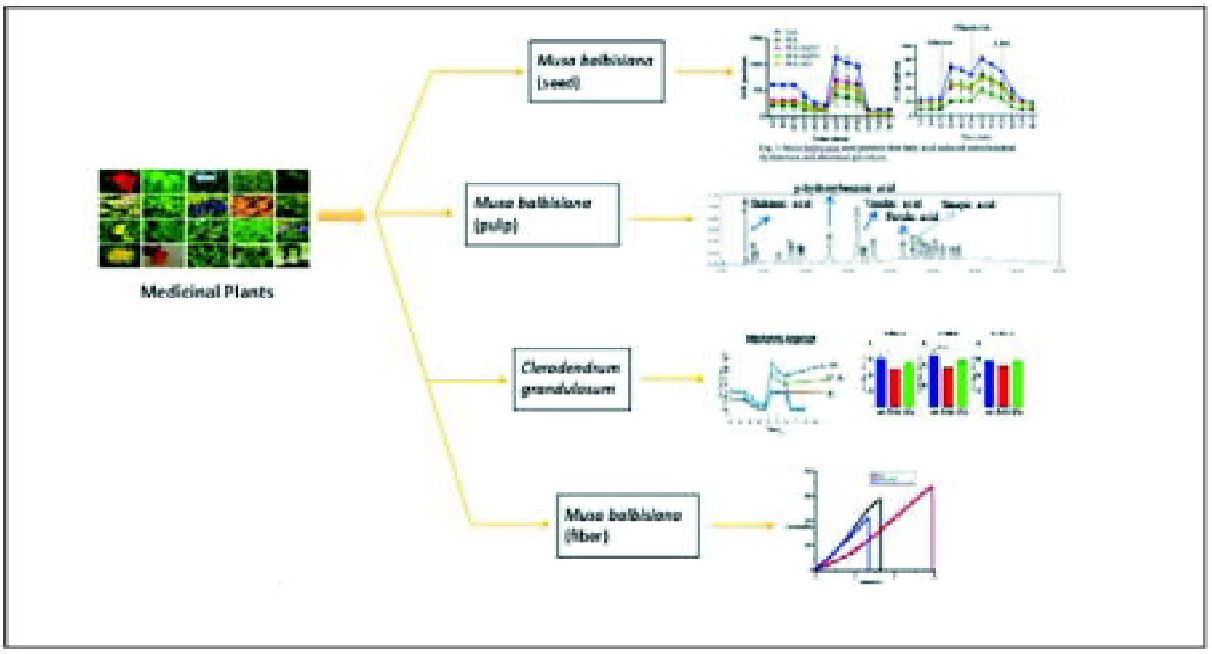


Figure 33 : Graphical abstract representing the medicinal plants and their isolated compounds against metabolic disorder(s).

The scented rice 'Joha' had shown potent antidiabetic activity in molecular signaling study. The medicinal plant *Garcinia pedunculata* also exhibited potent cardioprotective activities. The research on *Clerodendrum glandulosum* also exhibited potent anti-atherosclerotic activity both in *in vivo* and *in vitro* studies with special amelioration mitochondrial dysfunction.

B. Pre-clinical evaluation of Indian System of Medicine (ISM) towards the development of phytopharmaceutical drug

Coordinator: Dr. Jagat C Borah

Taking a clue of the global trends and opportunities in plant based medicines, in India, DCGI promulgated Phytopharmaceutical drug development similar to US-FDA botanical in 2015. Our group is focused on translational

research towards the development of phytopharmaceutical drug and/or lead molecules and/or Investigational New Drug (IND) from Indian Systems of Medicine (ISM) for Treatment of Diabetes Mellitus type 2 and its complications.

B.1. Isoverbascoside mediates the therapeutic potential of *Premnaherbacea*

Isoverbascoside is the most bioactive phytochemicals isolated, identified and characterized from *Premna harbacea,* a medicinal plant used in ISMand tested against insulin resistance. Isoverbascoside could alter insulin resistance condition through downregulation of p38MAPK, JNK, IKKβ and upregulation of IRS1/AKT/AMPK pathway in L6 cell line. Isoverbascoside is able to normalize the bioenergetic profile of FFA treated L6 cell line. Methanolic leaf extract of *Premnaher bacea* could lower the elevated body weight and blood glucose level of HF-HF diet fed diabetic *Sprague dawly*rats. Extract significantly increased glucose uptake in insulin resistant L6 Cells and activate IRS1/AKT/AMPK phosphorylation in both *in vitro* and *in vivo* muscle cells (Fig. 34).

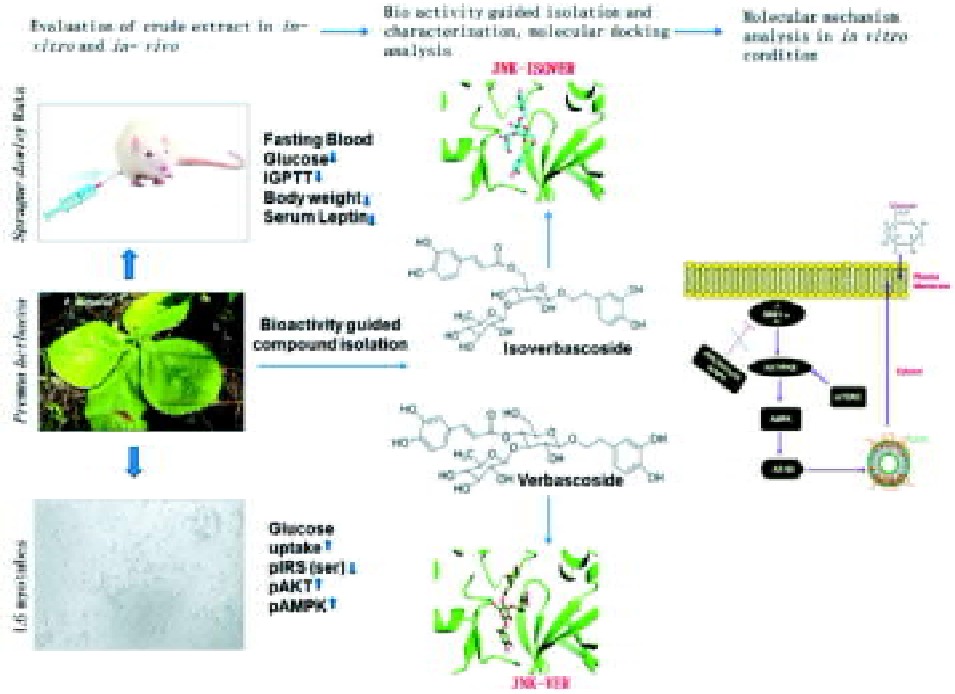


Figure 34: Therapeutic effect of *Premnaherbacea*in diabetic rat and isoverbascoside against insulin resistance in L6 muscle cells through bioenergetics and stimulation of JNK and AKT/mTOR signaling cascade (*Phytomedicine* 2021, 93, 153761).

C. Breast Cancer Chemoprevention by Dietary Phytochemicals

Coordinator: Dr. Suman Kumar Samanta

C.1. Mahanine mediated inhibition of breast cancer cell proliferation through CDK4/6 inhibition

Image prepared in Biorender software (free version)

We have shown previously that Mahanine (MH), a promising anticancer constituent of Ayurvedic medicine plant *Murraya koenigii*, inhibits growth of MCF-7 and MDA-MB-231 human breast cancer cells in culture and the mammary tumor in MNU induced RAT by causing apoptosis. However, the mechanism of MH-induced apoptosis is not fully understood. The present study is designed to systematically determine the role of estrogen receptor-α

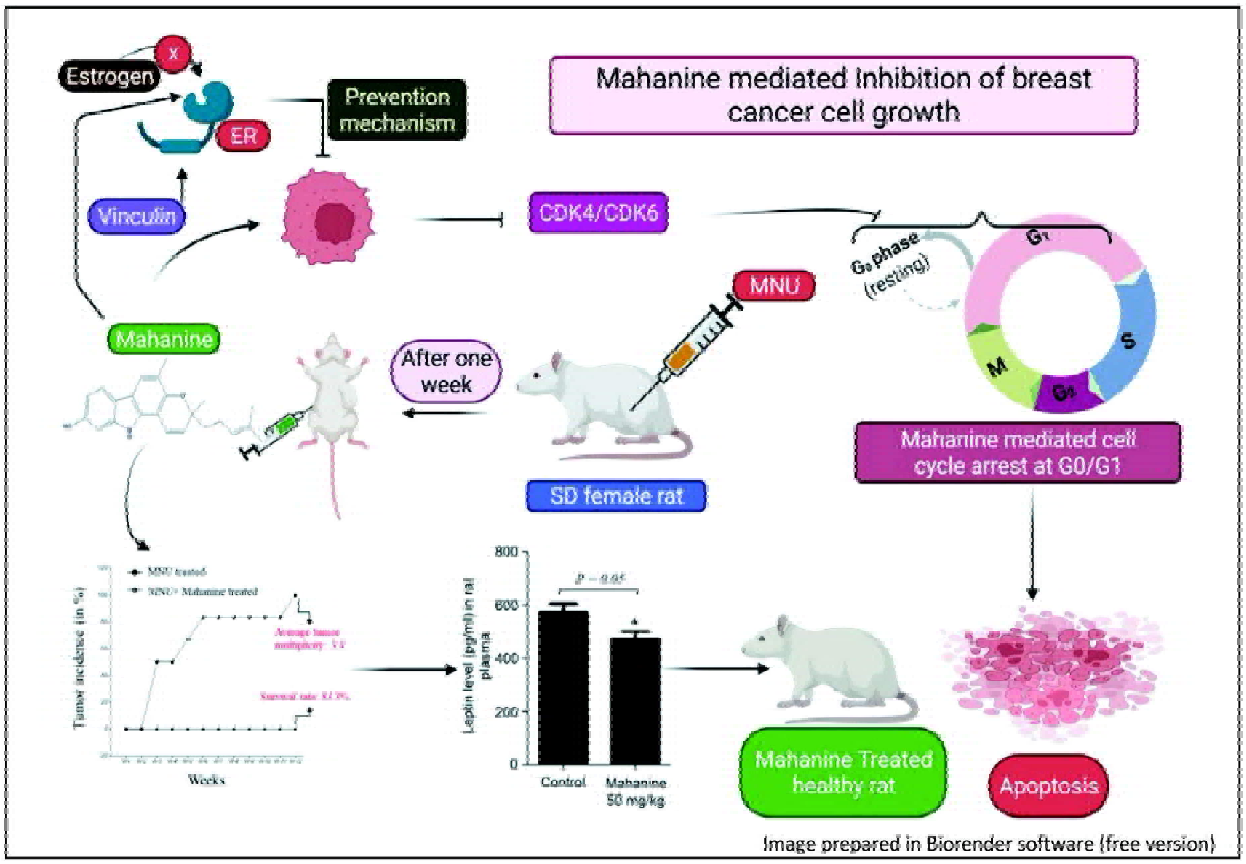


Figure 35 : Schematic diagram of mechanistic evaluation of mahanine mediated inhibition of breast cancer cell proliferation [Image credit: Biorender software (free version)].

(ER-α) in proapoptotic response to MH using MCF-7 and the archived mammary tumor from the RAT as model. Exposure of MCF-7 cells to MH resulted in a marked decrease in protein levels of ER-α and the downstream of ER-α regulatory gene product vinculin (Fig. 35).

The in vitro results showed us that the MH can act as CDK4/6 inhibitor. The results prompted us to check whether, the similar results reflect on the rat mammary tumor tissues or not. Interestingly, the results from the western blot analysis of rat tumor tissue show the similar trends and from there we are proposing MH as CDK4/6 inhibitor.

RESEARCH OUTPUT

Extramural Projects

Completed Projects

Title of the Project	Funding Agency, Total fund, Duration, PI/Coordinator	Achievement
Chemical profiling of Joha and Black rice of NER for nutritional, nutraceutical parameters and aroma compounds.	Funding Agency : DBT, Govt. of India as. Total Fund : INR 102.14 Lakhs, Duration: 3 years PI : Dr. R. Devi	Isolation, characterization and quantification of phytochemicals in different scented rice of Assam and development of valueadded products for health benefit.
Chemical investigation and therapeutic evaluation for linking marker compound(s) with anti-diabetic potential of young shoots of *Wendlandia glabrata* D.C. and fruits of *Phoebe cooperiana,* used by indigenous ST people of Arunachal Pradesh. (No. BT/ PR24712/NER/95/828/2017)	Funding Agency : DBT, Govt. of India. Total Fund : INR 85.96 lakh Duration : 3 Years PI : Dr. Jagat C Borah	Development of standardized chemically defined anti-diabetic potential enriched fraction with pre-clinical data for future Phytopharmaceutical development.

Ongoing Projects

Title of the Project	Funding Agency, Total fund, Duration, PI/Coordinator	Goal
Evaluation of antioxidant and anti-hyperlipidemic property of few selected medicinal plants used by the tribal population of Goalpara district, Assam	Funding Agency : DBT, Govt. of India as PI. Total Fund : INR 18 lakhs, Duration: 3 years (2019-2022) PI. Dr. R Devi	To study the antioxidant and anti-hyperlipidemic property of few selected medicinal plants used by the tribal population of Goalpara district, Assam.
Empowerment of Tribal population of selected District of Assam by scientific exploration of *Musa balbisiana*- a versatile medicinal plant of Northeast.	Funding Agency : DST, Govt. of India. Total Fund : INR 37.73 Lakhs Duration : 3 yrs (2020-2023) PI. Dr. R Devi	To study the exploration of banana (Musa balbisiana) a garden has been developed at IASST and in the SC/ ST villages; fibre extraction is under process along with training of the ethnic tribal population towards skill development. This endeavor has already started employment generation.
Characterization of high value phytochemicals of Anti-diabetic and immunomodulatory properties in North-Eastern banana varieties.	Funding Agency : DBT, Govt. of India. Total Fund : INR 71.32 lakhs Duration : 3 years (2018-2021), PI. Dr. R Devi	To study the bioactive compound(s) present in Musa balbisiana and study the effect of those compounds in in vivo model system.

