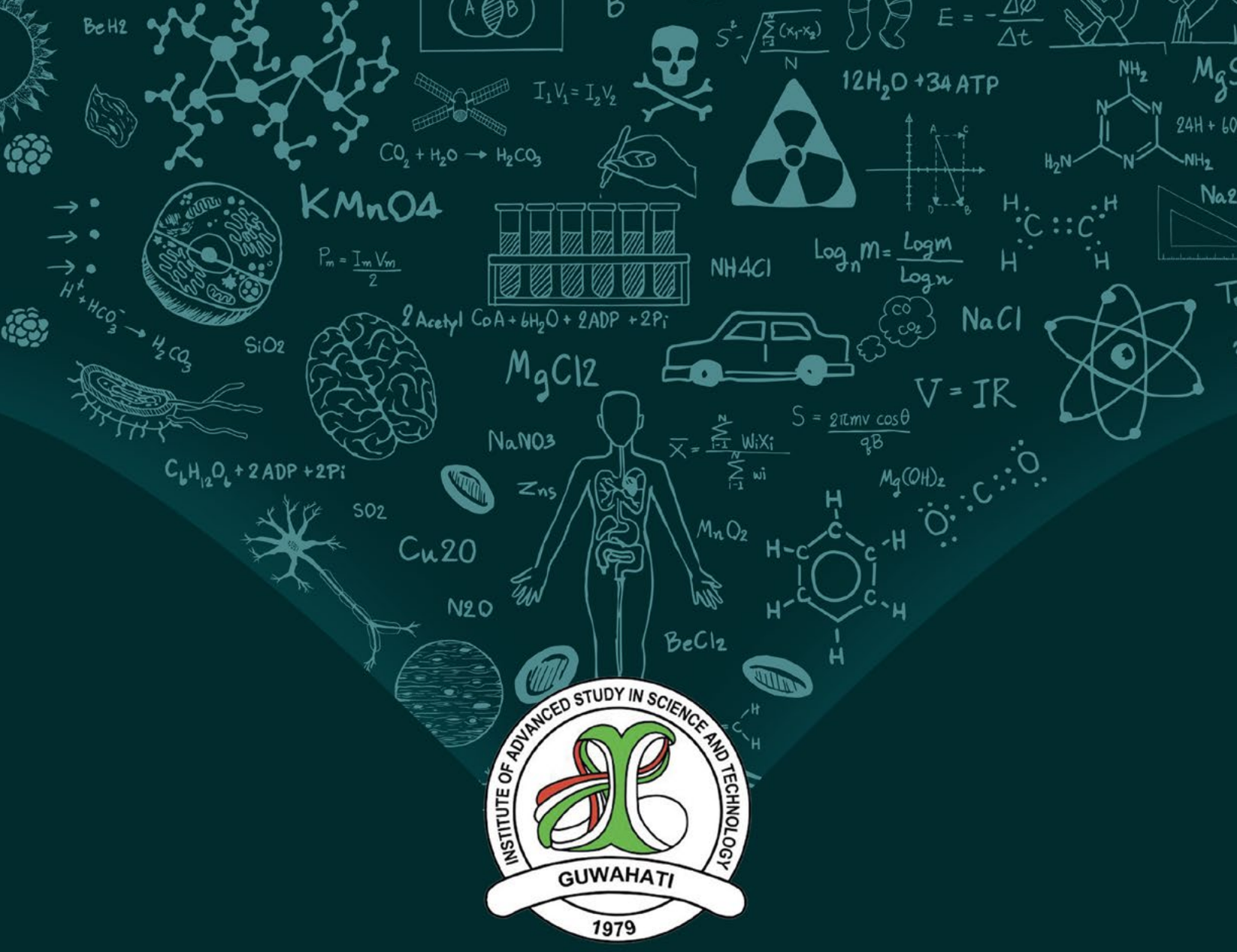


ANNUAL REPORT 2019-20

INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY (IASST)

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

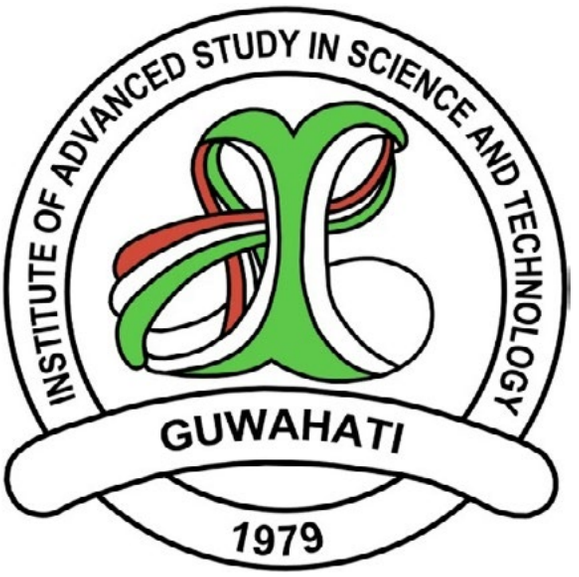
“Success can come to you by courageous devotion to the task lying in front of you”

-- CV Raman

“For, each man can do best and excel in only that thing of which he is passionately fond, in which he believes, as I do, that he has the ability to do it, that he is in fact born and destined to do it”

-- Homi J Bhaba

ANNUAL REPORT
2019-20



Institute of Advanced Study in Science and Technology (IASST)
An Autonomous Institute under Department of Science and Technology, Govt. of India

CONTENTS

FOREWORD

Its an unparalleled honour and pleasure to pen down few words for the rising IASST which has been groomed and nurtured by legendries directors since its establishment in 1979 and then the taking over by the DST in March 2009. IASST in a year and decade after taking over by DST has made numerous significant strides in sphere of science and its empowering impact on society at large.

IASST persistently pursues and firmly believes in inculcating science in its purest and truest form as pressing as possible to their faculty fraternity and its students with a theme to share and contribute in growth & development of nation.

IASST in essence started flocking its wings wide apart to explore the opportunities in its entire width and length, to name a few of the bright spots are ISO certification; BS-II level COVID testing lab; state-of-the- art vibration free central instrumentation facility building (CIFB); Incubation Centre under the aegis of IASST as IASST's Social Venture and Entrepreneurship Consortia (ISVEC) in collaboration with BioNEST of M/s BIRAC, New Delhi; Quality Control and Quality Assurance (QCQA) Laboratory under phytochemical mission for NE India; GLP compliant Animal House facility (AHF) and construction of Academic staff apartment complex. All of these bright spots are in final phase of completion. We are now embracing ourselves on the path of profound science applications and its venturing to potentially emerge as holistic centre of R&D.

To its credit, IASST has bagged many awards and rewards including the Best performing research institute for the year 2019-2020 by the Government of Assam. It always thrives to empower society at large for greater benefit to humankind. This year IASST has tied up with two premier institutes of India i.e. Tezpur University & AcSIR (Academy of Scientific & Innovative Research, An institute of national importance); a significant boost for students to enrol and garner their Ph.D. degree in collaboration with their mother institute (IASST).

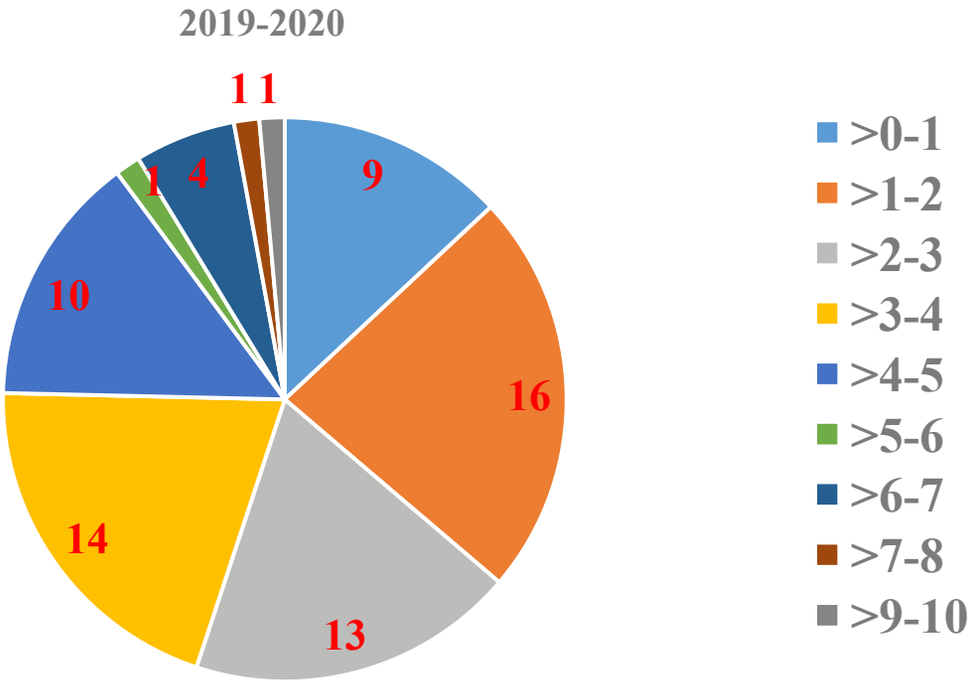
We showcase the technology developed and infrastructure facility to student of schools, colleges and universities of NE India from time to time to seed the flavour of science and inquisitiveness. We believe these tiny seeds when sprout can not only bring with it a giant tree but a whole ecosystem worthy of society to survive and persist on its own.

I thank all the employees and research scholars of the institute for actively taking part in all round development activity of the institute and Editorial board for bringing out the Annual Report 2019-2020 of IASST in time.

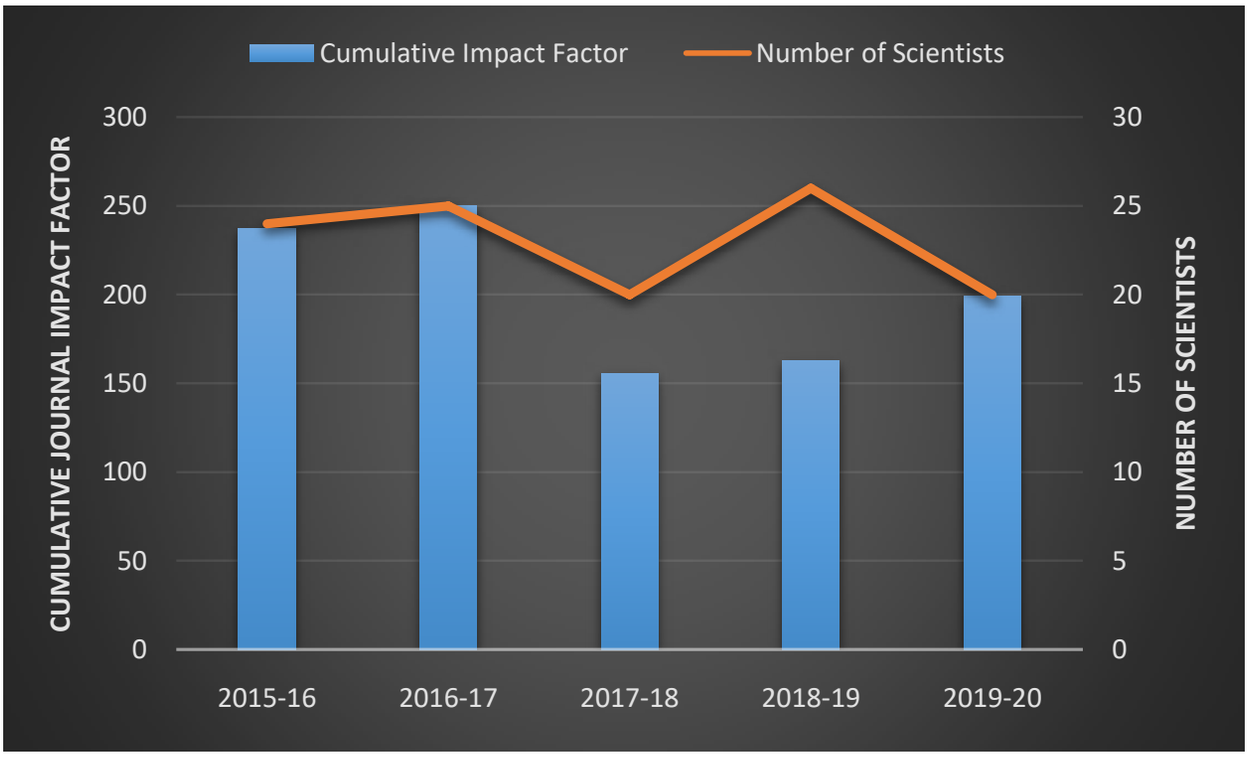
H. Bailung
Director (Additional Charge)

RESEARCH OUTPUT AT A GLANCE

Distribution of peer reviewed publications over various impact factor ranges



Impact Factor Trend over last five years

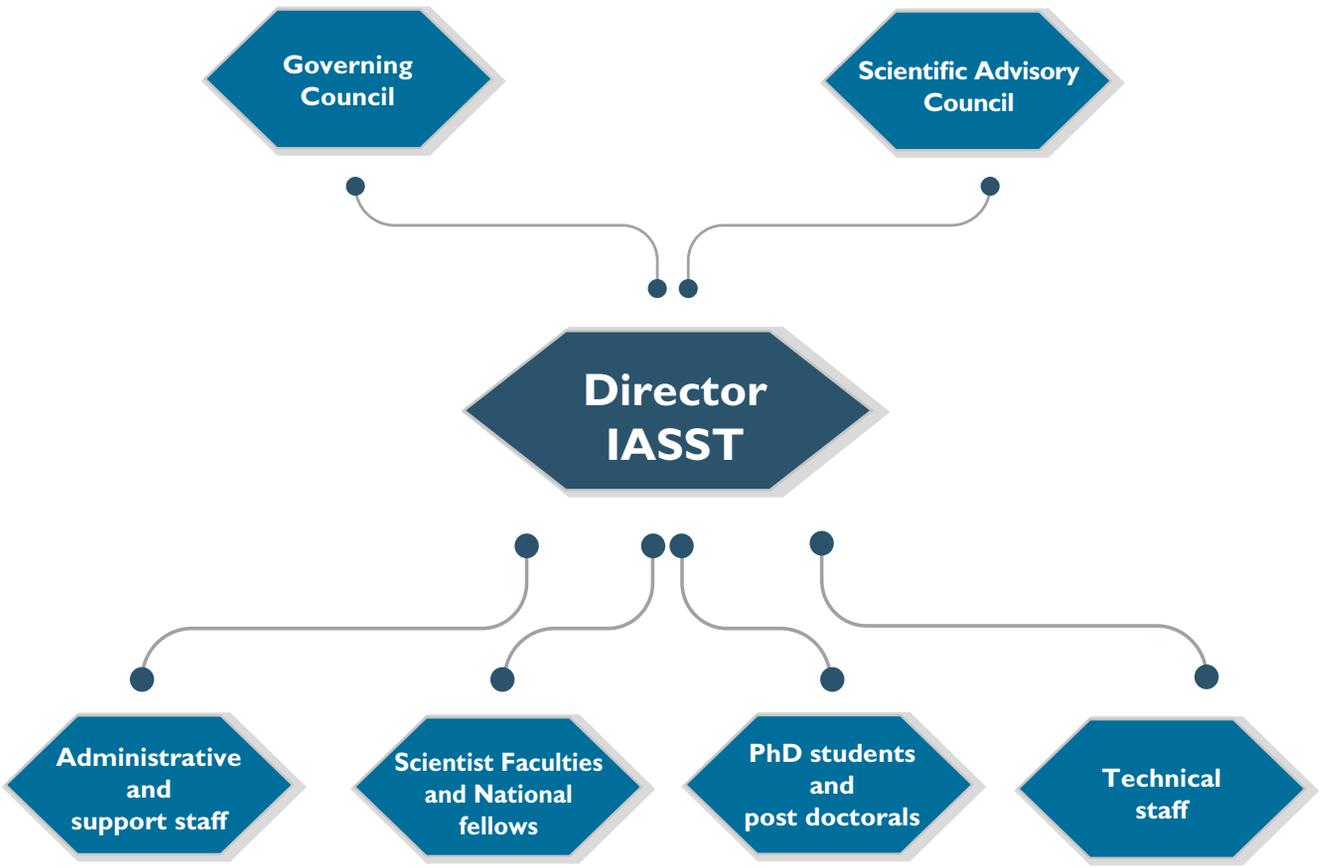


Total Indian patents filed (granted + filed): 01+05

Total peer reviewed journal publications: 72

Total journal impact factor: 198.978

IASST ORGANIZATION AND MANAGEMENT



IASST organization and management chart

IASST COMMITTEES

GOVERNING COUNCIL (GC) OF IASST

Chairperson

Prof. Abhay Karandikar
Director, IIT Kanpur

Members

Dr. M. C. Kalita
Sr. Professor
Dept. of Biotechnology
Gauhati University

Prof. Kamal Lochan Panigrahi
Department of Physics
IIT Kharagpur

Prof. P. J. Handique
Vice Chancellor
Gauhati University

Prof. Ashutosh Sharma
Secretary
Department of Science & Tech. (DST)
Govt. of India, New Delhi

Mr. B. Anand, IAS
Additional Secretary and Financial Advisor
DST, Govt. of India, New Delhi

Prof. Uday Bandyopadhyay
Director
Bose Institute, Kolkata

Mr. Hemen Das
Secretary
Department of Science and Technology
Govt. of Assam, Guwahati

Member-Secretary

Up to 29/02/2020
Dr. N. C. Talukdar
Director, IASST

W.e.f. 01/03/2020 onwards
Prof. H. Bailung
Director (Additional charge)
IASST, Guwahati

SCIENTIFIC ADVISORY COUNCIL (SAC) OF IASST

Chairperson

Prof. P. Balaram
Former Director
IISc, Bangalore

Members

Prof. Dinakar S. Patil
Visiting Professor
Dept. of Metallurgical Eng.
& Material Sciences, IIT Mumbai

Prof. Sibaji Raha
Former Director
Bose Institute
Kolkata

Prof. Goutam Dey
Emeritus Professor
S N Bose National Center for Basic Sciences
Kolkata

Prof. Pranab Goswami
Department of Biosciences and Bioengineering
IIT Guwahati

Prof. U.C. Gupta
Head, Dept. of Mathematics
IIT Kharagpur

Prof. Arun Chattopadhyay
Department of Chemistry
IIT, Guwahati

Dr. Niranjan Chakraborty
Former Director
National Institute of Plant Genome Research
New Delhi

Dr. Kanury Venkata Subba Rao
Former Head, DDRC
Translational Health Science And Technology Institute
Faridabad

Prof. Appa Rao Podile
Vice Chancellor, University of Hyderabad
Hyderabad

Dr. N. C. Talukdar
Director
IASST, Guwahati

Prof. H. Bailung
Head, Physical Sciences Division
IASST

FINANCE COMMITTEE (FC) OF IASST

Chairperson

Upto 29/02/2020
Dr. N. C. Talukdar
Director, IASST
Guwahati

From 01/03/2020 onwards
Prof. H. Bailung
Director (Additional charge)
IASST, Guwahati

Members

Mr. B. Anand, IAS
Joint Secretary and Financial Advisor
DST, New Delhi

Dr. B. K. Shukla
Scientist G and Head, AI Division
DST, New Delhi

Prof. H. Bailung
Head, PSD, IASST, Guwahati

Mr. Uttam Ch. Das
Registrar
NIPER, Guwahati

Member-Secretary

Mr. Pradyut Borkataki
FAO, IASST, Guwahati

BUILDING WORKS COMMITTEE (BWC) OF IASST

Chairperson

Upto 29/02/2020
Dr. Narayan Chandra Talukdar
Director, IASST
Guwahati

From 01/03/2020 onwards
Prof. Heremba Bailung
Director (Additional charge)
IASST, Guwahati

Members

Prof. Sudeep Talukdar
Department of Civil engineering
IIT Guwahati

Chief Engineer
CPWD, Shillong or his nominee

Prof. Heremba Bailung
Head, PSD, IASST
Guwahati

Member Secretary

Dr. Diganta Goswami
Registrar, IASST
Guwahati

OTHER OFFICIALS OF IASST

Chief Vigilance Officer, DST, Govt. of India:	**Dr. Akhilesh Gupta** Adviser and head, SPLICE and climate ChangeProgramme, DST, New Delhi
Vigilance Officer, IASST:	**Dr. Neelotpal Sen Sarma** Professor, PSD, IASST
Appellate Authority (RTI), IASST:	**Dr. N.C. Talukdar** Director, IASST **Prof. Heremba Bailung** Director (Additional charge) IASST, Guwahati (From 01/03/2020 onwards)
Central Public Information Officer(CPIO), IASST:	**Dr. Diganta Goswami** Registrar, IASST
Chairperson, Women Cell, IASST:	**Dr.(Mrs.) Munima B. Sahariah** Associate Professor II, PSD, IASST
Nodal Public Grievance officer, IASST:	**Dr. Biswajit Choudhury** Assistant Professor-II, PSD, IASST

INSTITUTIONAL MANPOWER

Dr. N. C. Talukdar (Upto 29/02/2020):	Director
Prof. Heremba Bailung (W.e.f. 01/03/2020):	Director (Additional charge)

Basic and Applied Plasma Physics

Prof. Heremba Bailung	Professor II & Head
Prof. Joyanti Chutia	Emeritus Scientist
Dr. Subir Biswas	Assistant Professor II
Dr. Kamatchi Sankaranarayanan	Assistant Professor II
Dr. Sumita Kumari Sharma	DST Women Scientist
Dr. Nirab Chandra Adhikary	Technical Officer –B
Pallabi Pathak	CSIR-SRF
Tonuj Deka	CSIR-SRF
Binita Borgohain	SRF
Yoshiko Bailung	SRF (DST-INSPIRE)
Rakesh Rushel Khanikar	SRF (DST-INSPIRE)
Ibnul Farid	SRF (DST-INSPIRE)
Bidyut Chutia	SRF (DST-INSPIRE
Palash J. Baruah	SRF (DST INSPIRE)
Paragjyoti Sut	JRF
Prarthana Gogoi	JRF
Parismita Kalita	JRF
Dibyajoti Bora	JRF
Kuldip Kalita	Project Scientist
Abhijit Baruah	Project Scientist
Hanan A. Hoque	Market Analyst
Krishna Kanta Swargiary	Technician
Bipul Kumar Das	Multi-Tasking Staff

Advanced Material Sciences

Dr. Neelotpal Sen Sarma	Professor I
Dr. Devasish Chowdhury	Associate Professor II
Dr. Arup Ratan Pal	Associate Professor II
Dr. Sarathi Kundu	Associate Professor II
Dr. Munima B. Sahariah	Associate Professor II

Dr. Biswajit Choudhury	Assistant Professor II
Dr. Anamika Kalita	DST INSPIRE Faculty
Dr. Robinson Jose	DBT-RA
Parijat Borgohain	SRF
Ujjal Saikia	SRF
Sristi Mazumdar	SRF
Hrishikesh Talukdar	CSIR-SRF
Deepshikha Gogoi	SRF
Bandita Kalita	SRF
Jayanta Sarmah Boruah	SRF
Suman Sarkar	CSIR-SRF
Bablu Basumatary	JRF
Santanu Podder	JRF
Subhankar Pandit	SRF (DST-INSPIRE)
Sweety Biswasi	SRF (DST-INSPIRE
Gautomi Gogoi	SRF
Ankita Deb	SRF
Jahnabi Gogoi	SRF
Purbajyoti Bhagowati	SRF (DST-INSPIRE)
Samiran Upadhyaya	SRF
Payal Saha	JRF
Raktim Jyoti Sarmah	JRF
Trishamoni Kashyap	JRF
Jyotisman Bora	JRF
Bijay Kumar Sah	CSIR-SRF
Kabyashree Phukan	CSIR-JRF
Sazzadur Rahman	JRF (DST-INSPIRE)
Sanu Sarkar	CSIR-JRF
Sanjib Sau	CSIR JRF
Manash P. Nath	CSIR-JRF
Manju K. Jaiswal	JRF (DST-INSPIRE)
Dhrubanka Sarma	JRF
Kangkan J. Goswami	JRF
Suvankar Deka	JRF
Babul Ch. Deka	Multi-Tasking Staff

Traditional Knowledge Based Drug development and Delivery

Dr. (Mrs.) Rajlakshmi Devi	Associate Professor-II & i/c BCSS
Dr. Jagat Ch. Borah	Associate Professor II
Dr. Prasenjit Manna	Assistant Professor II
Dr. Soumyadeep Nandi	Ramalingaswami Fellow
Dr. Rosy Mondal	DST INSPIRE Faculty
Dr. Aparajita Ghosh	Scientist-C
Dr. Suman Kumar Samanta	Scientist-C
Juri Pathak	Technical Officer-A
Julie Bordoloi	Technical Assistant-II
Dr. Asim Kumar Dutta	Research Scientist
Dr. Partha Pratim Dutta	Research Scientist
Dr. Kishor Deka	Research Scientist
Dr.Yunus Sheikh	Research Associate
Dr. Saydur Rahman	Research Associate
Sagar Ramrao Barge	SRF
Paramita Choudhury	JRF
Puspanjali Khound	JRF
Swarnali Bhattacharjee	JRF
Bhaswati Kashyap	JRF
Barsha Deka	SRF
Shilpi Saikia	JRF
Jonali Brahma	JRF
Nonibala Gurumayum	JRF
Kasturi Dutta	JRF
Deepsikha Swargiary	JRF
Devi Basumatary	CSIR-JRF
Gurumayum Shalini Devi	JRF (DST-INSPIRE)
Pranamika Sharma	JRF
Kangkan Jyoti Kalita	JRF
Junmoni Nath	JRF
Himangshu Sarma	JRF
Partha Pratim Sarma	JRF

Semim Akhtar Ahmed	JRF
Simanta Bharadwaj	Technical Assistant
Bandita Pathak	Technical Assistant
Deepmala Devi	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
Abinash Nath	Animal Keeper
Gwhwm Basumatary	Animal Keeper

Biodiversity and Ecosystem Research

Dr. (Mrs.) Arundhuti Devi	Associate Professor I & i/c RMES, LSD
Dr. N. C. Talukdar	Former Director
Prof. Suresh Deka	Retired Professor
Dr. M.R. Khan	Associate Professor-II
Dr. Debajit Thakur	Associate Professor -II
Dr. Rahul Hepat Pralhad	Assistant Professor -II
Dr. Wahengbam Romi	DST INSPIRE Faculty
Dr. Rajiv Borah	DST INSPIRE Faculty
Dr. Kaushik Bhattacharya	NPDF
Dr.Archana Nath	NPDF
Dr. Parijat Saikia	NPDF
Dr.Bhaskar Das	NPDF
Dr. Anowar Hussain	NPDF
Dr. Kaustavmani Patowary	Research Associate
Subrata Goswami	Technical Assistant
Anupam Bhattacharya	Research Associate
Dr. Kamal Das	Research Associate
Dr. Ananya Barman	DBT-Research Associate
Dr. Atanu Adak	Research Associate
Rictika Das	DST Women Scientist
Suravi Kalita	CSIR-SRF
Khanindra Sharma	SRF
Dibyajyoti Koiri	JRF
Ria Deb	JRF
Bhaswati Devi	JRF
Priyanka Sarkar	JRF
Bhuwan Bhaskar	JRF
Rabiya Sultana	JRF (UGC MANF)
Tulsi Kumari Joishy	SRF (DST-INSPIRE)
Dibyayan Deb	SRF
Santanu Das	SRF
Barsha Deka	SRF
Garima Raj	JRF
Manashi Das	SRF
Md. Shadab	JRF
Sujata Deka	JRF
Arun Kumar	DBT-JRF
Moirangthem Goutam Singh	ICMR-JRF
Ranjita Das	JRF (RGNF-UGC)
Atlanta Borah	JRF
Juri Saikia	JRF (RGNF)
Chingakham Juliya Devi	CSIR-UGC-JRF
Shabiha Nudrat Hazarika	JRF
Monalisa Kalita	JRF
Tamali Sinha	CSIR- JRF
Satabdi Saha	JRF
Jinu Medhi	UGC-JRF
Bidyarani Devi	JRF
Madhurankhi Goswami	SRF
Suparna Sen	SRF
Chandana Malakar	DBT-SRF
Nilam Sarma	SRF
Aditya N. Konwar	JRF
Surajit Basak	JRF
Manomohan Huzuri	Technical Assistant
Madan Chandra Kalita	Multi-Tasking Staff
Srikanta Baishya	Multi-Tasking Staff

Rajkumari Mazumdar	Technical Assistant

Mathematical and Computational Sciences

Dr. Gautam Choudhury	Associate Professor-II and i/c CCNS
Dr. (Mrs.) Lipi B. Mahanta	Associate Professor-II
Dr. Santu Das	Assistant Professor-II
Niranjan Bhagaboti	Technical Officer-B
Ajay Kr. Saw	JRF
Priyanka Kalita	JRF
Snigdha Mahanta	JRF
Karishma Sharavan	JRF
Daisy Das	JRF
Silpisikha Goswami	JRF
Kangkana Bora	SRF-INSPIRE Fellow
Anjana Begum	JRF MAN Fellow
Elima Hussain	JRF
Debabrata Sarma	JRF
Balabhadra Pathak	Multi-Tasking Staff
Bolin Das	Multi –Tasking Staff

Administration and Accounts

Dr. Diganta Goswami	Registrar
Pradyut Borkataki	Finance & Accounts Officer
Rajesh Sharma,	PRO
Prabodh Kr. Deka	Section Officer (Admin.)
Suresh Ch. Sarma	Section Officer (Acctts.)
Rabin Ch. Kalita	Superintendent
Ramen Mahanta	Superintendent
Saraswati Bora	Superintendent
Dwijendra Deka	Superintendent
Lelin Gogoi	Superintendent
Munindra Singh	Technical Assistant
Diganta Das	Assistant
Gora Gupta	Assistant
Prabhat Ch. Barma	Assistant
Kumud Baishya	Assistant
Phatik Baishya	Driver
Nimai Hazam	Driver
Lakshmi Kanta Soud	Multi-Tasking Staff
Madhabi Das	Multi-Tasking Staff
Nripen Ch. Goswami	Multi-Tasking Staff
Satish Ch. Das	Multi-Tasking Staff
Niren Sarma	Multi-Tasking Staff
Ratul Baishya	Multi-Tasking Staff
Binoy Kr. Choudhury	Multi-Tasking Staff
Pradip Das	Multi-Tasking Staff
Madhu Ram Kalita	Multi-Tasking Staff
Munna Basfor	Sweeper

Temporarily engaged person

Dr. Dhruba Sharma	Deputy Registrar (Academic)
Jayanta Borthakur	Network& System Administrator
Ajay Kr. Chakraborty	Programme Executive
Nabajyoti Choudhury	Programme Manager
Nayan Talukdar	Technical Officer (Instrumentation)
Dr. Anil Kumar	Technical Coordinator
Debajit Deka	Jr. Network Administrator
Pinky Taye	Assistant
Hemanta Sharma	Assistant (Accounts)
Bijayeta Devi	Assistant
Pallabi Konwar	Assistant
Udipta Deka	Assistant
Ksh. Sharmina Devi	Receptionist
Rinki Das	Receptionist
Sanjubi Sharma	Project Assistant

Nirmali Devi	Hindi Assistant
Moonmee Deka	Assistant (Accounts)
Milan Jyoti Das	Technical Assistant
Mehjabin Ali	Project Assistant
Lachman Thapa	Driver
Pranab Talukdar	Driver
Bimal Das	Driver
Sanjib Kr. Das	Driver
Ripon Saikia	Driver
Prakash Kr. Kachari	Field Supervisor
Madan Kr. Das	Cook
Manindra Deka	Cook cum Hostel Care Taker

Engineering and Estate Management

Montu Deka	Assistant Engineer

Temporarily engaged person

Hiranya Kr. Das	Estate Management Consultant
Gautam Kr. Medhi	IEME
Prantik Sarma Baruah	Assistant Field Manager
Rupen Pegu	Fishery Management Assistant
Md. Mahammad	Junior Engg. (Civil)
Bikash Jyoti Das	Junior Engg. (Elect)
Shankar Daimari	Work Supervisor
Muktaram Kumar	Work Supervisor
Kumud Patgiri	Electrician
Prasant Das	Assistant
Kishore Das	Resident Electrician
Hiren kalita	Resident Electrician
Uddipta Deka	Resident Electrician
Dijoraj Roy Choudhury	Plumber
Anima Baishya	Cleaner
Dinesh Deka	Gardener
Ajay Baishya	Mali

Knowledge Resource Center

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

Temporarily engaged person

Subhrojit Sengupta	Technical Assistant

IASST Consultants

Prof. Dharmeswar Das	Chief Consultant Former Director & VC (A), ICAR-IVRI, Izatnagar Dean, Faculty of Vety. Science, AAU
Prof. B.N. Goswami,	FNA, FASc, Consultant (Flood forecasting Project) FNASc, FTWAS Former Director, IITM, Pune, SERB Distinguished Fellow, Cotton University
Professor O. K. Medhi	Consultant (Tea waste Project) Renowned Organic Chemist and former Vice Chancellor, Gauhati University
Professor Nalin Kr. Mohan	Consultant (Tribal area dev. program) Former Director of Extension education and Chief Scientist, AAU
Dr. Aswini Bezbaruah	Consultant Medical Officer Senior Consultant-Internal Medicine Excelcare Hospital, Guwahati
Dr. Satyabrata Deka	Consultant Medical Officer M.B.B.S., DPM (Ped)
Dr. Bangshidhar Kalita	Consultant (Horticulture) Retired Joint Director, Deptt. of Agriculture Govt. of Assam
Mr. B. Bose	Consultant (Admin and Engineering) Retired Sr. manager NII, New Delhi

RESEARCH ACTIVITIES

BASIC AND APPLIED PLASMA PHYSICS

The basic and applied plasma physics section of the Physical Sciences Division of IASST has been engaged in a few thrust areas of research. For example, waves and instabilities associated with ion-acoustic waves, ion beam plasma interaction, plasma sheath boundary, dusty plasma are investigated in low temperature dc/rf discharge plasmas. Recently, a new prototype laboratory/device has been developed to generate cold atmospheric pressure plasma for its utilization in a variety of applications such as nanomaterial synthesis for enhanced photocatalytic activity, surface modification, and biomedical applications.


Prof. Heremba Bailung


Prof. Joyanti Chutia


Dr. Nirab Adhikary


Dr. Subir Biswas


Dr. Sumita K. Sharma


Dr Kamatchi Sankaranarayanan


Binita Borgohain


Yoshiko Bailung


Rakesh Rushel Khanikar


Ibnul Farid


Palash Jyoti Baruah


Bidyut Chutia


Kuldip Kalita


Hanan Ashrafi Hoque


Paragjyoti Sut


Parismita Kalita


Prarthana Gogoi


Dibyajyoti Borah


Krishna Kanta Swargiary


Bipul Kr. Das

A. Basic and Applied Plasma Physics (Coordinator: Prof. Heremba Bailung)

(i) Sheath Structure Modification in the Presence of Ion Flow in Near Ionospheric Plasma

We produce plasma in a vacuum vessel using dc discharge with parameters very close to the earth's ionospheric plasma to study the interaction with metal surfaces. A low density (n_e~ 10^5-10^6cm^{-3}) and low temperature (T_e~0.2 – 0.4 eV) plasma is achieved using an indigenously developed magnetic filter. Spacecraft/satellites are subjected to supersonic/hypersonic plasma flow in the lower earth orbit. The plasma interacts with the spacecraft surface and with the payloads in many ways. The interactions commonly occur through a thin non-neutral space charge region with a high electric field. Thus there is an accumulation of charges on the spacecraft surface. The charge generates a potential gradient between the spacecraft and relative to the space plasma and spacecraft ground. A shift in the spacecraft ground can affect the instrumentation used in collecting or emitting the charged particles. The studies on such interactions provide information on the ambient plasma environment around the spacecraft/ satellite. Sheath modification in the presence of subsonic ion flow is studied in low density and low-temperature plasma produced in the laboratory.

(ii) Development of Pt_Ti Binary Catalyst Electrode for Proton Exchange Membrane (PEM) Fuel Cell

Fuel cell technology has drawn great research interest around the world as an alternate energy source for future use in stationary, transportation, and portable applications. It converts chemical energy contained in the supplied fuel into electrical energy through electrochemical reactions. Some notable features of fuel cells are its high efficiency, environmentally friendly, zero toxic emission, quiet operation process. In general, the hydrogen-supplied fuel cell or Proton Exchange Membrane (PEM) fuel cell is the most suitable candidate for large scale applications in the automobile and portable device sectors in the near future.

We use the Pt_Ti alloy electrode catalyst produced by the plasma co-sputtering method using Pt and Ti target and deposited on carbon paper and the silicon wafer. This catalyst deposited carbon paper will be used as a GDL (Gas Diffusion Layer) for the fabrication of the Membrane Electrode Assembly (MEA). The plasma discharge parameters are optimized so that the deposited film's surface contains more Pt than Ti nanoparticles to enhance the surface catalytic activity. The chemical and electronic state of the catalyst used as an electrode is further examined by X-Ray Photoelectron Spectroscopy (XPS).

Atomic force microscopy (AFM) analysis (Figure 1) reveals the formation of a conical pillar-like structure on the surface of deposited alloy catalysts. The Pt_Ti alloy catalyst is successfully fabricated with a pillar-like structure on the catalyst surface using the plasma co-sputtering method. Unfortunately, the prepared alloy catalyst does not show high effective surface area (ESA). Future plane to increase the ESA of Pt_Ti binary alloy catalyst is by increasing the number density and height of the pillar structure offering more roughness which will eventually help in PEM fuel cell performance.

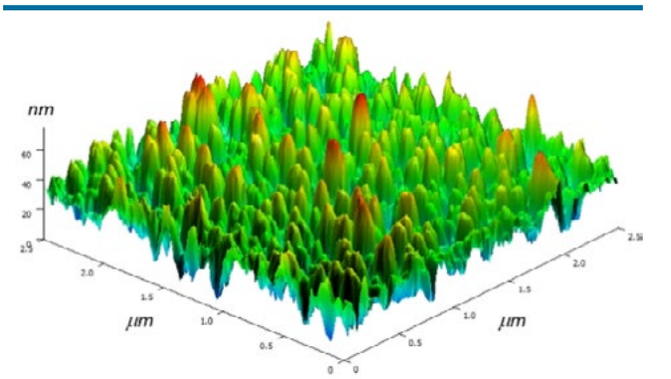


Figure 1: AFM micrograph of prepared alloy catalyst

(iii) Single-Step Synthesis and Shape Transformation of Au/CuO Nanocomposites by In-Liquid Plasma Discharge

The application of In-liquid plasma in the nanomaterial field has been rapidly growing mainly because of the production of desired nanomaterials at the expense of minimum cost. The generation of plasma in liquid can lead to the creation of reactive species, UV radiations, and low and high energetic electrons. In recent years, the transformation of the shape and structure of the nanomaterials using different methods have been extensively studied to increase the catalytic efficiency of nanomaterials. Electrical and optical properties depend on the structure and shape of the nanomaterials. Metal nanoparticles are frequently doped or decorated on semiconducting material to transform their shape or enhance their properties. In this report, we have discussed

the synthesis and shape transformation of Au/CuO nanocomposites by generating plasma between two vertically pointed copper electrodes inside a solution of $HAuCl_4$.

Initiation of discharge in the liquid, evaporation of copper anode leads to the formation of CuO nanoparticles (NPs). Anisotropic growth of CuO NPs takes place by self-aggregation to form nanospindles through the Ostwald ripening process (Figure 2a). During the experiment, Au nanoparticles are formed via reduction of ions by reactive species such as e_{aq} and H_2O_2. The simultaneous formation of Au nanospheres over CuO nanospindles (Figure 2b) leads to the formation of Au/CuO nanocomposites.

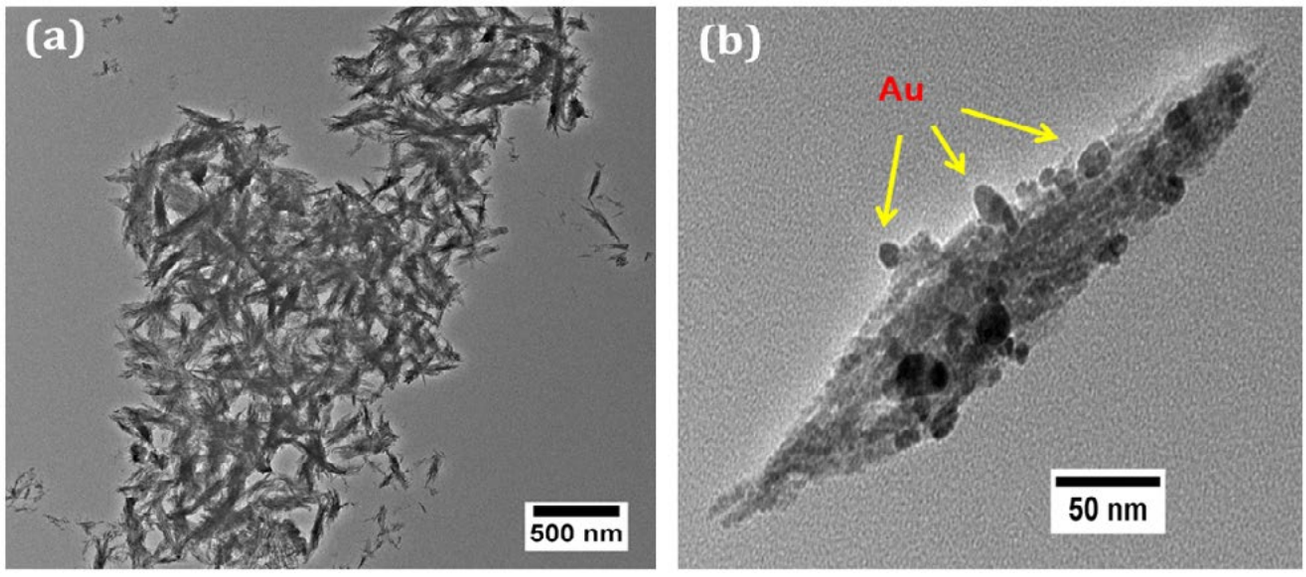


Figure 2: TEM image of (a) CuO nanospindles, (b) Existence of Au nanoparticles on a single CuO nanospindles

This is a single-step process to synthesize various nanocomposites having the desired shape. The spindle shape CuO nanostructures decorated with gold nanoparticles have shown enhanced photocatalytic activity in the visible region of the electromagnetic spectrum.

(iv) Ion Acoustic Peregrine Soliton under Enhanced Landau Damping

The Peregrine soliton is also known as the rogue waves in hydrodynamics (ocean or sea waves) investigated experimentally in low-temperature plasma. The present experiment is aimed to investigate the effect of the inherent damping process on the evolution of ion-acoustic Peregrine soliton. The Landau damping is a process in which a longitudinal space charge wave (e.g., ion-acoustic wave) in plasma decays exponentially with time. Eventually, Landau damping prevents the growth of instability and creates a region of stability in the parameter space. In laboratory discharge plasma with Maxwellian electrons, ion waves suffer Landau damping, which becomes dominant when ion temperature becomes comparable to electron temperature($(T_i \sim T_e)$. In a double plasma device, electron to ion temperature ratio is normally high (≥10) so that the propagating wave suffers negligible Landau damping. Experimentally we control the Landau damping by applying a radio frequency (rf) signal (frequency ~ ω_{pi}) to the separation grid to heat the ions. When they pass through the grid, the ions oscillate as the frequency applied to the grid is in the range of ion plasma frequency and gain energy. By adjusting the amplitude of the rf signal, a plasma ion temperature enhancement can be obtained. This enhances the number of resonant particles and thereby increases the Landau damping and suppressess the growth of the Peregrine soliton.

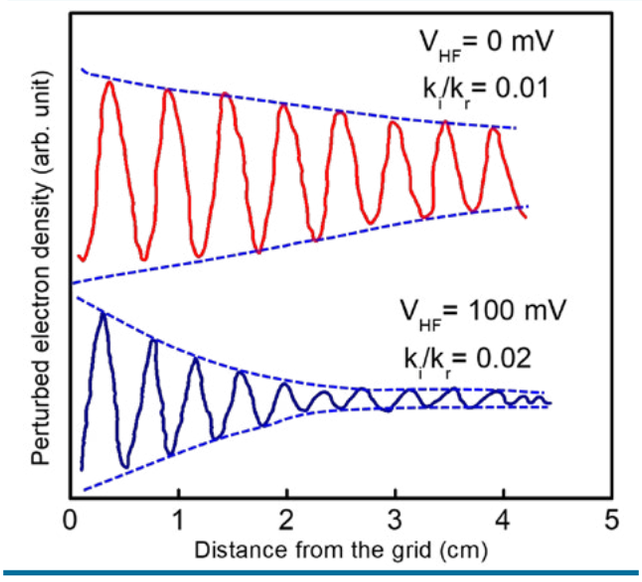


Figure 3: Typical interferometer pattern for a 500 kHz signal at V_{HF} = 0 and 100 mV. The measured damping rates are also shown

(v) Study of a Cold Atmospheric Pressure (CAP) Argon Plasma Jet for Surface Modification

Atmospheric pressure low-temperature plasma is becoming a subject of great interest in various fields of science and applications because of lower cost and simplified operations. It has attracted much attention because of its use in several emerging novel applications, such as plasma processing, biological and chemical decontamination of media, excimer light sources, textile industry, and wastewater treatment. The radiation from the plasma is used to diagnose gas temperature (T_g), electron temperature (T_e), and electron density (n_e). A schematic of a non-equilibrium plasma jet developed indigenously is shown in Figure 4a. The discharge is generated by applying high voltage ~4-7 KV at a frequency of 30 KHz. Optical emission spectroscopy (OES) is particularly used for the study of atmospheric pressure plasma jets. A typical spectrum of Ar CAP plasma jet is shown in Figure 4b.

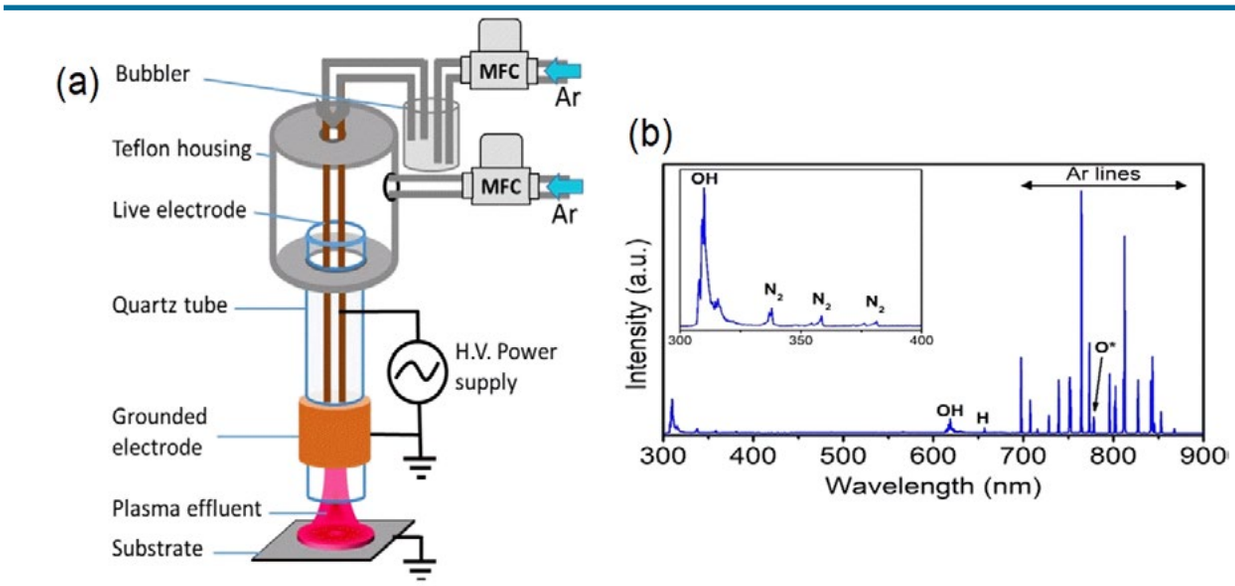


Figure 4 (a)Schematic diagram of the set up. MFC=mass flow controller, Ar=Argon. (b) OES of Ar Plasma jet

Besides the Ar lines, noticeable transitions from N_2, O, H, OH are also observed. These emissions are due to the excitation of air molecules and moisture present in the environment through electron impact excitation and energy transfer reactions with the high energetic Ar metastable atoms.

The gas temperature is measured from the best fit between the experimental and the simulated spectra of OH (A-X) rotational transition in the range 306-310 nm of the emission spectrum. It appears as an impurity in the plasma. The temperature is found to be 800±50 K for the plasma jet in the active region between the two electrodes. But it is far lesser in the application area. The electron excitation temperature (T_{exc}) is measured to be ~0.22 eV. The excitation temperature gives us an idea about the population of atomic excited states in the plasma. Also, it can be considered as a rough estimate of electron temperature (T_e) whenever a direct measurement of T_e is not available. The electron density (n_e) is estimated from the study of line shapes and various broadening mechanisms. From our analysis of the line, the electron density comes out to be ~ $6x10^{14}$ cm^{-3}. This value agrees well with the values reported in the literature for this type of plasma jet. Superhydrophobic thin films are deposited on silicon, glass and PET surfaces with HMDSO monomer vapor and Ar gas mixture using the plasma jet.

(vi) Suppression of Dust Density Wave in Nano Dusty Plasma

A mixture of nanometer-sized dust particles and the normal electron-ion plasma is commonly classified as the nanodusty plasma. Nanodusty plasma is commonly observed in natural environments such as in noctilucent clouds and in laboratory conditions such as fusion reactors and semiconductor processing devices. The presence of these particles increases the complexities of the normal plasma and introduces various kinds of waves and instabilities. Due to its smaller size and mass than the micron-sized particles, the time domain of the observed phenomena in nanodusty plasma is different. Moreover, due to the negligible effect of gravity, the study of nanodusty plasma has grown immensely in the last decade.

We study the nonlinear phenomenon of suppression of dust density waves in nanodusty plasma. A self-excited low frequency (60-90 Hz) dust mode is excited along the boundary of a dust void created inside the dust cloud. An external signal with frequency close to the internal mode is fed to interact with the streaming ion resulting in the suppression of the self-excited wave.

(vii) Pattern Formation in A Strongly Coupled Dusty Plasma Medium

A complex (dusty) plasma is a unique medium consisting of electrons, ions, and neutrals with additional micron or sub-micron sized charged particles. Due to the presence of highly charged and massive components, complex plasmas are involved in a wide variety of physical and chemical processes and therefore explored as model systems for many dynamical processes (e.g., phase transition, transport phenomena). The complex plasmas behave as many-particle interacting systems and provide unique opportunity to investigate many organized collective effects prevalent in fluids, clusters, crystals in greater temporal resolution as they appear in a slower time scale. Complex nonlinear dynamics and associated effects (instabilities, vortices, shocks, and turbulence) that occur behind an obstacle in charged particle flow are also studied rigorously in an astrophysical context. Auroral display is a unique phenomenon associated with plasma (e.g., solar wind) flow past a planet with magnetic field (e.g., the Earth). We study the pattern formation due to a strongly coupled dusty plasma flow past an obstacle. Two attached symmetrical counter-rotating vortices similar to the Föppl vortex pair in hydrodynamics form in the wake behind the void (obstruction). The vortex pair formation occurs within a very narrow range of critical Reynolds number Re ~77–135, which is larger in comparison to the hydrodynamic fluid and arising due to larger *p*/*n* (mass density/shear viscosity) ratio for dusty plasma fluid. The corresponding flow velocity range is (4-7) cms^{-1} and always associated with vortex filamentary type flow dynamics in the upstream void boundary. Particle Image velocimetry (PIV) analysis is done to obtain a better and clear understanding of the observed phenomena.

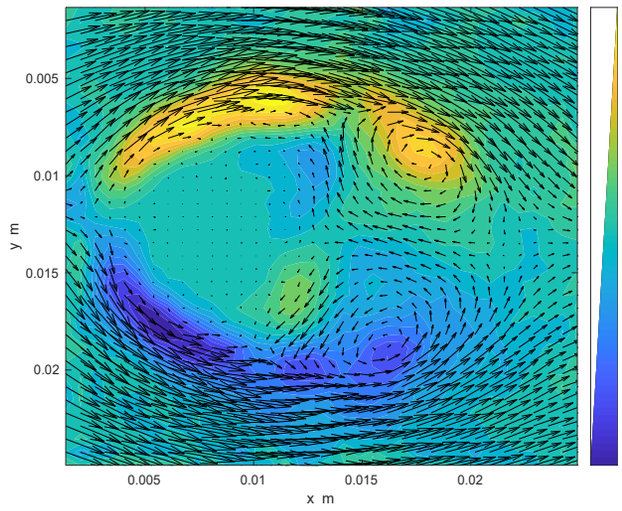


Figure 5: The vorticity profile and velocity vectors drawn from 90 consecutive images and the color bar shows the value of vorticity in s^{-1}.

B. Characterization of In-Situ Grown Nanodusty Plasma (Coordinator: Dr. Sumita K. Sharma)

The dusty plasma containing fine carbon-based particles (nanometer to sub-micrometer in size) is produced by injecting acetylene (C_2H_2) gas into the Argon (Ar) plasma, which is produced by using rf power 1-10 W at 13.56 MHz. Typical values of the plasma parameters measured with the help of a Langmuir probe are ion density ~ (10^{15} – 10^{16}) m^{-3} and electron temperature ~ (4-9) eV for Ar pressure 0.1-0.2 mbar and rf power 1-9 W. Nearly 1 min after acetylene exposure; fine particles start to appear which gradually fills the entire plasma volume within 8-10 min of C_2H_2 flow. The particles acquire negative charge in plasma by collecting electrons and ions and are electrostatically confined within the tube. The particle cloud is illuminated by a green laser and recorded in a 400–1000 fps camera. A typical image of the dust cloud observed nearly after 4 min of C_2H_2 flow is shown in Figure 6. A dust-free region, known as a void, appears at the center throughout the extended dust cloud.

The particles are collected on a substrate after switching off the plasma and then observed under Scanning Electron Microscope (SEM) to obtain their average size and shape. A typical SEM image of the grown plasma particles nearly 4 min of C_2H_2 flow is shown in the lower part of Figure 6. The particles are perfectly spherical in shape, with an average diameter ~227 nm. It is found that the average particle diameter increase from 73 nm to 685 nm for C_2H_2 exposure time of 2-10 min at rf power 1W. The number density of plasma grown particles is determined by using a laser extinction method in which the reduced laser intensity after passing through the dust cloud gives an estimate of the dust density (n_d). The measured dust density is found to be 10^{13}-10^{14} m^{-3} for C_2H_2 flow time of 2-10 min.

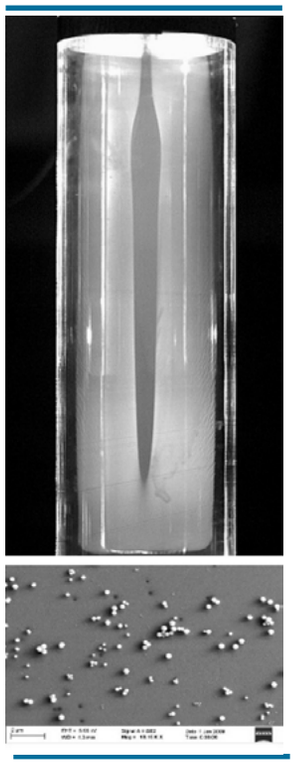


Figure 6: Snapshot of observed dust cloud and SEM image of particles for C_2H_2 flow time~ 4 min, RF power = 1 W.

C. Theoretical Modelling and Simulation Works on Nonlinear Wave in Multicomponent Plasma and Nanomaterial (Coordinator: Dr. Nirab C Adhikary)

(i) Three Dimensional Modified Korteweg-De Vries Equation in a Magnetised Relativistic Plasma

The nonlinear features of Ion Acoustic (IA) waves are studied in a fully relativistic three dimensional (3D) plasma system with consideration of the effect of both positron beam and trapped electrons. We consider a set of 3D magnetised hydrodynamic equations with time derivative pressure expansion for our plasma model along with kinetic Vlasov equation for electrons. The modified coefficient of the nonlinear term in the K-dV equation has arrived due to the impact of the vortex-like distribution of electrons. An analytical and numerical investigation of the nonlinear evolution equations is exhibited with external magnetic field effects, the time derivative pressure expansion, and other parameters like relativistic effect, mass variation, beam velocity, and temperature.

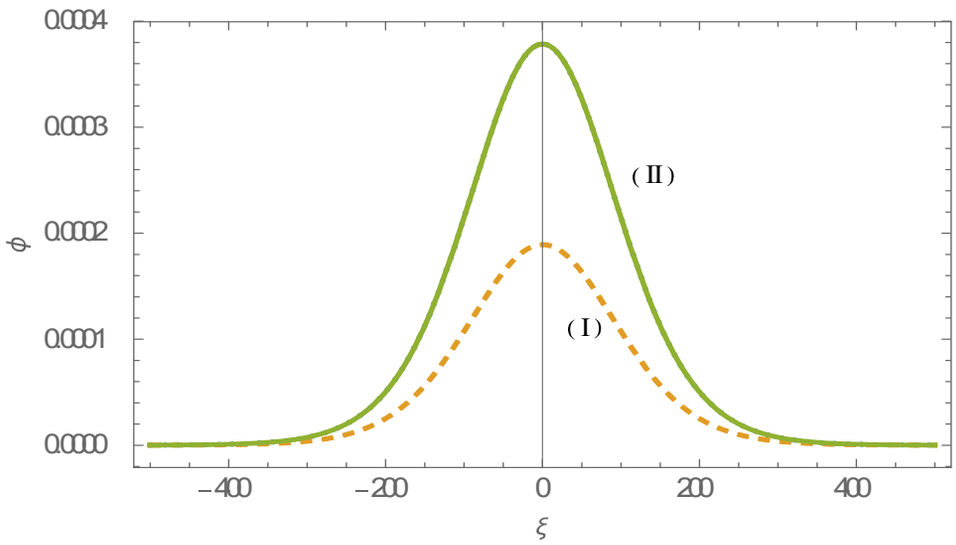


Figure 7. Graphical representation of solitary wave potential Ø varying with spatial variable ξ along with varying magnetic field strength (I) $\Omega = 10^{15}$ G (II) $\Omega = 10^{17}$G.

The structures of nonlinear propagation of waves in a plasma is greatly dependent on its velocity distribution and the common urge is to consider Maxwellian distribution, which gives rise to an equilibrium of thermodynamic character. As we have considered vortex-like distribution of electrons with full relativistic and magnetic field effect of ions, and positron beam, both having a time-dependent pressure expansion term. Figure 7 reveals the graphical representation of wave amplitude Ø and spatial variable ξ where the Ø increases with an increase in magnetic field Ω. This leads to the notion of an increase in magnetic field strength. This is due to the fact is that the soliton potential increases by the external magnetic field strength which affects the depressiveness of the system.

(ii) Instability Induced Modulation in Strongly Dispersive Electron-Positron-Ion Plasma

The linear and nonlinear behaviour of modulated envelope solitons is studied by using the Schrodinger equation. It also considers the contribution of higher-order terms for strongly dispersive cases in three-component plasma constituting electrons, positrons, and warm ions. Here, the warm ions are assumed as an inertial fluid. The electrons and positron beams are considered to be in the Maxwellian state, defined by the state of thermodynamic equilibrium in space plasma. In the analysis, it is exhibited that the lower & higher-order expansion terms are governed by nonlinear & linear Schrodinger equation respectively derived via a modified reductive perturbation method. In this system, the dynamics of the modulated waves are described by a varying dissipative Schrodinger equation, derived by using the concept of a scale parameter '*g*' into a power series of the smallest parameter $\in$, which considers a dissipative term in association with the finite imaginary part of the nonlinearity term.

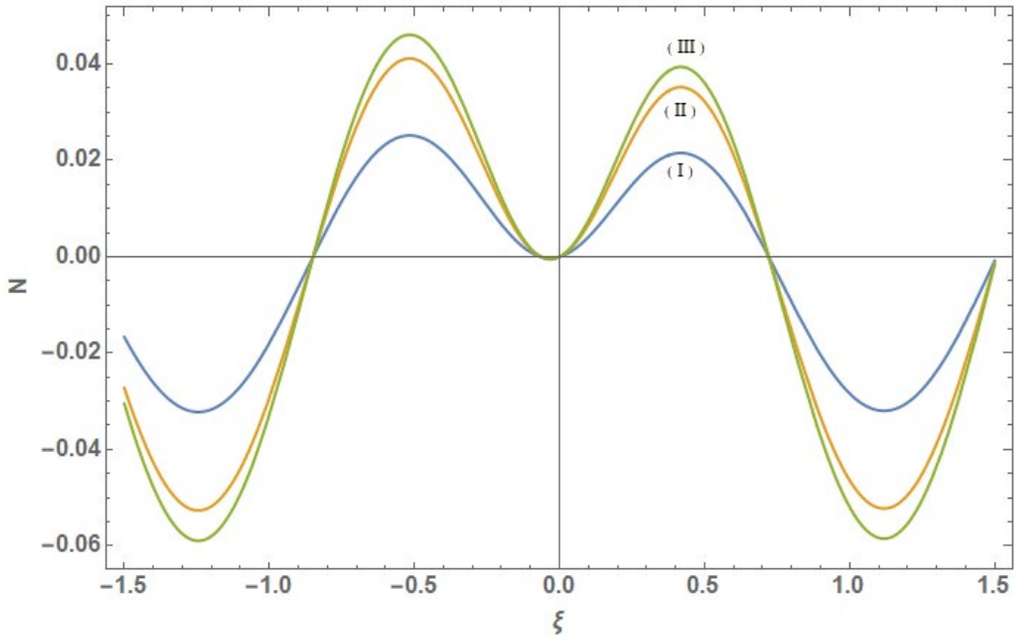


Figure 8. The variation of the spatial coordinateξ with respect to the soliton N at various ion temperature ratios (I)$\sigma=2\times10^{-5}$, (II) $\sigma=2\times10^{-3}$, (III) $\sigma= 2\times10^{-2}$ showing the fact the angular frequency w increases rapidly with the increasing wave number κ under the effect of rise in temperature of low temperature ions.

Results from numerical simulation confirm the predictions of stability and instability criteria, bright and dark solitons, breather like soliton, kink and anti-kink solitons, and definite forms for these solutions from first to fourth-order. The negative slope indicates dark soliton, and a positive slope indicates bright soliton in Figure 8. It is also observed that the propagation of the dark envelope soliton is relatively stable, and saturation occurs for a considerable distance. In contrast, at low temperatures, any system of particles loses their kinetic energy resulting in more particles descending to the system's ground state.

(iii) Structural and Electronic Properties of Stanene-BeO Heterobilayer

The superlattice of Sn/BeO heterostructure is developed by stacking Stanene and BeO monolayers. The structural and electrical properties are studied using DFT calculation with a vdW (Van der Waals) correction. The newly formed heterostructure exhibits an open band gap and the preservation of pristine stanene's intrinsic properties. The effect of spin-orbit coupling (SOC) is studied in pristine Stanene and Sn/BeO heterostructure. Moreover, biaxial strains and an external electric field is applied to this heterostructure and is found to tune the band gap effectively.

For modelling, a two-atom hexagonal unit cell is considered for the buckled honeycomb structure of stanene. The optimized lattice constant and buckling height of pristine stanene is 4.66 Å and 0.84 Å, respectively. Bader charge analysis shows that each Sn atom contains the same number of electrons (3.99 |e|). Similarly, four Be atoms and four O atoms are considered for BeO unit cell, and for that, the optimized lattice constant of BeO is found to be 2.89 Å. The lattice mismatch between the two monolayers is ~ 37 %. So, a combination of 2×2 lateral periodicity of stanene (a = b = 9.33 Å) and 3×3 lateral periodicity of BeO monolayer (a = b = 8.67 Å) is used for creating the Sn/BeO heterostructure. This heterostructure would experience a lattice mismatch of ~ 7 %. Therefore, BeO monolayer is stretched by 7% for ensuring heterostructure supercell commensurability. The stability and electronic properties of the heterostructure depend on the stacking patterns. Therefore, for our study, different stacking patterns have been considered, and the top and side view of one of them is shown in Figure 9.

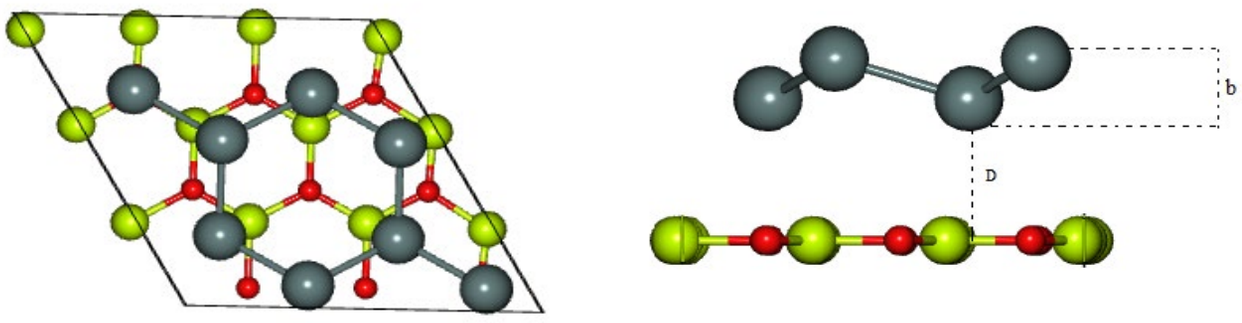


Figure 9. Sn-BeO stacking configurations (Top & Side view). D is for interlayer distance and 'b' is for buckling distance.

The effect of an applied electric field on the band gap of this heterostructure requires an electric field perpendicular to the heterostructure. As observed, the application of the electric field slightly affects the structure of the heterostructure. As a result, the buckling height of stanene changes from 0.84 Å to 0.92 Å. Whereas the interlayer distance changes from 3.0 Å to 3.2 Å, under the applied electric field strength from 0 to 2 V/nm. But significant tuning of electrical properties of the heterostructure can be achieved by the application of the electric field.