Title of the Project	Funding Agency, Total fund, Duration, PI/Coordinator	Goal
Phytopharmaceutical Development of Ficus semicordataBuch.-Ham. ex Sm. as per regulatory guidelines of DCGI.	Funding Agency : DBT, Govt. of India. September 2018 to September 2022. Total cost : INR 197.288 lakhs. PI. Dr. Jagat C Borah	For development of Phytopharmaceutical Drug in collaboration with CSIR and Industry.
Setting up a Quality Control & Quality Assurance laboratory facility for the Phytopha-rmaceutical mission for North East India.	Funding Agency : DBT, Govt. of India. January 2019 to June 2022. Total cost : INR 190.588 lakhs PI. Dr. Jagat C Borah	Setting up a NABL accredited QAQC laboratory for Herbals
A novel approach for integration of dietary phytochemicals with conventional drug and development of a therapeutic strategy through assessment of dissimilar biochemical parameter for breast cancer management	Funding Agency : CSIR, Govt. of India Total Fund : INR 28 lakhs Duration: 3 years (2020-2023) PI : Dr. Suman Kumar Samanta	Investigation the efficacy of a dietary phytochemical (as a chemopreventive agent) alone and/or combination with Tamoxifen/ Exemestane administration for anticipation of breast cancer in the different subtype.

In-house Projects

Ongoing Projects

Title of the Project	Funding Agency, Total fund, Duration, PI/Coordinator	Goal
Exploration of traditionally used medicinal plants of North East India for the prevention and treatment of metabolic syndrome	Funding Agency : IASST, DST Total Fund : INR 20 lakhs Duration : April 01, 2021 to March 31, 2023 PI : Dr. R Devi	To study the traditionally used medicinal plants of North East India as *Musa balbisiana*, *Clerodendrum glandulosum*, *Garcinia pedunculata* with detailed *in-vitro* and *in-vivo* studies and elucidation of molecular pathways.
Preclinical evaluation of selected medicinal plants based on Indian Systems of Medicine (ISM) used for treatment of Diabetes and Diabetic Nephro-pathy with an aimed for Development of Phytopharmaceutical Drug.	Funding Agency : IASST, DST Total Fund : INR 24 lakhs Duration : April 01, 2021 to March 31, 2023 Dr. Jagat C Borah	For Development of Phytopharmaceutical Drug. The study will contribute for development of new drugs from botanicals in a scientific way and would help in the global acceptance of the use of herbal products.

Publications

In cited journals

Author(s)	Title	Journal Name	Volume & Issue no./page no/DOI	Year of Publication
P.K. Deb, P. Khound, S. Bhattacharjee, P. Choudhury, H. Sarma, R. Devi and B. Sarkar	Variation in chemical constituents, in-vitro bioactivity and toxicity profile among different parts of Clerodendrumglandulosum Lindl. (C. colebrookianum Walp.)	South African Journal of Botany	140, 50-61. doi.org/10.3389/ fphar.2022.806470	2021
R. Kandimalla, M. Das, S. Bhattacharjee, P. Choudhury, R. Devi, N. C. Talukdar and S. K. Samanta	Effect of multiple doses of N-methyl-N-nitrosourea, an end product of Methyl guanidine (found in processed food), on the fertility of female Swiss albino mice	Heliyon (Cell Press)	7(4), e06738. doi.org/10.1016/ j.heliyon.2021 .e06738	2021
K. Phukan, R. Devi and D. Chowdhury	Green Synthesis of Gold Nano-bioconjugates from Onion Peel Extract and Evaluation of Their Antioxidant, Anti-inflammatory, and Cytotoxic Studies.	ACS Omega	6 (28), 17811-17823. DOI:10.1021/ acsomega.1c00861	2021
P.P. Sarma, N. Gurumayum, A. K. Verma and R. Devi	A pharmacological perspective of banana: Implications on therapeutical benefits and molecular docking	Food & Function	12(11):4749-4767. https://doi.org/ 10.1039/ D1FO00477H	2021
K. Phukan, R. R. Sarma, S. Das, R. Devi and D. Chowdhury	Carbon Dot Based Nucleus targeted fluorescence imaging and detection of nuclear hydrogen peroxide in living cells.	Nanoscale Adv.	4, 138-149. DOI: 10.1039/ D1NA00617G	2021
J. Khan, P. K Deb and R. Devi	Dietary flavonoids: Cardio protective potential with antioxidants effects ad their pharmacokinetics, toxico-logical & therapeutic concerns.	Molecules	26(13), 4021. doi:10.3390/ molecules26134021	2021

Author(s)	Title	Journal Name	Volume & Issue no./page no/DOI	Year of Publication
H. Sarma, M. Upadhyaya, B. Gogoi, M. Phukan, P. Kashyap, B. Das, R. Devi and H. K. Sharma.	Cardiovascular Drugs: An Insight of In-silico Drug Design Tools.	Journal of Pharmaceutical Innovation	https://doi.org/10.1007/s12247-021-09587-w	2021
M. Rudrapal, S. J. Khairnar, A. A. A. B. Dukhyil, J. Khan, M. Alaidarous, S. Palai, P. K. Deb, S. Bhattacharjee and R. Devi	Dietary Polyphenols and Their Role in Oxidative Stress-Induced Human Diseases: Insights into Protective Effects, Antioxidant Potentials and Mechanism(s) of Action	Frontiers in Pharmacology	13, 806470. doi.org/10.3389/fphar.2022.806470	2022
B Kashyap, S. R. Barge, S. Bharadwaj, B. Deka, S. Rahman, A. Ghosh, P. Manna, P. P. Dutta, Y. Sheikh, R. Kandimalla, S. K. Samanta, J. Boruwa, S. Saikia, D. Swargiary, P. Kamboj, D. Tuli, U. Pal, J. C. Borah, S. K. Banerjee and N. C. Talukdar	Evaluation of therapeutic effect of Premnaherbacea in diabetic rat and isoverbascoside against insulin resistance in L6 muscle cells through bioenergetics and stimulation of JNK and AKT/mTOR signaling cascade.	Phytomedicine	93, 153761. doi.org/10.1016/j.phymed.2021.153761	2021
S. R. Barge, B. Deka, B. Kashyap, S. Bharadwaj, R. Kandimalla, A. Ghosh, P. P. Dutta, S. K. Samanta, P. Manna, J. C. Borah and N. C. Talukdar	Astragalin mediates the pharmacological effects of Lysimachia candida Lindl on adipogenesis via downregulating PPARG and FKBP51 signaling cascade	Phytotherapy Research	1-14. doi.org/10.1002/ptr.7320	2021

Author(s)	Title	Journal Name	Volume & Issue no./page no/DOI	Year of Publication
B. Deka, S.R. Barge, S. Bharadwaj, B. Kashyap, P. Manna, J. C. Borah and N. C. Talukdar	Beneficial effect of the methanolic leaf extract of Allium hookeri on stimulating glutathione biosynthesis and preventing impaired glucose metabolism in type 2 diabetes.	Archives of Biochemistry and Biophysics	708, 108961. DOI: 10.1016/ j.abb.2021.108961	2021
P. Kamboj, S. Sarkar, S. K. Gupta, N. Bisht, D. Kumari, S.R. Barge, B. Kashyap, B. Deka, S. Bharadwaj, S. Rahman, P. P. Dutta, J. C. Borah, N. C. Talukdar, S. K. Banerjee and Y. Kumar.	Methanolic extract of LysimachiacandidaLindl. prevents high-fat-high-fructose-induced fatty liver in rats: Understanding the molecular mechanism through untargeted metabolomics study	Frontiers in Pharmacology	12, 653872. DOI: 10.3389/ fphar.2021.653872	2021
S. R. Barge, D. Jade, G. Gosavi, N. C. Talukdar and J. C. Borah.	In-silico screening for identification of potential inhibitors against SARS-CoV-2 transmembrane serine protease 2 (TMPRSS2)	European Journal of Pharmaceutical Sciences	162, 105820. DOI: 10.1016/ j.ejps.2021. 105820	2021
A. K. Borah, P. Sharma, A. Singh, K. J. Kalita, S. Saha and J. C. Borah	Adipose and non-adipose perspectives of plant derived natural compounds for mitigation of obesity.	Journal of Ethnopharmacology.	280, 114410. DOI: 10.1016/ j.jep.2021. 114410	2021
S.R. Barge, D. Jade, S. Ayyamperumal, P. Manna, J. C. Borah, C. M. J. Nanand and N. C. Talukdar	Potential inhibitors for FKBP51: an in silico study using virtual screening, molecular docking and molecular dynamics simulation.	Journal of Biomolecular Structure and Dynamics	1-13DOI: 10.1080/ 07391102.2021. 1994877	2021

Conference Presentations

Author(s)	Title	Conference Name	Venue	Year of Publication
N. Gurumayum and R. Devi	*Musa balbisiana* attenuates methylglyoxal-induced cytotoxicity and advanced glycation end product formation in HepG2 cells.	5th World Congress on Drug Discovery and Development- 2021	New Delhi	2021
P. Khound and R. Devi	Role of traditional knowledge based medicinal plant, Clerodendrum-glandulosum in amelioration of Mitochondrial stress	5th World Congress on Drug Discovery and Development- 2021	New Delhi	2021
P. Choudhury	Molecular insight of Aromatic rice (Jaha) on in vivo type II diabetic model system	4th International Conference on Oral Food and Nutrition	Singapore	2021
N. Sarma, H. Sarma, A. K. Borah and R. Devi	Potential application of natural fiber & 3D printing: A review	5th World Congress on Drug Discovery & Development 2021	New Delhi	2021
H. Sarma and R. Devi	Comparative Phytochemical screening and Free Radical Scavenging Ability of five Species of genus Clerodendrum	5th World Congress on Drug Discovery and Development- 2021	New Delhi	2021
N. Sarma, H. Sarma, S. Pait, M. Barma and R. Devi	Natural Fiber for Sustainable Development	National Science Day, 2022	IASST, Guwahati-35	2022
N. Sarma, H. Sarma, S. Pait, and R. Devi	Potential Application of Natural Fiber for Sustainable Green Future	National Seminar on "Emerging Priorities in science and technology with special focus on rural & green technology."	B. Barooah College	2022
M. Barma, U. K. Jana and R. Devi	Banana fiber: From waste to wealth	National Seminar on "Emerging Priorities in science and technology with special focus on rural & green technology."	B. Barooah College	2022

Author(s)	Title	Conference Name	Venue	Year of Publication
N. Gurumayum and R. Devi	Protective effects of bioactive fraction of *Musa balbisiana* on methylglyoxal induced oxidative damage in HepG2 cells.	National Seminar on "Emerging Priorities in science and technology with special focus on rural & green technology."	B. Barooah College	2022
S. Devi, S. Bharadwaj, S. Akhtar and J. C. Borah	Anti-diabetic effect of *Osbeckianepalensis* Hook in modulating hepatic gluconeogenesis through AMPK dependent inhibition of gluconeogenic enzymes. (Abstract ID: 3555773)	ACS Spring 2021	San Antonio, Texas	2021
D. Basumatary, B. Kashyap, J. C. Borah and N. C. Talukdar	Study of the effect of traditional medicinal plants in ameliorating the relationship between gut microbiota and intestinal epithelium in preventing non-alcoholic fatty liver disease (NAFLD)	ACS Fall 2021	Georgia World Congress Center (GWCC), Atlanta, GA, USA	2021
P. Sarma, B. Kashyap, T. Nandini and J. C. Borah	Isolated compounds from *Leucaena leucocephala* (Wild tamarind) attenuate oxidative stress related to type II diabetes mellitus via modulation of SIRT1/AKT signalling pathway.	International conference on Progress & challenges in Modern Day Science (PCMDS 2021)	Department of Chemistry, B. Borooah College	2021
S. A. Ahmed, and P. Sarma, S. Bharadwaj, J.and C. Borah	*In vitro* Investigation of Potential Anti-diabetic Activity of *Tribulus terrestris* L. by Modulating Hepatocyte Glucose Homeostasis	International conference on Progress and challenges in Modern Day Science (PCMDS 2021)	Department of Chemistry, B. Borooah College	2021
D. Swargiary, B. Kashyap, and J. C. Borah	*Phyllanthus niruri*L. prevents palmitate induced insulin resistance condition in muscle cells via SIRT1/AKT pathway	International conference on Progress and challenges in Modern Day Science (PCMDS 2021)	Department of Chemistry, B. Borooah College	2021

Conference Proceedings

Faculty / Research Scholar	Conference/Workshop/Exhibitions	Date and Venue
Dr. R. Devi, H. Sarma and N. Sarma	Conclave on Transforming Meghalaya State Through Science and Technology Interventions. Organized by NECTAR	9th-10th April, 2021, Shillong
Dr. R. Devi	Chaired as a Joint Convenor in the National Seminar on "Emerging Priorities in Science and Technology with Special Focus on Rural and Green Technology"	24th March 2022, B Borooah College, Guwahati, Assam
N. Sarma, S. Pait and Dr. R. Devi	Brain storming conclave on atmanirvar northeast at COTTON University	21st -22th Dec, 2021, Cotton University, Guwahati
N. Sarma	National Seminar on "Emerging Priorities in Science and Technology with Special Focus on Rural and Green Technology"	24th March 2022, B Borooah College, Guwahati, Assam
Ms. A. Saikia	Training program on Current Trend in R&D, Modern Advances and Technology for Scientific Understanding in AYUSH.	28th March 2022, CSIR-NEIST, Jorhat, Assam.
Ms. P. Sarma	Training program on Current Trend in R&D, Modern Advances and Technology for Scientific Understanding in AYUSH.	28th March 2022, CSIR-NEIST, Jorhat, Assam.
Ms. P. Sarma	Webinar: RSC Desktop Seminar Series with RSC Medicinal Chemistry & RSC BMCS	12th January, 2022. RSC Biological and Medicinal Chemistry Sector, United Kingdom.
P. Sarma	Webinar : Mastering HPLC method Development	19th June, 2021. American chemical society. Axion Training Institute, Chicago.