D. Experimental Investigation of Various Phenomena in Magnetized Plasma (Coordinator: Dr. Subir Biswas)

Designing of A Linear Machine for Magnetized Plasma Experimental Facilities

Plasmas embedded in the magnetic field is very common in both laboratory and nature. Unmagnetized plasma, generally, supports high-frequency electrostatic waves, low frequency electrostatic ion-acoustic waves, and electromagnetic waves. The magnetic field in the plasma enriched it with varieties of other natural modes. Sometimes the driving force is strong enough, and instead of single wave fluctuation, turbulence would be observed in plasmas.

Magnetic confinement of hot plasmas in fusion devices like Tokamak and Stellarator is a promising approach to achieve controlled fusion as a green energy source for humanity. However, the cross-field particle transport due to the waves-instabilities and turbulence is till now one of the main concerns for fusion research. Moreover, the interaction of the waves with the particles leads the mechanism for the heating of the fusion plasma. Therefore, the study of waves-instabilities and turbulence both in linear and nonlinear regimes, the coupling between waves and interaction of wave-particles, received massive attention from the very beginning of plasma physics research and is still active field research due to many unsolved problems.

However, complex field geometry, the simultaneous occurrence of various modes, and limitation of using some conventional diagnostics due to high heat flux restrict the study of wave-instabilities in control manner in magnetic-fusion devices like Tokamak, Stellarator. A linear device is suitable for such type of studies in a controlled way. Waves and instabilities are also ubiquitous in astrophysical plasmas. The study of them in a laboratory in a controlled way would be the direct simulation and the exploration of those astrophysical phenomena.

The design of a linear magnetized device is already started with the specific intentions of studying those waves-instabilities in a controlled manner. The vacuum chamber design is already completed. The design of the magnetic field coils for the device is in progress.

E. Biophysics and Biomaterials (Coordinator: Dr. Kamatchi Sankaranarayanan)

(i) Self-Assembly of Proteins Using Plasma Radiation

One of the significant challenges in protein stability is that proteins can self-assemble and aggregate, which alters proteins' native structure. In the preliminary data on the interaction of cold atmospheric plasma with the energy of 1 eV with the serum proteins, we observe a spontaneous self-assembly behaviour, which needs to be further

evaluated for the changes in the protein footprinting. In this regard, it is crucial to understand the role of cold atmospheric plasma on the structural changes in proteins and further use for biomaterial applications.

(ii) Protein Self-Assembly in Ionic Liquid

Folding of protein into its unique biologically active state is an intricate process. Protein refolding under in vitro conditions may be encouraged by either stabilizing native state of protein or accelerating the kinetics that leads to a precise folding reaction. Additionally, overpowering the undefined aggregation of the unfolded and/or intermediates on the folding pathway can also aid in refolding protein structure. The protein folding process becomes even more complex in the case of multidomain proteins (such as albumins), where inter-domain interactions can affect the complete folding process. Bovine serum albumin (BSA) and human serum albumin (HSA) are examples of such multidomain proteins. BSA and HSA are globular proteins; they function as biological carriers of fatty acid anions and other simple amphiphiles in the bloodstream. BSA and HSA are highly vital proteins from a biopharmaceutical perspective, as they are models for studying drug-protein interaction in vitro. Numerous experiments to characterize the binding capacity and binding sites of albumins have been carried out.

Over the past two decades, various studies have established in ionic liquid (IL) as a potential biocompatible solvent for proteins, particularly on enzyme-catalyzed reactions. One of the major challenges in protein stability is that proteins can easily unfold in the presence of denaturants like urea, which alters the native structure of proteins. There are numerous studies in which ionic liquids (ILs) act as promising biocompatible solvents (Bio-IL) for biomolecules.

In this context, we present the refolding ability of a biocompatible imidazolium-based ionic liquid, 1-ethyl 3-methyl imidazolium ethyl sulfate [Emim][ESO_4] (IL-1) and 1-ethyl 3-methyl imidazolium chloride [Emim][Cl] (IL-2) against the chemically induced structural changes in bovine and human serum albumin (BSA and HSA). The work is substantiated with several spectroscopic, thermal, and docking studies. In steady-state fluorescence spectroscopy, we observe that the emission intensity quenches for the protein in urea, which is reversible with the addition of ILs. Circular dichroism spectral studies reflect the reappearance of α-helical content, which is a good indicator of the refolding ability of ILs. Further, thermal fluorescence studies showed that ILs could refold the urea-induced denatured protein at higher temperature range only up to 7 M urea concentration, however, above 7 M urea concentration IL somehow fails to refold the protein.

The work is also supported by dynamic light scattering (DLS) measurements, the degree of BSA/HSA aggregation was reduced with the introduction of Bio-IL to the urea-BSA/ urea-HSA system ensuring the aggregate-free refolding (Figure 10). Furthermore, molecular docking studies were employed to probe the binding sites, and the results are well corroborated with the spectroscopic and thermal folding results. Therefore, through this paper, we aim to unravel the mechanistic intricacy of ILs using experimental and docking approaches. Overall, ILs act as recoiling medium for both native and unfolded (denatured by urea) of BSA/HSA native structure (Figure 11).

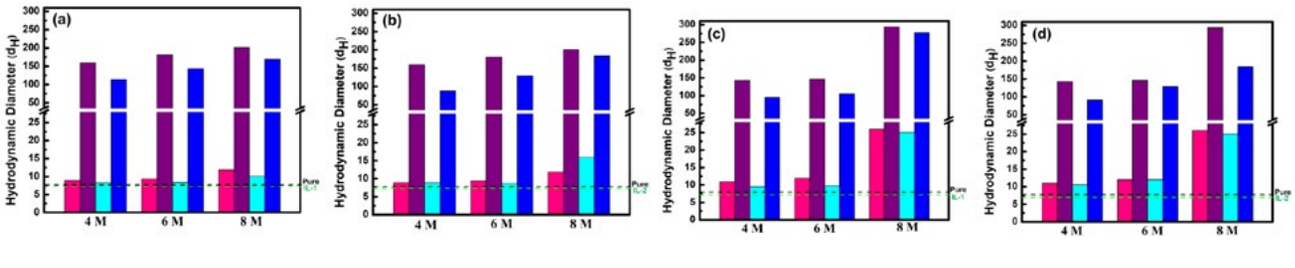


Figure 10. Bar graph for Hydrodynamic diameter (d_H) of monomers and aggregates of (a) BSA with varying concentrations of urea, urea with 10^{-5} M IL-1, (b) BSA with varying concentrations of urea, urea with 10^{-5} M IL-2, (c) HSA with varying concentrations of urea, urea with 10^{-4} M IL-1, (d) HSA with varying concentrations of urea, urea with 10^{-4} M IL-2. Here pink bars represent the monomers of BSA/HSA in urea, purple bars represent the aggregates of BSA/HSA in urea, cyan bars represent the monomers of BSA/HSA in urea with fixed concentrationof ILs and blue bars represent the aggregates of BSA/HSA in urea with fixed concentrationof ILs.

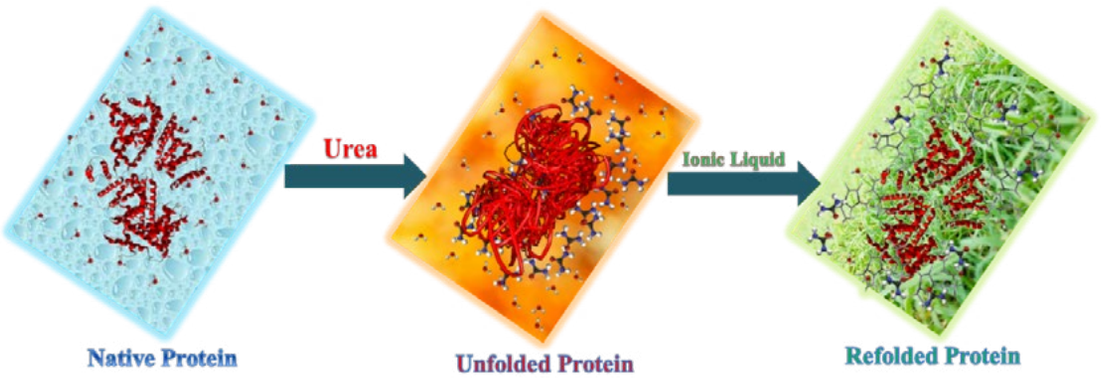


Figure 11 Protein folding under the ionic liquid

(iii) Fast Sensing Ammonia at Room Temperature with Proline Ionic Liquid Incorporated Cellulose Acetate Membranes

Amino acid ionic liquids (AAILs) are another class of ionic liquids derived using amino acids. AAILs are broadly used in dissolving biomass like DNA, cellulose or carbohydrates, as a gas absorbing medium especially CO_2 capture. Cellulose acetate (CA) is one of the commonly used low-cost membrane materials for various applications like reverse osmosis, ultrafiltration, gas permeation due to its long life time, high hydrophilicity and biod-egradability. It is reported that the performance of CA may be enhanced by mixing it with suitable additives like ionic liquids to accomplish new requirements and improvised membrane properties.

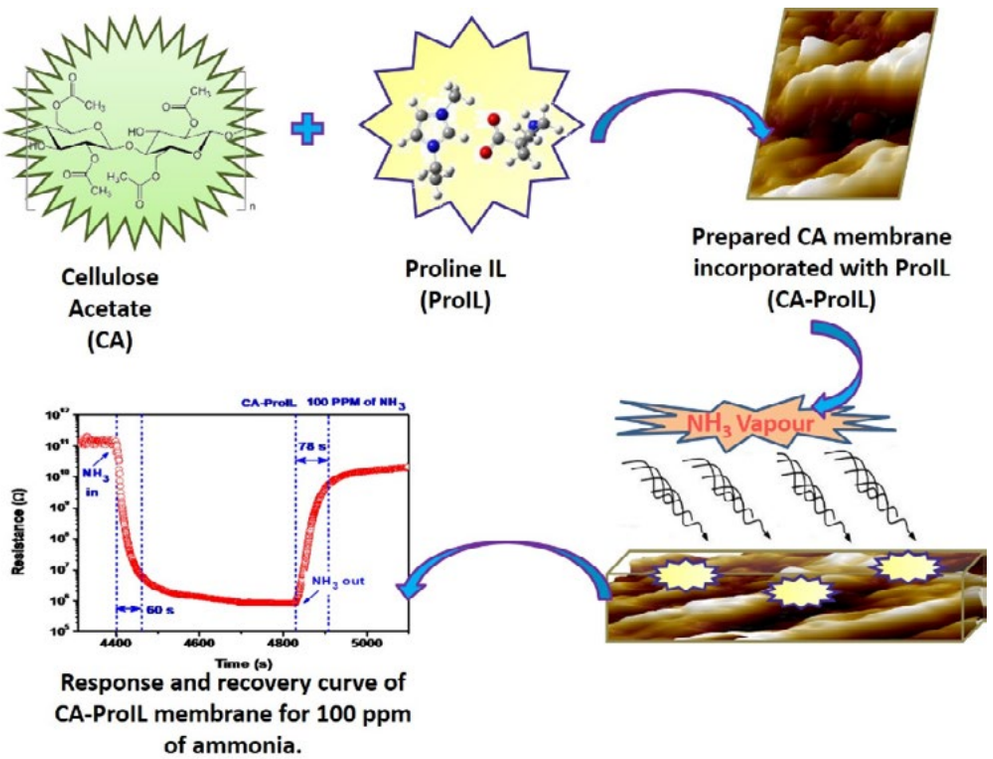


Figure 12. Schematic for CA-AAIL membranes for room temperature sensing of Ammonia

Gas sensors based on polymeric membrane using cellulose acetate and amino acid ionic liquids (AAIL) were prepared using the phase inversion method. Initially, AAIL was prepared by the neutralization method of amino acids L-Proline and L-Phenylalanine with the IL EMIM OH (base) to form ProIL and PheIL. The prepared membranes were characterized by FTIR, SEM, TGA, DSC, and AFM. Asymmetric nature and finger-like macrovoids was confirmed using SEM and AFM. The synthesized cellulose acetate membrane incorporated with IL and AAILs was tested for the gas sensing by quantifying the change in resistance in the absence and presence of the test gas inside a chamber. The results suggest that the CA membranes have great potential for room temperature ammonia gas sensing. Also, by incorporating IL, AAILs into the matrix, precise sensing with a lower response and recovery times of 60 s and 78 s is observed. Further, NMR analysis suggests the possible mechanism of adduct formation of ammonia with ProIL.

RESEARCH OUTPUT

Extramural Projects

Ongoing project

Title of the project	Funding Agency: Total Fund, Duration, PI/Coordinator	Goal
Study of Dynamical Behavior of Nanodusty Plasma Produced in a Reactive Gas Discharge	**Funding Agency**: DST, Women Scientist Scheme **Total Fund**: Rs. 31.00 Lakhs **Duration**: 2017-2020 **PI/Coordinator**: Dr. Sumita Kumari Sharma	Study of dust formation using reactive gas in plasma under different inert gas environments and optimization of discharge parameters for controlled growth. Parameterization of nanodusty plasma containing plasma grown particles in reactive gas discharge. Study of low frequency wave dynamics, structure formation processes and instabilities involving plasma grown dust particles
Feasibility Study of Commercial Scale Coating on Copper Alloys, Using Radio Frequency Plasma Technology	**Funding Agency:** DSIR, Government of India **Total Fund:** Rs. 20.00 Lakh **Duration:** 2019-2020 **PI/Corodinator:** Prof. Heremba Bailung	To study the techno-commercial status of surface protection of bell metal and brass in the main production centers of india To find the proper mechanism for technology transfer ofthe surface coating technology
Application of Dielectric Barrier Discharged Cold Atmospheric Plasma for the Treatment of Inflammation	**Funding Agency**: Indian Council for Medical Research (ICMR) **Duration:**2020-2023 **Total Fund**: Rs. 55.38 Lakhs **PI/Coordinator**: Dr. Subir Biswas and Dr. Prasenjit Manna	Development of a cold atmospheric plasma source and investigate it for its use in the treatment of human inflammation
Role of Interfacial Rheology in Protein-Protein Interactions	**Funding Agency**: DST INSPIRE Faculty Program **Duration:**2014-2020 **Total Fund**: Rs. 35 Lakhs **PI/Coordinator**: Dr. Kamatchi Sankaranarayanan	To develop models for studying protein-protein interactions through interfacial rheology.

Publications

In cited journals

Author's name	Title	Journal name	Volume & Issue no./page no.	Month/Year of publication
Binita Borgohain and Heremba Bailung	Sheath Characteristics in a Magnetically Filtered Low Density Low Temperature Multicomponent Plasma With Negative Ions	Physics of Plasmas	26/ 123511	December/ 2019
Ibnul Farid, Abhijit Boruah, Joyanti Chutia, Arup R. Pal and Heremba Bailung	Low Loaded Platinum (Pt) Based Binary Catalyst Electrode for PEMFC by Plasma Co-Sputtered Deposition Method	Materials Chemistry and Physics	236/ 121796	June/ 2019
Tonuj Deka, Bidyut Chutia, Yoshiko Bailung, Sumita K. Sharma and Heremba Bailung	Suppression of a Spontaneous Dust Density Wave by Modulation of Ion Streaming	Plasma Science and Technology	22/ 045002	January/ 2020

Author's name	Title	Journal name	Volume & Issue no./page no.	Month/Year of publication
Palash J. Boruah, Rakesh R. Khanikar and Heremba Bailung	Synthesis and Characterization of Oxygen Vacancy Induced Narrow Bandgap Tungsten Oxide (WO_{3-X}) Nanoparticles by Plasma Discharge in Liquid and Its Photocatalytic Activity	Plasma Chemistry and Plasma Processing	40/ 1019	March/ 2020
Ridip Sarma, Apul N. Dev, Birbaishri Boro, Ranjan Das and Nirab C. Adhikary	Three-Dimensional Modified Korteweg-De Vries Equation in a Magnetised Relativistic Plasma with Positron Beam and Vortex-Like Electron Distribution	The European Physical Journal D	74/ 23	February/ 2020
Bipradip Chakraborty, Madhurjya M Borgohain and Nirab C Adhikary	Structural and Electronic Properties of Stanene-Beo Heterobilayer	Matererials Research Express	7/ 015029	January/ 2020
Samir Thakur, Sankar M. Borah, Ashok Singh and Nirab C. Adhikary	Investigating the electronic and nonlinear optical properties of fullerene by substituting N, P, As, and Sb in the lattice structure: a DFT study	Applied Physics A	126/130	January/ 2020
Rabiya Sultana, Nirab C. Adhikary, Mohan C. Kalita, Narayan. C. Talukdar, Mojibur. R. Khan	Study of the Efficiency of a Double-chambered Microbial Fuel Cell using *Citrobacter sp*	Int. Journal of Scientific Research in Biological Sciences	6/1	February/ 2019
Priya Mehta, Seenuvasan Vedachalam, Gopal Sathyaraj, Somenath Garai, Gangasalam Arthanareeswaran, Kamatchi Sankaranarayanan	Fast Sensing Ammonia at Room Temperature with Proline Ionic Liquid Incorporated Cellulose Acetate Membranes	Journal of Molecular Liquids	305/ 112820	March/ 2020
Anamika Sindhu, Kavya Bhakuni, Kamatchi Sankaranarayanan, Pannuru Venkatesu	Implications of Imidazolium Based Ionic Liquids as Refolding Additives for Urea-Induced Denatured Serum Albumins	ACS Sustainable Chemistry & Engineering	8/ 604	December/ 2019
Soumya Joy, Gargi Rastogi, Kamatchi Sankaranarayanan	Photocatalytic Degradation of Phenol Using Ionic Liquid Stabilized TiO_2 Nanoparticles	Materials Research Express	6/ 115059	October/ 2019
B. Sasikumar, G. Arthanareeswaran, Kamatchi Sankaranarayanan, K. Jeyadheepan.	Synthesis and Formation of Phase Tuned TiO_2 and Ionic Liquid Incorporated Polymeric Membranes for Ammonia Sensing at Room Temperature	ACS Sustainable Chemistry & Engineering	7/ 15884	August/ 2019

Patents

Inventor(s)	Title	File No. for Enrollment	Provisional/Final Patent Grant No.	Issue No. of Patent Office
Nirab C Adhikary, Kaustav B Arya, Bhaswati Choudhury, Saurabh Kr. Barman, Pankaj Dutta, Hermba Bailung, Neelotpal Sen Sarma	An Electromechanical Warning Device for the Hearing Impaired	No. 201931034521	Nil	Nil

Presentation in Conference/seminars

Invited talks

Faculty	Title	Programme name	Date & Venue
Heremba Bailung	Some experimental aspects of Ion/Dust Acoustic Waves	National Conference on Green, Sustainable and Evolving Sciences (GSES 2019) and 64th Annual Technical Session of Assam Science Society	28th – 29th June 2019, Guwahati, Assam, India
Heremba Bailung	Basic discharge physics	DST-SERB school on Plasma Processing of Materials	3rd-22nd June 2019, IIT Bombay, Mumbai, India
Sumita K. Sharma	Plasma in laboratory: A basic introduction	Workshop in Basic Plasma Physics	12th-13th February 2020, Department of Physics, Assam Don Bosco University, Sonapur, Assam

Contributory

Author(s)	Title	Conference name	Oral/Poster	Date & Venue
Subir Biswas	Determination of Electric field distribution near the anode surface of a SMP diode	2nd National Conference on Recent Advances in Science and Technology	Oral	15-17th May 2019, Guwahati
Kamatchi Sankaranarayanan	Multi-tasking Ionic Liquids for Applications in Nanomaterials and Sensors	UKIERI Workshop	Oral	12th-13th February 2020, IIT Guwahati
Pallabi Pathak and Heremba Bailung	Illustrating Rogue Waves in Plasma with Continuous Wavelet Transformation Analysis	Green Sustainable and Evolving Science	Oral	28th-29th June 2019, Cotton University, Guwahati, Assam, India
Tonuj Deka and Heremba Bailung	Observation of Dust Acoustic Wave in Dusty Plasma with Nano Particles and its Analysis	Green Sustainable and Evolving Science	Oral	28th –29th June 2019, Cotton University, Guwahati, Assam, India
Binita Borgohain and Heremba Bailung	Sheath Studies in a Low Temperature and Low Density Plasma Near to Ionospheric Plasma	Green Sustainable and Evolving Science	Oral	28th–29th June, 2019, Cotton University, Guwahati, Assam, India
Yoshiko Bailung, Joyanti Chutia and Heremba Bailung	Modelling an Experiment Study of Fluid Flow Past an Obstacle in Strongly Coupled Dusty Plasma Fluid	Green Sustainable and Evolving Science	Oral	28th–29th June, 2019, Cotton University, Guwahati, Assam, India
Tonuj Deka and Heremba Bailung	Synchronization of Dust Density Wave by Ion Streaming Modulation in Nanodusty Plasma	61st Annual Meeting of the APS Division of Plasma Physics	Oral	21st - 25th October, 2019, Broward County Convention Centre, FL, Florida, USA
Yoshiko Bailung, Joyanti Chutia and Heremba Bailung	Non-Linear Structure Formation in Strongly Coupled Dusty Plasma Flow Past an Obstacle	61st Annual Meeting of the APS Division of Plasma Physics	Oral	21st - 25th October, 2019, Broward County Convention Centre, FL, Florida, USA
Abhijit Boruah, Ibnul Farid, Bhabesh K. Nath and Joyanti Chutia	Development of Plasma Modified Bio-Membrane For Proton Exchange Membrane Fuel cell (PEMFC)	International Conference on Plasma Science and Applications (ICPSA-2019)	Poster	11th - 14th November, 2019, University of Lucknow, India
Pallabi Pathak and Heremba Bailung	Ion Acoustic Peregrine Soliton Under Enhanced Dissipation	International Conference on Plasma Science and Applications (ICPSA-2019)	Poster	11th - 14th November, 2019, University of Lucknow, India
Binita Borgohain and Heremba Bailung	Understanding Sheath Behaviour in Low Temperature and Low Density Plasma Relevant to Ionospheric Plasma	International Conference on Plasma Science and Applications (ICPSA-2019)	Poster	11th - 14th November 2019, University of Lucknow, India

Author(s)	Title	Conference name	Oral/Poster	Date & Venue
Rakesh R. Khanikar, Palash J. Boruah and Heremba Baiung	Characterisation of an Atmospheric Pressure Plasma Jet for Fabrication of Super-hydrophobic Surfaces	International Conference on Plasma Science and Applications (ICPSA-2019)	Poster	11th - 14th November 2019, University of Lucknow, India
Ibnul Farid, Abhijit Boruah, Joyanti Chutia and Heremba Bailung	Performance of Co-sputtered Pt_Ag Binary Catalyst Electrode in PEM Fuel Cell	International Conference on Plasma Science and Applications (ICPSA-2019)	Poster	11th - 14th November 2019, University of Lucknow, India
Bidyut Chutia, Tonuj Deka, Yoshiko Bailung, Sumita K Sharma, Heremba Bailung	Nano Dust Cloud Expansion in Afterglow Plasma	International Conference on Plasma Science and Applications (ICPSA-2019)	Oral	11th - 14th November 2019, University of Lucknow, India
Palash J. Boruah, Rakesh R. Khanikar and Heremba Bailung	Synthesis of Narrow Bandgap Tungsten Oxide (WO_{3-x}) Nanoparticles by In-liquid Plasma Discharge	International Conference on Plasma Science and Applications (ICPSA-2019)	Poster	11th - 14th November 2019, University of Lucknow, India

Workshops/School/Meeting attended

Faculty/Research Scholar	Workshops/School	Date & Venue
Subir Biswas	5th India International Science Festival, IISF-2019	5th -8th November 2019, Kolkata
Rakesh R. Khanikar, Palash J. Boruah	DST-SERB school on Plasma Processing of Materials	3rd-22nd June 2019, IIT Bombay, Mumbai, India

Lectures Delivered at Other Institutes

Faculty	Topic	Date & Venue
Subir Biswas	Spectroscopic measurements of electric and magnetic field distributions in a relativistic self-magnetic-pinch diode	18th September 2019, IISc Bangalore, Bangalore, Karnataka
Subir Biswas	Spectroscopic measurement of magnetic- and electric-field distribution of a relativistic electron beam diode	22nd -25th October 2019, Institute for Plasma Research (IPR) Gandhinagar, Gandhinagar, Gujarat

Recognitions/ Awards/Achievements

Name	Particulars
Dr. Heremba Bailung	Nominated as Member of planning committee DST- SERB school 2020 – 2024
Dr. Kamatchi Sankaranarayanan	Selected for Regional Level for National Bio-entrepreneurship Competition by C-CAMP and BREC-BIRAC, Kolkata (4th November 2019)
Pallabi Pathak	Best poster award in Basic Plasma section in 12th International Conference on Plasma Science and Applications (ICPSA-2019) held at Lucknow University, India during 11th -14th November 2019
Abhijit Boruah	Awarded PDF at Institute for Plasma Research, Gandhinagar, Gujarat, India
Pallabi Pathak	Awarded PDF at Institute for Plasma Research, Gandhinagar, Gujarat, India
Tonuj Deka	Selected as Assistant Professor in Sipajhar College, Assam
Yoshiko Bailung	Selected as Assistant Professor in Goalpara College, Assam
Rakesh R. Khanikar	Awarded DST-INSPIRE SRF by Department of Science and Technology (DST) wef 9th December, 2019
Ibnul Farid	Awarded DST-INSPIRE SRF by Department of Science and Technology (DST) wef 9th December, 2019
Bidyut Chutia	Awarded DST-INSPIRE SRF by Department of Science and Technology (DST) w.ef 24th August, 2019
Palash J. Boruah	Awarded DST-INSPIRE SRF by Department of Science and Technology (DST) wef 27th September 2019

Advanced Material Sciences

The research activities in the Advanced Material Sciences group are inclusive of the development of polymeric sensor materials, development of carbon based nanomaterials for biomedical applications, soft-condensed matter physics, development of photoresponsive nanostructured materials, simulation and modelling of materials, and development of plasmonic materials for energy generation, and storage. In the present year, a riboflavin based conjugated biomolecule is used for ultrasensitive detection of nitrophenols. A high performance water-borne fluorescent acrylic based adhesive was also developed for various applications. In material nanochemistry, scientists are trying to develop a comprehensive bottom-up synthetic strategy to fabricate a variety of hybrid biomaterials, carbon-based nanomaterials, polymer nanocomposites for diverse applications. In the plasma-based synthesis of nanomaterials, the focus is on material synthesis suitable for advanced electronic, optoelectronic, and bio-electronic devices. Significant effort is going on in the field of soft matter physics with emphasis on thin films of fatty acids, lipids, proteins, polymers, nanomaterials. The use of plasmonics to harvest and store solar light for energy conversion is another aspect of the research being carried out in this program.


Dr. Neelotpal Sen Sarma


Dr. Devasish Chowdhury


Dr. Arup Ratan Pal


Dr. Munima B Sahariah


Dr. Sarathi Kundu


Dr. Biswajit Choudhury


Dr. Anamika Kalita


Bandita Kalita


Deepshikha Gogoi


Gautomi Gogoi


Jayanta Sarmah Boruah


Subhankar Pandit


Sweety Biswasi


Santanu Podder


Ankita Deb


Samiran Upadhyaya


Bablu Basumatary


Purbajyoti Bhagowati


Jahnabi Gogoi


Trishamoni Kashyap


Raktim Jyoti Sarmah


Payal Saha


Sanu Sarkar


Sazzadur Rahman


Bijay Kumar Sah


Jyotisman Bora


Manash P Nath


Manju K Jaiswal


Dhrubanka Sarma


Suvankar Deka


Babul Ch. Deka

A. Synthesis of High-value Polymers and Development of Sensors (Coordinator: Dr. Neelotpal Sen Sarma)

(i) Riboflavin Based Conjugated Biomolecule for Ultrasensitive Detection of Nitrophenols

In this work, we have successfully synthesized a biobased conjugate using riboflavin as the fluorescent tag molecule using an easy synthesis method. The steady-state fluorescence emission results indicate that the material developed from riboflavin and amino acid is efficient in selective, sensitive, and instant detection of picric acid (PA) in an aqueous medium (Figure 13). Here, L-BOC cystine is used as the required amino acids to prepare the probe. The probe is primarily fluorescent in nature, and its fluorescence diminishes upon the addition of PA, with concentration as low as 2 nM. The limit of detection for RC is calculated to be 0.37 nM of PA, which is remarkably low among the recent advancement. Moreover, RC is capable of sensing PA in real samples, which is of utmost importance in practical application. Thus, the bioconjugate RC acts as a straightforward and highly efficient optical sensor with practical applicability for real-time detection of picric acid.

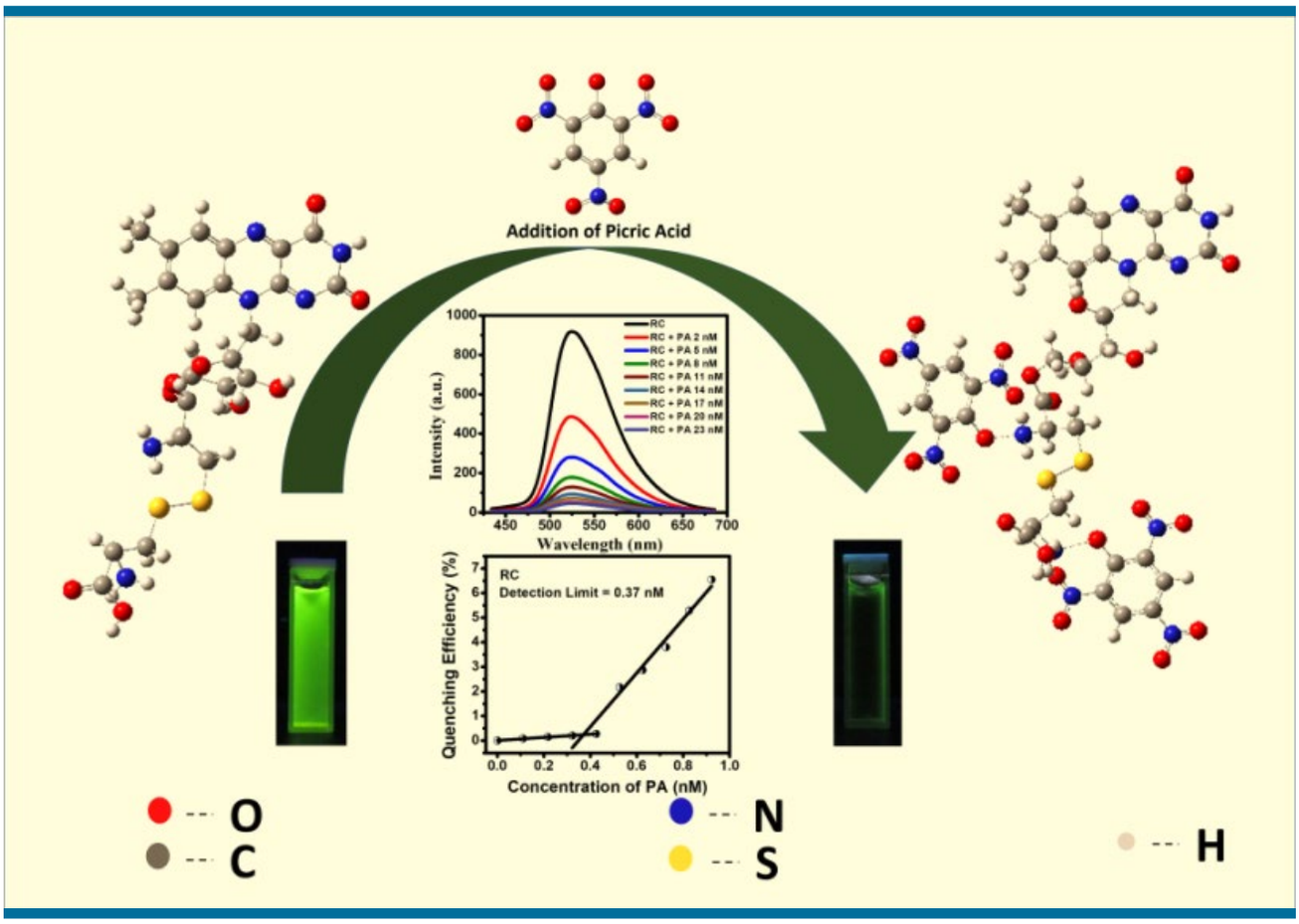


Figure 13: Photographs of fluorescent bioconjugate RC. It acts as a very simple and highly efficient optical sensor with practical applicability for real-time detection of picric acid.

(ii) High Performance Water-Borne Fluorescent Acrylic Based Adhesive: Synthesis and Application

The recent work reports three water-borne adhesives: poly(1-Vinyl-2-pyrrolidone-co-acrylic acid), poly(acrylonitrile-co-acrylic acid), and poly(1-vinyl-2-pyrrolidone-co-acrylonitrile-co-acrylic acid). The adhesives acid, being water-based, minimizes the problems associated with the use of toxic organic vapors in the adhesive industry. The best part of the synthesized adhesives is that they can be stored in the form of powder for long term use and is easy to carry and handle. The adhesives were found to be thermally stable; one of the adhesives showed thermal stability up to 300 °C. The lap shear strength of the adhesives was found to be appreciably high compared to the adhesives available in the local market.

Moreover, the fluorescence characteristic of the adhesives makes them suitable for the detection of fractured joints, when seen under UV light (Figure 14), but not visible under normal light, which is an essential tool in the craft making industry related to antiques. The polymers can also be used as anti-counterfeiting agents in intelligence. Thus, in a nutshell, we have tried to develop adhesives with multiple applications with better storage options than commercially available adhesives.

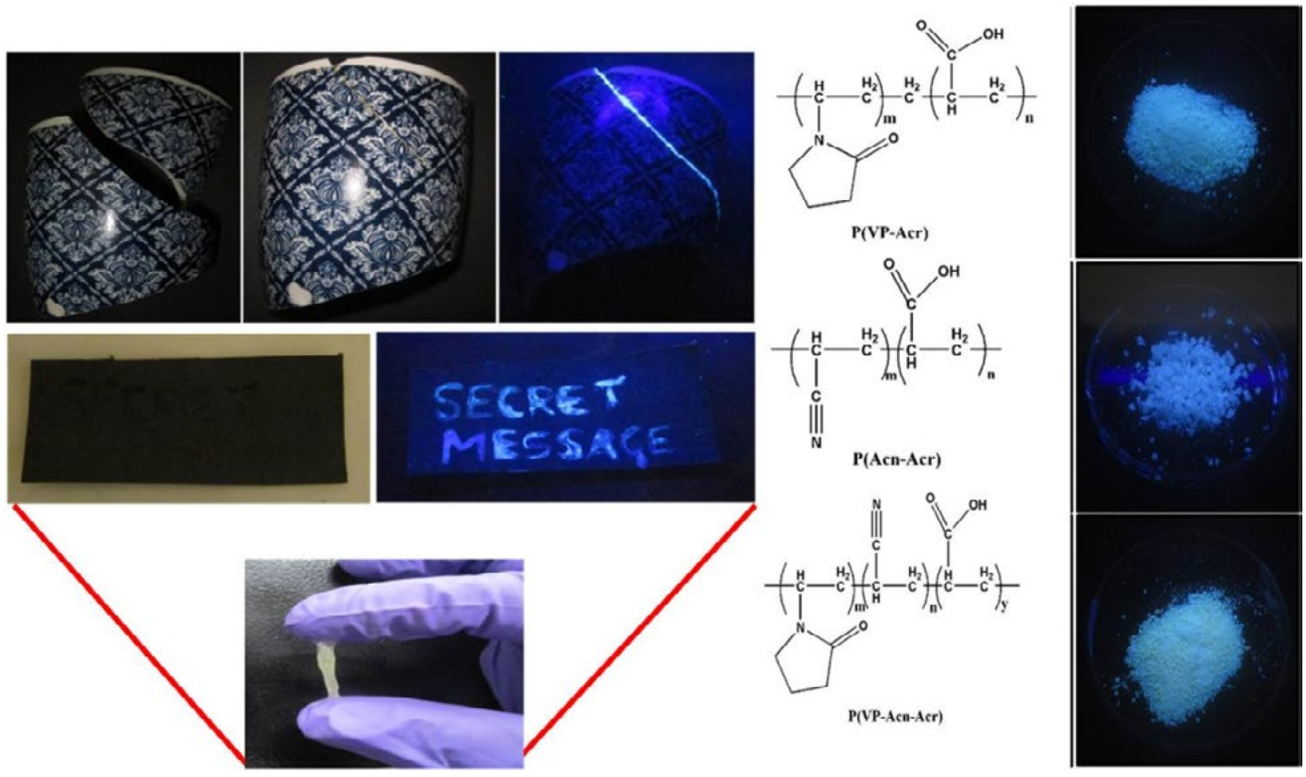


Figure 14: Synthesis and application of water-borne fluorescent acrylic adhesive which can be stored as a powder for long term use.

B. Material Nanochemistry (Coordinator: Dr. Devasish Chowdhury)

(i) DNA Carbon-Nanodots Based Electrochemical Biosensor for Detection of Mutagenic Nitrosamines

Mutagenic and carcinogenic substances are a threat to any living organism, and its detection is of paramount importance. In this work, we fabricate for the first time a DNA-carbon dots based electrochemical biosensor for sensitive and selective detection of mutagenic N-Nitrosamine like *N*-Nitosodimethylamine (NDMA) and *N*-Nitrosodiethanolamine (NDEA). At first, on the glassy carbon electrode (GCE), chitosan carbon dot was deposited, then, DNA was electro-statically immobilizing on the surface of carbon dots to fabricate the sensing electrode (DNA/chiCD/GCE modified electrode). In the presence of NDMA and NDEA, the absolute peak current increases when measured in differential pulse voltammetry, and thus it can detect NDMA and NDEA. The system DNA/chiCD/GCE modified electrode is highly selective and sensitive towards NDMA and NDEA. The detection limit was determined to be 9.9×10^{-9} M and 9.6×10^{-9} M, respectively. A group of N-Nitrosamine is mutagenic, enabling them to interact with DNA easily and modify its structure. These small structural modifications can easily get detected by electrochemistry. Due to the larger surface area and various surface functionalities, carbon dots provide multiple binding sites for DNA. In fact, to our knowledge, this is the first report of biosensor for carcinogenic or mutagenic compound NDMA and NDEA. The strategy used in the fabrication of an electrochemical sensor for N-Nitrosamine is shown in Figure 15.

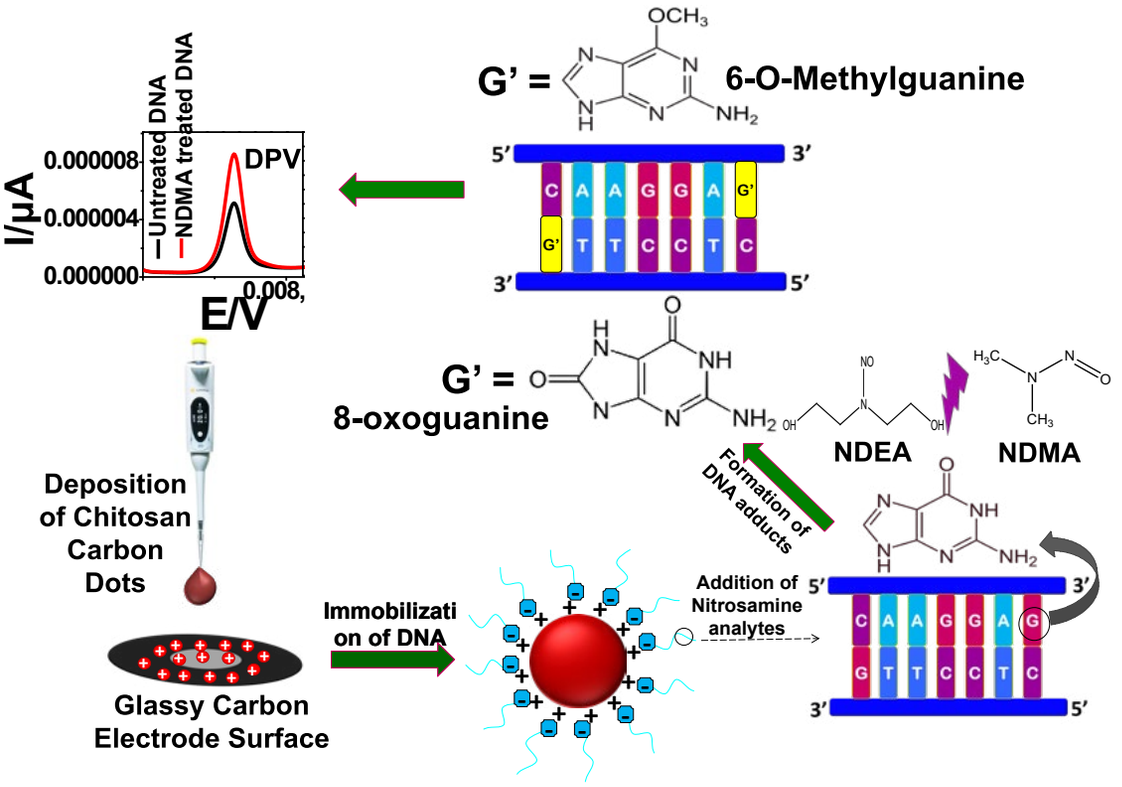


Figure 15: Scheme showing the fabrication of electrode and subsequent development of electrochemical sensor for NDEA and NDMA

(ii) Nano-Bio-Conjugate Film of Aloe Vera to Detect Hazardous Chemicals used in Cosmetics

It is of utmost importance to detect hazardous chemicals that affect human health. In this work, a simple method developed using a traditional medicinal herb, *Aloe vera,* as a carbon source to fabricate a nano-bio-conjugate film (Figure 16). The nano-bio-conjugate system comprises of *Aloe vera* gel itself and sodium alginate to form a fluorescent nano-bio-conjugate film. The film was successfully used as an optical 'turn-off' sensor in detecting analytes viz. para-aminobenzoic acid (PABA), benzophenone, hydroquinone and propylparaben, which are used in cosmetics and are listed as 'red-listed' chemicals. The applicability of the fluorescent film in detecting these hazardous chemicals were even assessed with some locally purchased cosmetic samples. Developments of such a detection system from sustainable sources make it an interesting option for fabricating sensors for hazardous chemicals.

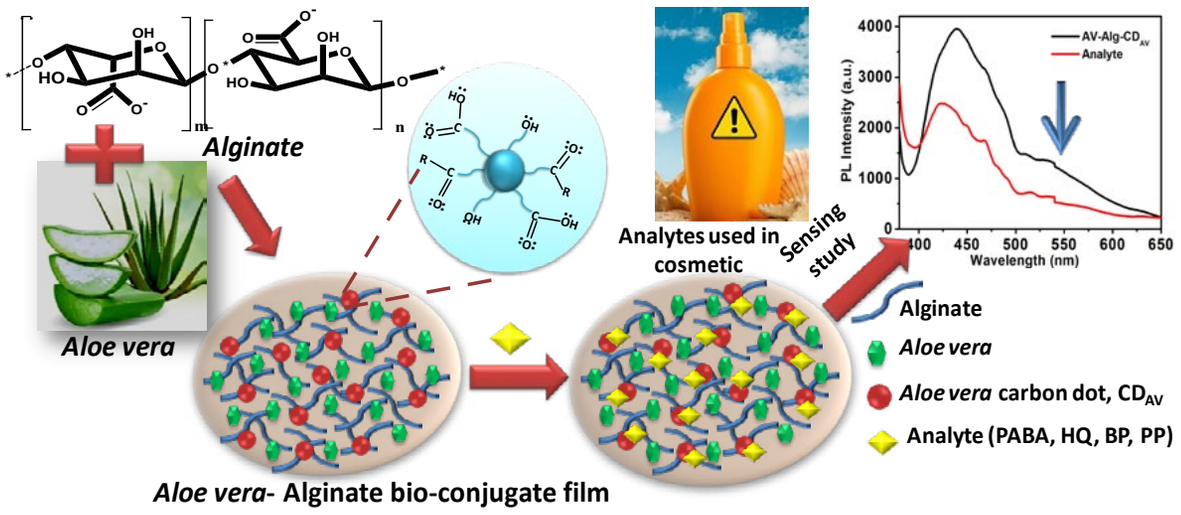


Figure 16: Scheme showing the fabrication of bio-conjugate film and its use as fluorescent based sensor for hazardous chemicals used in cosmetic.

(iii) Carbon Dots derived from water Hyacinth and its Application as Sensor for Pretilachlor

In this work, we develop a new strategy for producing carbon nanoparticles (carbon dots) using phosphoric acid as an activating agent from water hyacinth obtained from Assam, India. These carbon nanoparticles show green fluorescence under UV light, and the sizes are found below 10 nm. These carbon dots are applied as a fluorescence sensor for detecting the herbicide (pretilachlor)**.** The developed PL sensor is exclusively selective and sensitive for detection of this herbicide, and the limit of detection is found to be 2.9 μM. This sensor is also tested for real samples like soil contaminated with pretilachlor. Hence the sensing application of carbon dot in the detection of the herbicide can be considered an important step in protecting our environment. The use of a cheap source (water hyacinth waste) as a precursor material for developing the sensor makes the process sustainable.

(iv) Graphene Oxide Clay Nanocomposite as an Efficient Photo-Catalyst for Degradation of Cationic Dye

The development of nanocomposite for remediation of environmental pollutants like dye is essential in the present-day world. In this work, we successfully prepare graphene oxide–clay nanocomposite by different methods. The nanocomposite was characterized using various characterization techniques viz., UV–visible spectroscopy, Fourier-transform infra-red spectroscopy (FTIR), dynamic light scattering, X-ray diffraction (XRD), and scanning electron microscopy (SEM). The graphene oxide-clay nanocomposite was a very effective catalyst against the photodegradation of exclusively cationic dye like methylene blue (Figure 17). But the prepared nanocomposite was not found to be effective catalyst against the degradation of other anionic dyes like methyl orange and Eosin yellow. It is also demonstrated in the work that the nanocomposite catalyst can be reused several times without affecting its efficiency, the percentage degradation was 85 %, 75 % and 75 % for first, second and third cycle respectively.

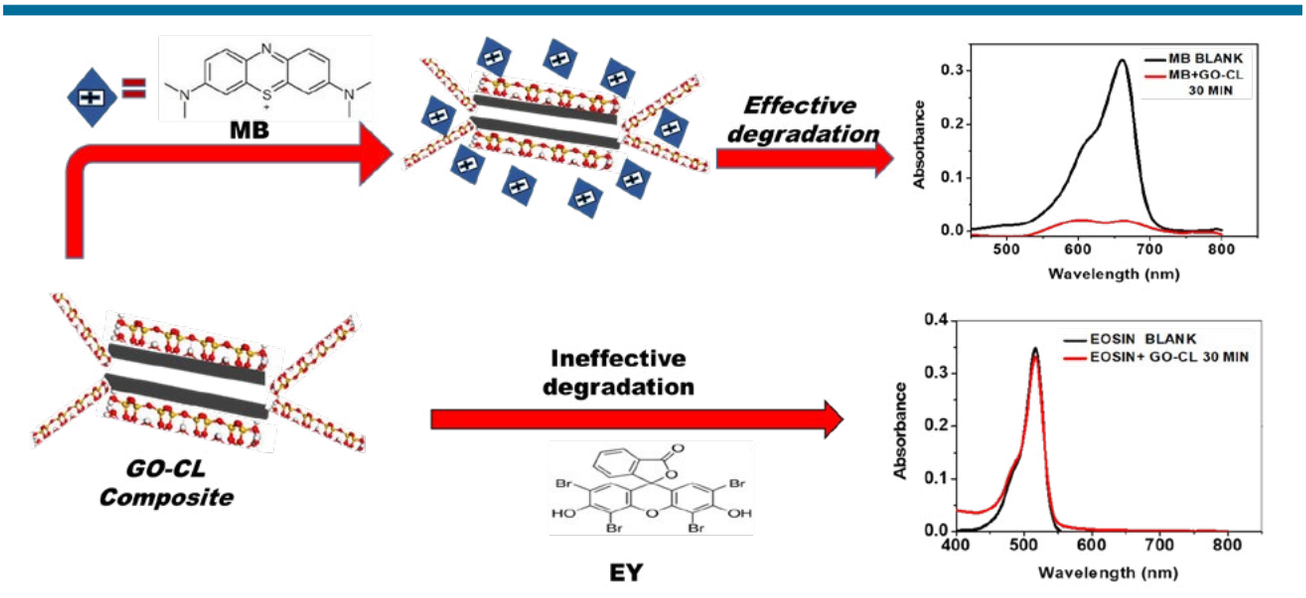


Figure 17: Scheme depicting the graphene oxide clay nanocomposite and its use as an effective photocatalyst for degradation of cationic dye.

C. Plasma Based Synthesis of Nanomaterials (Coordinator: Dr. Arup Ratan Pal)

(i) Plasma Based Process for the Synthesis of Crystalline Rubrene and Realization of a Pyro-Phototronic Device with Rubrene Based Film

Rubrene is a small molecule organic semiconductor that shows light absorption in the visible region. It is also well known for showing high charge carrier mobility. However, several experimental challenges regarding its synthesis and stability have been faced by the researchers.

In parallel, pyroelectricity is a phenomenon that utilizes polarization-dependent carriers for the generation of electric current. Generally, materials with non-centrosymmetric crystal structure induced by one of the perturbation *viz*. change in temperature, pressure or electric field across the material, can contribute to the polarization change, which is effectively utilized for high-performance device applications.

We have successfully synthesised of a fully organic framework based on crystalline rubrene thin film by a novel plasma-based single-step and environment-friendly process. In such a system, the successful phase transition of rubrene from amorphous to crystalline phase is achieved through optimization of the deposition conditions (Figure 18). Utilizing the directly grown plasma polymerized aniline-crystalline rubrene (PPA-CRB) thin-film, an optoelectronic device working under photovoltaic mode is fabricated. Our study reveals that crystalline rubrene film, prepared by this process, is useful for device fabrication, which shows photo-induced pyroelectric behavior (pyro-phototronic effect), though pyroelectricity is symmetry prohibited with rubrene being a centrosymmetric crystal. In the present system, pyro-phototronic behavior emerges solely as a result of surface layer polarization due to the presence of a very thin amorphous oxide layer formed over the crystalline rubrene film.

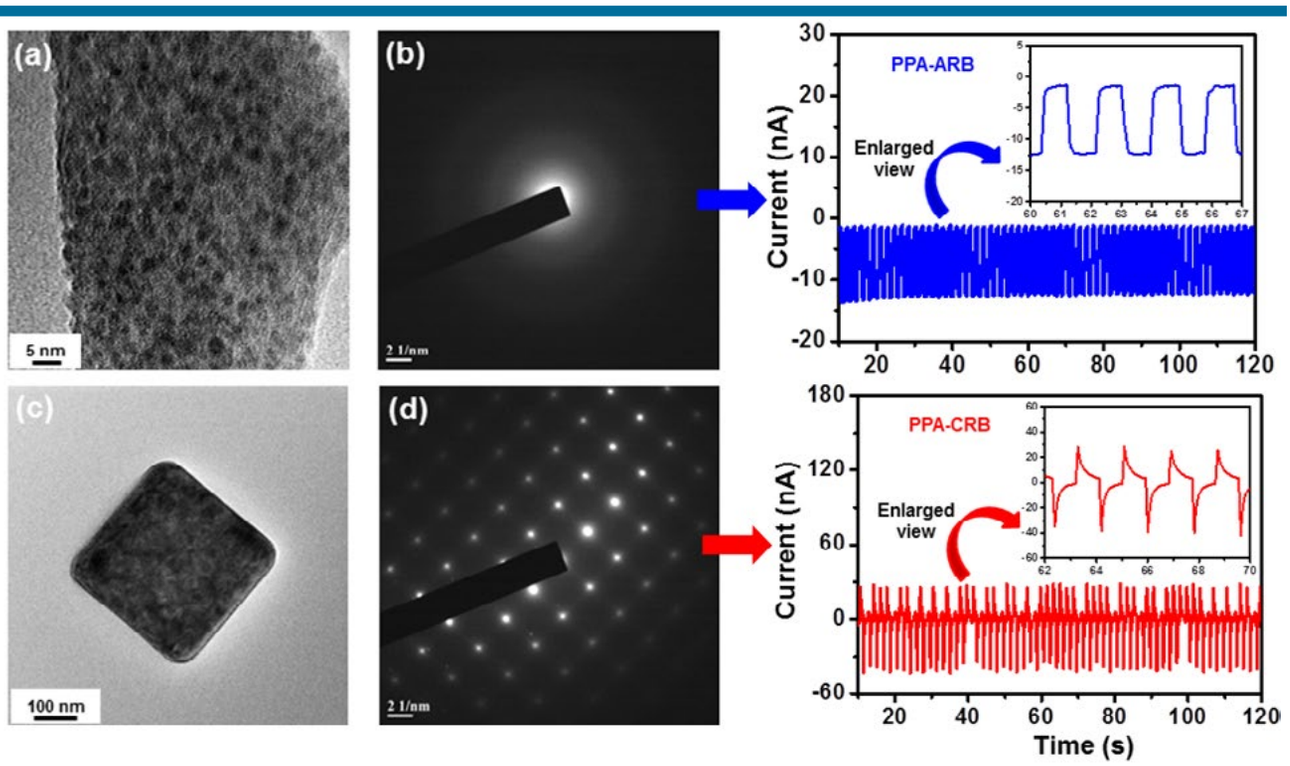


Figure 18: TEM image of (a) plasma polymerized aniline-amorphous Rubrene (PPA-ARB) film and (c) plasma polymerized aniline-crystalline Rubrene (PPA-CRB) film; selected area electron diffraction (SAED) pattern of (b) PPA-ARB film and (d) PPA-CRB film. I-t curves of the devices with PPA-ARB and PPA-CRB as active materials are shown to the right of the corresponding TEM images showing pyro-phototronic behavior for PPA-CRB device.

(ii) Development of Plasmon Thin Film Transistor using Plasma based Process

Plasmonic devices based on the coupling of resonant electromagnetic modes with free-electron oscillations in nanostructured metals have grown tremendously during the past decade. For plasmon to electric conversion device, one configuration is a transistor, known as plasmon thin film transistor.

In this work, fabrication of plasmon thin film transistor has been carried out by depositing a nanocomposite material on a pre-fabricated transistor substrate. Plasma polymerized aniline-rubrene hybrid semiconductors with attached gold nanoparticles are synthesized in a combined plasma process (Figure 19). Absorption spectra indicate that the polymer shows broad absorption in the UV-Visible region. Besides, the inclusion of gold nanoparticles (Au NPs) results in strongly enhanced absorption in the visible region of the electromagnetic spectrum due to light absorption by localized surface plasmon resonance (LSPR). The prepared thin film transistor device shows substantial augmentation of drain current when irradiated by a light source 520 nm where plasmon resonance takes place, leading to significantly high responsivity and detectivity. The plasmon thin film transistor with enhanced photoresponse in the visible region can be a promising device for future technologies.

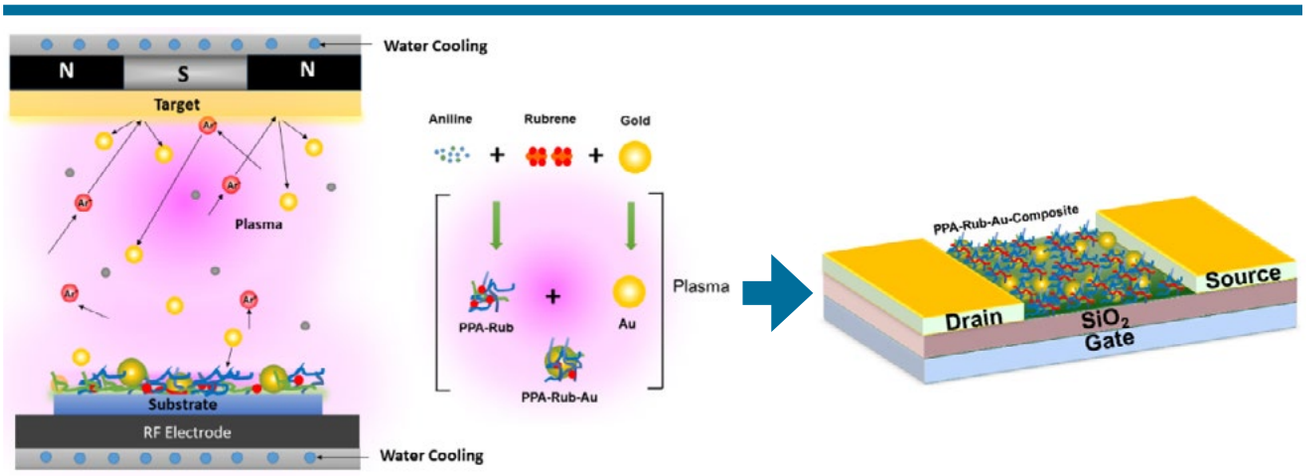


Figure 19: Graphical representation of the combined process of plasma polymerization of Aniline-Rubrene (PPA-Rub) and magnetron sputtering of Gold (Au) (left panel). Graphical representation of the plasmon transistor with active layer of PPA-Rub-Au as the composite material (right panel).

(iii) Study of Hot Carrier Generation from Titanium Nitride as Alternative Plasmonic Material

Since the inception of the field of plasmonics, Gold (Au) and Silver (Ag) has been used as plasmonic materials. However, the rapid development of this field demands the exploration of new materials. In this regard, titanium nitride (TiN) can be a proper substitute for conventional plasmonic materials.

One of the main advantages of using TiN is its flexibility of tuning the LSPR band from visible to the NIR region. We have synthesized two TiN samples where one sample (TiN-1) shows plasmon absorption band in the visible part, and the other one (TiN-2) shows LSPR in the NIR region. The electron microscopic study of TiN-1 shows the formation of almost spherical nanoparticles of average size around 5 nm. But the nanoparticles in the TiN-2 sample are a little bigger in size (average size 12 nm). Moreover, the particles are distorted spheroid shaped and comparatively densely packed. So, all these effects cause a significant red-shift of LSPR of TiN. We also found that apart from the size, shape, and distribution of the nanoparticles, the stoichiometry of the synthesized samples plays a major role behind this shift. The samples' stoichiometry is studied by the X-Ray Photoelectron Spectroscopy (XPS) (Figure 20). XPS study shows that apart from the pure TiN phase, the samples also contain a significant Ti-N-O and Ti-O phases. Residual oxygen present inside the chamber is the origin of those two oxygen-related phases. We found that the relative amount of Ti-N and Ti-N-O plays a major role in selecting the LSPR band of TiN. TiN-1 sample shows visible plasmon absorption as the Ti-N phase dominates over Ti-N-O, but in the case of TiN-2, the Ti-N-O phase is the dominating one. That is why this oxynitride dominating phase shows LSPR in the NIR region.

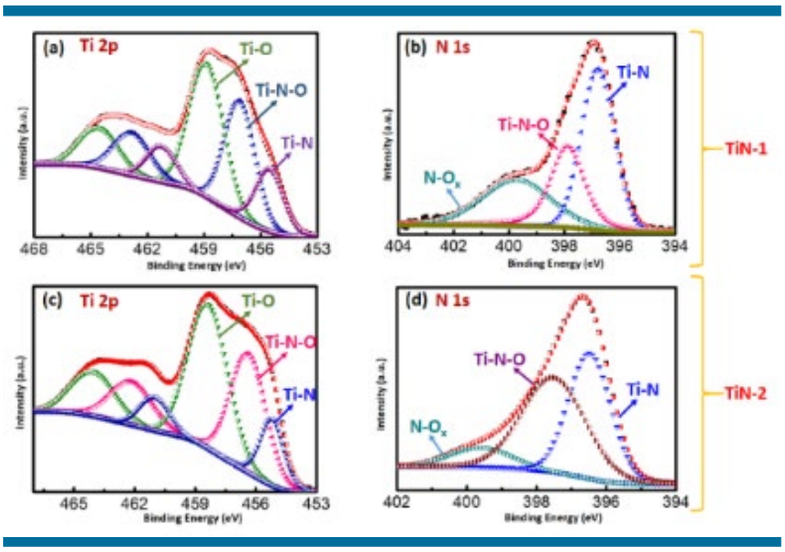


Figure 20: Deconvoluted XPS spectra of Ti 2p and N 1s of TiN-1 and TiN-2

After the successful synthesis of wavelength-tunable TiN samples, we have fabricated plasmon based optoelectronic devices operating in respective LSPR regions of the two synthesized TiN samples. Hot carriers are generated when plasmon decays – this is the main motive behind the fabrication of photo-devices using plasmonic materials. Distribution of plasmon energy among electrons and holes is dependent on the choice of the material. For plasmonic TiN, plasmon energy is almost equally distributed among both the carriers. So, we have fabricated two types of photo-devices – in one type, TiN is associated with p-type CuO semiconductor where hot holes

are responsible for photocurrent generation. In the other type of the device, TiN is associated with n-type TiO2 semiconductor, where the flow of hot electrons generate photocurrent. The generation of these two types of hot carriers in two different devices is studied in detail.

D. Materials Modelling and Simulation (Coordinator: Dr. Munima B. Sahariah)

(i) Global Optimization and Electronic Properties of Metal Nitrides

The research field of 'Plasmonics' is all about the interaction of light with the matter under resonant conditions. This resonant light-matter interaction in some particular materials gives rise to unique optical, electrical, and thermal properties. In recent times, metal nitrides have come up as prospective alternative plasmonic materials against the conventional ones consisting of noble metals. We focus on titanium nitride, which is a refractory material and hence is stable against the heat caused by absorption of light. Our approach is to probe the electronic and optical properties of the titanium nitride nanoclusters using ab-initio molecular dynamics (AIMD) and Density Functional Theory (DFT). The prerequisite for this is to search for the structures of the nanoclusters corresponding to the global minima of their respective energy surfaces. Thus, the systems are annealed and simulated at sufficiently high temperature and then quenched to trap the global structure. The calculation of the electronic Density of State (DOS) of these nanoclusters reveals their metallic nature.

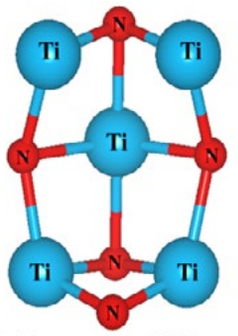


Figure 21: Global Minima Geometry of Ti5N5 Nanocluster System obtained from AIMD Simulation

(ii) Magnetic Properties of Inverse Heusler Compound

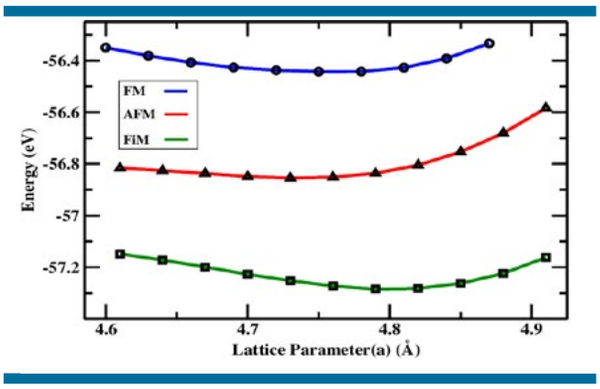


Figure 22: Comparison of Lattice Parameter vs. Energy plots among Ferromagnetic, Antiferromagnetic, and Ferrimagnetic structure of Mn2PtSn

The magnetic materials exhibiting non-collinear spin structures, which have a significant probability for applications in spintronic devices, are among the noted things that keep the researchers more enthusiastic about the simulation of these materials. As the magnetic properties of Heusler compounds can be tuned easily, one can concentrate on modelling of a Heusler compound with noncollinear spins which will be stable in a range of temperatures. Recently, Mn_2-based Heusler alloys have drawn much attention due to their high magnetocrystalline anisotropy (MCA) and high Curie temperature well above room temperature. We take up Mn-Pt-Sn composition for simulation, which has experimentally shown stable non-collinear magnetic skyrmion structures. Before going into the non-collinear structures it is first essential to understand the magnetic properties of the collinear states in the system under consideration. The system has been optimized with three different collinear magnetic structures i.e., ferromagnetic, anti-ferromagnetic and ferri-magnetic out of which ferri-magnetic structure has been found to be the most stable one.

E. Soft Materials and Nanomaterials at Interfaces and Inside Bulk (Coordinator: Dr. Sarathi Kundu)

Soft materials show fascinating structural and physical properties at interfaces and also in solutions. Specific structures, interactions, and properties are explored from the thin films and solutions of such systems at different physicochemical conditions.

(i) pH-Dependent Structure, Pattern and Hysteresis Behaviour of Lipid-Protein Monolayer Complex

Understanding lipid-protein interactions in model membranes is a challenging task. Limited information exists regarding the relative influence of hydrophobic and electrostatic forces on the organization of proteins inside

model membranes, while these forces determine the structure of lipid-protein complexes. We measured the surface pressure (π) - molecular area (*A*) isotherm cycles of protein (BSA) – lipid (DMPA) mixed monolayers below and above the isoelectric point of BSA (≈ 4.8). At pH 4.0, below the isoelectric point, BSA is positively charged and exposes few hydrophobic groups at its surface, compression-decompression isotherms show a nearly reversible hysteresis. At pH ≈7.0, above the isoelectric point, BSA is negatively charged and more hydrophobic. At this pH, compression-decompression isotherms show an irreversible hysteresis. This behaviour indicates that the deformation of BSA molecules under pressure is reversible below the isoelectric point, while it becomes irreversible above it. X-ray reflectivity (XRR) studies for protein-lipid mixed monolayers show that BSA molecules move from the zone close to the water and near the lipid polar heads toward the zone occupied by their hydrocarbon tails when surface pressure increases. The surface pressure in combinations with hydrophobic and electrostatic interactions is mostly responsible for such structural modifications (Figure 23).