Invited Talks

Faculty	Title	Programme Name	Date and Venue
Dr. R. Devi	Herbal medicine to Drug development: Research and key challenges	Lecture series	31st January 2022. School of Pharmaceutical Sciences, University of Science & Technology Meghalaya
Dr. R. Devi	The effect of Aromatic rice (Joha) Phytonutrient(s) in High Fat High Carbohydrate (HFHC) diet induced insulin resistance in vivo model system.	Lecture series	8th-10th November, 2021. FCT-2021, France.

Faculty	Title	Programme Name	Date and Venue
Dr. R. Devi	Importance of science and its future perspective.	---	19th April 2021. Tetelia High School, Guwahati.
Dr. J. C. Borah	Natural Products: Their Importance and applications	National Webinar on Natural Products	27th November, 2021. Department of Chemistry, St. Anthony's College, Shillong, Meghalaya.
Dr. R. Devi	Importance of science and its future perspective.	---	April 19th 2021 Tetelia High School, Guwahati.

Patents

Inventor(s)	Title	Patent Application No.	Provisional/Final Patent grant No.	Issue number of Patent Office
R. Kandimalla, S. Kalita, B. Choudhury, R. Devi, and J. Kotoky	Poly Herbal Formulation for Treatment of Painful Diabetic Neuropathy	201631008543	393442	Date of grant: 29.03.2022

Co-ordinator: Dr. Kamatchi Sankaranarayanan

A.1. Cold Atmospheric Plasma for SARS-Cov-2 Virus Deactivation

Cold atmospheric pressure (CAP) plasma can deactivate SARS-CoV-2 spike protein, which is responsible for the spread of the Coronavirus. We have proposed CAP plasma based disinfection method to be a better alternative to those environmentally hazardous chemical-based decontamination methods. The entire process is green as there are no chemical wastes produced in the plasma treatment and therefore, this method is highly advantageous from the environmental safety prospects. The Angiotensin converting enzyme (ACE2) protein is the binding hotspot for the Coronovirus spike protein and in our work using ELISA technique the binding efficiency of the CAP treated spike protein to the ACE2 protein has been analyzed. In the work published recently in RSC (Royal Society of Chemistry) Advances, we have highlighted the significant deactivation of the SARS-CoV-2 Spike protein by CAP plasma treatment within 2 minutes and a complete deactivation is achieved within 5 minutes due to the short lived highly reactive oxygen and nitrogen species (ROS/RNS) generated in the plasma (Fig. 36). Further, using RT-PCR test, we have established that CAP plasma is also capable of deactivation of the RNA of SARS-CoV-2 virus.

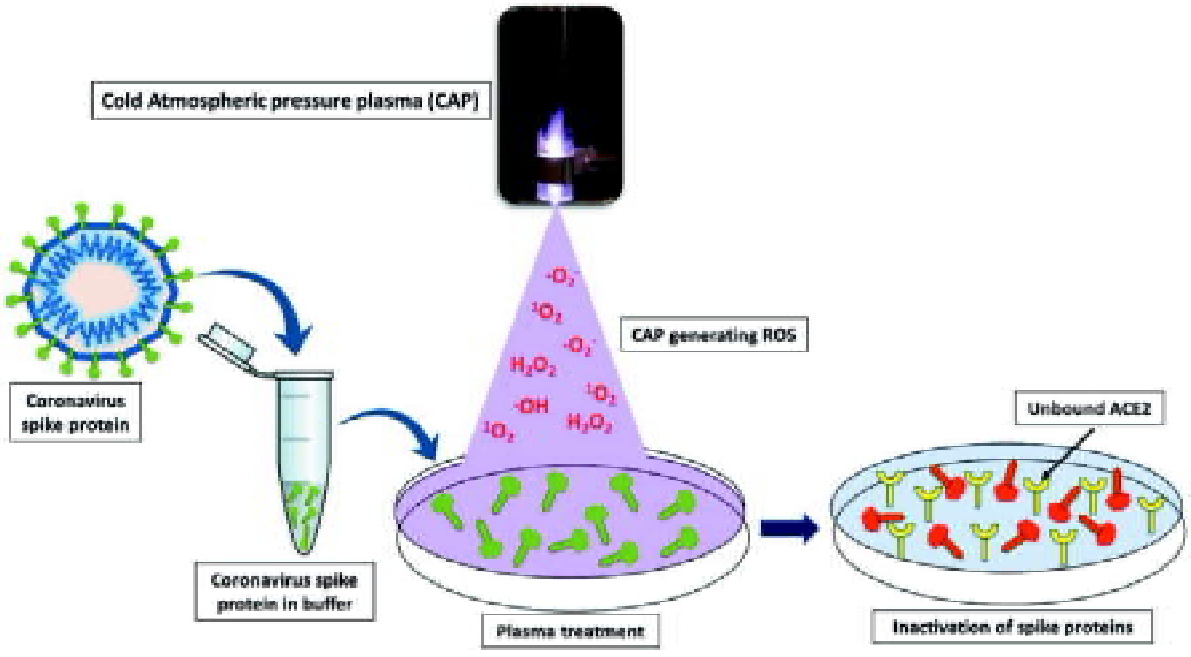


Figure 36 : CAP for the deactivation of the SARS-CoV-2 spike protein binding to ACE2 protein.

A.2. Polyoxometalates for Neurodegeneration

Neurodegenerative disorders are one of the most devastating disorders worldwide. Although a definite mechanistic pathway of these kind of neurodegenerative disorders is still not clear but studies show that these diseases are initiated by protein misfolding. For almost all the neurodegenerative disorders the fundamental reason is the accumulation of the amyloid beta fibrils in brain. Hen Egg White Lysozyme (HEWL), which is a good model of random coil structure, can be converted to highly arranged amyloid fibrils. We have monitored the fibrillation kinetics with Thioflavin T assay and have studied the role of time, temperature and pH in the fibrillation process (Fig. 37).

Further, we have studied the role of a special class of inorganic nanomaterials called as polyoxometalates (POMs) in the process of the HEWL fibrillation using varied spectroscopic and calorimetric techniques. We observe that the POMs bring in a more structural self-assembly of the protein HEWL and hence minimizes the fibrillation. This study could pave way for utilizing POMs for possible application in neurodegeneration.

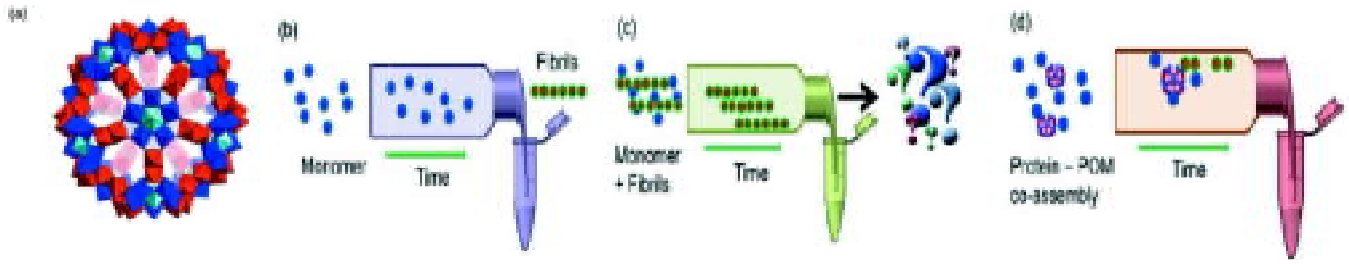


Figure 37 : (a) Structure of Polyoxometalates, **(b) - (d)** Protein co-assembly using Polyoxometalates.

Extramural projects

Ongoing projects

Title of the project	Funding Agency, Total fund, Duration, PI/Coordinator, Co-Investigator	Goal
Rheological Behaviour of the Concomitant Self-Assembly of Protein/ Peptides Prompted by Water Soluble Inorganic Nanomaterials : A Fundamental Advancement Towards the Central Dogma of Parkinson's Disease	SERB-Startup Research Grant Total Fund: INR 28.1 Lakh Duration: January, 2021-January, 2023 PI: Dr. Kamatchi Sankaranarayanan	To understand the rheological behavior of proteins/peptides which tend to form amyloid fibrils.

In-house Projects

Ongoing Projects

Title of the project	Funding Agency, Total fund, Duration, PI/Coordinator, Co-Investigator	Goal
Cold Atmospheric Plasma activated biomolecular self-assembly and applications in Plasma medicine	Funding Agency : IASST Total Fund: INR 15 Lakh Duration: April, 2021-March, 2023 PI: Dr. Kamatchi Sankaranarayanan.	To study the effect of Cold Atmospheric Plasma on different biomolecules.

Publications

In Cited Journals

Author (s)	Title	Journal name	Volume & Issue no./page no.	Year of Publication
R. R. Khanikar, M. Kalita, P. Kalita, B.Kashyap, S. Das, M. R. Khan, H. Bailung, and K.Sankara-narayanan	Cold Atmospheric Pressure Plasma for attenuation of SARS-CoV-2 Spike protein binding to ACE2 protein and the RNA deactivation	RSC Advances	12, 9466-9472. https://doi.org/10.1039/D2RA00009A	2022
J. S. Boruah, K.Sankaranarayanan and D. Chowdhury	Insight into carbon quantum dot-vesicles interactions: Role of functional groups	RSC Advances	12, 4382-4394. https://doi.org/10.1039/D1RA08809B	2022
M. Kalita, B. J. Allardyce K. Sankaranarayanan D. Devi and R. Rajkhowa	Sericin from mulberry and non-mulberry silk using chemical-free degumming	The Journal of the Textile Institute	https://doi.org/10.1080/00405000.2021.1964766	2021

Invited Talks

Faculty	Title	Programme Name	Date and Venue
Dr. K. Sankaranarayanan	Gender policy, processes, procedures, practices	First GSAT training on GATI framework and Methodology	24th Dec. 2021 Chandraprabha Saikiani Centre for Women Studies, Tezpur University
Dr. K. Sankaranarayanan	Promotion of Scientific Temper Among the Youth	Youth Conclave for Empowering the Youth of North-East India through the Advancement of Technology and Skill	9th Dec. 2021 Chandraprabha Saikiani Centre for Women Studies, Tezpur University
Dr. K. Sankaranarayanan	Resource person and delivered talk on the topic 'Interesting World of Proteins: From Basics to Applications in Industry	Winter School in Physics and Chemistry for college teachers	25th November 2021Kannur University, Kerala (by UGC-HRDC)

Conferences/Workshops/Seminars/Meetings Attended

Faculty/Research Scholar	Conference/Workshop/Exhibitions	Date and Venue
Dr. K. Sankaranarayanan	Cold Plasma for Biomedical Applications at Savitribai Phule Pune University	30th - 31st July 2021
Dr. K. Sankaranarayanan	44th Indian Biophysical Society Meeting (IBS 2022) organized by ACTREC, Tata Memorial Centre, Navi Mumbai.	30th-31st March 2022 and 1st April, 2022

FACILITIES OF IASST

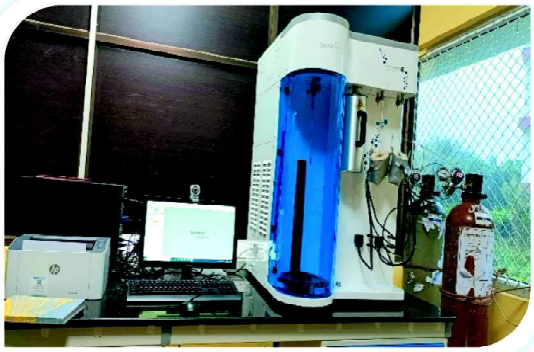
Activities of the Research and Development (R&D) Cell

Research and development - R&D - is the process by which an institute works to obtain new knowledge that it might use to create new technology, products, services, or systems which it will either use or sell. In IASST R&D Cell was newly introduced in the initial months of 2021 and started its full activity by April 2021. After the formation, the R&D Cell under the guidance of the Director IASST initiated the collection of research project proposals from the faculty members of the institute to support them with "In-house Projects" from the core fund of the institute so that their research activity accelerates without any financial hiccup. For the F/Y 2021-22, 14 numbers in-house projects were sanctioned and assessment had also been done for all these projects.