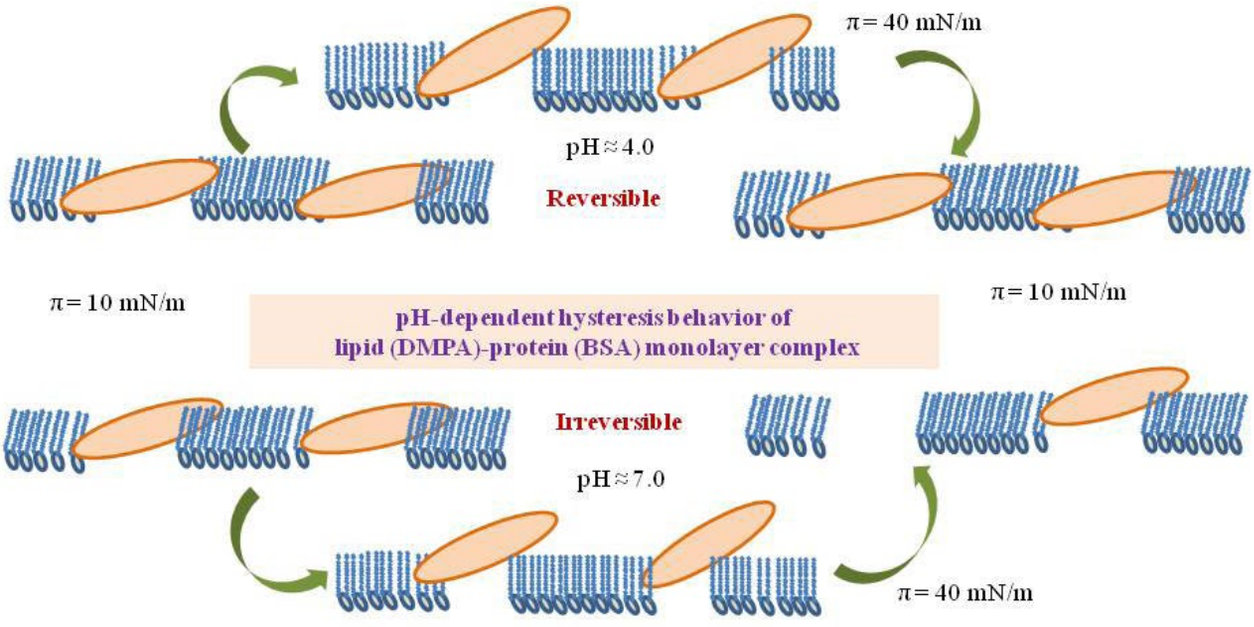


Figure 23: Schematic representation of structural modifications for lower (10mN/m) and higher (40mN/m) surface pressure at (a) pH ≈ 4.0 and (b) pH ≈ 7.0. DMPA-BSA mixed monolayer gets a modification at higher surface pressure.

(ii) Behavior of Protein-Lipid Mixed Monolayer on the Spreading Order of the Individual Component

Surface pressure (π) – mean molecular area (*A*) isotherms of protein (BSA)-lipid (DMPA) mixed films are examined by varying their ratio and altering the spreading order of BSA and DMPA on the watersurface to study the protein-lipid interactions and the corresponding structures and patterns at different interfacial conditions. *π–A* isotherms and compression-decompression isotherm cycles of protein-lipid mixed monolayers below and above of the isoelectric point of BSA (pI ≈ 4.8) are also examined. Below the isoelectric point of BSA (pH ≈ 4.0), i.e., when BSA is weakly hydrophobic and has a net positive charge, it shows low hysteresis irrespective of the spreading order of the molecules. However, at pH ≈ 7.0, i.e., when the overall charge of BSA is negative and is strongly hydrophobic, the protein-lipid mixed films display higher hysteresis value. Besides, the properties of the isotherms, the surface morphology and secondary conformations of protein inside the mixed films are obtained from XRR, AFM and FTIR spectroscopy, respectively after depositing the mixed films on solid substrates. Nearly similar information is obtained after altering the spreading order of BSA and DMPA, which indicates that the spreading of molecules on the water surface is one of the better ways of forming the lipid-protein mixed film at the air-water interface (Figure 24).

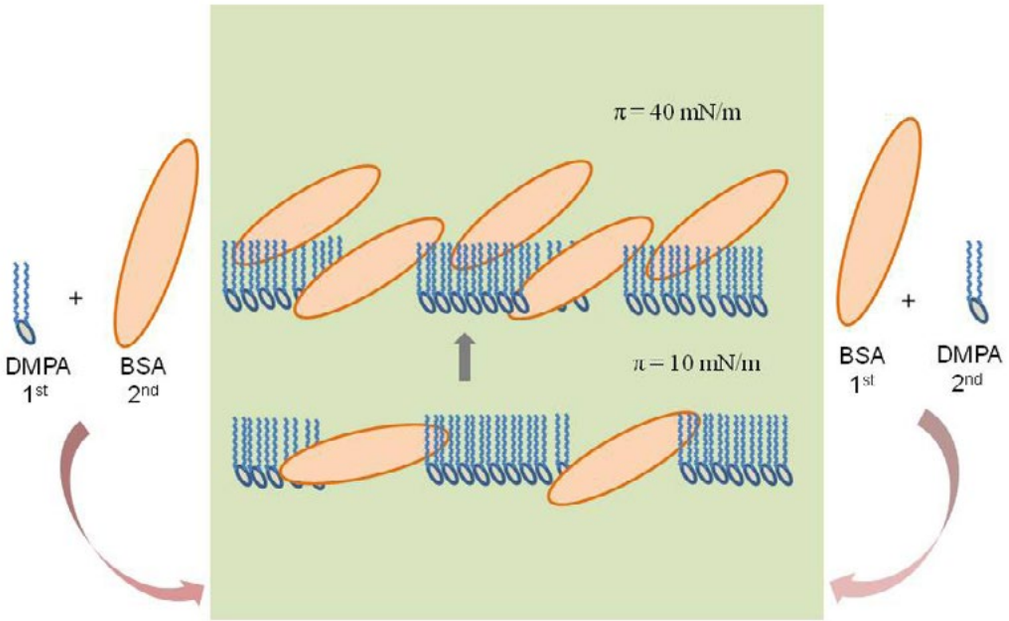


Figure 24: Schematic representation of the structural modifications of the protein-lipid mixed films for lowers (10 mN/m) and higher (40mN/m) surface pressure at a particular subphase pH for two different spreading conditions, i.e., for BSA-DMPA and DMPA-BSA conditions. Nearly the same structural and morphological information are obtained for both the BSA-DMPA and DMPA-BSA mixed film.

(iii) Förster Resonance Energy Transfer-mediated Globular Protein Sensing using Polyelectrolyte Complex Nanoparticles

Polyelectrolyte complex nanoparticles (PEC NPs) are synthesized using two oppositely charged polyelectrolytes, i.e., anionic poly (sodium 4-styrene sulfonate) (PSS) and cationic poly (diallyledimethylammoniumchloride) (PDADMAC) at molar mixing ratios (n^-/n^+) of ≈ 0.4, 0.67, 0.75 and 1.5 by applying consecutive centrifugation to modify the optical property of PSS. However, for n^-/n^+ ≈ 0.75, PEC NPs exhibit larger blue-shift and specific emission peak occur at ≈ 278 nm for the 225 nm excitation. The mechanism of such modification of PSS emission after complex formation is proposed. This specific emission by PEC NPs nearly matches with the optical absorption wavelength of globular proteins. The emission intensity of PEC NPs is therefore quenched in the presence of globular proteins (bovine serum albumin, human serum albumin, lysozyme, and hemoglobin) through resonance energy transfer between the donor (PEC NPs) and acceptor (globular proteins). The spectral overlap integral and the variation of the separation distance from 1.8 to 2.5 nm between the donor and acceptor confirms the resonance energy transfer. Sensing of proteins by the PEC NPs is possible within the detection limit of 5 nM. Therefore, such PEC NPs can be used as an efficient and promising protein sensing material (Figure 25).

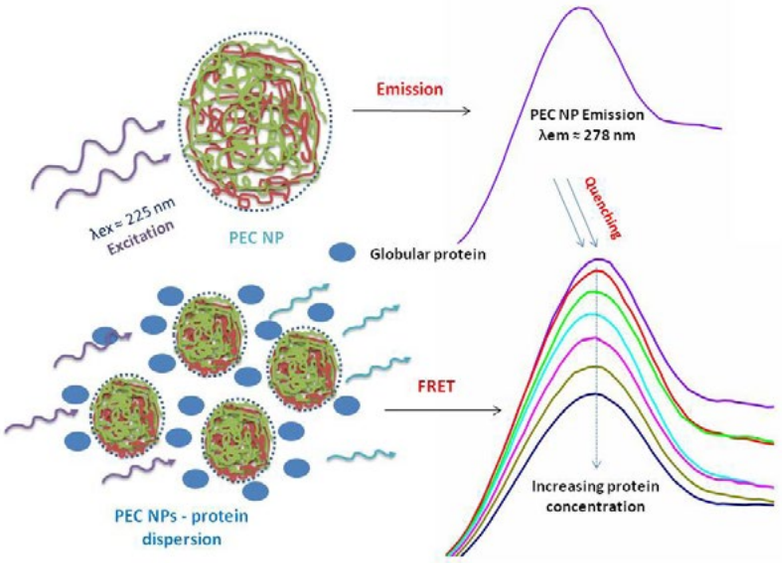


Figure 25: Schematic illustration of the emission and quenching behaviour of PEC NPs in presence of different globular proteins

F. Plasmonics for Energy Conversion (Coordinator: Dr. Biswajit Choudhury)

Hot Electron Injection and Interfacial Charge Separation in Plasmonic Photocatalysis

Harvesting and confining visible to NIR photons at a nanoscale gap is useful for plasmon driven photochemical energy conversion. Hot electrons generated by surface plasmon decay can be exploited for photocatalytic removal of phenol under visible light. The detoxification of water is performed using Ag-TiO_2(B)-C_3N_4(CN) and Au-TiO_2(B)-C_3N_4(CN) ternary photocatalysts. A large density of Au nanoparticles is anchored on the porous edges of TiO_2(B) nanorods. These porous sites and the surface of TiO_2(B) have a sparse distribution of oxygenated defects and Ti^{3+}, wherein Ag and Au firmly adhere. The charge transfer interaction between metal nanoparticles and TiO_2(B) is evident from the negative binding energy shift of Ag 3d and Au 4f peaks in the XPS. The rate of phenol removal with pristine TiO_2(B) is 7.7 $\times 10^{-3}$ min^{-1}. The photocatalytic rate from Au-TiO_2(B) to Au-TiO_2(B)-CN increases from 1.9×10^{-2} min^{-1} to 3.2×10^{-2} min^{-1}. The photodegradation rate increases from 2.3×10^{-2} min^{-1} in Ag-TiO_2(B) to 4.8×10^{-2} min^{-1} in Ag-TiO_2(B)-CN (Figure 26a). It seems that Ag containing samples show better photocatalytic response than Au containing does. The reason is the longer mean free path of electrons in Ag than in Au as well as a lesser interparticle separation in Ag dimers than Au dimers. Thus, Ag containing samples shown considerable accumulation of hot-electrons at the interparticle distance or the hot-spot regions. Photocurrent response for the samples is measured under visible light (400-800 nm) and at 470 nm, 510 nm, and 575 nm. Photoresponse in the ternary system under visible light (Figure 26b) is higher than under monochromatic 510 nm excitation (Figure 26c). The selective excitation promotes Ti^{3+} excitation and hot electron transfer from metal to TiO_2(B). However, visible light excitation triggers both hot-electron transfer and interfacial charge separation in the ternary heterojunction. The Ti^{3+} states in TiO_2(B) promote direct hot electron transfer from metal to semiconductor (Figure 26d).

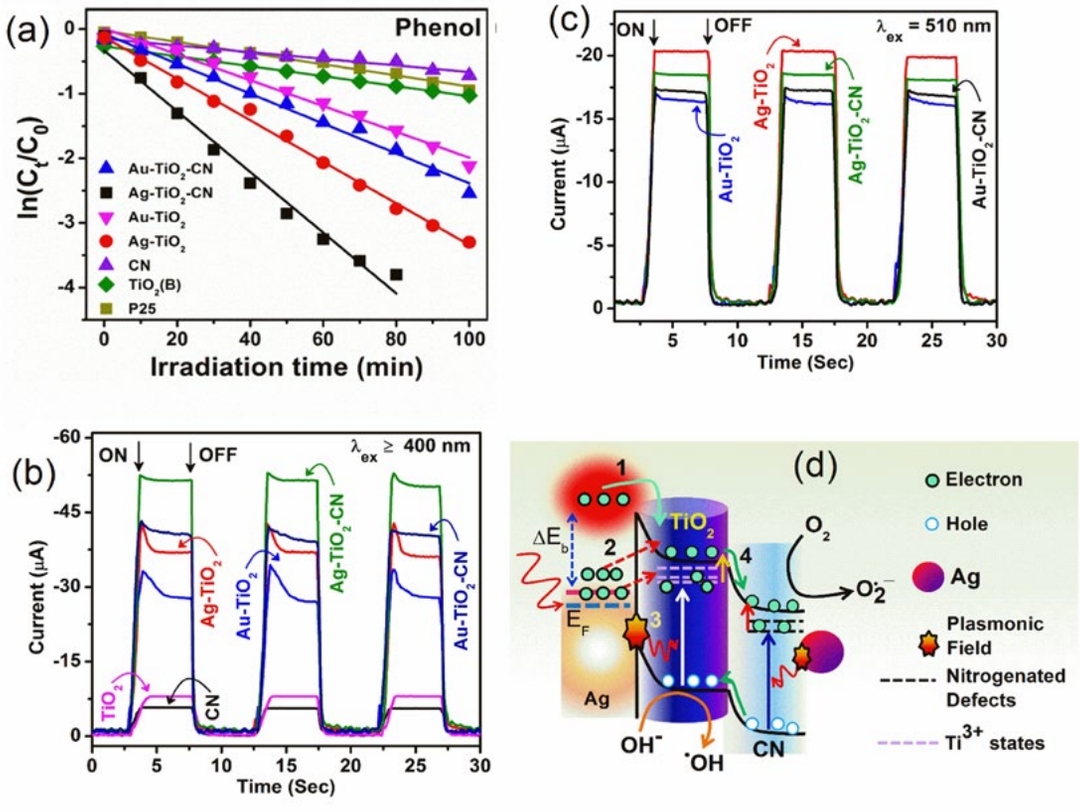


Figure 26: The rate of phenol removal from water under visible light using different photocatalyst (a). The photocurrent responses recorded under the visible light (b) and 510 nm excitation (c). The mechanism of plasmonic hot-electron transfer and interfacial charge separation in Ag-TiO_2(B)-CN (d).

G. Metal Organic Frameworks (MOFs) (Coordinator: Dr. Anamika Kalita)

MOFs are considered a hybrid of organic-inorganic entities with extended porous structures composed of positively charged metal ions linked by organic ligands/linker molecules, leading to many MOF structures with compositional and architectural variety unlike many other materials available. Their structural diversity with uniform pore structures and tunable porosity, flexibility in network topology, geometry, and chemical functionality leads to high selectivity and increased binding ability towards visitor molecules such as gases, ions. Therefore, MOFs have emerged as excellent materials of high potential in gas adsorption, storage, and separation. Amongst various organic molecules available for preparing organic ligands/linkers, 1,4,5,8-Naphthalene Diimide derivatives (NDIs), a class of neutral, π-conjugated, planar, highly redox-active compounds possessing an ease of substitution with varied functionality on the diimide nitrogen, are often considered as excellent candidates for making potential functional ligands for construction of MOF structures. Their planar, aromatic structure and electron-deficient core strongly interact with guest species. Therefore, our research group mainly focused on the development of organic linkers of Naphthalene Diimide via simple condensation reaction with different pendant moieties such as isoniazid, pyridine, isophthalic acid, salicylic acid derivatives with suitable coordinating sites to have potential interaction with metal ions to construct porous MOFs. As a part of the extension of earlier work, few MOFs have been successfully developed by utilizing the as-synthesized organic linkers of NDI with metal ions (Ca, Mg, Zn) and their adsorption properties towards environmentally concern gases like CO_2 has effectively been investigated as compared to N_2 gas (Figure 27). The obtained results indicate the effectiveness of porous MOF towards the adsorption of CO_2 gas.

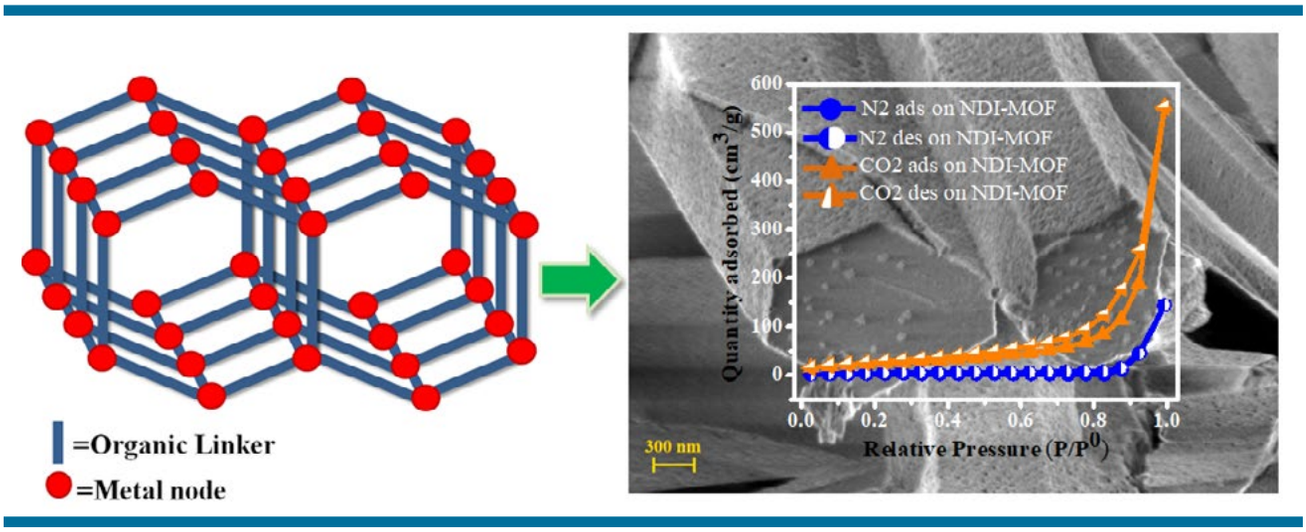


Figure 27: Schemetic illustration of CO_2 adsorption properties of porous NDI-MOF.

RESEARCH OUTPUT

Extramural Projects

Ongoing projects

Title of the project	Funding Agency; Total fund; Duration; PI/Coordinator	Goal
Plasma Based Synthesis of Materials for Plasmonic Infrared Photodetector	**Funding Agency:** SERB, Government of India **Total Fund:** Rs. 83.20 Lakh **Duration:** 2018-2021 **PI/Coordinator:** Dr. Arup Ratan Pal, IASST **Co-Investigator:** Prof. H. Bailung, IASST	Preparation of Infrared (IR) transparent electrode by growing carbon nanostructures by atmospheric pressure glow discharge plasma enhanced chemical vapour deposition process. Synthesis of IR absorbing nanostructures by magnetron sputtering and tuning the plasmon absorption band of the nanostructures up to 3000 nm by tailoring the properties of the material with optimization of Synthesis Conditions. Development of Plasmonic IR detector by using the above mentioned IR transparent electrode and IR absorbing nanostructures, and study of the device performance including spectral responsivity, detectivity, time response and stability, and study of device photo-physics.
Development of Nanoparticle or Microparticle Adjuvanted Subunit Oral vaccine against Poultry Salmonellosis	**Funding Agency**: DBT, New Delhi, Twinning Program **Total Fund**: Rs. 18.43 lakh **Duration**: 2016-2019 **PI/Coordinator**: Dr. Devasish Chowdhury	The present study has been undertaken with the hypothesis that the subunit vaccine formulation comprising whole outer membrane protein (obtained from capsular type A and D of pasteurellamultocida) that are adjuvanted with either calcium phosphate nanoparticle or aluminum hydroxide nanoparticles or poly-lactide co-glycolidemicroparticles would confer protective immune in pigs against swine pasteurellosis. In the present proposal it is hypothesized that calcium phosphate nanoparticle or aluminum hydroxide nanoparticle adjuvanted outer membrane protein vaccine would give strong antibody response and would replace the conventional alum adjuvanted vaccine.
Non-collinear Magnetism in Heusler Materials	**Funding Agency**: DST, Govt. of India **Total Fund**: Rs. 25.20 Lakh **Duration**:2020-2023 **PI/Coordinator**: Dr. Munima B. Sahariah	Aim of this research is to understand the stability and pinning behaviour of noncollinear skyrmionic magnetic structure in mn-based heusler alloy.
DST INSPIRE Faculty Award "Hybrid nanomaterials of semiconductor metal oxides-carbon nanomaterials deposited with noble metal nanoparticles for energy and environmental applications".	**Funding Agency**: DST Government of India **Total Fund**: Rs. 35 Lakh **Duration**: 2016-2021 **PI/Coordinator**: Dr. Biswajit Choudhury	The project aims to understand the photocatalytic activity of semiconductor metal oxides (TiO_2, ZnO, CeO_2, etc.) and Carbon Nanomaterials (Graphene, C_3N_4) in pristine as well as in its hybrid forms deposited with Au, Ag, etc. under the illumination of visible light. Plasmonic effect tunability with size, shape variation will also be considered.

Title of the project	Funding Agency; Total fund; Duration; PI/Coordinator	Goal
DST INSPIRE Faculty Award "A Facile Strategy Towards Naphthelene Diimide based Metal Organic Frameworks-Polymer Composite Membrane as Traps for Selective Capture of CO_2".	**Funding Agency:** DST, Government of India **Total Fund**: Rs. 35 Lakh **Duration**: 2018-2023 **PI/Coordinator**: Dr. Anamika Kalita	The project aims to design potentially active organic linkers as well as Metal Organic Frameworks (MOFs). Employing Naphthalene Diimide as core entity with various pendent groups such as salicylic acid, pyridine, isoniazid, isophthalic acid having -OH, -COOH, $-NH_2$ as coordinating sites are consideredfor tuning the structural property as well as adsorption behavior towards guest analytes. Adsorption behavior of environmentally concern pollutants via using as-synthesized MOFs and their derived polymer composites will also be investigated.

Publications

In cited journals

Author(s)	Title	Journal Name	Volume & Issue No./Page No.	Month/ Year of Publication
Sristi Majumdar, Debajit Thakur, Devasish Chowdhury	DNA Carbon-Nanodots Based Electrochemical Biosensor for Detection of Mutagenic Nitrosamines	ACS Applied Bio Materials	3(3)/ 1796	February/ 2020
Ankita Deb, Rasna Saikia, and Devasish Chowdhury	Nano-Bioconjugate Film From Aloe Vera to Detect Hazardous Chemicals Used in Cosmetics	ACS Omega	4(23)/ 20394	November/ 2019
Kailash Barman, Devasish Chowdhury and Pranjal K. Baruah	Bio-Synthesized Silver Nanoparticles Using Zingiber Officinale Rhizome Extract as Efficient Catalyst for the Degradation of Environmental Pollutants	Inorganic And Nano-Metal Chemistry	50(2)/ 57	September/ 2019
Achyut Konwar, Ankita Deb, Archita Kar, Devasish Chowdhury	Dual Emission Carbon Dots from Carotenoids: Converting a Single Emission to Dual Emission	Luminescence	34(8)/ 790	August/ 2019
Manash Jyoti Deka, Parlie Dutta, Sewaljyoti Sarma, Okhil Kumar Medhi, Narayan Chandra Talukdar, Devasish Chowdhury	Carbon Dots Derived from Water Hyacinth and their Application as A Sensor for Pretilachlor	Heliyon	5/ e01985	June/ 2019
Jahnabi Gogoi, Abhipsa Dev Choudhury, Devasish Chowdhury	Graphene Oxide Clay Nanocomposite as an Efficient Photo-Catalyst for Degradation of Cationic Dye	Materials Chemistry and Physics	232/ 438	May/ 2019
Jayanta Sarmah Boruah and Devasish Chowdhury	Hybrid Oleic Acid-Graphene Quantum Dot Vesicles for Drug Delivery	Chemistry Select	4/ 4347	April/ 2019
Santanu Podder and Arup Ratan Pal	Plasmonic Visible-NIR Photodetector Based on Hot Electrons Extracted from Nanostructured Titanium Nitride	Journal of Applied Physics	126/083108	August/ 2019

Author(s)	Title	Journal Name	Volume & Issue No./Page No.	Month/ Year of Publication
Shantanu Podder and Arup Ratan Pal	Hot Carrier Devices Using Visible and NIR Responsive Titanium Nitride Nanostructures with Stoichiometry Variation	Optical Materials	97/ 109379	November/ 2019
Sweety Biswasi, Arup Ratan Pal	Plasmon Thin Film Transistor Using Plasma Polymerized Aniline–Rubrene–Gold Nanocomposite in One-Step Process	Plasma Chemistry and Plasma Processing	40/ 371	September/ 2019
Hrishikesh Talukdar, Sarathi Kundu	Förster Resonance Energy Transfer-Mediated Globular Protein Sensing Using Polyelectrolyte Complex Nanoparticles	ACS Omega	4/ 20212	November/ 2019
Bijay Kumar Sah, K. Das, SarathiKundu	pH-Dependent Structure, Pattern and Hysteresis Behaviour of Lipid (DMPA)- Protein (BSA) Monolayer Complex	Colloids and Surfaces A	579/ 123663	July/2019
Bijay Kumar Sah, Sarathi Kundu	Behaviour of Protein (BSA)-Lipid (DMPA) Mixed Monolayer on the Spreading Order of the Individual Component	Chemistry and Physics of Lipids	225/ 104810	August/ 2019
Biswajit Choudhury, Ujjal Saikia, Munima B. Sahariah, Amarjyoti Choudhury	Vacancy Induced p-Orbital Ferromagnetism in MgO Nanocrystallite	Journal of Alloys and Compounds	819/153060	November/ 2019
Trishamoni Kashyap, Sweety Biswasi, Arup Ratan Pal, Biswajit Choudhury	Unraveling the Catalytic and Plasmonic Roles of g-C_3N_4 Supported Ag and Au Nanoparticles Under Selective Photoexcitation	ACS Sustainable Chemistry and Engineering	7(23)/ 19295	October/ 2019
K.K. Paul, P.K. Giri, H. Sugimoto, M. Fuji,Biswajit Choudhury	Evidence for Plasmonic Hot Electron Injection Induced Superior Visible Light Photocatalysis by g-C_3N_4 Nanosheets	Solar Energy Materials and Solar Cells	201/110053	July/ 2019
Anamika Kalita, Akhtar Hussain Malik, Neelotpal Sen Sarma	Stimuli-Responsive Naphthalene Diimide as Invisible Ink: A Rewritable Fluorescent Platform for Anti-Counterfeiting	Chemistry-An Asian Journal	15(7)/ 1074	January/ 2020

Conference Proceedings

Author(s)	Title	Journal Name	Volume & Issue No./Page No.	Month/ Year of Publication
Hrishikesh Talukdar, Suman Sarkar, Sarathi Kundu	Electrical Investigation on Thin Films of Poly (3,4-Ethylenedioxythiophene): Poly (Styrenesulfonate) in Presence of Cationic Polyelectrolyte	AIP conference Proceedings (Published by the American Institute of Physics)	2115/ 030286-1-030286-4	July/ 2019
Bijay Kumar Sah, SarathiKundu	Surface pH Induced Hysteresis Behavior of Lipid (DMPA)-Protein (BSA) Complex Monolayer	AIP conference Proceedings (Published by the American Institute of Physics)	2115/ 030285-1-030285-4	July/ 2019
Ashim Chandra Bhowal, Subhankar Pandit, Sarathi Kundu	Lysozyme Induced Luminescence Gold Nanoclusters as Hg^{2+} Sensor	AIP conference Proceedings (Published by the American Institute of Physics)	2115/ 030094-1-030094-4	July/2019

Author(s)	Title	Journal Name	Volume & Issue No./Page No.	Month/ Year of Publication
Subhankar Pandit, SarathiKundu	Optical Activity of Polyelectrolyte (PSS) – Protein (Lysozyme) Complexes	AIP conference Proceedings (Published by the American Institute of Physics)	2115/ 030037-1-030037-4	July/2019
Raktim Jyoti Sarmah, Bijay Kumar Sah, Sarathi Kundu	Monolayer Behavior of Human Serum Albumin (HSA) at Air-Water Interface	AIP conference Proceedings (Published by the American Institute of Physics)	2115/ 030043-1-030043-4	July/2019
Suman Sarkar, SarathiKundu	Structure, Morphology and Electrical Behaviors of Polymer (Polystyrene)-Metal (Copper) Composite Thin Films	AIP conference Proceedings (Published by the American Institute of Physics)	2100/ 020100-1-020100-4	April/2019

Book Chapter

Authors	Other Details
Neelotpal Sen Sarma, P. Dutta and S. Chakravarty	**Chapter 9:** Sustainable Nanostructural Materials in Biosensor Application **Book:** Dynamics of Advanced Sustainable Nanomaterials and Their Related Nanocomposites at the Bio-Nano Interface, **Publisher:** Elsevier, **Year of Publication:** 2019 **ISBN**: 978-0-12-819142-2
Chayanika Devi, Pankaj Kalita, Devasish Chowdhury and Manash Barthakur	**Chapter 5**: Preparation and Characterization of Gold Nanoparticles Conjugated Insulin **Book**: Smart Healthcare for Disease Diagnosis and Prevention **Publisher**: Academic Press **Year of Publication**: 2020 **ISBN**: 978-0-12-897113-0
Madhusmita Dhupal, Mukesh Kumar Gupta, Dipti Ranjan Tripathy, Mohit Kumar, Dong Kee Yi, Sitansu Sekhar Nanda, and Devasish Chowdhury	**Chapter 3**: Recent Advances in Pharmaceutical Applications of Natural Carbohydrate Polymer Gum Tragacanth **Book**: Natural Polymers for Pharmaceutical Applications, Volume 1: Plant Derived Polymers **Publisher**: Apple Academic Press **Year of Publication**: 2020 ISBN: 9781771888455
Biswajit Choudhury, Anamika Kalita	**Chapter 3**: Defect Engineered Inorganic Materials for Supercapacitor **Book**: Inorganic Nanomaterials for Supercapacitor Design **Publisher**: CRC Press **Year of Publication**:2019 **ISBN**: 9780429277900

Patents

Inventor(s)	Title	File no. for enrollment	Provisional/final patent grant no.	Issue no. of patent office
Neelotpal Sen Sarma, Dass and Samiran Upadhyaya.	A Waterborne Thermally Stable Fluorescent Acrylic Based Adhesive and a Green Method of Synthesis of the Adhesive	202031001224	N/A	No. 202031001224 filed on 10.01.2020
Arup R. Pal, Amreen Ara Hussain and Deepshikha Gogoi	A Process for Synthesis of Crystalline Rubrene Incorporated Thin Film	Indian Patent, Application No. 201931016529 dated 25-04-2019	N/A	--

Presentation in Conferences/Seminars

Invited Talk

Faculty	Title	Programme Name	Date & Venue
Devasish Chowdhury	Introduction to Electron Microscopy	"Material characterization and Tribology" under TEQIP-III	3rd-4th May, 2020, Assam Science and Technology University (ASTU), Guwahati.
Dr. Devasish Chowdhury	Writing Collaborative Research Project	Workshop on "Writing Effective Collaborative Research Proposals"	27th February, 2020, NEDFi Convention center, Guwahati organized by ASTU
Devasish Chowdhury	Carbon Based Bio-Polymer Nanocomposites	International Conference on Emerging Trends in Chemical Sciences (ETCS-2020)	13th-15th February, 2020, Gauhati University, Guwahati.
Devasish Chowdhury	Carbon Nanomaterials	A Discussion Meeting on "Future Collaborative Research in Nano"	9th-10th January, 2020, IIT Guwahati
Devasish Chowdhury	Introduction to Nanoscience and Nanotechnology	A day-long Public Outreach and Curtain Raiser Programme of India International Science Festival, IISF-2019.	2nd November, 2019, IASST, Guwahati
Devasish Chowdhury	Hybrid Nano-Biopolymer Composites with Varied Applications	International Symposium on Sustainable Polymers & National Symposium on Chemistry Education for Sustainable Engineering	23rd-25th August, 2019, IIT Guwahati, Guwahati
Devasish Chowdhury	Carbon Based Bio-Polymer Nanocomposite with Superior Properties	International Conference in Advances in Polymer Science and Rubber Technology" (APSRT 219)	24th-27th September, 2019, IIT Kharagpur, Kharagpur
Arup R. Pal	Plasma based Synthesis of Materials for Optoelectronic Devices	12th International Conference on Plasma Science and Applications (ICPSA-2019)	University of Lucknow, November 11-14, 2019
Arup R. Pal	1. Plasma based synthesis of nanomaterials for optoelectronic devices. 2. Plasma Process for Growth of Carbon Nanostructures. 3. Radiofrequency Plasma Technology for Corrosion Protection.	DST-SERB school on "Plasma Processing of Materials"	IIT-Bombay, June 03-22, 2019
Sarathi Kundu	Structures and Organization of Organic Molecules (Fatty Acids, Lipids and Globular Proteins) at Interfaces	International Conference on Materials Science (ICMS2020)	4th-6th March, 2020 Tripura University, Tripura.
Sarathi Kundu	Optical and Sensing Behavior of Biopolymer and Polyelectrolyte Complex	International Conference on Natural Polymers (ICNP – 2019)	6th-8th December, 2019, Institute for Holistic Medical Sciences, Kottayam, Kerala
Munima B. Sahariah	Defect Formation and Interactions in Cu-Nb Interface	10 th International Conference of the Asian Consortium on Computational Materials Science (ACCMS-10)	22nd-26th July, 2019 City University of Hong Kong, Hong Kong