R&D cell also looks after the extramural projects funded by different department/ministries. In the F.Y. 2021-22 a total of 36 numbers of Extramural Projects (including 3 consultancy projects) were handled by the cell.

Sophisticated Analytical Instrument Centre (SAIC)

IASST is envisioned to emerge as a leading knowledge-based institute of excellence for carrying out high quality scientific research. Sophisticated Analytical Instrument Centre (SAIC) at IASST provides support to achieve its objectives and to meet the growing demand of superior infrastructural needs of the researchers of the North Eastern region. At present SAIC is having more than thirty-five instruments. Few of the instruments are the following:



BET Surface Area Analyzer

Field-Emission Scanning Electron Microscope (FE-SEM)

Transmission Electron Microscope (TEM)

Liquid Chromatography with tandem Mass Spectrometry (LCMSMS)

ANIMAL HOUSE FACILITY

Animal House Facility (AHF)

A mini-Animal House Facility is being maintained in the institute premises since long back which houses experimental animals like albino rat, mouse and rabbit and this caters to the need of scientists of IASST and also the scientists of this region. The animals are maintained as per guidelines of CPCSEA Government of India, and Animal Welfare Division and guidance of the Institutional Animal Ethics Committee. A fully committed veterinary doctor has been appointed for round the clock dedicated service related to animal study.

New Animal House

IASST has developed a GLP like state-of-the-art new AHF with 8000 sq. ft. area and also having all modern facilities to do advanced research for validation of both synthetic and natural agents of this region for development of new drug molecules. The construction is completed and is ready to house a variety of normal and genetically modified rats and mice such as ob/ob, nude, SCIT etc.

Photograph of New Animal House

Photograph of Old Animal House

QUALITY CONTROL AND QUALITY ASSURANCE (QC & QA)

Quality Control and Quality Assurance(QC&QA) facility developed at IASST under the Phytopharmaceutical Mission, Govt. of India, has applied for NABL accreditation of two test products (Turmeric and Chilli), with 14 chemical discipline scopes and 2 scopes for AYUSH products for testing as per ISO/IEC 17025: 2017. Quality testing as per pharmacopeia standards (IPC/PCIMH) of six new highly traded medicinal plants of NER is also in pipeline for accreditation. It has also applied for drug testing license under State Drug Control (Rule160A-J of D&C rules, 1945) and Spices Board's scheme for testing Spice Products.

QCQA facility, IASST. A. QCQA laboratory facility signboard; B. Phytochemistry laboratory; C. Microbiology laboratory; D. Taxonomy laboratory; E. Waiting Room; F. QCQA sample receiving room.

COVID-19 TESTING AND RESEARCH LABORATORY

During the 1st wave of the Covid-19 pandemic, IASST realized the urgent need of the society in the crucial moment of human crisis and decided to offer it's laboratory and manpower to set up a RT-PCR based testing facility to enhance the testing capacity under 'testing-tracking-isolation' policy of the government. In collaboration with the National Health Mission (NHM) and PWD, Govt. of Assam, the Covid-19 testing and research laboratory in IASST was set up in just 5 days working day & night, which was inaugurated on the 1st June, 2020 by the then honorable Minister of Health and Family Welfare, Dr. Himanta Biswa Sarma (currently Chief Minister of Assam). The laboratory was reopened by Prof. Ashis K. Mukherjee, honorable Director of IASST during the 2nd wave of the pandemic on 28th April 2021. By a dedicated team of scientists, research scholars and casual workers of IASST and doctors from Guwahati Medical College, the laboratory has conducted more than 1.5 lakhs tests till date.

Reopening of the Covid-19 lab by Prof. Ashis K. Mukherjee, honorable Director of IASST on 28thApril 2021during the 2ndwave of the pandemic.

ASTRONOMICAL TELESCOPE AND OBSERVATORY

Figure 1 : Snapshot of the sky observation event for the research scholars of IASST

An astronomical telescope (Celestron CGX-L Equatorial 1400 Schmidt-Cassegrain Optical Telescope) along with its dome have been installed on the terrace of the observatory building of the institute (Fig. 1). Aperture of the telescope is 14" with focal ratio f/11. A camera (Celestron Skyris 236 Camera) for astronomical imaging is also attached with the telescope. Telescope is placed inside the observatory dome of about ~3 m in diameter and ~3 m in height. Dome head is having motorized control with forward and reverse switched movement. Along with this main telescope, a small telescope (Celestron Advanced VX 6" Schmidt-Cassegrain Small Optical Telescope) is also procured for its advantage of carrying it to various places. A sky observation event has been organized for about 40 research scholars of IASST on 6th and 7th December, 2021. The planet Jupiter, Saturn and Venus had been observed. Jupiter had been seen with its 4 satellites visible. Saturn had been seen along with its ring. The moon surface had also been explored with the telescope.

Bionest-IASST- An Initiative by BIRAC, DBT, GoI

BioNest-IASST – Team Members

Prof. Ashis Kr. Mukherjee
(DIRECTOR-IASST)

Dr. Devasish Choudhury
Assoc. Professor, IASST

Mr. Sagar Kumar
Manager, (I & O)

Dr. Tania Paul
Manager (S&T)

Mr. Minku Das
Office Assistant

BioNest-IASST – Key Activities

- Section 8 Company formed –IASST Social Venture &Entrepreneurship Council,
- Infrastructure (exclusive labs, common labs, bootstrapping area, conference room, office room) functional.
- Got affiliated with TIE & ISBA
- MoU done with KIIT TBI, Bhubaneshwar & Assam Institute of Management, Ghy
- Published 4 volumes of newsletter- CREATORS.
- Physical & Virtual incubation started.
- Seventeen events/webinars and one hackathon was organized wherein No. of participants reached=1100 approx.

BioNest-IASST Services

Technical Consultancy	Business Consultancy	Legal Consultancy	Advisory Mentoring
Network Linkages	IPR Consultancy	Fund Facilitator	Training/ Workshop

Bionest-IASST is housed in 2nd floor of SAIC building.

Collaboration done with Mr. Pranjal Baruah, Ashoka Fellow, Founder, Mushroom Development Foundation (MDF) for enhancement of Commercial production of Mushroom at IASST.

Bionest-IASST in association with India Accelerator organized an offline interactive session with the would-be & budding entrepreneurs of North East India. The Guest of honor was Sri. Dhrubajit Sarma State lead project Manager for PMFME scheme at AIDC Ltd, Guwahati.

IASSTBioNEST | bionest.iasst | bionest-iasst | https://srasta-iasst.org/bionest/

STAFF WELFARE MEASURES

1. Medical Facility

The institute has its medical reimbursement system through which bills on expenses of both indoor and outdoor treatment in respect of all employees and their family members are reimbursed as per CGHS rules and rates. In addition to regular employees the medical facility is also provided to research scholars and temporary employees engaged for short term on contract basis. One part time allopathic doctor is also engaged as Consultant Medical Officer (CMO) who visits IASST on all week days for consultation in the institute as well as in her private chamber. Facilities like rest bed, pressure machine and common medicines are available in the institute. A dedicated room equipped with routine medical equipment and medicines is being used as Doctor's Chamber in the main building. Beside this the institute empanelled few renowned hospitals of Guwahati to provide medical facilities as per central government/CGHS rates. These includes- **1)** Ayursundra Superspecialty Hospital, Garchuk, Guwahati-35, **2)** Hayat Hospital, Lalganesh, Guwahati-34, **3)** Arya Hospital, Rehabari, Guwahati-8, **4)** GNRC limited, Guwahati-6, **5)** GNRC Limited, Sixmile, Guwahati-22, **6)** Narayana Superspecialty Hospital, Amingaon, Guwahati-31 and **7)** Panacea Medical Research and Diagnostic, Bhangagarh, Guwahati. These hospitals also organized "Health checkup and Awareness camps" at IASST time to time to spread awareness about risky non-communicable diseases and advise on good life style and healthy living to keep doctor's away.

2. Canteen and Mess Facility

The institute canteen is outsourced to a private Caterer who serves meals, snacks and beverages in hygienic condition to employees, students and guests at subsidized rates. There is facility of serving snacks and beverages inside the main building through Vending Machine. The private caterer also provides hygienic food to the boarders and guests in the Dorothy Hodgkins Students and Scientists' Home.

3. Benevolent Fund

An IASST employees' Benevolent Fund was established by equal contribution from employees and the Institute. All the regular staff members are member of the Fund. The fund envisages a benefit in the form of one-time payment to nominees of the members in case of death and permanent disability while in service.

4. Group Insurance

A Group Insurance Scheme for the employees of the institute is operating with the Life Insurance Corporation of India. All the regular employees of the institute are members of the scheme. Subscription for the scheme is made by the institute to get appropriate insurance cover for each group of employees.

5. Housing Facility

The institute has limited housing facility. Six (6) nos. of quarters in the old residential building are allotted to few essential service staff of the institute. In the Essential Service Staff Quarter (ESSQ) twelve nos. of essential staff reside. In the essential Service quarter complex, there is arrangement of 12 Godrej bunker beds in each of the separate dormitory rooms for boys and girls accommodation who visit IASST for different training and summer internship programme. The Director is residing in the newly built quarter in the midst of Bio Conservation Hub. The

newly built Scientific Staff Quarter comprises of three blocks, Block A- 5 nos. of Type-V quarter, Block B- 6 nos. of Type-IV quarter and Block C-8 nos. of Studio Apartment. Few Faculty members and the Registrar reside in the Scientific Staff Quarter. The Superintendent of the Director Office also resides in the Campus. In the SSH and the Old hostel, accommodation have been made for 52 nos. of research scholars. Moreover, there are 3 (three) nos. of VIP suites and six (6) nos. of scientist room in SSH for accommodating guests who visit IASST from various parts of India and abroad.

DIFFERENT GOVERNMENT POLICIES ADOPTED IN IASST

1. Reservation Policy

The Institute is following post based rosters for affecting the prescribed percentage of reservations to SC/ST/OBC/ EWS in all its new recruitments as per Government of India Rules in this regard.

2. Official Language Policy

The institute is paying emphasis on implementation of provisions of Official Language Act and the rules made and instructions issued there under. All the Letter heads of the Institute are in bilingual format. Annual Report of the Institute is published both in English and Hindi. All the nameplates and signboards of the institute are made Trilingual/ bilingual (Hindi and English). The institute appointed a Hindi Assistant who is looking after the implementation of the official language at IASST. The employees have started getting used to writing note in the file in official Hindi language. Hindi workshops and Official Language Implementation committee (OLIC) meeting as per prescribed norms were also organized in the institute during 2021-22. The institute is also celebrating Hindi Diwas in every year with great zeal to popularize Hindi as a "Rajbhasa".

REVENUE GENERATION

The Institute realizes that there has to be efforts towards revenue generation venture without affecting the primary mandates of high quality basic research and academic programme of producing Ph. Ds. and to train graduate and post grduate level students for developing research skill. Through several extramural grants, institute earns overhead charges which are handy in reducing the maintenance cost provision of core budget. The internal source of income generation during 2021-22 is highlighted in the following table.

Source of Income	Amount (Rs.)
Laboratory Instrument uses charge	14,17,650.00
Sale Proceeds of institute products	2,74,524.00
Other Receipts (Fees/Overhead/Bank interest)	40,37,258.00
Hostel/guest house receipt	15,84,005.00
Total	**73,13,437.00**

List of Ph.D. awardees

Name of student	Name of Supervisor	Title of the thesis	Award giving university
Dr. Gautomi Gogoi	Dr. Sagar Sharma (Guide) and Dr. Neelotpal Sen Sarma (Co-guide)	Studies on new types of organic semiconductors based on diketopyrrolopyrrole and naphthalene diimides	Cotton University, Guwahati, Assam.
Dr. Khanindra Sharma	Dr. Arundhuti Devi, Dr. Neelotpal Sen Sarma	Development of treatment strategies for the remediation of effluents of paper and oil industries	Cotton University, Guwahati, Assam.
Dr. Himangshu Deka	Dr. Arundhuti Devi	Study on biochemical aspects of phenolics in tea with special reference to catechins	Gauhati University, Assam.
Dr. Tulshi Joshi	Dr. M. R. Khan, Associate professor, LSD	Study on the effect of fermented dairy products on human gut bacteria	Cotton University, Guwahati, Assam.
Dr. Manshi Das	Dr. N. C. Talukder, former Director, IASST	Assessment of Microbial Diversity and Dynamics of the Rhizobacteria and ArbuscularMycorrhizal (AM) Fungi in soil and Plants root under shifting cultivation in northeast India	Cotton University, Guwahati, Assam.
Dr. Suruchi Aggarwal	Dr. N. C. Talukder, former Director, IASST	Developing Computational Methods for large scale quantification and analysis of proteins and their modifications	Cotton University, Guwahati, Assam.
Dr. Yoshiko Bailung	Prof. J. Chutia, Supervisor Dr. A. R. Pal, Co-supervisor	Studies on static and dynamical Structures in dusty plasma	Gauhati University, Assam
Dr. Silpisikha Goswami	Dr. Dipak Sarma, Assoc. Prof., Cotton University (as Principal guide).	Analytical and numerical approach to some heat and mass transfer problems	Cotton University, Guwahati, Assam.