Lectures delivered at other institutes

Faculty	Topic	Date & Venue
Dr. Munima B. Sahariah	Computational and Mathematical Physics (TQIP sponsored short term course)	29th October – 02nd November, 2019 NIT, Nagaland

Contributory

Author(s)	Title	Conference name	Oral / Poster	Date & Venue
Samiran Upadhyaya and Neelotpal Sen Sarma	n-Vinyl Pyrrolidone based Semi-conducting Polyelectrolytes for Solid State Electrical Application and Acid Vapour Sensing	Recent Advances in Applied Sciences (RAAS, 2019)	Poster	17th-18th May, 2019 Department of Applied Sciences, Gauhati University, Guwahati
Samiran Upadhyaya and Neelotpal Sen Sarma	Semi-Conducting Polyelectrolytes of Bright Blue Fluorescent Copolymer of 1-Vinyl-2-Pyrrolidone And Acrylonitrile: Materials for Solid State Electrical Application and Acid Vapour Sensor	2nd National Conference on Recent Advances in Science and Technology (NCRAST 2019)	Poster	15th-17th May, 2019 NEDFi Convention Centre, Guwahati
Gautomi Gogoi, Neelotpal Sen Sarma and Sagar Sharma	Photovoltaic Properties of Regioisomers of Diketopyrrolopyrroles Upon Substitution with Different Donor Moieties: A DFT Study	Recent Advances in Applied Sciences (RAAS, 2019)	Poster	17th-18th May, 2019, Department of Applied Sciences, Gauhati University, Guwahati
Samiran Upadhyaya and Neelotpal Sen Sarma	Acrylic Based Fluorescent Adhesive: Role of Fluorescence in Crafts and Anti-Counterfeiting Applications	International Symposium on Sustainable Polymers and National Symposium on Chemistry Education for Sustainable Engineering	Oral	23rd-25th August, 2019 Indian Institute of Technology, Guwahati
Samiran Upadhyaya and Neelotpal Sen Sarma	Thermally Stable Water-Borne Acrylic-based Powder Adhesive	International Conference on Advances in Chemical and Materials Sciences (ICCM, 2019)	Poster	17th-19thOctober, 2019 Mangalore University, Mangalagangothri, Karnataka
Gautomi Gogoi, Neelotpal sen Sarma and Sagar Sharma	A computational study on the optoelectronic properties of oligothiophene and oligofuran.	International Conference on Advances in Chemical and Materials Sciences (ICCM, 2019)	Poster	17th-19thOctober, 2019 Mangalore University, Mangalagangothri, Karnataka
Gautomi Gogoi, Smruti R Sahoo, Basanta Kumar Rajbongshi, Sridhar Sahu, Neelotpal Sen Sarma and Sagar Sharma	A Computational Approach to Obtain a New Ambipolar Organic Semiconductor by Combining Two Acceptor Moieties	International Conference on Emerging Trends in Chemical Sciences (ETCS-2020)	Oral	13rd-15th February, 2020 Gauhati University, Guwahati
Sristi Majumdar, Debajit Thakur and Devasish Chowdhury	Stimuli-responsive drug delivery system: Carbon dot coated alginate beads as a smart biomaterial	European Society for Biomaterials (ESB 2019) Conference	Poster	9th-13th September, 2019 International Congress Center Dresden, Germany
Jayanta Sarmah Boruah and Devasish Chowdhury	Hybrid Palmitic Acid Vesicles for Toxin Absorption	National Conference on Green, Sustainable and Evolving Sciences (GSES-2019)	Poster	28th-29th June, 2019,Cotton University
Jayanta Sarmah Boruah and Devasish Chowdhury	Carbon Nanomaterial-Vesicles Hybrid System for Biomedical Application	International Symposium on Sustainable Polymers and National Symposium on Chemistry Education for Sustainable Engineering	Oral	23rd-25th August, 2019 Dept. of Chemical Engineering, IIT Guwahati

Author(s)	Title	Conference name	Oral / Poster	Date & Venue
Jayanta Sarmah Boruah and Devasish Chowdhury	Nanocomposite of Palmitic Acid Vesicles for Toxin Absorption	International Conference Onchemical, Bio & Environmental Engineering (CHEMBIOEN 2020)	Oral	13rd-14th February, 2020 Dept. of Chemical Engineering, NIT Jalandhar
Jayanta Sarmah Boruah, Pankaj Kalita, Devasish Chowdhury and Manash Barthakur	Conjugation of Citrate Capped Gold Nanoparticles with Gabapentine to Use as Biosensor	International Conference on Material Sciences (ICMS 2020)	Poster	4th-6th March, 2020 Department of Physics, Tripura University
Ankita Deb and Devasish Chowdhury	Fabrication of Nano-Bioconjugate Film Using Aloe Vera to Detect Hazardous Chemicals Found in Cosmetics	International Conference on Advances in Chemical and Material Science (ICCM-2019)	Poster	17th-19th October, 2019, Department of Chemistry Mangalore University
Ankita Deb and Devasish Chowdhury	Development of Nano-Bioconjugate Film Using Aloe Vera to Detect Hazardous Chemicals Found in Cosmetics	International Symposium on Sustainable Polymers &National Symposium on Chemistry Education for Sustainable Engineering	Oral	23rd-25th August, 2019 IIT Guwahati
Ankita Deb and Devasish Chowdhury	Fabrication of Nano-Bioconjugate Film Using Aloe Vera	TEQIP- III Sponsored National Conference "Recent Advances in Applied Sciences (RAAS'2019)	Poster	17th-18th, 2019 Gauhati University
Jahnabi Gogoi, Abhipsa Dev Choudhury, Devasish Chowdhury	Synthesis of a Graphene Oxide Clay Nanocomposite as an EfficientPhotocatalyst for the Degradation of Cationic Dye in Water	TEQIP- III Sponsored National Conference on Recent Advances in Applied Sciences (RAAS'2019)	Poster	17th-18th May, 2019 Gauhati University
Jahnabi Gogoi and Devasish Chowdhury	Template Based Fluorescent Detection of Trifluralin Herbicide Using Metal Conjugated Polyethylene Glycol Carbon Dot	International Conference on Advances in Chemical and Material Science (ICCM-2019)	Poster	17th-19th October, 2019 Department of Chemistry, Mangalore University
Kabyashree Phukan	Isolation of Naringinase Producing Soil Bacteria and its Enzymatic Activity	National seminar on Advances in Aquaculture and Biodiversity (NSAAB-2019)	Poster	22nd-23rd November, 2019 Department of Zoology, Gauhati University
Santanu Podder and Arup Ratan Pal	Differences of Hot Carrier Generation From Optically Tunable Plasmonic Titanium Nitride at the Interface of p-Type and n-Type Semiconductors	2nd Indian Material Conclave, organised by Material Research Society of India (MRSI)	Poster	11th-14th February,2020 CGCRI, Kolkata
Jyotisman Bora and Arup Ratan Pal	Plasma-Based Synthesis of Metal Nitrides for Optoelectronic Applications	2nd Indian Material Conclave, organised by Material Research Society of India (MRSI)	Poster	11th-14th February,2020 CGCRI, Kolkata
Bablu Basumatary and Arup Ratan Pal	Synthesis of Graphene Oxide by PECVD and its Application as Transparent Electrode for PN Junction Pyro-Phototronic Device for Fast Response UV Light Detection	2nd Indian Material Conclave, organised by Material Research Society of India (MRSI)	Poster	11th-14th February,2020 CGCRI, Kolkata
Deepshikha Gogoi and Arup Ratan Pal	Synthesis of Polyaniline-Crystalline Rubrene Nanosystem by One-Step Plasma Process and its Application in a Pyro-Phototronic Device	2nd Indian Material Conclave, organised by Material Research Society of India (MRSI)	Poster	11th-14th February,2020 CGCRI, Kolkata

Author(s)	Title	Conference name	Oral / Poster	Date & Venue
Sweety Biswasi and Arup Ratan Pal	Plasmon Thin Film Transistor prepared by Plasma Based Process for Advanced Optoelectronic Applications	2nd Indian Material Conclave, organised by Material Research Society of India (MRSI)	Poster	11th-14th February,2020 CGCRI, Kolkata
Sweety Biswasi and Arup Ratan Pal	Plasmon Thin Film Transistor Using One step Plasma Based Process	6th International Conference on Advanced Nanomaterials and Nanotechnology (ICANN-2019)	Poster	18th-21stDecember, 2019 Indian Institute of Technology Guwahati
Purbajyoti Bhagowati & Munima B. Sahariah	An *ab initio* molecular dynamics approach to determine the low energy structures of titanium nitride (TiN) nanoclusters	National Conference on Electronic Structure-2019 (NCES-2019)	Poster	27th-29th November, 2019 S. N. Bose National Centre for Basic Sciences, Kolkata, India
Purbajyoti Bhagowati & Munima B. Sahariah	Low Energy Structures of Small Titanium Nitride (TiN) Through *Ab Initio* Molecular Dynamics	6th International Conference on Advanced Nanomaterial and Nanotechnology (ICANN2019)	Poster	18th-21st December, 2019 Indian Institute of Technology Guwahati (IITG), India
Payal Saha & Munima B. Sahariah	First-principle study on collinear magnetism of Mn2PtSn Heusler compound	National Conference on Electronic Structure-2019 (NCES-2019)	Poster	27th-29th November, 2019 S. N. Bose National Centre for Basic Sciences, Kolkata, India
Payal Saha & Munima B. Sahariah	DFT based study on magnetic properties of Mn2PtSn Heusler compound	6th International Conference on Advanced Nanomaterial and Nanotechnology (ICANN2019)	Poster	18th-21st December, 2019 Indian Institute of Technology Guwahati (IITG), India
Hrishikesh Talukdar and Sarathi Kundu	Studies on Structural, Optical and Electrical Properties of Polyelectrolyte Thin Films	64th DAE Solid State Physics Symposium (DAE SSPS -2019)	Poster	18th-22nd December, 2019 Indian Institute of Technology, Jodhpur, Rajasthan, India
Bijay Kumar Sah and Sarathi Kundu	Surface Pressure and pH Dependent Structure and Optical Emission Behaviours of Protein (Bsa) Thin Films	64th DAE Solid State Physics Symposium (DAE SSPS -2019)	Poster	18th-22nd December, 2019 Indian Institute of Technology, Jodhpur, Rajasthan, India
Subhankar Pandit and Sarathi Kundu	Optical Responses of Bovine Serum Albumin (BSA) in Presence of TiO_2 Nanoparticles	64th DAE Solid State Physics Symposium (DAE SSPS -2019)	Poster	18th-22nd December, 2019 Indian Institute of Technology, Jodhpur, Rajasthan, India
Raktim Jyoti Sarmah and Sarathi Kundu	Modifications of DMPA (1,2-Dimyristoyl-Sn-Glycero-3 Phosphate) Monolayer at Air-Water Interface in Presence of Cholesterol	64th DAE Solid State Physics Symposium (DAE SSPS -2019)	Poster	18th-22nd December, 2019 Indian Institute of Technology, Jodhpur, Rajasthan, India
Trishamoni Kashyap, Biswajit Choudhury	Solvothermal Synthesis of Multiphase Cu/Cu_2O Micro-Nanocrystals With Broad Band Optical Absorption	6th International Conference on Advanced Nanomaterials and Nanotechnology	Poster	18th-21stDecember, 2019 IIT Guwahati
Trishamoni Kashyap, Biswajit Choudhury	UV Light Promoted Photocatalytic Response in Au-Ag Bimetallic Nanoparticles Decorated Graphitic Carbon Nitride Nanosheet	2nd Indian Material Conclave, organised by Material Research Society of India (MRSI)	Poster	11th-14thFebruary, 2020 CGCRI, Kolkata

Conferences/Workshops/Meetings Attended

Faculty/Research Scholar	Conferences/Workshops/Exhibitions	Date & Venue
Arup Ratan Pal	Meeting of Regional Coordination Council Of the ISRO-GU RAC-S	5th March 2020, Gauhati University
Anamika Kalita	5th edition of India International Science Festival (IISF-2019)	5th-8th November, 2019 Science City, Kolkata
Deepshikha Gogoi, Bablu Basumatary and Santanu Podder	DST-SERB school on "Plasma Processing of Materials"	3rd-22ndJune 2019, IIT-Bombay, Mumbai, Maharashtra
Manash Pratim Nath	107th Indian National Science Congress	2nd -7th January, 2020 University of Agricultural Sciences, Bengaluru

Other Activities

Awards/Recognition/Achievements

Name	Particulars
Neelotpal Sen Sarma	Acted as external examiner of the oral defense evaluation to access the Ph. D. thesis work of student of Department of Chemical Science, Tezpur University, Tezpur on 07.06.2019
Neelotpal Sen Sarma	Invited for the evaluation and viva-voce of M.Tech. project dissertation at the Department of Chemical Science, Tezpur University, Tezpur on 7th June 2019
Neelotpal Sen Sarma	Acted as external examiner of the oral defense evaluation to access the Ph. D. thesis work of student of Department of Chemical Science, Tezpur University, Tezpur on 24th January 2020
Devasish Chowdhury	The work on development of pesticide sensor was highlighted in The Hindu Newspaper in 22nd December 2019 Edition.
Gautomi Gogoi	Best Poster Award in the National Conference on Recent Advances in Applied Sciences (RAAS'2019) Held at Gauhati University from 17th-18thMay, 2019
Ankita Deb	Awarded best poster award at National Conference on "Recent Advances in Applied Sciences" RAAS' 2019 organized by Department of Applied Sciences, Gauhati University, Assam, India, 17th-18thMay, 2019.
Sristi Majumdar	Awarded travel grant from SERB, DST for attending and presenting a paper at European Society for Biomaterials (ESB 2019) Conference, Dresden, Germany
Sweety Biswasi	Awarded best poster award at 6th International Conference on Advanced Nanomaterials and Nanotechnology (ICANN-2019), Organized by IIT Guwahati, 18th-21stDecember 2019.
Sarathi Kundu	Acted as external examiner to conduct the practical examination for M.Sc. Physics (Physics Laboratory-II) of University of Science and Technology (USTM), Meghalaya during 25th-26thJune 2019.
Sarathi Kundu	Chaired a Technical Session in International Conference on Natural Polymers (ICNP – 2019) held at Mahatma Gandhi University, Kottayam, Kerala during 6th-8thDecember2019.
Bijay Kumar Sah	Awarded CSIR-SRF Fellowship (Grant No: 09/835(0027)/2019-EMR-I) during this Period of time.
Arup Ratan Pal	Acted as a Judge for Poster Competition in 66thFoundation Dayof the Physics Department, Gauhati University on 20thFebruary 2020.
Sarathi Kundu	Acted as an External Examiner to conduct the practical examination for M.Sc. Physics (Physics Laboratory-II) of University of Science and Technology (USTM), Meghalayaduring25th-26thJune 2019.
Sarathi Kundu	Chaired a technical session in International Conference on Natural Polymers (ICNP – 2019) held atMahatma Gandhi University, Kottayam, Kerala during 6th-8thDecember 2019
Bijay Kumar Sah	Awarded CSIR-SRF fellowship (Grant No: 09/835(0027)/2019-EMR-I)

MATHEMATICAL AND COMPUTATIONAL SCIENCES

Mathematical and Computational Sciences are essential to deploy analytic thinking and computational techniques to tackle science and engineering problems. In the Mathematical and Computational Sciences (MCS) division at IASST, we are primarily engaged in the application of Mathematics, Statistics, and Computer Science in solving physical problems having significance in science, engineering, and society. The research on Mathematics covers up core areas like topology and algebra to the applied fields such as fluid dynamics, fuzzy mathematics. The current research focus in Mathematics is on geophysical fluid dynamics and the allied areas in marine science and technology, river modelling, and flood forecasting in the Brahmaputra river basin. Research on Statistics is focused but not limited to queuing theory – a branch of the stochastic process, which has a significant impact on other areas like industrial engineering, digital communication systems, and telecommunication systems. This research area also includes environmental statistics, biostatistics, and epidemiology. At present, all these studies are focused on their application to areas of health. On the other hand, the primary research areas in Computer Science are focused on computer vision and pattern recognition, where machine learning and deep learning techniques are studied and developed for various applications on medical, textile, and ballistic datasets.


Dr. Gautam Choudhury


Dr.(Mrs.) Lipi B Mahanta


Dr. Santu Das


Niranjan Bhagobaty


Snigdha Mahanta


Silpisikha Goswami


Elima Hussain


Daisy Das


Anjana Begum


Devabrat Sharma


Bolin Das


Balabhadra Pathak

A. Stochastic Process
(Coordinator: Dr. Gautam Choudhury)

Queueing theory is a branch of Applied Stochastic Process with growing application in the field of Industrial Engineering, Digital Communication Systems and Tale Communication Systems, Manufacturing Systems, Inventory Systems, ensuing an essential research domain in today's world.

(i) Reliable Queueing System

- We have analyzed a queueing system with optimal N-policy to minimize the system cost where the customer's arrival rate varies according to the system status: build-up, setup, and busy period. This cycle starts right after the system is empty. The server remains idle until the arrival of N customers. The server starts his set up immediately after the number of waiting customer reaches N and at the end of the setup period, the server commences its service under the first-come-first-served service discipline with exhaustive service wherein the busy period the customer has the opportunity to select any one from the two types of service provided by the server. The customer's feedback again to the head of the queue with some probability in case of dissatisfaction and take another regular service or may depart from the system.
- We have studied different types of vacation policy with two types of heterogeneous service, showing the application from a practical point of view. We have basically studied two vacation policy namely, Random vacation policy and Modified vacation policy, and have shown application in the Telecommunication system and production to order system.

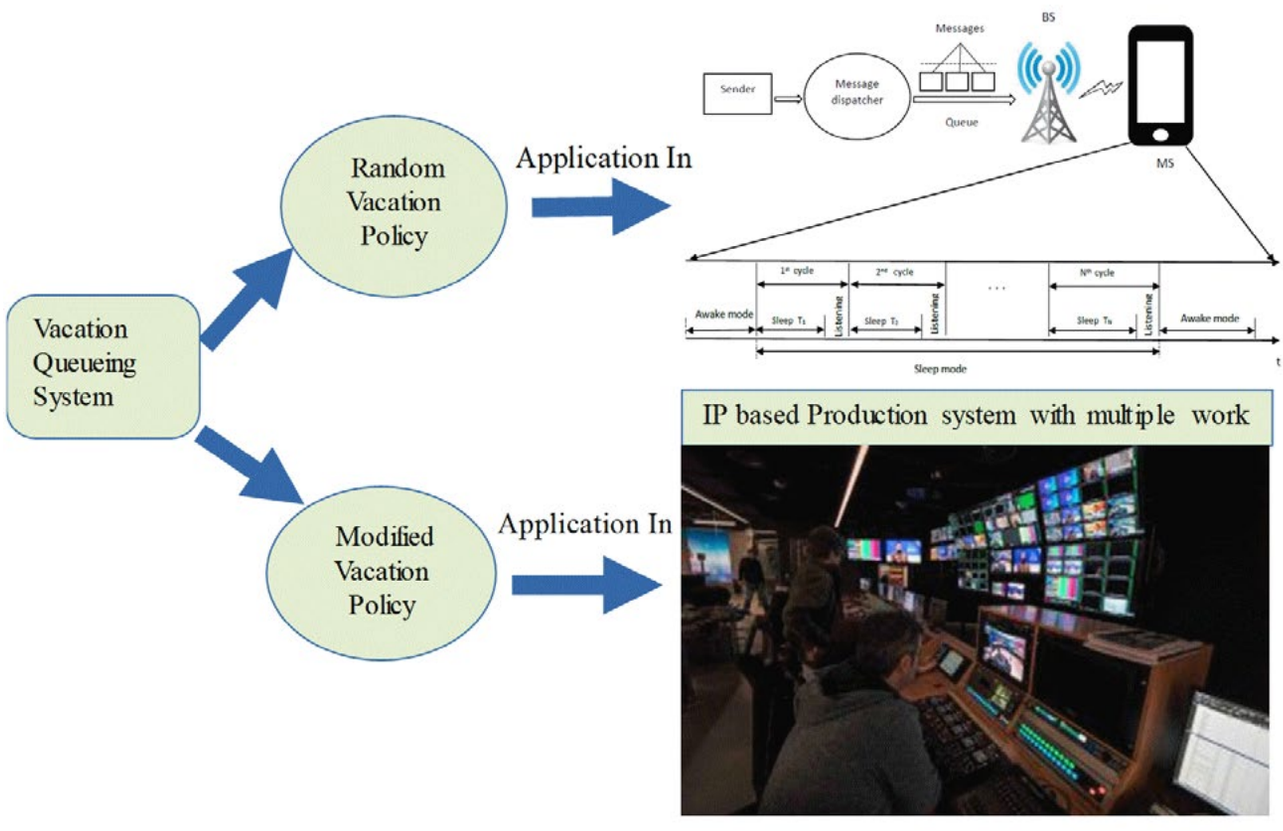


Figure 28: Queing System

In Random Vacation Policy, the server takes the maximum number of random vacations until it finds any customer waiting in the queue at a vacation completion epoch. If no arrival occurs after completing the maximum number of random vacations, the server stays dormant in the system and waits for the upcoming arrival. The modified vacation policy captures the operation of a closedown period, type 1 vacation period, type 2 vacation period, a start-up period, and a dormant period. Here, type 1 vacations take a short period of random duration, and type 2 vacation takes a long period of random duration. Also, we have generalised Random vacation policy and Modified vacation policy to two types of general heterogeneous service models.

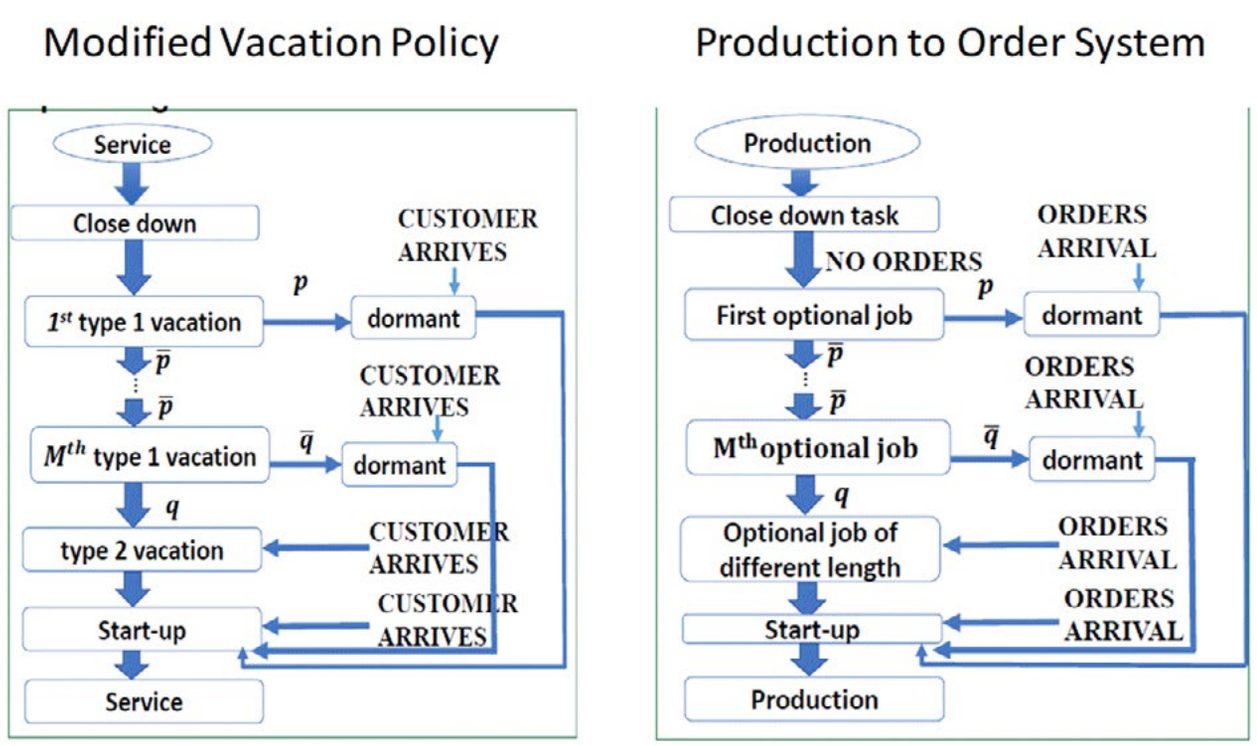


Figure 29: Modified Vacancy and Production to Order System

(ii) Unreliable Queueing System

An unreliable queueing system is characterised by a random breakdown of the service station, which is practically inevitable. In the breakdown period, the server remains unavailable for a short duration of time where it is sent for repair, in many practical situations the repair is not immediate but subject to some delays due to various reasons usually referred to as delay time.

An unreliable queue delivering two types of general heterogeneous service with an optional re-service policy is investigated. The server provides two types of general heterogeneous service to an arriving unit (customer) with an option to repeat the same type of service again (once) in case of dissatisfaction or may leave the system if satisfied. While providing services, the server may break down at any moment, and as soon as breakdown occurs, the server is sent for repair, which is further subjected to some delays. After the server is repaired, the server starts completing its remaining service in both the type of services or repeated services. The server remains idle until the queue size builds up to a pre-assigned threshold level N in the build-up period. As soon as the queue size becomes *N* (≥1), the server undertakes a gear up time called Setup time (SET) in order to set up the system into an operative mode (set up period), on completion of which service starts (busy period).

For these types of queueing systems, we have studied various stochastic processes such as queue length process, waiting time process, busy period processes, and backlog processes. Moreover, for unreliable queueing models, we have carried out the reliability aspects. Further, we have investigated the cost optimization problem of these models and the effect of breakdown rates on mean time to the first failure of the server.

B. Artificial Intelligence in Medical Image Analysis (Coordinator: Dr. Lipi B Mahanta)

As soon as it was possible to scan and load medical images into a computer, researchers have built systems for automated analysis of medical images (Figure 30). Initially, from the 1970s to the 1990s, medical image analysis was done with sequential application of low-level pixel processing (edge and line detector filters, region growing) and mathematical modelling (fitting lines, circles, and ellipses) to construct compound rule-based systems that solved particular tasks. There is an analogy with expert systems using many if-then-else statements that were popular in artificial intelligence in the same period. These expert systems have been described as similar to rule-based image processing systems. At the end of the 1990s, supervised techniques under the machine learning

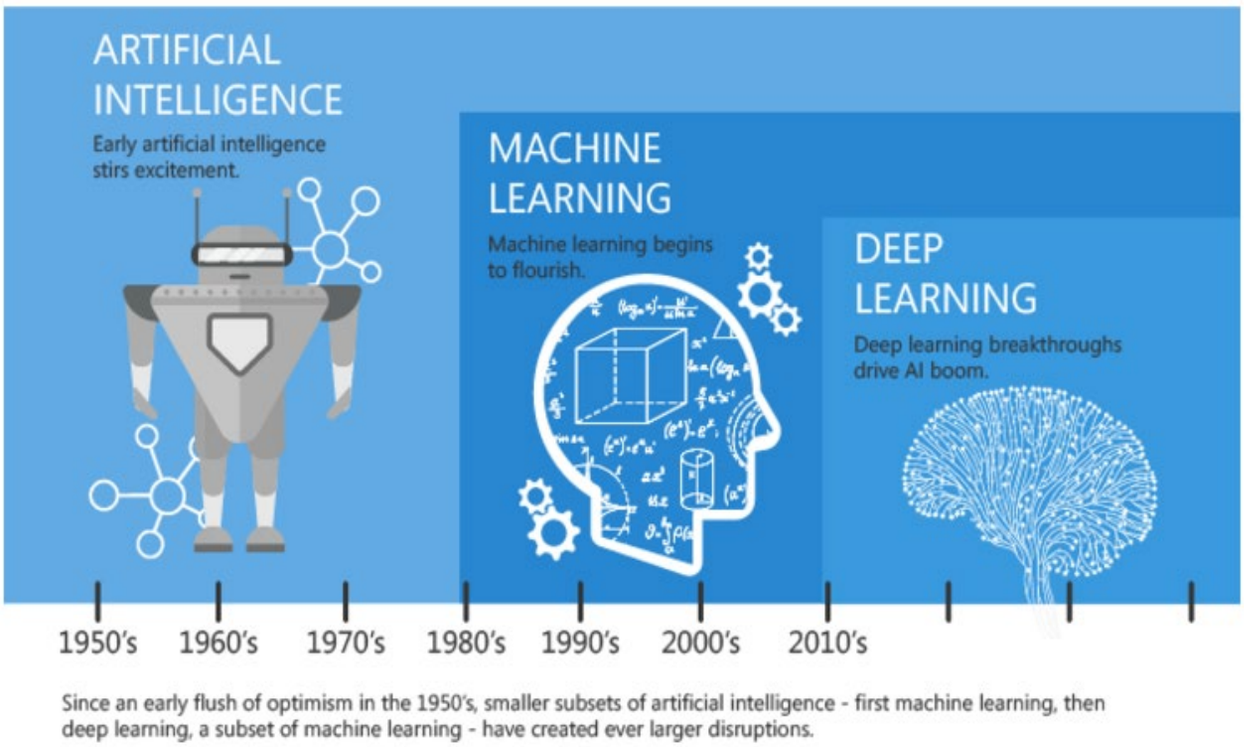


Figure 30: Timeline of Artificial Intelligence
(***Source:*** Linkedn/Machine Learning vs Deep Learning)

paradigm arrives, where training data is used to develop a system, and become increasingly popular in medical image analysis. Examples include active shape models (for segmentation), atlas methods (where the atlases that are fit to new data from the training data), and the concept of feature extraction and use of statistical classifiers (for computer-aided detection and diagnosis). This pattern recognition or machine learning approach is still very popular and forms the basis of many successful commercially available medical image analysis systems starting from cancer diagnosis to survival analysis. Thus, we have seen a shift from systems that are completely designed by humans to systems that are trained by computers using example data from which feature vectors are extracted.

A logical next step is to let computers learn the features interpretable from the medical images that optimally represent the data for the problem at hand. This concept lies at the basis of many deep learning algorithms models (networks) composed of many layers that transform input data (e.g., images) to outputs (e.g., disease present/absent) while learning increasingly higher-level features. The most successful type of model for image analysis to date is convolutional neural networks (CNNs). CNNs contain many layers that transform their input with convolution filters to a small extent. Work on CNNs has been done since the late seventies, and they were already applied to medical image analysis in 1995. They saw their first successful real-world application in LeNet for hand-written digit recognition. Despite these initial successes, the use of CNNs did not gather momentum until various new techniques were developed for efficiently training deep networks, and advances were made in core computing systems. In subsequent years, further progress has been made using related but deeper architectures. In computer vision, deep convolutional networks have now become the technique of choice.

Applications of deep learning to medical image analysis first started to appear at workshops and conferences, and then in journals. The number of papers grew rapidly in 2015 and 2016. The topic is now dominant at major conferences, and the first special issue appeared of IEEE Transaction on Medical Imaging in May 2016. One of the theme works by the research group in CCNS involves computer vision and artificial intelligence in areas of computational pathology, and includes both statistical, deep learning and machine learning strategies aiming for state-of-the-art results. These works are briefly introduced below:

(i) Cervix Cancer

Dr. Lipi B. Mahanta and her research team have been working on hospital-based indigenous pap-smear data acquisition related to cervix cancer and aiming for automated disease diagnosis. This data repository consisting of 963 liquid-based cytology images were acquired from the cytological smears of healthy and cervical cancer patients through collaboration with medical experts from premier medical diagnostic institutes of North-eastern India (**Figure 31**). Two studies have emerged from this dataset: one on the binary classification of the cells and the other on multi-class classification, both applying deep learning techniques. The study explores six different deep convolutional neural networks- Alexnet, Vggnet (vgg-16 and vgg-19), Resnet (resnet-50 and resnet-101), and Googlenet architectures for multi-class (four-class) diagnosis of cervical pre-cancerous as well as cancer lesions and incorporates their relative assessment. It highlights the addition of an ensemble classifier with three of the best deep learning models for yielding a high accuracy multi-class classification.

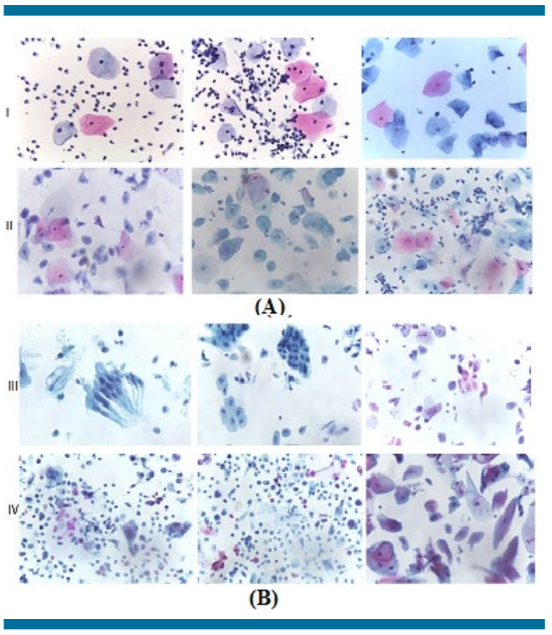


Figure 31: (A) Images belonging to class NILM and LSIL and (B) Images belonging to class HSIL and SCC.