M.Sc. / B. Tech projects/Internship/Training Courses Offered at IASST

Students Name	College / University	UG/PG Projects/ Intern	Status of Project	Duration
Manoj Singh	Amity University, Rajasthan	Internship	Completed	6th April - 30th June, 2021
Ritwick Ranjan Sarma	Yenepoa Research Centre, Yenepoa Deemed to be University	Dissertation	Completed	10th Feb - 9th Aug, 2021
Sandeepan Kakati	Manipal Institute of Technology, Manipur	Dissertation	Completed	1st Feb - 30th July, 2021
Ravindra Chandra	Guru Ghasidas University, Bilaspur	Dissertation	Completed	25th March - 1st Sep 2021
Nikita Choudhury	Assam Engineering College, Guwahati Assam	Internship	Completed	25th April - 26th June, 2021
Hrishikesh Sarma	Department of Physica, Guwahati University, Assam	Internship	Completed	21st April - 15th Aug, 2021
Violina Sarmah	Department of Biophysics, Pub Kamrup College, Assam	Internship	Completed	16th March - 15th July, 2021
AshimJyoti Bharati	Department of Biophysics, Pub Kamrup College, Assam	Internship	Completed	16th March - 15th July, 2021
Manashjyoti Deka	Department of Biophysics, Pub Kamrup College, Assam	Internship	Completed	16th March - 15th July, 2021
Gaurav Raghunath Nalkar	Nanoscience and technology, School of Nanoscience and Technology, Shivaji University Kolhapur,	Internship	Completed	7th Oct 2021 - 24th Jan, 2022
SukanyaBaruah	IISER, Kolkata	Internship	Completed	04th Jan, - 31st Mar, 2022
Deep Lahan	North Lakhimpur Collage, Assam	Internship	Completed	3rd Jan, - 3rd March, 2022
Nitya Panthi	Assam Don Bosco University, Guwahati	Internship	Ongoing	30th Jan, 2022 - till date
BhagyaLakhmi Rajbongshi	Assam Don Bosco University, Guwahati	Internship	Ongoing	24th Dec, 2021 - till date
Ankita Sharma	Anandaram Dhekial Phookan College, Nagaon, Assam	Internship	Ongoing	31st Jan, 2022 - till date

Students Name	College / University	UG/PG Projects/ Intern	Status of Project	Duration
Taniya Paul	University of Science and Technology, Meghalaya, (USTM)	Internship	Ongoing	12th Jan, 2022 - till date
Mostakfijur Rahman	University of Science and Technology, Meghalaya, (USTM)	Internship	Ongoing	17th Jan, 2022 - till date
John Lalnuntlung Khawbung	University of Science and Technology, Meghalaya, (USTM)	Internship	Ongoing	17th Jan, 2022 - till date
Rinku Talukdar	North Guwahati College, Assam	Internship	Ongoing	21st Dec, 2021 - till date
Moriom Brabin	University of Science and Technology, Meghalaya, (USTM)	Internship	Ongoing	12th Jan, 2022 - till date
Barsha Sharma	Darrang College, Tezpur	Internship	Ongoing	1st Jan, 2022 - till date

DEVELOPING COLLABORATIVE NETWORK

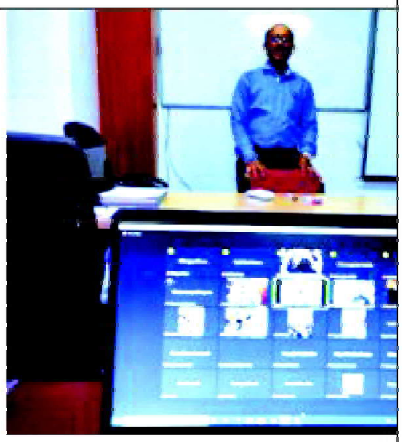
MoU between IASST with AARANYAK, Guwahati, Assam

A MoU was signed between IASST and AARANYAK, Guwahati, Assam, India on 8th October, 2021 to develop academic and research collaboration in the areas of mutual interest and exchange of academic information, scholarly information in the fields of biodiversity and the environment.

MoU between IASST with Guwahati Medical College Hospital (GMCH), Assam

A MoU between IASST and Guwahati Medical College Hospital (GMCH), was signed on 9th March, 2022 to undertake research projects/collaborations of mutual interest and expertise so as to yield result oriented outcomes for both the institutes GMCH and IASST.

SCIENTIFIC SOCIAL RESPONSIBILITY

Activity	Date	Name of the supervisor/ In-charge	Description	Photograph
An official visit to Satargaon (IASST adopted village)	28/11/2021	Prof. A. K. Mukherjee	IASST team headed by the Director, IASST visited Saratgaon village on 28/11/2021 to take an account of the economic and other benefits of IASST's intervention in the village and also to interact with the villages to understand their need/ requirements.	
Science education programme under the SC/ST community development project, IASST. IASST, Guwahati have initiated a "Lab Experience Based Science Education" for school students of BTC under a project funded by the SEED division, DST, Govt. of India. The objectives of this science education program are to enhance mastery of subject matter among students, developing scientific reasoning among students and also to develop critical, quantitative thinking amongst students.			Under this project, IASST is conducting online teaching and lab based science education programme in selected government schools of BTC. Through this project over 50,000 students of BTC from Class VIII to XII will be benefitted directly or indirectly.	
Teaching in virtual mode	From July 2021 onwords	Dr. M.R. Khan	Several government and private schools from BTC and other parts of the state are connected with this virtual teaching programme. About 80-100 students have attended per lecture.	

Training / awareness programmes for school students	19 April 2021	Dr. M.R. Khan	Altogether 86 students from class IX-XI attended the lecture and demonstration class. Two faculty members from IASST have delivered lectures and demonstrated some science model related to science syllabus of class IX-XII students. This programme was also organised as a part of our celebration of 75th year of India's independence "Azadi ka Amrut Mohotsav".	
Lab experience based science education in Udalguri and Kokrajhar district	22-26 Nov. 2021; 26-31 Dec. 2021; 7-13 Feb. 2021	Dr. M.R. Khan	IASST project team visited 18 government schools in Udalgudi and Kokrajhar district of Assam for *lab experience based science education* to the students of class VIII-XII. More than 2000 students attended our demonstration and hands-onclass/training.	
Scientific kit distribution to Govt. Schools in Udalgudi and Kokrajhar districts	16th Decem ber 2021 and 7th March 2022	Dr. M.R. Khan	This programme was organized under DST's SC/ST Community Development Project at IASST. Under this program, eighteen (18) high schools/ higher secondary under Udalgudi and Kokrajhar districts were provided Scientific Kit with the objectives to improve students' ability to identify questions through direct	

			laboratory exposures and to enhance their concepts that guide scientific intelligence.	
Income generation from Eri rearing in adoption Scheduled-Tribe Villages	2021-22	IASST	Most of the women in the adopted village namely Bakrapara, Kallapara and Satargoan accepted the Eri rearing as one of the major sources of income as their livelihood. During 2021-22, 36 farm women were involved in Eri rearing in Bakarapara, Kallapara and Satargaon villages and earned an amount of Rs. 4.26 lakh in total from cocoon & larvae.	

Visit of CAG Audit Team to IASST

Sl. No.	Name of Guest	Affiliation	Purpose of visit	Date
1.	CAG Audit team	Office of the Director General of Audit, Environment & Scientific Departments, Kolkata, Nizam Palace, 234/4 A.J.C .Bose Road, Kolkata-700020.	Auditing at IASST	21.02.2022-11.03.2022

PHOTO GALLERY

Administrative Staff

SAIC Team members

BioNest Group

QA&QC Team

Engineering Cell

KRC Team

Academic Cell

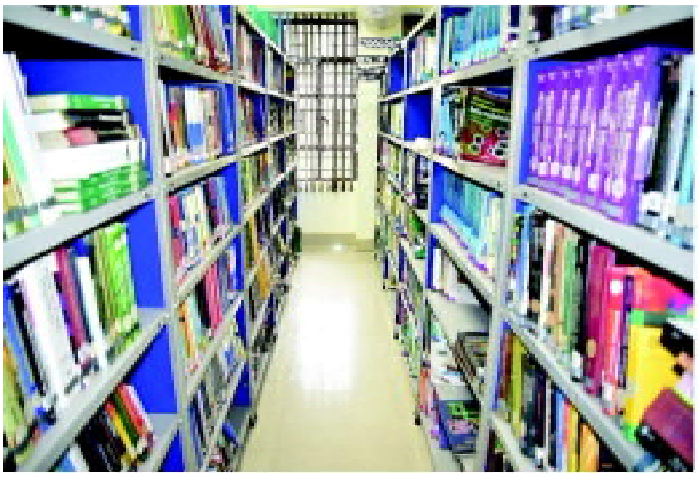
IT Cell Team

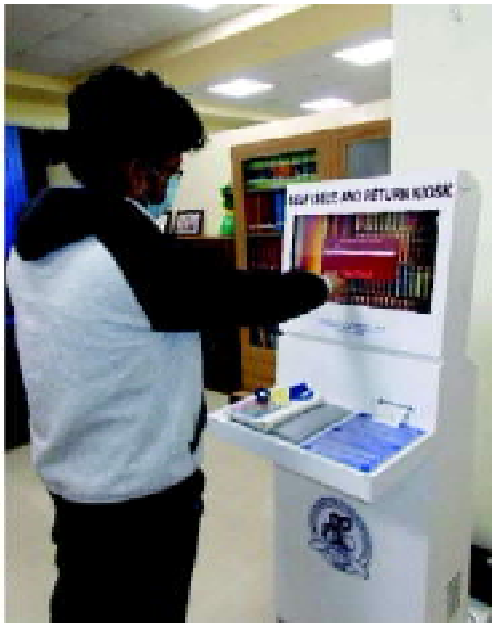
Editorial Board Members

KNOWLEDGE RESOURCE CENTER

The Knowledge Resource Centre (KRC) of IASST is the hub of learning and research activities. Since its inception, the KRC has been playing an important role in providing information and various academic services to its users using modern tools to the scientific community involved in Research and Development activities in the institute. It is a special library and the library has the memberships of the National Knowledge Resource Consortium (NKRC), National Digital Library (NDL), Developing Library Network (DELNET) and Current Science Association (CSA). The center also provides its services to the researchers of other educational and research institutes in North East India. The KRC collection includes 8,065 Books, 2939 bound Periodicals, 109 Theses, 184 Dissertations, 506 Research Papers (Journal articles and chapters in book). The center provides its patrons the access to subscribed e-resources like e-journals comprised of scholarly content via Wi-Fi and LAN (Local Area Network) connections and also manages the use of iThenticate, a plagiarism checks software and Grammarly, a writing assistant software and sigma plot, a scientific graphing and data analysis software. The institute also has its own Institutional Repository (IR) or Digital Library, accessible through institute's Wi-Fi or LAN facility which provides access to digital resources produced by the institute.

In the year 2021-2022, the services and activities were improvised with 335 new books procured based on the requisition of the patrons, 421 books circulated, photocopy and printing services of 75,250 pages and 21 scans provided. The KRC is partitioned into sections such as Circulation Section, Property Counter, Technical Processing Section, Reading Area, Digital Resource Section, Periodical Section, Book Section, Mini Conference Room, Back Volume Section and Faculty Reading Room, providing the perfect reading and brainstorming environment to the users.



Glimpses of Knowledge Resource Center

75th YEAR OF INDIA'S INDEPENDENCE "AZADI KA AMRIT MAHOTSAV"

MEETING/CONFERENCE/SEMINAR/WORKSHOP/TRAININGCOURSE/ SYMPOSIUM ORGANIZED UNDER THE BANNER OF 75TH YEAR OF INDIA'S INDEPENDENCE- "AZADI KA AMRIT MAHOTSAV"

Sl. No.	Name of Programme	Name of the Speaker/ Resource Person	Affiliation	Title of talks/ Lecture	Date
1	Final Round of FAME-Biotech 2021	Dr. Sharad Daulatrao Pawar	Assistant Director, Central Ayurveda Research Institute for Drug Development, Kolkata	Jury of the Biotech idea hackathon	26.06.2021
		Dr. Probodh Borah, Professor & Head	Dept. of Animal Biotechnology, College of Veterinary Science, Assam Agricultural University, Guwahati		
		Dr. K Karthikeyan	CEO, NEATEHUB, Atal Incubation Centre of AAU Jorhat		
		Dr. Nitin Maurya	Scientist & Head, National Innovation Foundation - India		
		Mr. Ashim Baidya	Manager, Nodal Officer (ROGW), MSME Promotional Initiative Vertical, - SIDBI Guwahati		
2	International Day for the Preservation of Ozone Layer	Prof. B N Goswami, FNA, FASc, FNASc, FTWAS	SERB Distinguished Fellow, Cotton University, Guwahati	Contrasting successes of the Montreal Protocol for saving the Ozone layer and the Paris Agreement for restraining Global Warming to 1.5 degree C	16.09.2021

Sl. No.	Name of Programme	Name of the Speaker/ Resource Person	Affiliation	Title of talks/ Lecture	Date
3	World Heart Day talk	Dr. Amiya Kumar Sarma	MD Internal Medicine, Retired as General Manager (Medical) from Indian Oil. Presently working as Medical Consultant at 3D HEALTHCARE, New Guwahati Centre and ESI MODEL Hospital, Beltola	Prevention of coronary heart disease	29.09.2021
4.	World Mental Health Day	Dr. Nahid Suraiya Islam	Psychiatrist, GNRC hospital, Guwahati, Assam	Stress management in an institution	10.10.2021
5.	World Diabetes Day	Professor Uma Kaimal Saikia	Prof. and Head, Department of Endocrinology, Gauhati Medical College, Assam	Diabetes Mellitus-the way forward	14.11.2021
6.	World Soil Day	Dr. Manmohanjit Singh	Punjab Agricultural University	Soil Physical Quality Vis-À-Vis Soil Erosion Under Changing Climatic Scenario	05.12.2021
7.	Awareness Programme on Sexual Harassment of Women at Workplace	Prof. Polly Vauquline	HoD, Dept. Women's Studies, Gauhati University	Awareness talk and interaction on sexual harassment	09.12.2021
8.	Startup India Incentives for Satrt-ups	Mr. Sagar Sengar	Assistant Manager-Startup India Team	The startup ecosystem growth in India over the past 6 years, the funding landscape, and how GoI is facilitating and empowering the entrepreneur under 'Make in India' initiative	19.01.2022

Sl. No.	Name of Programme	Name of the Speaker/ Resource Person	Affiliation	Title of talks/ Lecture	Date
9.	International Day of Women and Girls in Science	Dr. Atya Kalpey	Chief Scientist, Head, Environmental Biotechnology and Genomics Division, CSIR- NEERI, Nagpur Vice President, Organization for Women in Science for the Developing World (OWSD), Asia Pacific Region (Unit of UNESCO)	Equity, Diversity and Inclusion: Water Unites US	11.02.2022
10.	International Women's Day 2022	Dr. K. Karthikeyen	CEO - NEATEHUB	Women in Innovation: Addressing real-world Problems	08.03.2022
		Ms. Bornali Sharma Baruah	Easy Haat Pvt. Ltd		08.03.2022
		Ms. Watila Longkumer	Founder - Naro Ki		08.03.2022
		Ms. Sabina F. Saikia	Founder - Eco Web Pvt Ltd		08.03.2022
		Dr. Anamika Kalita	DST INSPIRE Faculty, IASST Guwahati		08.03.2022
		Dr. Ananya Barman	BIRAC (BIG Grantee)		08.03.2022
		Ms. Angira Sarmah	Admin/HR Manager, NEATEHUB		08.03.2022
11.	International Day of Mathematics	Prof. Swaroop Nandan Bora	Department of Mathematics IIT Guwahati Guwahati - 781039 Assam	Mathematics: Lingua Franca in Science and Engineering	14.03.2022

IASST organised Virtual Lab visit for the School Students and Covid-19 Awareness Programme under the banner of 75th years of India's Independence- "Azadi ka Amrit Mahotsav"

The Institute of Advanced Study in Science and Technology (IASST) has organized a virtual laboratory visit program on 13th August 2021 for school students on the occasion of the national celebration of the 75th year of India's Independence-'Azadi Ka Amrit Mahotsav'. Honorable Director of IASST, Professor Ashis K. Mukherjee, welcomed the school students and also opined that the SRS-Cov-2 virus-induced Covid-19 had jeopardized every sphere of life, entails an unprecedented challenge to public health and hinders work and education; however, we should not lose hope and must be able to tackle the situation. In this pandemic time, students cannot go to school and do the practical. To overcome that challenging situation, IASST took a unique initiative to motivate school students towards science and technology by arranging the virtual laboratory visit to showcase the modern instrument facilities and few cutting-edge technologies of IASST. Professor Heramba Bailung, Head of the Physical Sciences Division, lucidly explained plasma science and demonstrated plasma generation in the laboratory, including 'aurora borealis'. Dr. Mojibur R. Khan, Associate Professor, Life Sciences division, talked about DNA/RNA and demonstrated the process to study them. Dr. Khan has also showed the modern technique of RT-PCR for detecting the SARS-CoV-2 virus, the causative agent for Covid-19. Sixty-three students from class VIII to X, representing various schools of Assam participated in this programme.

The Institute also organized a Covid-19 awareness program on the same day for the residents of nearby localities. In this program, face masks and a newly formulated hand sanitizer were distributed among the nearby villagers and shopkeepers. The programme was flagged off by The Director of the institute, Prof. Ashis K. Mukherjee, and some other scientists and officials of IASST. The sanitizer, "Nirvyadhi," composed of herbal ingredients has been formulated in the Environmental Chemistry Laboratory, IASST, headed by Dr. Arundhuti Devi. The formulation was tested and standardized by her research scholars following WHO's recommendations. The focus of the entire program was to spread the message of the appropriate Covid behavior among the mass, including the importance of wearing masks, administering vaccines, maintaining social distance, and using hand sanitizers among the common multitude to contain the spread of Covid -19 pendamic.

EMINENT SCIENTISTS / PERSONALITIES WHO VISITED IASST AND DELIVERED LECTURE UNDER THE BANNER OF 75TH YEAR OF INDIA'S INDEPENDENCE- "AZADI KA AMRIT MAHOTSAV"

Sl. No.	Name of Scientist/ Speaker	Affiliation	Title of talk/ Lecture	Date
1.	Prof. Debi P. Sarkar	Former Director, IISER Mohali and Shanti Swaroop Bhatnagar Awardee	Glorious past-exciting present and encouraging future of biological research in India: From basic science to translational exploration	13.04.2021
2.	Prof. Arup Kumar	SERB Distinguished Fellow, CSIR-Central Glass and Ceramic Research Institute- Kolkata	Metal Insulator transition revisited	27.04.2021
3.	Prof. T. Ramasami	Padma Bhushan, Former Secretary, Department of Science and Technology and Former Director of the Central Leather Research Institute, Chennai, India	NER as Treasure House for Original Research	03.05.2021
4.	Prof. P. Balaram	Padma Bhushan, Professor, National Centre for Biological Sciences, Bangalore and Former Director, IISc, Bangalore	Chemistry, Biology and the Unity of Nature	03.05.2021
5.	Mr. Amitava Banerjee	IICA-MCA assessed eligible Independent Director, Former Consultant, National Foundation for Corporate Governance	E-commerce for business beyond borders and it's necessity in Northeast	15.07.2021
6.	Dr. Pijush Chandra Das	Deputy Director, Training & Placement, Tezpur University	Placement guidelines & personality development	15.07.2021
7.	Professor Pritam Deb	Professor of Department of Physics and Chair Professor of IPR Cell, Tezpur University	Magnetism in Meso to Quantum dimension: New questions, New Directions and Some probable solutions	19.07.2021

Sl. No.	Name of Scientist/ Speaker	Affiliation	Title of talk/ Lecture	Date
8.	Prof. Pulok Kumar Mukherjee	Director, Institute of Bioresources and Sustainable Development (IBSD), Imphal	Metabolomics for Quality Evaluation of Herbal Drugs and Ethno pharmacology	02.08.2021
9.	Prof. Sandeep Kumar	Former Professor, Raman Research Institute, Bangalore	Supramolecular nanocomposites as Advanced Materials for Opto-electronics	13.09.2021
10.	Shri Kul Prasad Upadhyaya	Asstt. Director (Raj Bhasha), Tezpur University	Raj bhasha aur computer par hindi	09.09.2021
11.	Prof. Anupam Chatterjee	Department of Biotechnology & Bioinformatics, NEHU, Shillong	The systemic adverse effects of Areca-nut: Evaluation of Carcinogenic Risks and Its Early Detection	17.09.2021
12.	Prof. Pratap Jyoti Handique	Vice-Chancellor, Gauhati University	Medicinal plant diversity of North East India: Conservation and Utilization	08.10.2021
13.	Mr. Subhas Bhattacharjee	Former Managing Director, NERAMAC Ltd., Ministry of DoNER, Govt. of India, Guwahati	Agribusiness and food processing entrepreneurship in northeast	09.11.2021
14.	Mr. Ajinkya Shinde	General Manager, Manager, Bridge People Technology Solutions	Operating Spring Share software	10.11.2021
15.	Ms. Pooja H.G.	Product Manager Marketing, Bridge People Technology Solutions	Operating Spring Share software	10.11.2021
16.	Mr. Pranjal Baruah	Ashoka Fellow, Founder, Mushroom Development Foundation (MDF), Guwahati	Sustainable Livelihoods with Mushroom Cultivation as a Social Enterprise- Industriali-zation of Mushroom Cultivation	17.12.2021
17.	Prof. Ramesh Chandra Deka	Professor, Dept. of Chemical Sciences, Director, Centre for Multidisciplinary Research, Tezpur University	Computational Approaches for Designing Heterogeneous Catalysts and Drug Molecules	18.02.2022

Sl. No.	Name of Scientist/ Speaker	Affiliation	Title of talk/ Lecture	Date
18.	Prof. Nashreen S. Islam	Dept. of Chemical Sciences, Tezpur University	Theme of National Science Day at IASST: Integrated Approach in S&T for sustainable future	28.02.2022
19.	Prof. Nayandeep Deka Baruah	Dept. of Mathematical Sciences, Tezpur University	Theme of National Science Day at IASST: Integrated Approach in S&T for sustainable future	28.02.2022
20.	Prof. Vinod K Tiwari	Department of Chemistry, Institute of Science, Banaras Hindu University, Varanasi	Hindi implementation increasing letter communication in hindi	24.03.2022
21.	Prof. Bhagat Oinam	Centre for Philosophy, School of Social Sciences, JNU, New Delhi	Importance of social sciences	30.03.2022

SCIENTIFIC TALK, LECTURE DELIVERED BY IN-HOUSE FACULTIES UNDER THE BANNER OF 75TH YEAR OF INDIA'S INDEPENDENCE- "AZADI KA AMRIT MAHOTSAV"

Sl. No.	Name of the Speaker	Affiliation	Title of talk/ Lecture	Date
1	Dr. Heremba Bailung	Head, PSD, IASST	*Spira mirabilis:* A structure prevalent in tiny DNA molecule to the Galaxies of the universe	23.04.2021
2	Dr. (Mrs). Rajlakshmi Devi, HoD - LSD	HoD - LSD	Traditional Knowledge to Drug Development: Research and key Challenges	28.05.2021
3	Prof. Neelotpal Sen Sarma	Advanced Material Sciences (PSD)	Polymer- behind all good and bad things	04.08.2021
4	Prof. A.K. Mukherjee	Director, IASST	Bioactive Components of Plants for the Treatment of Thrombotic Complications	26.08.2021
5.	Dr. Arup Ratan Pal	Assoc. Prof. - II, Advanced Material Sciences (PSD)	Plasma Polymerization	31.08.2021
6.	Dr. Devasish Chowdhury	PSD, IASST	Vigilance and its Importance in R & D set-up	22.09.2021
7.	Dr. Debajit Thakur	Assoc. Prof. - II, Bio-diversity and Ecosystem Research (LSD)	Tea (*Camellia sinensis*)-Microbe Interactions: Insights into the functional characteristics of Tea associated microorganisms	24.11.2021
8.	Dr. Sarathi Kundu	Assoc. Prof. - II, Advanced Material Sciences (PSD)	Collapsed Structures of Organic Thin Films	21.12.2021
9.	Dr. Mojibur R. Khan	Assoc. Prof. II, Bio-Diversity & Eco-System Research (LSD)	Gut feeling' on Darwinism: Microbiome and health	19.01.2022
10.	Dr. Gautam Choudhury	Associate Prof. II, Mathematical and Computational Sciences (MCSD), IASST	Fun with some mathematical patterns	29.03.2022

EVENTS AND CELEBRATIONS UNDER THE BANNER OF 75TH YEAR OF INDIA'S INDEPENDENCE- "AZADI KA AMRIT MAHOTSAV"

Sl. No.	Event/ Celebration	Name of the guest	Affiliation	Title of the Lecture	Date
1	World Health Day	Dr. Daboo Patwari	Consultant, Dept. of Internal Medicine, Hayat Hospital	Post Covid complications and also talked about doubts about Covid vaccines	07.04.2021
		Dr. B K Baishya	Professor & Head, Dept. of Neurosurgery, Gauhati Medical College & Hospital	Symptoms and prevention of Stroke	
2	Earth Day Celebration	Prof. B. N. Goswami	SERB Distinguished Fellow at Cotton University and Former Director, Indian Institute of Tropical Meteorology, Pune	Climate Emergency: The Earth's Warning to Stop and Reverse Anthropogenic Degradation of its Environment	22.04.2021
3	World IPR Day	Mr. Siddhartha Devnath	(Scientist-C) who is heading the Patent Information Centre of Assam Science Technology & Environment Council (ASTEC), Guwahati, Assam	Intellectual property rights- the steps of technology evolution	26.04.2021
4	Swachhata Pakhwada	All the staff and students of the institute actively participated in the activities of the Swachhata Pakhwada.			01.05.2021-15.05.2021
5.	50th DST Foundation Day	Prof. T. Ramasami	Padma Bhushan and Former Secretary to DST, Govt. of India, Former Director, CSIR-CLRI, Chennai	NER as a treasure house for Original Research	03.05.2021
		Prof. P. Balram, Padma Bhushan	Professor, National Centre for Biological Sciences, and Former Director, IISc, Bangalore	Chemistry, Biology and the Unity of the Nature	