(ii) Childhood Brain Cancer (Medulloblastoma)

The research team has also been working on medulloblastoma, which is the most common malignant tumour in children accounting for most of all brain tumours, and that requires close attention due to the low survival rate. It has four subtypes based on histology: classic, nodular, large cell, and desmoplastic. Each subtype has different architectural in-formation and diagnosis. The study is evaluated on indigenous patient samples collected from the northeast region. It contributes towards database generation to create a data set of childhood medulloblastoma samples since there exists no publicly available benchmark dataset. The studies of the group propose i) a texture-based method for categorization of the cells, ii) an automated cell segmentation method from the whole slide images (**Figure 32**), iii) explores various segmentation techniques, and iv) proposes a feature reduction, using MANOVA.

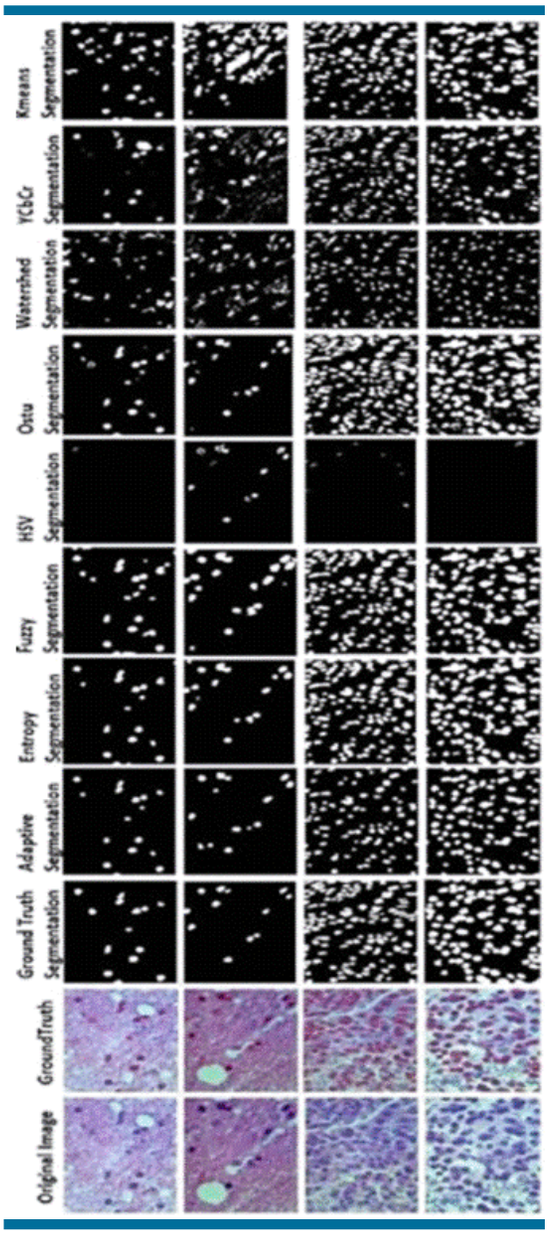


Figure 32: Segmentation output of the different algorithms

(iii) Oral cancer

In this study, too, a data repository is created. This is the first dataset containing histopathological images of the normal epithelium of the oral cavity and OSCC and can be used as a benchmark dataset. The images were captured using a Leica ICC50 HD microscope from Hematoxyline and Eosin (H&E) stained tissue slides collected, prepared, and catalogued by medical experts from 230 patients. Some images from the first and second sets are shown below in Figure 33. Using this dataset, the team proposed a machine learning methodology that detects OSCC automatically using shape, texture, and color features from biopsy images, after auto-segmentation of cells from whole slide image strips. From a total of 573 extracted, the method selects the most significant ones using a two-level selection method with two well-known methods: namely t-test and principal component analysis (PCA). After

that, five classifiers, namely Decision tree, Support Vector Machine (SVM), Logistic Regression, Linear Discriminant and K-Nearest Neighbor (KNN) have been applied on these reduced feature sets to classify the cell nuclei into the normal and malignant category, and performance was evaluated employing five-fold cross-validation technique. Adequate mathematical modelling, which is pertinent to describe a physical phenome- non, is of significant importance in a modern scientific study-be it analytical or numerical study, including the statistical analysis of experimental data.

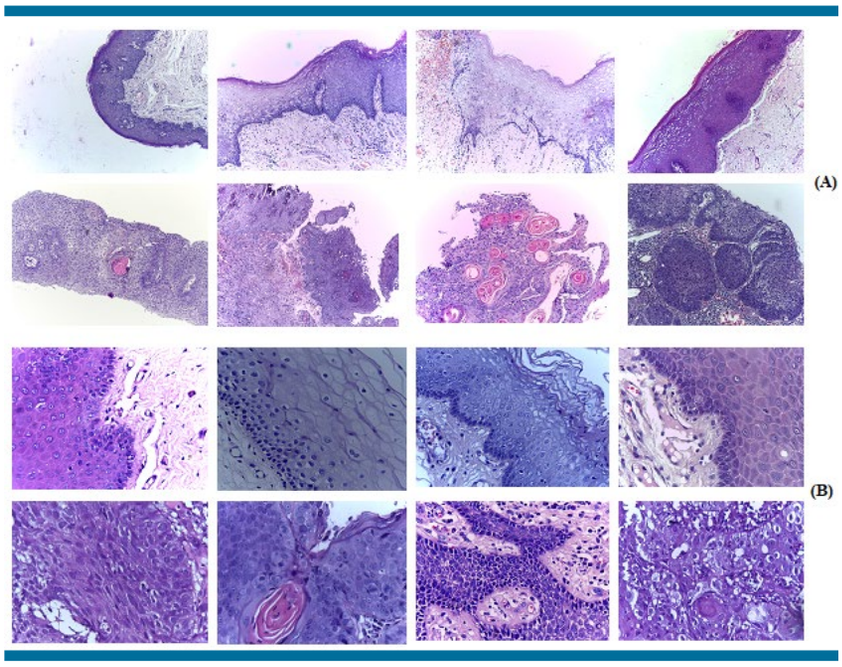


Figure 33: Some images with (A) 100x and (B) 400x magnification from the dataset. Top rows of each set depict normal cell and bottom rows depict abnormal cell.

C. Flood Prediction Models and Mathematical Treatment of Geophysical Fluid (Coordinator: Dr. Santu Das)

Mathematical research of this division is primarily distributed into the following categories:

(i) Wave-structure interaction problem – fundamental theoretical developments

Due to the significant amount of space in coastal water, there is a keen interest in the construction of offshore floating structures, which can be used for habitation and industrial uses. Moreover, due to global warming, the sea-water level is predicted to rise continuously, which in turn affects the total habitable landmass. 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 as well since climate change continuously changes the landscape of sea-ice. Both these aspects of practical issues demand an exhaustive number of engineering applications be addressed. Although at first glance, these two problems seem to be different, the corresponding mathematical formulations are very closely related. 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. Currently, his research is directed towards understanding some basic concepts of such waves in a complex system.

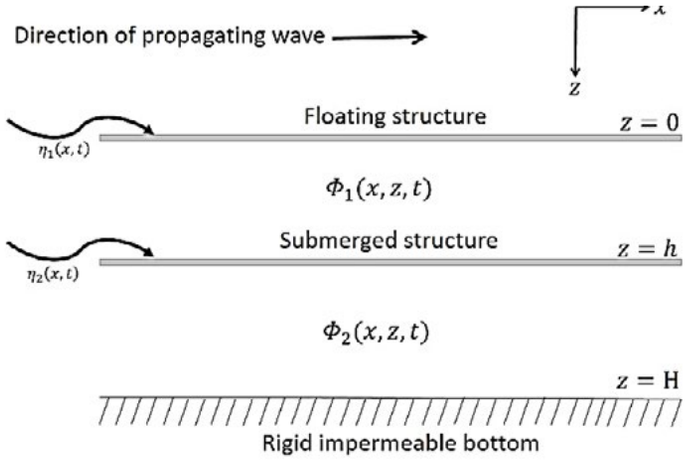


Figure 34: Schematic diagram of the physical system. Hydroelastic waves propagate along both the floating structure (surface mode) and the submerged plate (interfacial mode)

(ii) Improvement in the Brahmaputra basin flood prediction model using the rainfall and DEM data

The Brahmaputra River in India (Assam state) is subject to high variation in flow-rate across the season, abrupt channel configuration change, and colossal sediment transport. The geographical features of the Himalayan range in this area, such as slope, flow from other tributaries of the Brahmaputra River, canopy layers, soil characteristics, act as a catalyst in flooding.

Table 1. Station name, their location, total seasonal rainfall and 99th percentile of daily rainfall values (Goswami et al (2010), J. Geophy. Res, Vol 115, D12114, doi:10.1029/2009JD012275)

Station Name	Lat(N)-Lon(E)	Average Total Seasonal Rainfall (mm) (Decreasing Order)	99th Percentile Value (mm)
Passighat (PGT)	28.07/95.34	3944.94	190.00
Dibrugarh (DIB)	27.48/95.02	3110.44	166.67
N Lakhimpur (NLP)	27.29/94.10	2989.14	115.92
Silchar (SLC)	24.91/92.98	2802.14	114.75
Dhubri (DHB)	26.15/90.13	2542.34	169.65
Kailashahar (KSH)	24.31/92.01	2401.89	114.00
Chaparmukh (CHP)	26.20/92.52	2204.48	165.68
Shillong (SHL)	25.57/91.88	2045.60	129.01
Majbat (MJB)	26.75/92.35	1913.65	106.08
Agartala (AGT)	23.89/91.24	1882.65	108.77
Tezpur (TZP)	26.62/92.78	1644.04	80.00
Guwahati (GHT)	26.12/91.59	1568.14	88.94
Kohima (KOH)	25.66/94.12	1469.84	63.86
Imphal (IMP)	24.76/93.90	1204.13	63.39
Lumding (LMD)	25.75/93.17	1102.00	78.35

Compared to other parts, the North East of India (NEI) receives quite a higher amount of yearly average rainfall. Every year, during monsoon, a vast area in the basin gets affected by the overflow of the river and thus puts the lives of thousands of people residing in the fertile alluvial area in danger. Recently, researchers started an extensive study of the Brahmaputra basin, taking into account the variable topography, water height level monitoring, soil characteristics, etc. and predicted the arrival of an incoming flood (flood pulse). It goes without saying that the incorporation of an atmospheric model, predicting the rainfall pattern in the area, with the existing hydrological model will profoundly improve the flood prediction accuracy and help the residents of the alluvial areas take preventive measures to cope up with the floodwater. The primary objective of this study is to develop a much improved and accurate flood prediction model for the Brahmaputra River basin and operationalize a real-time system to provide early warning to the inhabitants of the basin. Currently, we are on the verge of completing writing a research proposal to be submitted to a funding agency.

(iii) General fluid flow – MHD, heat and mass transfer, and magma flow

We first consider the influence of the Soret effect and radiation on MHD flow of micropolar fluid passes the semi-infinite moving plate embedded in a porous plate. Thermo diffusion effect is assumed to be constant for the study. Secondly, the heat and mass transfer flow of Newtonian and non-Newtonian fluid over the bidirectionally stretching sheet are compared. We took into consideration the Brownian motion in the presence of thermophoresis effect and Biot numbers. Currently, we have started working on Magma flow in a conduit, which can be formulated as a fluid dynamical heat and mass transfer problem. So far, a literature review of the application of Navier-Stokes equations in magma flow study is in progress.

RESEARCH OUTPUT

Extramural Projects

Ongoing projects

Title of the project	Funding Agency; Total fund; Duration; PI/Coordinator	Goal
On the Development of an Automated Image Analysis System for Detection of Cervical Pre-Cancerous and Cancer Lesions Using Liquid Cytology Based Pap Smear Images. BT/PR12127/ MED/32/358/2014	**Funding Agency**: DBT, Govt. of India; **Total fund:** Rs. 50.93 lakhs; **Duration**: 2016-2019; **PI/Coordinator**: Dr. Lipi B. Mahanta Extended to May 2020	To Design & Develop aDecision Support Software for Detection of Cervical Pre-Cancerous & Cancerous Lesions. To Assess the Impact of Some Risk Factors (Socio-Economic, Environmental, Lifestyle, Medical History, Diet, Anthropometry and Hematology) Of The Patients. To Evaluate Human Papillomavirus (HPV) DNA Testing As An Alternative Screening Method.
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 **Coordinator**: Dr. Santu Das (**Co-P**I)	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.

Publications

In Cited Journals

Author (s)	Title	Journal name	Volume & Issue no./ page no.	Month / Year of publication
Amartya Ranjan Saikia, Kangkana Bora, Lipi B. Mahanta and Anup Das	Comparative Assessment of CNN Architectures for Classification of Breast FNAC Images	Tissue and Cell	57/8-14	April/ 2019
Daisy Das, Lipi B. Mahanta and Shabnam Ahmed	A Study on MANOVA as an Effective Feature Reduction Technique in Classification of Childhood Medulloblastoma and its Subtypes	Network Modeling Analysis in Health Informatics and Bioinformatics	9/16	March/ 2020
Tabassum Yesmin Rahman, Lipi B. Mahanta, Anup K. Das and Jagannath D Sarma	Automated Oral Squamous Cell Carcinoma Identification using Shape, Texture and Color Features of Whole Image Strips	Tissue and Cell	63/ 101322	April/ 2020
Tabassum Yesmin Rahman, Lipi B. Mahanta, Anup K. Das and Jagannath D Sarma	A Histopathological Image Repository of Normal Epithelium of Oral Cavity and Oral Squamous Cell Carcinoma	Data in Brief	29/ 105114	April/ 2020
Elima Hussain, Lipi B. Mahanta, Himakshi Borah and Chandana Ray Das	Liquid Based-Cytology Pap Smear Dataset for Automated Multi-Class Diagnosis of Pre-Cancerous and Cervical Cancer Lesions	Data in Brief	30/ 105589	April/ 2020

Author (s)	Title	Journal name	Volume & Issue no./ page no.	Month / Year of publication
Elima Hussain, Lipi B. Mahanta, Chandana Ray Das and Ratna Kanta Talukdar	A Comprehensive Study on the Multi-Class Diagnosis of Pap Smear Images Using a Fusion-Based Decision From Ensemble Deep Convolutional Neural Network	Tissue and Cell	65/ 101347	August/ 2020
Gautam Choudhury, Priyanka Kalita and S. Dharmaraja	Analysis of Single Server Queue with Modified Vacation Policy	Communication in Statistics-Theory and Methods.	49/ 511-553	May/ 2020
Anjana Begum and Gautam Choudhury	Analysis of An Unreliable Single Server Batch Arrival Queue With Two Types of Services Under Bernoulli Vacation Policy	Communication in Statistics-Theory and Methods.	48/ 1659972	June/ 2019
Chandi Ram Kalita and Gautam Choudhury	An $M^X/\left(\frac{G_1}{G_2}\right)/1$ Repeated Queue With N-Policy and Setup Time Subject to Server's Breakdown and Delayed Repair	Communication in Statistics-Theory and Methods.	48/ 1620783	May/ 2019
Gautam Choudhury, Arun Mahanta, Hemanta Kumer Sarmah and Ranu Paul	Cantor Set as a Fractal and its Application in Detecting Chaotic Nature of Piecewise Linear Map	Proceeding National Academy of Science India, Ser. A	006138	June/ 2019
Chandi Ram Kalita and Gautam Choudhury	Analysis of an $M^X/\left(\frac{G_1}{G_2}\right)/1$ Unreliable Repeated Service Queue and Delayed Repair Under Randomized Vacation Policy	Communication in Statistics-Theory and Methods.	48/1513142, 1-34	March/2019
Santu Das, Trilochan Sahoo and Michael H. Meylan	An Investigation of The Properties of Flexural-Gravity Wave Propagation in a Coupled Submerged and Floating Plate System	European Journal of Mechanics - B/Fluids	82/123-134	March/2020
Dipak Sarma and Silpisikha Goswami	Effect of Electromagnetic Force on MHD Free Convective Heat And Mass Transfer Flow Over a Vertical Porous Plate	JP Journal of Heat and Mass Transfer	DOI: 10.17654	January/2020

Conference proceedings:

Author (s)	Title	Journal/Conference name	Volume & Issue no./page no.	Month/ Year of publication
Manas Jyoti Das and Lipi B. Mahanta	Multiscale Anisotropic Morlet Wavelet for Texture Classification of Interstitial Lung Diseases	Artificial Intelligence and Data Engineering (AIDE)	1133	2019
Pratyashee Changmai, Kangkana Bora, R. Suresh, Navamita Deb and Lipi B. Mahanta	On The Study of Automated Identification of Firearms Through Associated Striation Marks	31st International Symposium on Ballistics.	1/ https://doi.org/10.12783/ballistics2019/33156	November/ 2019
Daisy Das and Lipi B. Mahanta	On the Study of Childhood Medulloblastoma Auto Cell Segmentation from Histopathological Tissue Samples	8th International Conference on Pattern Recognition and Machine Intelligence (PReMI)	11942/3–12	December/ 2019

Author (s)	Title	Journal/Conference name	Volume & Issue no./page no.	Month/ Year of publication
Manas Jyoti Das and Lipi B. Mahanta	Design and Analysis of an Isotropic Wavelet features-based Classification algorithm for Adenocarcinoma and Squamous Cell Carcinoma of Lung Histological Images	8th International Conference on Pattern Recognition and Machine Intelligence (PReMI)	11942/50–60	December/ 2019
Lipi B. Mahanta, Kangkana Bora, Sourav Jyoti Kalita and Priyangshu Yogi	Automated counting of Platelets and White Blood Cells from Blood Smear Images	8th International Conference on Pattern Recognition and Machine Intelligence (PReMI)	11942/13–20	December/ 2019

Presentation in Conferences/Seminar

Invited talks:

Faculty	Title	Programme name	Date and Venue
Gautam Choudhury	A Single Serverunreliable Queueing System with Repeated Service Policy and Generalizedvacations	International Conference on Recent Trends in Mathematical Sciences	15th-18th May 2019, Department of Mathematics, Tripura University, Agartala, Tripura, India- 799022
Santu Das	Blocking Dynamics of Flexural-Gravity Waves	Workshop on "Time domain analysis on hydroelasticity problems"	12thDecember 2019. Dept. of Ocean Engineering and Naval Architecture, IIT Kharagpur, India – 721302.

Visits to national/international institutes/laboratories

Faculty	National/international institutes/laboratories	Date
Santu Das	IIT Kharagpur, India - 721302	09 - 27 December, 2019

Contributory:

Author (s)	Title	Conference name	Oral/Poster	Date and Venue
Elima Hussain and Lipi B. Mahanta	An Epidemiology Study on Prevalence of Cervical Cancer and its Associated Risk Factors among Women Attending Cervical Cancer Screening at a Public Hospital of Assam	Two-Day National Seminar on Statistics for People, Society And Economy	Oral	22nd-23rd February 2019, Department of Statistics, Gauhati University
Daisy Das and Lipi B. Mahanta	Statistical Method in Analysis of Childhood Medulloblastoma and its Subtypes From Extracted Set of Features	Two-Day National Seminar on Statistics for People, Society And Economy	Oral	22nd-23rdFebruary 2019, Department of Statistics, Gauhati University
Kangkana Bora, Lipi B. Mahanta, and M. K. Bhuyan	Automated Cervical Dysplasia Detection: A Multi-Resolution Transform based Approach	Second International Conference on Advances in Electrical, Electronic and System Engineering	Oral	2nd-3rd November 2019, Department of Physics, Gauhati University
Daisy Das, Lipi B. Mahanta, Basanta K Baishya and Shabnam Ahmed	Classification Of Childhood Medulloblastoma and its Subtypes Using Transfer Learning Features - A Comparative Study of Deep Convolutional Neural Networks	International Conference on Computer, Electrical & Communication Engineering (ICCECE)	Oral	16th-18thJanuary 2020, Techno India University, West Bengal

Author (s)	Title	Conference name	Oral/Poster	Date and Venue
Silpisikha Goswami and Dipak Sarma	Dufour Effect on an MHD Heat and Mass Transfer Flow Over in a Porous Medium.	International Conference on Recent Advances in Mathematics and it's Applications	Oral	16th-18th April 2019, Tripura University

Conferences/Workshops/Seminars/Meetings attended

Faculty/research scholar	Conference/Workshop/Exhibitions	Date & Venue
Anjana Begum	52nd Annual Convention of Operational Research Society of India and International Conference	15th-18thDecember 2019, Indian Institute of Management Ahmedabad, Gujarat.
Anjana Begum	International Conference on Recent Advances in Statistics and Data Science for Sustainable Development	20th-23rdDecember 2019,Department of Statistics, Utkal University, Odisha, India-751004.
Santu Das	Workshop on "Time domain analysis on hydroelasticity problems"	9th-13th December 2019, Dept. of Ocean Engineering and Naval Architecture, IIT Kharagpur, India – 721302.

Chaired Sessions in Conferences/seminar

Faculty	Session Topic	Programme Name	Date & Venue
Gautam Choudhury	Probability and Statistics	International Conference on Recent Trends in Mathematical Sciences	May 15-18, 2019, Department of Mathematics, Tripura University, Agartala, Tripura, India

BIODIVERSITY AND ECOSYSTEM RESEARCH

Biodiversity and Ecosystem Research (BDER) program comprises an extensive collection of research opportunities in the domain of Seri-biotechnology, chemistry of ecology, human gut microbiome, and Plant-microbe interactions. Seri-biotechnology research includes Mugasilkworm physiology, pathology and use of silk-based materials in biotechnological applications. Remediation of polluted wastewater and soil by using various chemical and biological techniques and restoration of disturbed/polluted ecosystems are being evaluated under this research program. Further the impact of air pollution on health of human beings especially lung related is being conducted. A team under this program is also investigating the nature of the human microbiome and its links with well-being of the human body and how this knowledge can be translated for microbiome-based therapeutics. Under the plant-microbe interaction, a study on Microbial roles in yield management of scented rice of North East India is being carried out. Biosurfactant producing novel rhizobacteria are being studied to investigate the potency of the bacterial strain in promoting plant growth and controlling fungal infections in plants. The program also harbors an area of study on the application and functioning of indigenous rhizosphere associated beneficial microflora and endophytic microbial community prevalent in a commercial crop like tea, for plant growth promotion and disease suppression for sustainable crop production.


Dr. N. C. Talukdar


Prof. Suresh Deka


Dr. Arundhuti Devi


Dr. Mojibur R Khan


Dr. Debajit Thakur


Dr. Rahul Hepat


Dr. Wahengbam Romi


Dr. Rajiv Borah


Dr. Anowar Hussain


Dr. Bhaskar Das


Dr. Kaustavmani Patowary


Manashi Das


Shabiha Nudrat Hazarika


Tulsi Kumari Joishy


Tamali Sinha


Madhurankhi Goswami


Chandana Malakar


Nilam Sarma


Santanu Das


Rajkumari Mazumdar


Rictika Das


Juri Saikia


Dibyajyoti Koiri


Anupam Bhattacharya


Manalisa Kalita


Mayanglambam Bidyarani Devi


Jinu Medhi


Ria Deb


Aditya Narayan Konwar


Surajit Basak


Bhaswati Devi


Subrata Goswami


Manomohan Huzuri


Srikanta Baishya


Madan Chandra Kalita

A. Isolation of a Biosurfactant producing Novel Bacterial Strain for general welfare of Mustard Plant

(Coordinator: Prof. Suresh Deka)

Plant Growth Promoting and Bio-Control Efficacy of a Biosurfactant Producing Novel Bacterial Isolate Bacillus Altitudinis MS16

A biosurfactant producing novel rhizobacteria has been isolated from the rhizosphere of *C. winteriness*. The bacterial strain is identified as *Bacillus altitudinis* MS16 (accession No. MG066459). The potency of *Bacillus altitudinis* MS16 strain in promoting growth in plants and controlling fungal infections in crop plants under *in vitro* and *in vivo* conditions have been evaluated. Under *in vitro* conditions, *B. altitudinis* MS16 was found to fix atmospheric nitrogen, solubilize insoluble phosphorus, zinc and potassium and secrete IAA and several hydrolytic enzymes. Additionally, the strain showed robust motility, remarkable root colonizing efficiency and can act strongly against phytopathogens like *Colletotrichum gloeosporioides*, *Sclerotinia sclerotiorum*, *Corynespora cassiicola*, *Fusarium verticillioides* and *Fusarium oxysporum* f.sp. *Pisi* with maximum inhibition against *S. sclerotiorum* (83.0%). Bacterial treatment revealed severely altered morphology of fungal mycelia in ultramicroscopic observations involving SEM, CLSM and AFM. Leaf detached bioassay and *in planta* studies showed potential bio-control efficiency of MS16 with 95.7 ± 2.5 % and 96.5 ± 1.7 % inhibition in stem inoculation and 98.32 5 ± 0.56 % inhibition in leaf inoculation against *S. sclerotiorum*. Additionally, root colonization by the strain resulted in prominent root architectural changes. Seed bacterizations showed increased seed germination rate and seedling vigor, root and shoot length, fresh and dry weights of both root and over the control under *in-vitro* and *in planta* conditions. The overall findings are suggestive of the efficacy and potency of *B. altitudinis* MS16 in plant growth promotion and in control of sclerotinia infection in mustard plants.

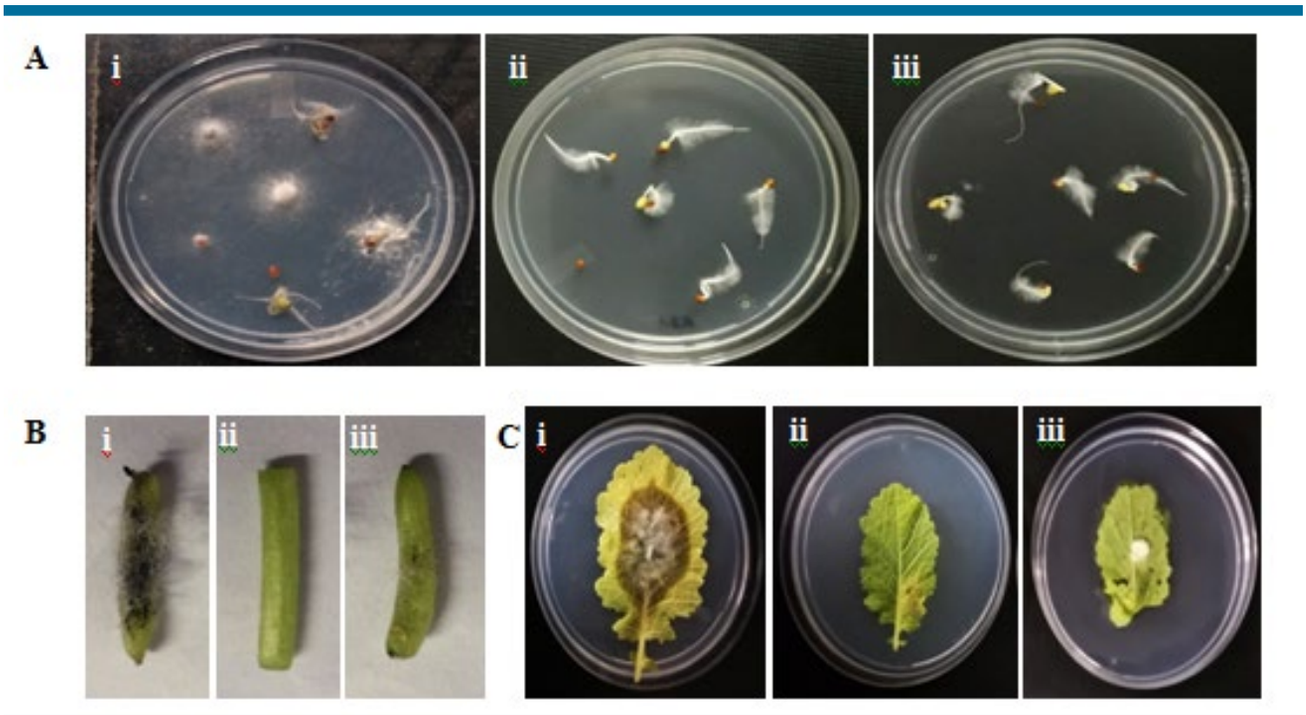


Figure 35: (A) Antagonistic effect of MS16 against *S. sclerotiorum* on mustard seeds (i) Negative control showing least seed germination, plumule and seed coat infection at 7 days of inoculation (ii) Positive control showing no visible infection with good germination (iii) MS16 treated stem showing no visible infection with prominent germination (B) Antagonistic effect of MS16 against *S. sclerotiorum* on mustard stems (i) Negative control showed visible lesion with cottony mycelia growth at 7 day inoculation (ii) while positive control showing no visible lesion (iii) MS16 treated stem showing no visible infection with restricted mycelial growth (C) Biocontrol efficiency of MS16 by detached leaf bioassay (i) Negative control showing maximum lesion diameter with mycelial growth at 7 days after inoculation (ii) Positive control showing no visible lesion (iii) Bacterized mustard leaf showed no visible lesion at 7 day of inoculation. All the experiments were performed in triplicates

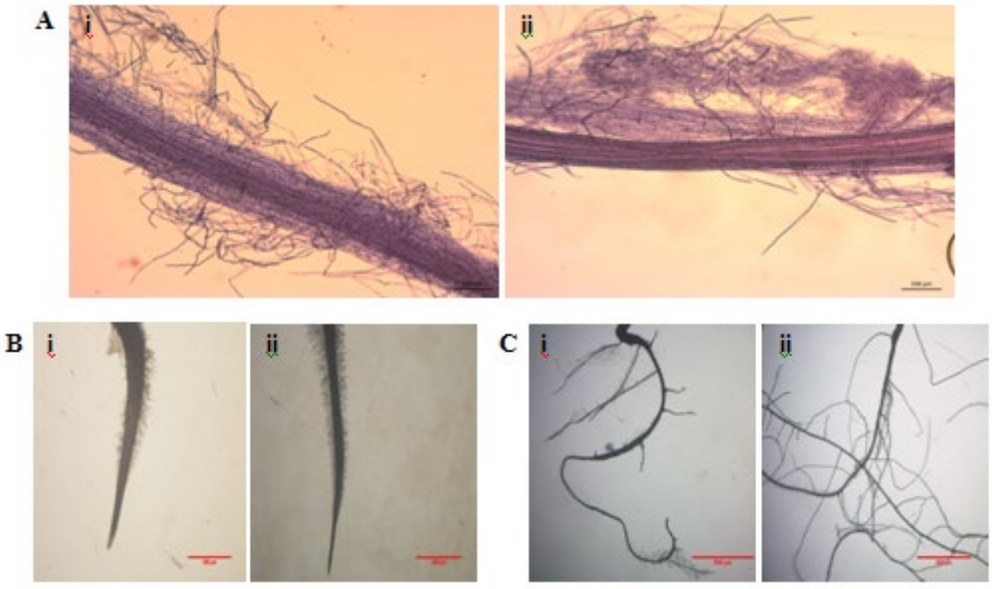


Figure 36: Morphological changes in root system architecture (A) Visualization of root hairs in light microscope under 10X (i) Control root showed comparatively less number of root hairs as that of MS16 colonized roots. Scale bar=100 µm (B) Stereomicroscopic visualization of root hairs at different time intervals (i) Control root without MS16 inoculation after 4 days of seed germination (ii) Treated root with MS16 inoculation after 4 days of seed germination (C)(i) Control root after 12 days of seed germination (ii) Treated root after 12 days of seed germination. Scale bar=500 µm

B. Chemistry of Ecology, Natural Resource Management and Sustainable Development (Coordinator: Dr. Arundhuti Devi)

(i) Treatment of Crude Oil Contaminated Wastewater via an Electrochemical Reaction

Oil field formation water is the amount of wastewater produced during the crude oil drilling process. The total volume of formation water generated during the oil drilling process is about 1.6 times that of the amount of crude oil produced. Formation water contains a wide range of cyclic and acyclic hydrocarbons, which are highly carcinogenic. It targets the essential organs as well as severe damage to the glucose metabolism cycle of a living being.