Sl. No.	Event/ Celebration	Name of the guest	Affiliation	Title of the Lecture	Date
6.	National Technology Day	Mr. Stanzin Tsephel	Director, BORDA South Asia	Nature Based solutions for solving Sanitation problems	11.05.2021
		Mr. Arumugam Kalimuthu	Program Director, Wash Institute	Application of Technology in Urban Waste Management	
7.	Biodiversity Day	Dr. Ramesh Krishnamurthy	Scientist, Wildlife Institute of India, Dehradun	Biodiversity and Technology: Towards integrated nature-culture solutions' which was well appreciated by the audience	22.05.2021
8.	World Environment Day	Prof. Krishna Gopal Bhattacharyya	Professor of Chemistry, Assam Don Bosco University	Ecosystem Restoration	05.06.2021
		Prof. Ramkrishna Sen	Professor of Biotech-nology, Indian Institute of Technology, Kharagpur	UN-SDG-inspired Algae-driven Journey through the Contem-porary R&D Challenges of Environment, Energy and Water	
		Prof. Banwari Lal	Senior Director, Environmental and Industrial Biotechnology Division, The Energy and Resources Institute, New Delhi	Case study on restoring Oil Spill/oil-contaminated site of Kuwait Oil Company	
9	World Youth Skills Day	Mr. Amitava Banerjee	IICA -MCA assessed eligible Independent Director and former consultant of National Foundation for Corporate Governance, Govt. of India	E-commerce for business beyond borders and its necessity in Northeast	15.07.2021
		Dr. Pijush Chandra Das	Deputy Director of Training & Placement, Tezpur University	Placement Guidelines & Personality Development	

Sl. No.	Events/ Celebration	Name of the guest	Affiliation	Title of the Lecture	Date
10	Entrepreneurship Awareness Camp	Mr. Walid H. Barbhuiya	Founder of Lekh Vidhi	Types of Legal Entity and Basics of company formation for New generation entrepreneurs	17.07.2021
11	Rashtriya Ekta Diwas-2021	All the staff and students of the institute observed this special occasion to foster and reinforce their dedication to preserve and strengthen unity, integrity and security of the nation, by reinforcing the value of a strong and united India.			31.10.2021
12	World Water Day	Prof. Arup Kumar Sarma	Dept. of Civil Engg., IIT Guwahati	Groundwater: Making the invisible visible	22.03.2022

INDEPENDENCE DAY CELEBRATION

The Institute of Advanced Study in Science and Technology (IASST), Guwahati celebrated Independence Day 15th August, 2021 under the banner of 75th Year of India's Independence-"Azadi Ka Amrit Mahotsav" with great enthusiasm and patriotic fervor. The program started with tricolor flag hoisting by Prof. Ashis K. Mukherjee, Director, IASST, followed by singing of the national anthem. While addressing the gathering appealing to their nationalistic spirit, the Director urged them to feel pride in being an Indian and fulfilling one's duty and responsibility for the country's holistic development. He also emphasized the necessity of women's empowerment and autonomy for the progress of the country. In his speech, the Director highlighted some salient features of the New Education Policy(NEP), 2020 and stated the need of the hour to transform the Indian universities as multidisciplinary learning and research centers to provide meaningful, localized solutions to the country's problems. The Director opined that our students should think from a citizen-centric perspective and inculcate greater societal values and research culture.

This year, IASST started a unique program of felicitating the region's unsung heroes. Two such persons, one retired school teacher and another entrepreneur who has contributed to society in their respective fields, were honored on this auspicious day. Further, certificates and prizes were distributed to winners of the Slogan writing competition and essay writing competition organized among the research scholars of the institute and the school students from class VIII to X in Assam, respectively. The Director, IASST, also inaugurated a children's park in the IASST campus.

75th Independence day celebration at IASST with Vigour and Fervour. Two No. of unsung heros this vicinity are also felicitated in this occasion.

HINDI PAKHWADA

Between 1st to 15th September 2021, Hindi Pakhwada was organized at IASST. The Pakhwada was inaugurated by Prof. Ashis Kumar Mukherjee, Director, IASST in a traditional way. Keeping covid-19 in mind, both online and offline events were held through zoom meeting and very limited physical presence of IASST family members. The Director, IASST stressed on more usage of Hindi in the office environment, talked about the importance of hindi and how the language can contribute in uniting the country. During those 15 days various programs and events were organized for the IASST family members.

CELEBRATION OF 43RD FOUNDATION DAY OF IASST

IASST, Guwahati celebrated it's 43rd Foundation Day with a nine days long programme from 25th October to 3rd November, 2021. Sports and cultural competitions for students, faculty and non-teaching staffs were organized from 25th October to 2nd November, 2021. The celebration started with indoor and outdoor sport events (including football, cricket, table tennis, badminton, carrom etc.) from 25th to 29th October, 2021. Cultural events got started from 29th October, 2021 with flower decoration and salad decoration competitions. Drawing competition for school students and painting competition for research scholars were organized on 30th October and 1st November respectively. Similarly, singing, dancing, instrumental and poem competitions were held on 2nd November, 2021.

Flag hoisting on 3rd November 2021 during the Foundation Day Celebration

In the final day of the celebration i.e., on 3rd November, the program started with hosting of IASST flag by the Director, IASST followed by singing State Anthem. It was followed by invocation and lightening of lamp by dignitaries and signing IASST anthem. Thereafter, the Director, IASST delivered his welcome speech. After the welcome speech, felicitation of the Ph.D. degree recipients and Covid-19 lab warriors of IASST was done by Prof. Asish K. Mukherjee, Director, IASST, Prof. Dhrubajyoti Chattopadyay and Dr. G. Narahari Sastry. Thereafter, Prof.

Dhrubajyoti Chattopadyay, Vice Chancellor, Sister Nivedita University, Kolkata delivered Madam Dorothy K. Hodgkin Foundation Day Lecture on "*COVID-19: prevention and cure*". Following this, Dr. G. Narahari Sastri, Director, NEIST, Jorhat delivered Sri C. V. Raman foundation day Lecture on "*AI as a tool for drug discovery*". The morning session ended with a vote of thanks by Prof. H. Bailung, Chairman of organizing committee. During Post lunch session, cultural programme and prize distribution of co-curricular activities was organized. The cultural programme includes dance performance, singing and fashion show by IASST research scholars and staff members.

Lighting of lamp by dignitaries

Prof. Dhrubajyoti Chattopadyay, Vice Chancellor, Sister Nivedita University, Kolkata delivering Madam Dorothy K. Hodgkin Foundation Day Lecture

Dr. G. Narahari S., Director, NEIST, Jorhat delivering Sri C. V. Raman foundation day Lecture

Felicitation of PhD degree holders by dignitaries

OBSERVATION OF CONSTITUTION DAY

Institute of Advanced Study in Science and Technology, Guwahati, observed Constitution Day on 26th November 2021 with full enthusiasm to commemorate India's adoption of the Constitution. Director Prof. Ashis K. Mukherjee, Registrar, faculty members, staff, and all the students read the Preamble of the Constitution along with the Hon'ble President of India.

Director, Registrar, faculty members, staff and all the students reading the Preamble of the Constitution along with the Hon'ble President of India

REPUBLIC DAY CELEBRATION

Institute of Advanced Study in Science and Technology (IASST), Guwahati, Assam, celebrated the 73rd Republic Day of India on the 26th January 2022 in the Institute with patriotic spirit. The faculty, staff, and research scholars participated in the celebrations by adhering to the covid appropriate behavior. The function started with the unfurling of the National Flag, followed by a review of the parade by Prof. Ashis K. Mukherjee, Director, IASST. Speaking on this occasion, Prof. Mukherjee urged the IASST fraternity to uphold the core values that were the foundation for the Constitution of India in governance, functioning at the workplace and in day-to-day life. The Director also gave insight into the various accomplishments achieved by IASST and motivated the young scholars and faculty members to bring more laurels for the Institute and country through their hard work. Adding further, Prof Mukherjee praised the success of Govt. of India for vaccinating more than 1.5 billion people and appreciated the doctors, scientists, and frontline Covid workers for their fearless, untiring efforts to mitigate this pandemic.

Further, IASST virtually felicitated two eminent social workers, namely Dr. Digambar Narzary, Founder of NEDAN Foundation, who work with the poor and voiceless ethnic communities living in the far-flung un -reach villages of the North East Region of India, and Mrs. Yogabrata Dutta, Trustee of Amar Ghar, an old age home. The program ended with the message to create a great nation, golden India or Swarnim Bharat, through collective efforts from all the individuals.

Unfurling of the National Flag during the Republic Day celebration

CELEBRATION OF NATIONAL SCIENCE DAY

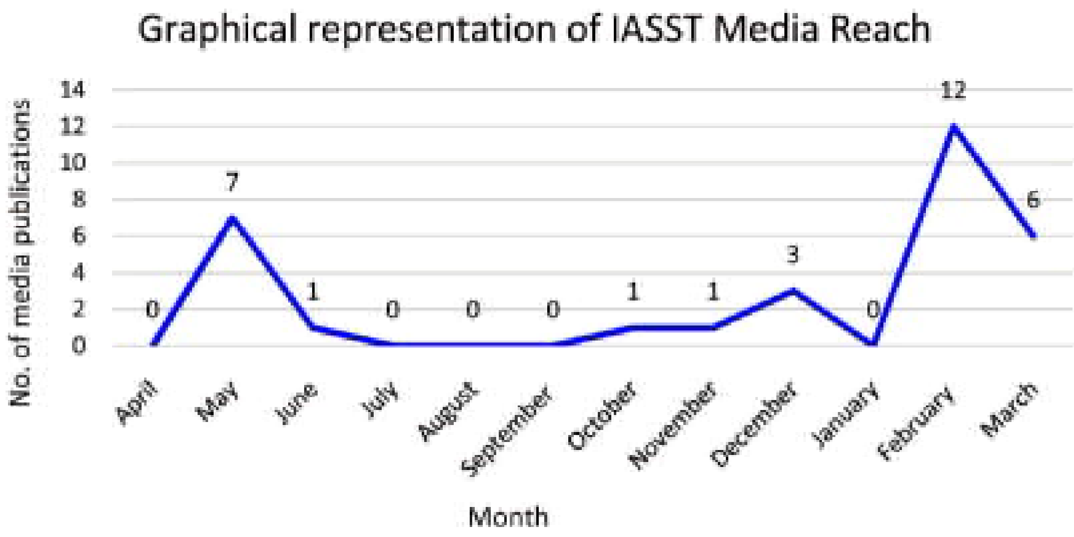
The Institute of Advanced Study in Science and Technology celebrated the National Science Day on 28th February 2022 at the institute premises under the Azadi ka Amrit Mahotsav celebrations. The theme for the National Science Day for this year is "Integrated Approach in Science and Technology for Sustainable Future". At the outset, Prof. Ashis K. Mukherjee, Director, IASST offered floral tribute to the statue of Sir C. V. Raman and stated that Sir Raman and other great Indian scientists had contributed significantly to propagating the true spirit of science in India. In his inaugural address, the Director stated that science is an integral part of Indian culture and since the dawn of civilization, India has contributed significantly in every sphere of science. He emphasized that the empowerment of women and the weaker sections of the society through science and technology is an essential approach for building a strong nation. He applauded the endeavours of DST, Govt. of India and IASST to boost the S&T at multiple levels through various schemes to build a Golden India. On this occasion, motivational and inspirational talks were delivered by two eminent scholars Prof. Nashreen S. Islam, Dept. of Chemical Sciences, and Prof. Nayandeep Deka Baruah, Dept. of Mathematical Sciences from Tezpur University.

To commemorate the National Science Day, IASST organized various events, such as poster presentation, popular science story writing competition, and science quiz competition among the research scholars and staff of IASST. To encourage scientific temper, scientists of IASST demonstrated various scientific concepts through a virtual laboratory visit and the program was attended by more than 300 students of classes IX and X from different schools of Assam. Hon'ble Director of IASST distributed the cash prizes and certificates to the winners of various competitions.

IASST Media Reach

Sl. No.	Topic of the Programme	Name of the newspaper/ web news portal, etc.	Date of Publication
1.	Ph.D conferred to Ranjita Das of IASST	Asomiya Pratidin	09.04.2021
2.	Earth day observed	Amar Asom	26.04.2021
3.	The current world is not healthy	Dainik Asam	26.04.2021
4.	Earth day celebrated with focus on climate change	Assam Tribune	26.04.2021
5.	Earth day celebrated at different places	Dainik Janambhumi	26.04.2021
6.	Earth day celebrated at different places	Hook Times	26.04.2021
7.	Webinar organized at IASST Boragaon	Niyomiya Barta	26.04.2021
8.	Covid-19 tests at IASST	The Assam Tribune	30.04.2021
9.	Swachhta pakhwada at IASST	The Assam Tribune	30.04.2021
10.	Covid-19 tests and research are beginning at IASST	Amar Asom	30.04.2021
11.	Covid-19 tests at IASST	Dainik Asom	30.04.2021
12.	Covid-19 tests and research are beginning Boragaon at IASST	Dainik Janambhumi	30.04.2021
13.	Swachhata pakwada mission conducted on the initiative of IASST	Dainik Jonombhumi	02.05.2021
14.	Swachhata pakwada mission started in the campus of IASST	Amar Asom	02.05.2021
15.	6th Swachhata pakwada organized at IASST	Purbanchal prahari	02.05.2021
16.	Plantation drives organised across Guwahati	The Assam Tribune	17.06.2021
17.	International Day of Biological Diversity celebrated through Google Meet	Dainik Jonombhumi	17.06.2021
18.	International Day of Biological Diversity celebrated at IASST	Asomiya Khabor	17.06.2021
19.	International Day of Forest celebrated at Boragaon	Dainik Janambhumi	22.03.2021
20.	Webinar at IASST on the occasion of World Youth Skill Day	Asomiya Khabor	19.07.2021
21.	World Youth Skill Day Webinar	Dainik Janambhumi	19.07.2021
22.	Ph.D. conferred to Miss Rabiya Sultana of IASST	The Assam Tribune	11.08.2021
23.	IASST holds virtual laboratory visit programme for school students	The Assam Tribune	23.08.2021
24.	75th Independence Day celebrated with patriotic fervour	The Assam Tribune	23.08.2021
25.	Ph.D conferred to Mrs. Rashmi Rekha Baruah of IASST	The Assam Tribune	25.08.2021
26.	Protest against dumping ground set up in Guwahati	Amar Asom	21.09.2021

Sl. No.	Topic of the Programme	Name of the newspaper/ web news portal, etc.	Date of Publication
27.	Remembering Anuj Barua by Dr. Suresh Deka	Amar Asom	09.10.2021
28.	MoU between IASST & Aranyak	Niyomiya Barta	11.10.2021
29.	MoU signed between IASST and Aranyak	The Assam Tribune	12.10.2021
30.	Vigilance awareness week at IASST, Frontier Hqrs SSB	The Assam Tribune	14.12.2021
31.	IASST Guwahati's 43rd Foundation Day celebrated	Dainik Batori Kakot	07.01.2022
32.	IASST'S 43rd foundation day organized	Niyomiya Barta	07.01.2022
33.	IASST Guwahati's foundation day organized	Dainik Asam	10.01.2022
34.	IASST'S 43rd foundation day celebrated	Dainik Ganajagaran	10.01.2022
35.	IASST'S 43rd foundation day celebrated	Purvanchal Prahari	11.01.2022
36.	IASST Foundation day ceremony	Purvanchal Prahari	10.01.2022
37.	IASST observes 43rd foundation day	The Assam Tribune	10.01.2022
38.	IASST'S Foundation day on 3rd November	Dainik Asam	10.01.2022
39.	IASST'S Foundation day	Amar Asom	10.01.2022
40.	IASST'S Foundation day on 3rd November	Dainik Asom	10.01.2022
41.	IASST'S Foundation day	Amar Asom	10.01.2021
42.	IASST'S foundation day celebration	Niyomiya Barta	10.01.2022
43.	Probiotic showing promise in healthy ageing discovered	The Assam Tribune	06.02.2022
44.	Scientists find new probiotic promoting longevity	PRAG News	07.02.2022
45.	Scientists find new probiotic promoting longevity	The Times of India	09.02.2022
46.	Scientists find new probiotic promoting longevity	Dainik Asam	09.02.2022
47.	New probiotic that promotes longevity and healthy aging discovered	www.longevity.technology	10.02.2022
48.	How to reduce ageing? Indian scientists recommend a yogurt	India Today website	11.02.2022
49.	Indian scientists develop a next-generation probiotic that provides hope for longevity and healthy aging	Orissadiary.com	11.02.2022
50.	National Science Day celebrated	The Assam Tribune	01.03.2022
51.	National Science Day celebrated at IASST	Asomiya Khabar	01.03.2022
52.	Science Day at IASST	Niyomiya Barta	01.03.2022
53.	National Science Day celebrated at IASST	Asom Aditya	01.03.2022
54.	National Science Day celebrated at IASST	Purvanchal Prahari	01.03.2022
55.	Meeting at IASST	Dainik Asam	01.03.2022
56.	Scientific kits distributed to 12 high schools of Kokrajhar	The Sentinel	09.03.2022
57.	IASST to distribute scientific kits to BTC schools	The Sentinel	16.03.2022



Scientists find new probiotic promoting longevity

Kangkan Kalita
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Guwahati: Scientists in Assam have achieved a major breakthrough by developing a next-generation probiotic that has ushered in hope for longevity and healthy aging among the elderly.

In the early 20th century, Nobel Laureate Elie Metchnikoff had proposed that healthy bacteria found in fermented dairy products may promote healthy aging. Hundred years later, a team of scientists at the central-government funded Institute of Advanced Study in Science and Technology (IASST) in Guwahati, led by scientist Mojibur R Khan, and Prof. Ashis K. Mukherjee, director of the institute, in collaboration with Prof. MC Kalita of Gauhati University and research scholars Arun Kumar and Tulsi Joishy has discovered the next generation probiotic bacterium Lactobacillus plantarum JBC5, from a dairy product that looks promising in promoting healthy aging. The team has developed a yogurt, using this probiotic bacteria, which can be consumed to derive all these health benefits and increase life expectancy. The study, 'A Potential Probiotic Lactobacillus plantarum JBC5 Improves Longevity and Healthy Aging by Modulating Antioxidative, Innate Immunity and Serotonin-Signaling Pathways in Caenorhabditis elegans', was recently published in the highly regarded peer-reviewed journal, Antioxidant, endorsing the finding.

Scientists at IASST in Guwahati have discovered the next generation probiotic bacterium Lactobacillus plantarum JBC5

Khan said that the bacterium demonstrated a 27.81% increase in the life span of the model organism, Caenorhabditis elegans (a kind of worm), accompanied by the hallmarks of healthy aging by providing improved immunity against pathogenic infections, increased learning ability and memory, gut integrity and oxidative stress tolerance. "In contrast, it significantly reduced the accumulation of body fat and inflammation, which will also help in reducing aging factors among humans. Around 70% genes of the worm we experimented with are similar to human beings," he added.

Mukherjee said the probiotic promotes delay the onset of age-associated diseases such as obesity, decline in cognitive functions, and increases immunity in the elderly. A patent has been filed to claim the discovery. Mukherjee hoped that the probiotic get commercialised soon so that the laboratory-generated technology could reach people.

Advances in medical science have increased life expectancy and led to the rapid growth of the aging population. The United Nations has predicted that one in every 11 people will be older than 65 by 2050. However, the researchers in IASST opined that aging is generally associated with a higher risk of age-related health issues, such as obesity, neurodegenerative diseases (Parkinson's, Alzheimer's, cardiovascular diseases, diabetes, cancers, autoimmune and inflammatory bowel diseases. Thus, they said it raises concern in populated countries like India where these diseases are common.

IASST Scientists find new probiotic promoting longevity published in The Times of India on 09.02.2022

THURSDAY, OCTOBER 28, 2021 — CITY

Vigilance awareness week at IASST, Frontier Hqrs SSB

STAFF REPORTER

GUWAHATI, Oct 27: The Institute of Advanced Study in Science and Technology (IASST) is celebrating Vigilance Awareness Week 2021 from October 26 to November 1 with the theme 'Independent India @ 75: Self Reliance with Integrity'.

"IASST is committed to fighting malpractices, corruption and promote transparency in the organisation. Many events are planned throughout the week to create awareness regarding vigilance among its employees," an IASST spokesperson said.

The event began with 'Integrity Pledge' administered by Prof Ashis K Mukherjee, Director, IASST to all the students and employees of IASST. On this occasion, an event was organised and Joseph Khiu, Deputy SP, CBI Guwahati who was the chief guest of the programme highlighted the role of CBI in weeding out corruption in the country.

Prof Mukherjee stressed the need for creating an environment motivated towards weeding out corruption and unethical practices.

IASST is also organising a 'Vendor's Meet' to sensitise the vendors and suppliers related to vigilance.

Dr Devasish Chowdhury, Vigilance Officer, IASST and Dr Diganta Goswami, Registrar, IASST will discuss the steps taken in IASST to promote transparency and clean administration at IASST.

At Frontier Hqrs SSB: As in the previous years, Sashastra Seema Bal (SSB) Frontier Headquarters Guwahati, as part of its efforts to involve its men as active participants in ensuring a 'Corruption Free India', is observing the Vigilance Awareness Week from October 26 to November 1.

The Vigilance Awareness Week is observed every year at the end of October in which October 31, the birth anniversary of Sardar Vallabhbhai Patel falls.

This year, the Vigilance Awareness Week is being observed on the theme 'Independent India @75: Self Reliance with Integrity'.

Observance of the Vigilance Awareness Week commenced on Tuesday with a pledge taking by officers and officials at Frontier Headquarters SSB Guwahati. As part of it, three days of online quiz, slogan writing and debate competition on vigilance and corruption-related topics at Frontier level and Force Hqrs Level are being organised during the week.

Sonam Budh (DIG), Inspector General Dr KK Singh, Commandant (Vety/Admn) and other officers of the Frontier were present during the programme.

Vigilance awareness week celebrated at IASST published in Assam Tribune on 14.01.2021

আই এ এছ এছ টিত ৰাষ্ট্ৰীয় বিজ্ঞান দিৱস উদ্‌যাপন

মহানগৰ খবৰ, ২৮ ফেব্রুৱাৰী ঃ পশ্চিম গুৱাহাটীৰ ৰবাপাওস্থিত বিজ্ঞান আৰু প্ৰযুক্তিৰ উচ্চ অধ্যয়ন প্ৰতিষ্ঠান চমুকৈ 'আই এ এছ এছ টি' টোহৰত বিগত বছৰৰ দৰে এইবেলিও আজি ৰাষ্ট্ৰীয় বিজ্ঞান দিৱস উদ্‌যাপন কৰা হয়। প্ৰতিষ্ঠান টোহৰত থকা ভাৰতৰ ন'বেল বঁটা বিজয়ী বিজ্ঞানী স্যাৰ চি ভি ৰমনৰ প্ৰতিমূৰ্তিত পুষ্পাঞ্জলি অৰ্পণেৰে কাৰ্যসূচীৰ শুভাৰম্ভ কৰে আই এ এছ এছ টিৰ সঞ্চালক অধ্যাপক আশিস কুমাৰ মুখাৰ্জীয়ে। আনহাতে এই উপলক্ষে অনুষ্ঠিত চমু অনুষ্ঠানত ভাষণ প্ৰসংগত অধ্যাপক মুখাৰ্জীয়ে ৰাষ্ট্ৰীয় বিজ্ঞান দিৱস উদ্‌যাপনৰ তাৎপর্য দাঙি ধৰি এইবাৰৰ বিজ্ঞান দিৱসৰ মূল বাণী ইন্টিগ্ৰেটেড এপ্ৰ'চ ইন এছ এণ্ড টি ফ্ৰাছটেইনেবুল ফিউচাৰ' সম্পৰ্কেও ব্যক্ত কৰে। তেনেদৰে দিৱসৰ লগত সংগতি ৰাখি অনুষ্ঠিত সভাত নিমন্ত্ৰিত অতিথি হিচাপে তেজপুৰ বিশ্ববিদ্যালয়ৰ ৰসায়ন বিজ্ঞান বিভাগৰ অধ্যাপক নাহৰিণ এছ ইছলাম আৰু গণিত বিজ্ঞান বিভাগৰ অধ্যাপক নয়নদ্বীপ ডেকা বৰুৱা উপস্থিত থাকি বিজ্ঞান দিৱসৰ মূল বাণীৰ ওপৰত ব্যাখ্যা আগবঢ়ায়। তদুপৰি দিৱসৰ লগত সংগতি ৰাখি বিজ্ঞান দিৱসক কুইজ আৰু পোষ্টাৰ প্ৰতিযোগিতা অনুষ্ঠিত কৰাৰ লগতে প্ৰাচীৰ পত্ৰিকা উন্মোচন কৰা হয়। নিখিল অনুষ্ঠিত সামৰণি অনুষ্ঠানত বিজয়ী প্ৰতিযোগীসকলক বঁটা বিতৰণ কৰে সঞ্চালক অধ্যাপক আশিস কুমাৰ মুখাৰ্জীয়ে। আনহাতে কাৰ্যসূচীত ৰাজ্যৰ বিভিন্ন প্ৰান্তৰ শিক্ষানুষ্ঠানৰ নৱম আৰু দশম শ্ৰেণীৰ প্ৰায় ৬০০ গৰাকী ছাত্ৰ-ছাত্ৰী উপস্থিত থাকে।

National Science Day Celebrated at IASST published in Asomiya Khabar on 01.03.2022

day. According to report, a forest team noticed an elephant carcass during patrolling duty in the wildlife sanctuary on natural causes. There were no injuries signs on the elephant, which was about 65 to 70 years old.

IASST to distribute scientific kits to BTC schools

OUR CORRESPONDENT

KOKRAJHAR, March 3: The Institute of Advanced Study in Science and Technology (IASST), Guwahati has initiated a 'Lab Experience Based Science Education' for school students of the Bodoland Territorial Council (BTC) under the SEED programme of the Department of Science and Technology, Government of India, in accordance with the new NEP, 2020. The IASST has decided to hold a distribution ceremony of teaching kits to be held at Simbargaon High School in Kokrajhar on March 7.

Dr. Dhruba Sharma, Deputy Registrar (Academic), IASST, Guwahati, informed that the objective of this science education programme is to enhance mastery of subject matter among ST students of BTC area as laboratory experiences may enhance students' understanding of specific scientific facts and concepts and develop scientific reasoning among tribal students in which laboratory experiences may promote a student's ability to identify questions and concepts that guide scientific intelligence. Sources said it will develop critical, quantitative thinking amongst students; provide opportunities to learn to use scientific apparatus and develop collaborative problem-solving skills in students.

Sharma said under this programme, till now in two phases they have covered 18 government schools with approximate 2,500 students in BTC for science education through direct teaching and/or lab based demonstration by IASSST scientist/ resource persons. This project will help to improve student's ability to identify questions and will enhance their concepts that guide scientific intelligence. It will directly or indirectly benefit over 58,000 students of BTC from classes VIII to XII.

During the second Lab Based Science Education programme on physical mode, the IASST has covered 12 government schools in Kokrajhar district and as per the approved programme, each school or cluster of schools will be provided teaching kit from IASST after the completion of the demonstration programme.

IASST to distribute scientific kits to BTC schools as published in The Sentinel on 16.03.2022

FINANCIAL STATEMENTS