By keeping this in mind, we synthesized ZnO nanoparticles (NPs) via electrochemical reaction using hydrogen peroxide

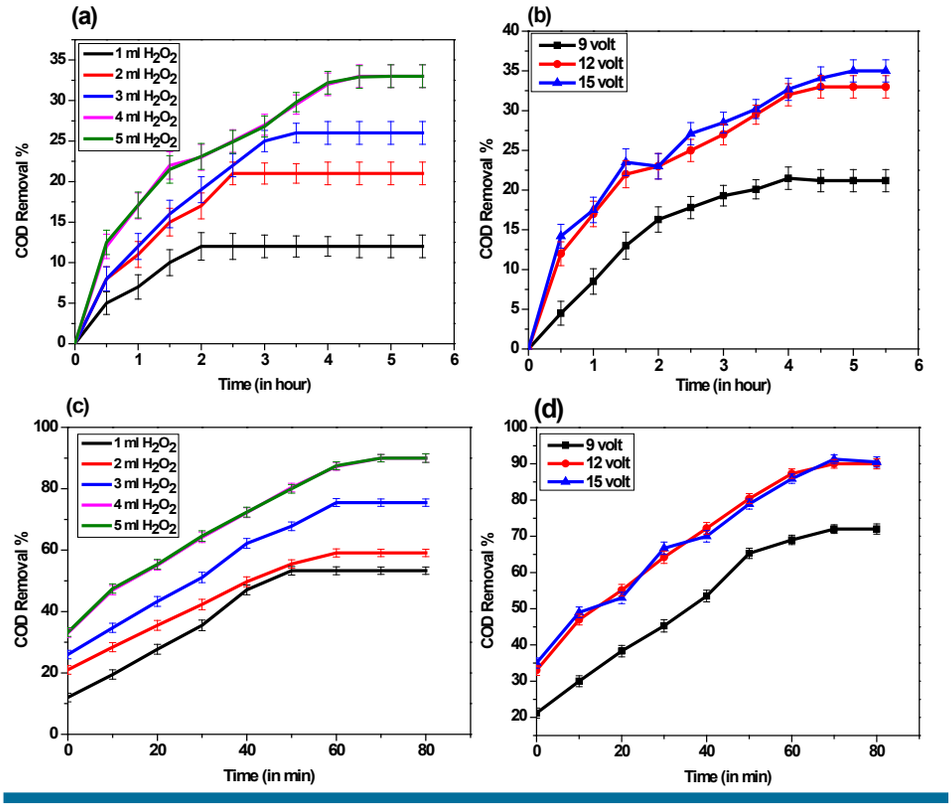


Figure 37: COD removal % by (a) electrochemical reaction at 12 volts and different concentration of H_2O_2 in mL, (b) electrochemical reactions operated at different applied voltage (9, 12, 15 volts) (c) ZnO NPs formed by different dose of H_2O_2 with power supply of 12 volts, and, (d) ZnO nanoparticles formed at different applied voltage (9, 12, 15 volts).

as the electrolyte. These ZnO NPs removed petroleum hydrocarbons from formation water via adsorption mechanism owing to the high efficiency and benefits of nanoparticles as adsorbent due to its high surface area. The formation water samples were subjected to the electrochemical treatment with Zn rods as electrodes and H_2O_2 as the electrolyte, and during the progress of the electrochemical reaction, the ZnO NPs were formed in the *in-situ* condition. Finally, the samples were put in centrifugation at 10,000 rpm for 40 minutes to separate the ZnO NPs from the treated sample. Electrochemical reactions were performed at 9, 12, and 15 volts and were found that the reaction gives its best performance at 12 volts, i.e., nearly 90 % COD removal. UV-DRS absorption spectra confirmed the synthesis of ZnO NPs from the absorption at ~370 nm. The formation of ZnO is further confirmed by the study of the crystal structure of ZnO NPs using XRD analysis. On comparing the XRD diffraction patterns of synthesized ZnO NPs before and after adsorption of hydrocarbons with that of XRD pattern of commercial (analytical grade) ZnO, it was found that synthesized ZnO NPs and commercial ZnO were characterized by distinct diffraction peaks at 31.7°, 34.3°, 36.2°, 47.5°, 56.5° and 62.8° associated to the (100), (002), (101), (102), (110), (103) crystal planes. Moreover, JCPDS No. 01-089-1397 and 03-065-3411 corresponding to the ZnO NPs before and after adsorption indicates that the synthesized ZnO is having hexagonal wurtzite structure.

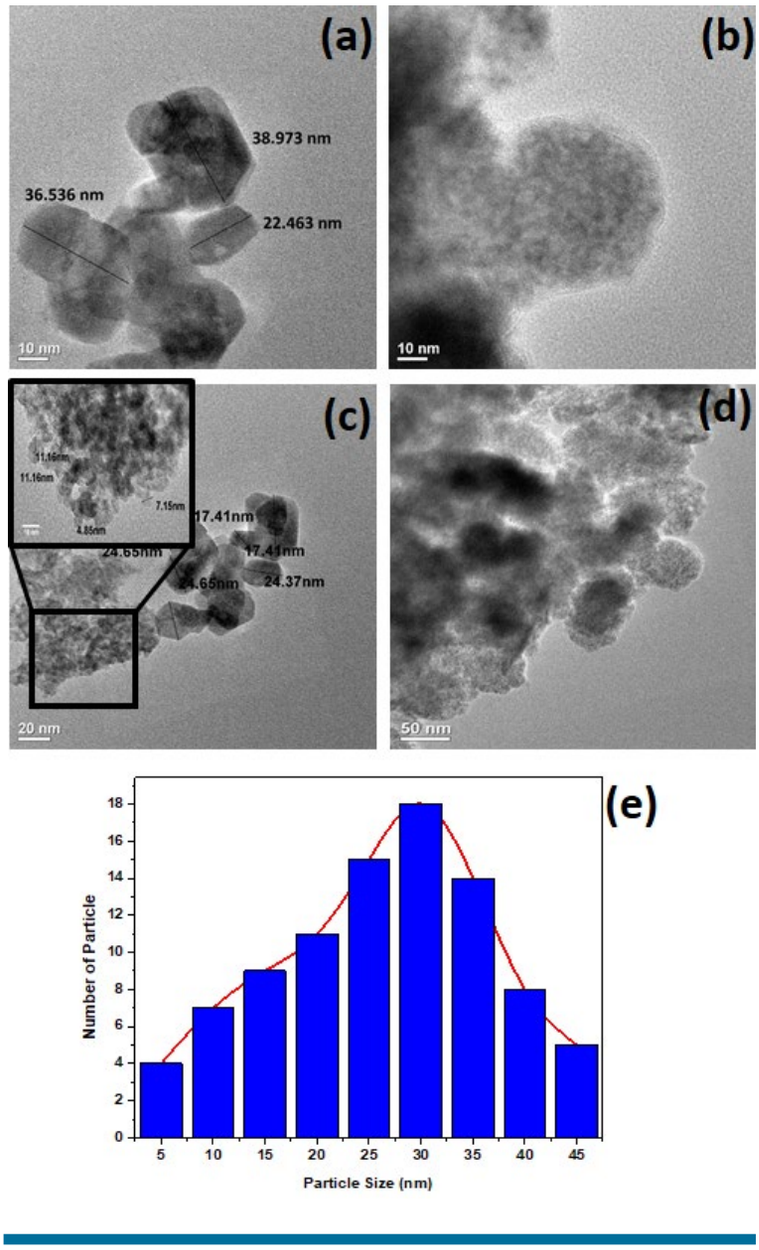


Figure 38: TEM pictures of ZnO nanoparticles

The surface morphology of ZnO NPs before and after the adsorption of hydrocarbons was studied by SEM. SEM images affirmed that the size of synthesized ZnO NPs is approximately 35±5 nm. TEM analysis revealed that the size of NPs on an average ranged from 35 to 40 nm (Figure 38 a), which is in close agreement with the SEM result. TEM image (Figure 38b-e) also confirmed the presence of an organic layer (hydrocarbons) due to the agglomeration of ZnO NPs.

GC-MS study confirmed the presence of 214 numbers of hydrocarbons (ranging between C8 to C33) in the untreated formation water samples with a maximum peak intensity of 3.5 and resolution 10,000,000. GC-MS analysis revealed that out of 214 numbers of compounds (present in the untreated sample), a total of 131 number of compounds were adsorbed by ZnO NPs. Further, the absence of any compound in the chromato-gram of the treated sample attributes that the rest of the compounds were completely or partially degraded by electrochemical degradation reaction. Moreover, this technique overcomes some of the important drawbacks of the existing techniques in the area of electrochemical research, such as the generation of toxic byproducts, unwanted side reactions, and involvement of hazardous chemicals.

(ii) Occurrence and Assessment of Total Organic Carbon, Heavy Metal Content and Metal Bioaccumulation in a Freshwater Wetland of Indo-Burmese Province

The present study aims to assess the quality of water and accumulation of heavy metals in aquatic organisms of an urban tropical freshwater wetland.

Table 2. Mean and standard deviation values of metals in plant samples of Deepor Beel

		As	Cd	Cr	Cu	Fe	Mn	Ni	Pb	Zn
E. crassipes	PRM	44.2	12.7	56.1	74.1	9992.2	498.3	38.3	183.2	647.3
	MON	24.5	5.7	34.2	34.9	9312.2	347.8	24.6	154.8	478.7
	POM	33.1	10.8	43.8	59.7	9971.1	407.6	30.7	170.2	610.8
	AVG	33.9	9.7	44.7	56.2	9758.5	417.9	31.2	169.4	578.9
	SD	9.8	3.6	10.9	19.8	386.6	75.7	6.8	14.2	88.7
E. ferox	PRM	50.3	16.8	84.8	230.2	4612.3	964.3	61.1	351.8	661.2
	MON	34.2	3.8	67.5	142.2	3578.5	645.2	48.5	197.7	597
	POM	45.8	14.5	58.8	198.3	3789.7	879.3	57.7	289.3	645.8
	AVG	43.4	11.7	70.3	190.2	3993.5	829.6	55.7	279.6	634.6
	SD	8.3	6.9	13.2	44.5	546.2	165.2	6.5	77.5	33.5
H. verticillata	PRM	45.3	14.9	58.4	174.1	2978.8	704.2	28.3	178.1	644.8
	MON	25.1	7.9	46.9	112.5	2787.2	587.2	17.6	167.7	578.2
	POM	38.7	10.1	51.2	133.7	2897.1	629.7	21.2	170.1	608.4
	AVG	36.3	10.9	52.1	140.1	2887.7	640.3	22.3	171.9	610.4
	SD	10.3	3.5	5.8	31.2	96.1	59.2	5.4	5.4	33.3

The study revealed that few water parameters mainly dissolved oxygen, biological oxygen demand, fluoride, and some metals failed to meet the required standard limits, which indicates that the water is neither fit for drinking purpose nor for the health of aquatic organisms living in the aquatic body. Among the major ions, the fluoride concentration (1.8 ± 0.9 to 3.9 ± 0.9 ppm) was found to exceed the WHO limit (1.5 ppm). The metal contents in water samples were found to be highest in the premonsoon period (Jan-March) because of less dilution of the water, i.e., absence of rainfall in that season. The TOC showed a highly significant positive correlation (> 0.75) with TDS, NO_3-N, K, As, Cd, Co, Cr, Cu, Mn, Pb, and Zn at 0.01 level of confidence. TOC also had a significant correlation (approximately 0.70) with PO4-P, Fe and Ni at 0.05 level of confidence.

The overall metal distribution in Deepor Beel plants occurred in the decreasing order of Fe > Mn > Zn > Pb > Cu > Cr > Ni > As > Cd. in our study, *E. ferox* and *H. verticillata* had better metal accumulation for almost all the metals except Fe (table 1).

The mean concentration of Zn, Fe, Mn, Cr, Pb and Cd in the fishes was found to be quite higher than the prescribed Food and Agriculture Organization (FAO)/ World Health Organisation (WHO) limits (JECFA 2012) for fishes. Figure 39 shows that the highest metal accumulation occurred in the organs, particularly the kidney; whereas, the least accumulation occurred in the muscles.

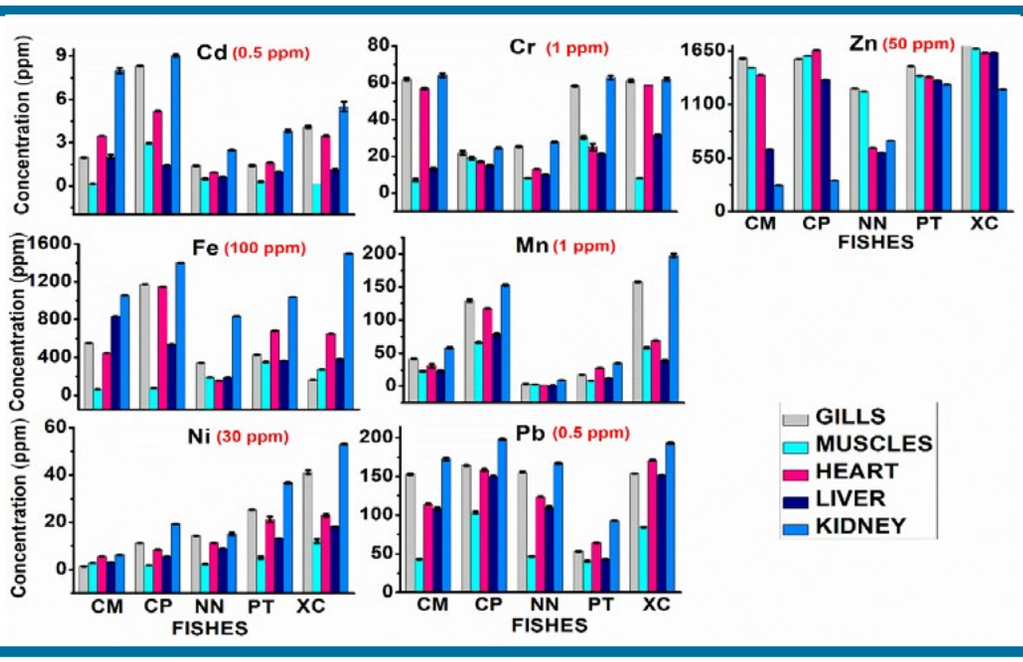


Figure 39: Heavy metal distribution in selected fish species of Deepor Beel- *C. marulius* (*CM*), *C. punctatus* (*CM*), *N. notopterus* (*NN*), *P. terio* (*PT*), and *X. cancila* (*XC*). The WHO limit for each metal in fish is mentioned in red color in the insets.

The bioconcentration factor (BCF) values succinctly pointed out the heavy metal contamination threat to the existing aquatic flora and fauna of the Beel. *C. punctatus* showed high BCF values for Cd, Fe, Mn and Pb while *X. cancila* with maximum BCF values for Cr, Ni and Zn. This study points out that water contamination of Deepor Beel is a matter of concern for the aquatic life and human health; moreover, the need for adoption of proper management strategies for restoration of the Ramsar wetland and assertion of water source security.

C. Ethnicity, human microbiome and health (Coordinator: Dr. Mojibur R. Khan)

(i) Ethnicity and gut microbiome

The human gastrointestinal (GI) tract harbors a vast degree of microbial diversity which influences the host physiology and health.

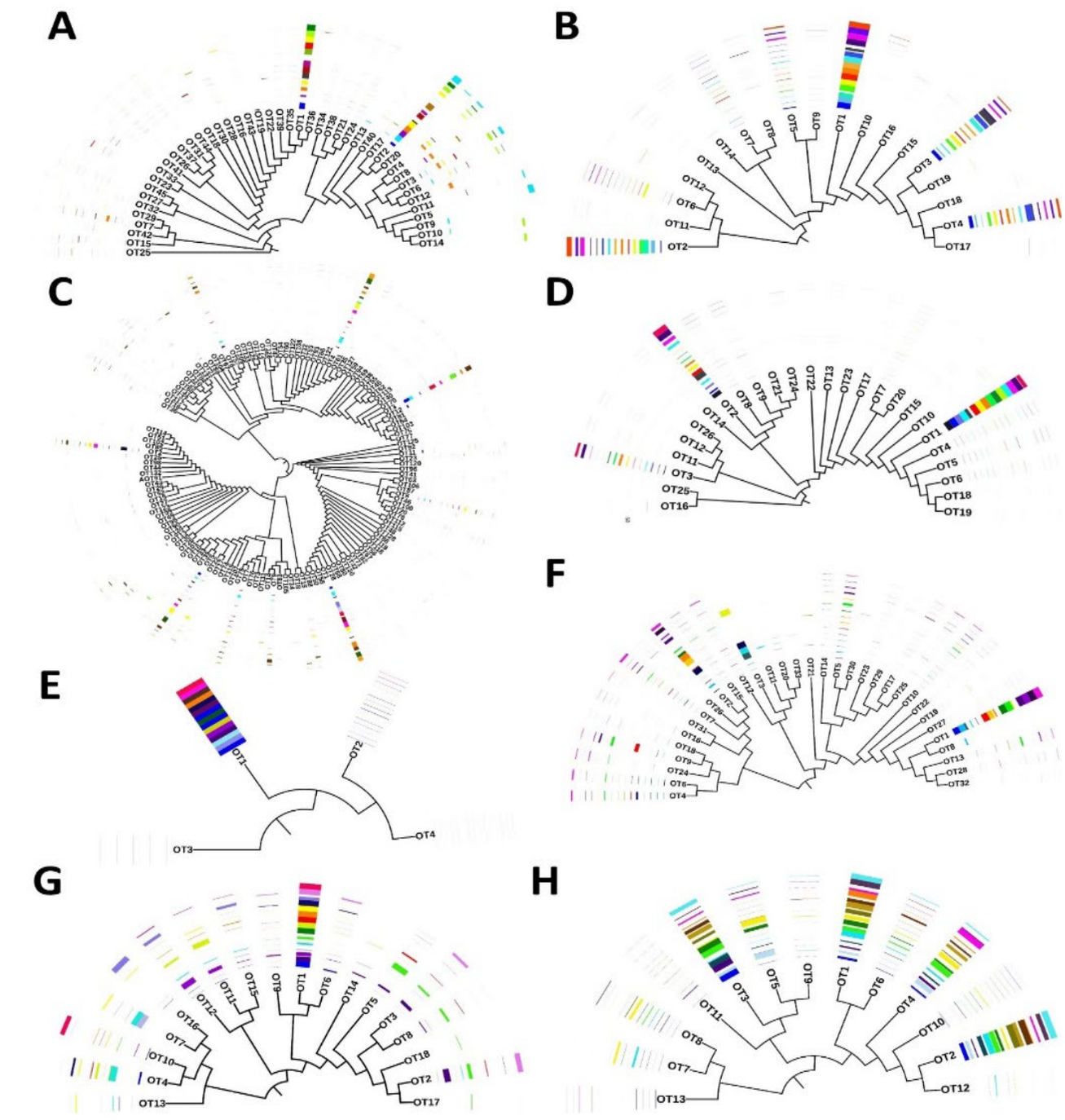


Figure 40: Phylogenetic tree representing the relationships of the oligotypes detected under each bacterial genera, (A) *Faecalibacterium* (B) *Ruminococcus* (C) *Eubacterium* (D) *Collinsella* (E) *Roseburia* (F) *Clostridium* and (G) *Blautia* and their occurance across the 15 ethnic groups. Bars represent the frequency of the oligotypes in an ethnic group denoted by 15 colours

Gut microbial diversity of 15 ethnic groups from Assam (Bodo, Karbi, Tai-Phake, Tai-Aiton and Tea-tribe), Manipur (Kuki, Meitei and Tangkhul), Sikkim (Bhutia, Nepali and Lepcha) and Telangana (Kolam, Koya, Gond and Nayak) were analysed by Next Generation Sequencing (NGS) of the fecal metagenomic DNA samples using Illumina Miseq platform. NGS data revealed dominance of bacterial phyla ***Firmicutes*** and ***Bacteroidetes*** in the ethnic groups. Among the bacterial genera ***Prevotella*** was the most dominant genus, followed by ***Faecalibacterium***, ***Eubacterium***, ***Clostridium***, ***Blautia***, ***Collinsella***, ***Ruminococcus***, ***Roseburia*** etc. Oligotyping was performed to resolve the distribution of closely related but distinct bacterial groups within a genus for some of the core genera using the V3-V4 region of 16S rDNA. Based on entropy analysis, the bacterial genera were resolved into various oligotypes those were earlier mapped into same taxon. The oligotyping of the core bacterial genera ***Faecalibacterium***, ***Eubacterium, Clostridium, Blautia, Collinsella, Ruminococcus and Roseburia*** showed distribution of different oligotypes across the ethnic groups (Figure 40). The oligotyping analysis revealed highest diversity of the genus ***Ruminococcus*** (134 oligotypes) and dominance of single oligotype under the genus ***Collinsella*** among 4 oligotypes.

(ii) Traditional dietary habits and gut microbiome

Rice beverage and microbiome

Traditionally prepared rice beverage is widely consumed by most of the ethnic groups of the North-East of India. There has been a research interest in understanding the ingredients and attributes in such drinks and their implications on human health. This research is exploring (1) rice beer fermentation processes of various ethnic groups in the North-East of India in which various types of herbs are used and also (2) their implications on human health. Previously, we had reported the chemical constituents of rice beverages and their probable role in human physiology. Our ongoing study on the microbiome data from the drinkers of two variants (***Poro*** and ***Nogin Apong***) of the ***Mishing*** ethnic group of Assam and a non-drinker control group from ***Vaishnavite satra*** of Majuli indicates the effect of the variants on gut microbiome and also the differential abundance of the bacteria in the groups. A predictive model based on machine learning algorithm has been developed to categorise an individual based on the gut microbiome.

Dairy products

Traditionally in Assam people prefer to consume curd prepared using raw milk (RMC) over those prepared from boiled milk (BMC). Previously, we had shown the differences in microbial and metabolite compositions and their effect on human gut microbiome. Our ongoing work on the consumers of RMC and BMC indicates their role on human gut microbiome (Figure 41). A phylogenetic tree assigned individuals of RMC consumers (Majuli) in one cluster while individuals from BMC consumers from Aanthmile and Jagiroad localities near Guwahati into another cluster (Figure 41A). It was observed that consumption of milk products; curd and ***Jolpan*** (rice snack) were the major differentiating factors. Principal component analysis (PCA) differentiated these populations based on milk product and curd consumption habits along with few blood parameters (Figure 42B).

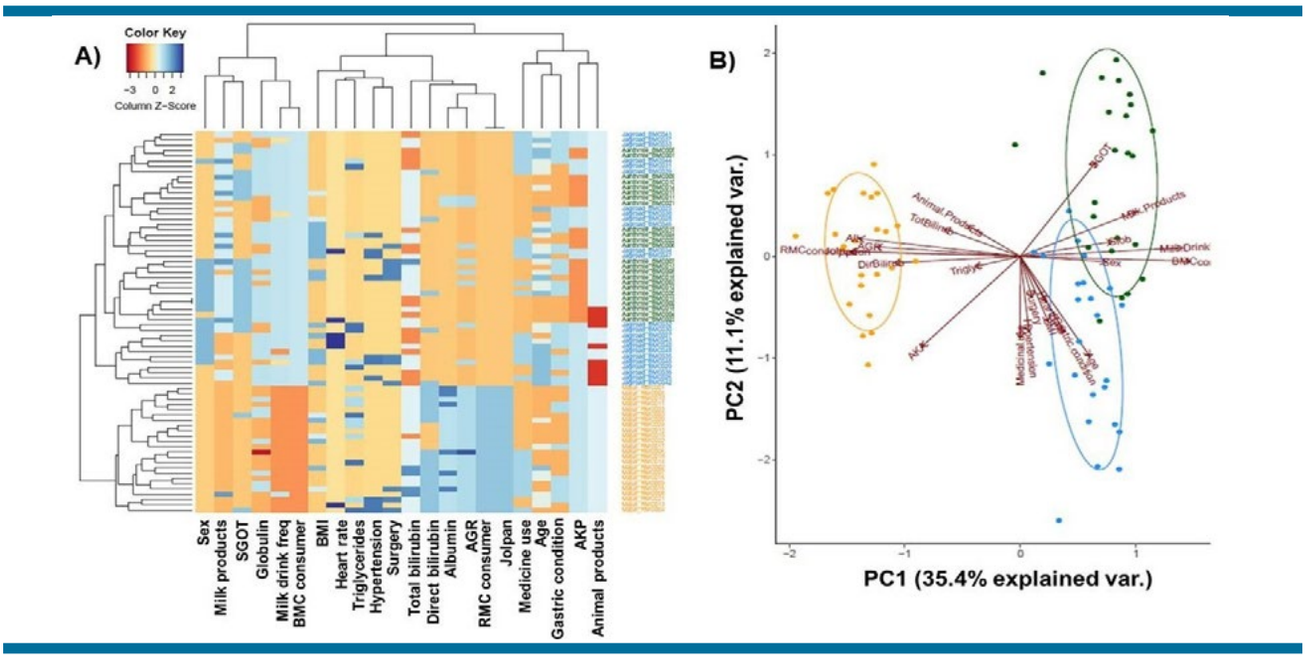


Figure 41: Effect of dairy products on human health. (A) A heatmap and (B) principal component analysis (PCA) plot based on the dietary habits and blood parameters of RMC and BMC consumers.

(iii) Beneficial microbes from the fermented food products

Development of next generation probiotic

Bacteria isolated from curd were tested in the experimental model organism *Caenorhabditis elegans* for probiotic properties.

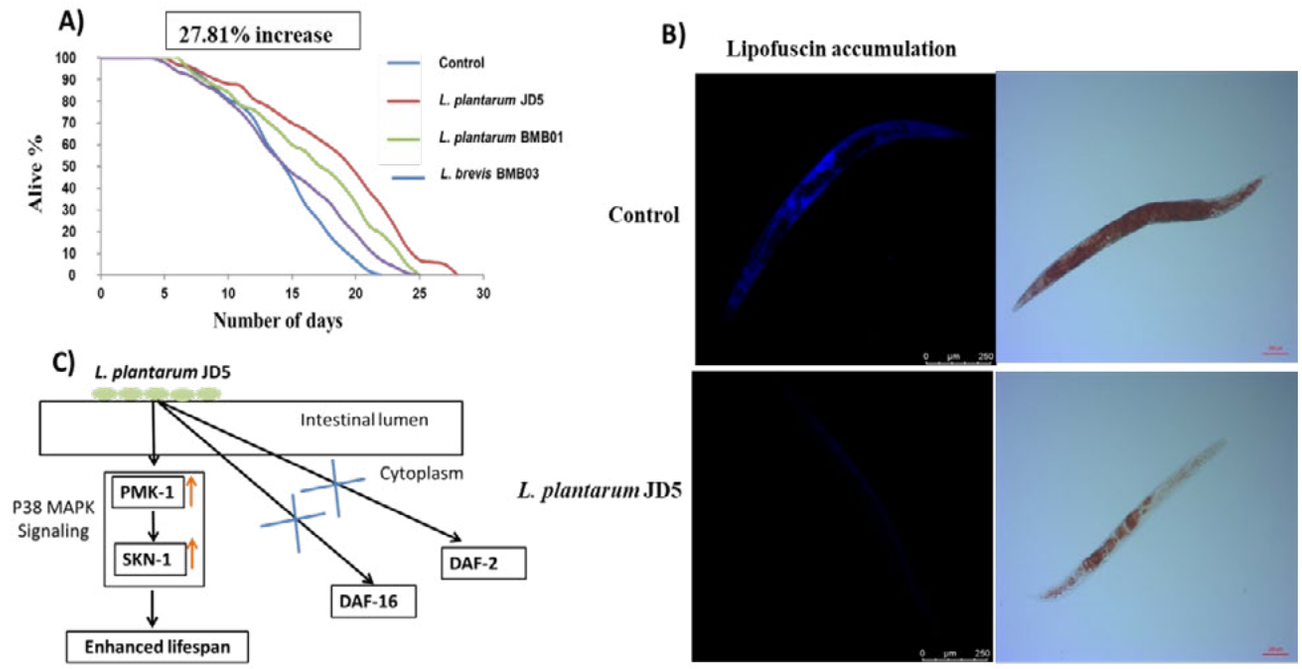


Figure 42: Effect of probiotic on the longevity of *C. elegans* **(A)** Effect of *Lactobacillus plantarum* JD5 (isolated from curd) on the lifespan of *C. elegans*. **(B)** Effect of *Lactobacillus plantarum* JD5 on the age-related biomarkers of *C. elegans*. **(C)** Predicted mechanism of action of *Lactobacillus plantarum* JD5 in enhancing lifespan.

A bacterium *Lactobacillus plantarum* JD5 enhanced the mean lifespan by 27.81% compared to control*C. elegans* (Figure 42A). The age-related parameters of youngness, such as pharynx pumping and locomotory activity were also significantly increased in the JD5-treated *C. elegans*. Other age-related parameters such as lipofuscin and fat accumulation were significantly reduced in the JD5-treated *C. elegans* (Figure 42B). Studies on the genetic mutants of *C. elegans* revealed that *L. plantarum* JD5 causes these anti-ageing effects via p38 MAPK pathway, which is also known to be involved in immune and stress responses (Figure 42C).

D. Exploration of culturable microflora endowed with antagonistic activity and plant growth promoting characteristics (Coordinator: Dr. Debajit Thakur)

(i) Antimicrobial Biosynthetic Potential and Diversity of Culturable Soil Actinobacteria from Forest Ecosystems of Northeast India

The present investigation was undertaken with an aim to isolate actinobacteria from Pobitora Wildlife Sanctuary (26°12′ to 26°16′N and 91 °58′ to 92 °05′E) and Kaziranga National Park (26°30′ to 26°45′N; 93°08′ to 93°36′E) of Assam, India and screening them against an array of microbial pathogens responsible for human pathogenesis. A total of 107 actinobacteria were isolated, of which 77 exhibited significant antagonistic activity. The restriction digestion profile of the 77 antagonistic actinobacteria were analysed by ARDRA fingerprinting analysis using restriction endonuclease. Digestion with Hinf1 showed different restriction banding patterns and the dendrogram was constructed. Critical analysis of the dendrogram obtained from Unweighted Pair Group Method with Arithmetic Mean (UPGMA) revealed three major clusters consisting of *Streptomyces* sp. *Nocardia* sp. and *Kribbella* sp. Overall analysis of the soil samples from the two forest ecosystems, indicated *Streptomyces* as the dominant genus in these habitats (Figure 43).

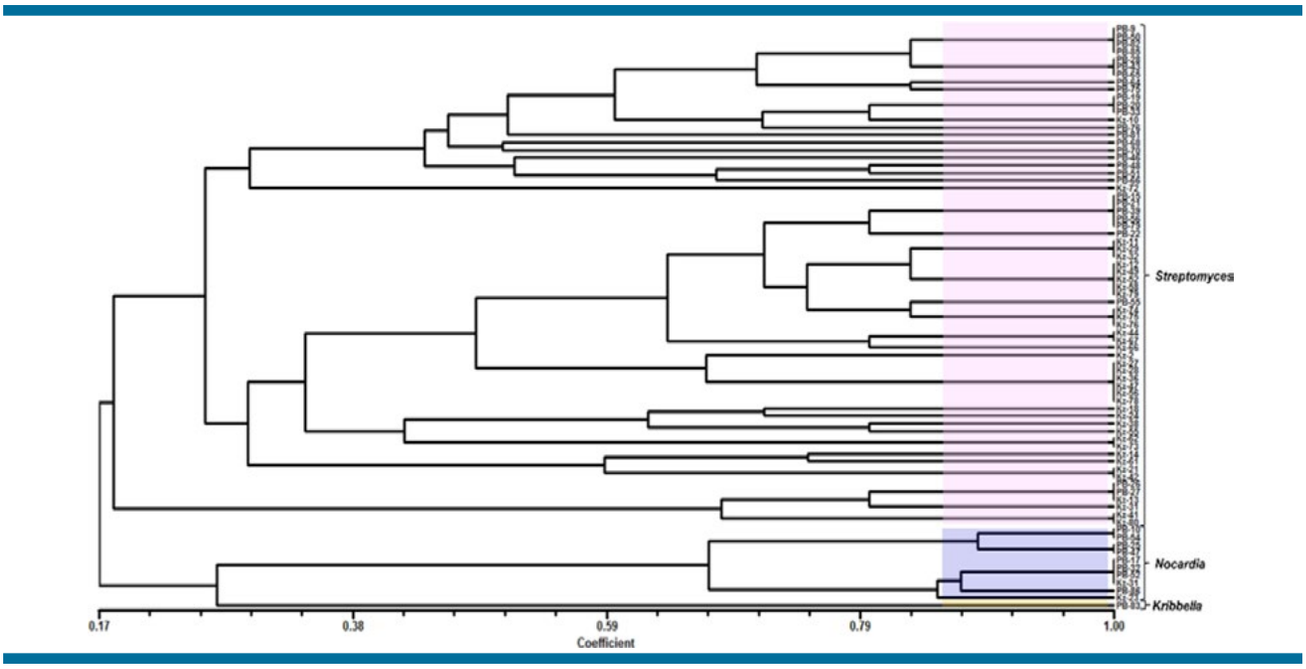


Figure 43: UPGMA dendrogram showing the clustering of 77 antagonistic actinobacteria isolates based on the 16S rDNA generated from ARDRA by Jaccard's coefficient using NTSYS-pc 2.02e. The scale on the x-axis refers to the similarity coefficient

Molecular identification indicated that these actinobacteria predominantly belonged to genus *Streptomyces*, followed by *Nocardia* and *Kribbella*. Four actinobacterial strains, viz. *Streptomyces* sp. PB-79 (GenBank acc. no. KU901725), *Streptomyces* sp. Kz-28 (GenBank acc. no. KY000534), *Streptomyces* sp. Kz-32 (GenBank acc. no. KY000536) and *Streptomyces* sp. Kz-67 (GenBank acc. no. KY000540) showed ~89.5% similarity to the nearest type strain in EzTaxon database and may be considered as novel strain. *Streptomyces* sp. Kz-24 (GenBank acc. no. KY000533) showed only 96.2% sequence similarity to *S. malaysiensis* and exhibited minimum inhibitory concentration of 0.024 µg/mL against methicilin resistant *Staphylococcus aureus* ATCC 43300 and *Candida albicans* MTCC 227 (Figure 44). MIC of the ethyl acetate extract derived from the strain *Streptomyces* sp. Kz-24 supports the popular notion that antimicrobial metabolites extracted from *Streptomyces* sp. at very low concentrations can be one of the finest sources of potent antimicrobials for treatment of infectious diseases especially those caused by clinically resistant pathogens, such as *P. aeruginosa*, MRSA and *C. albicans*.

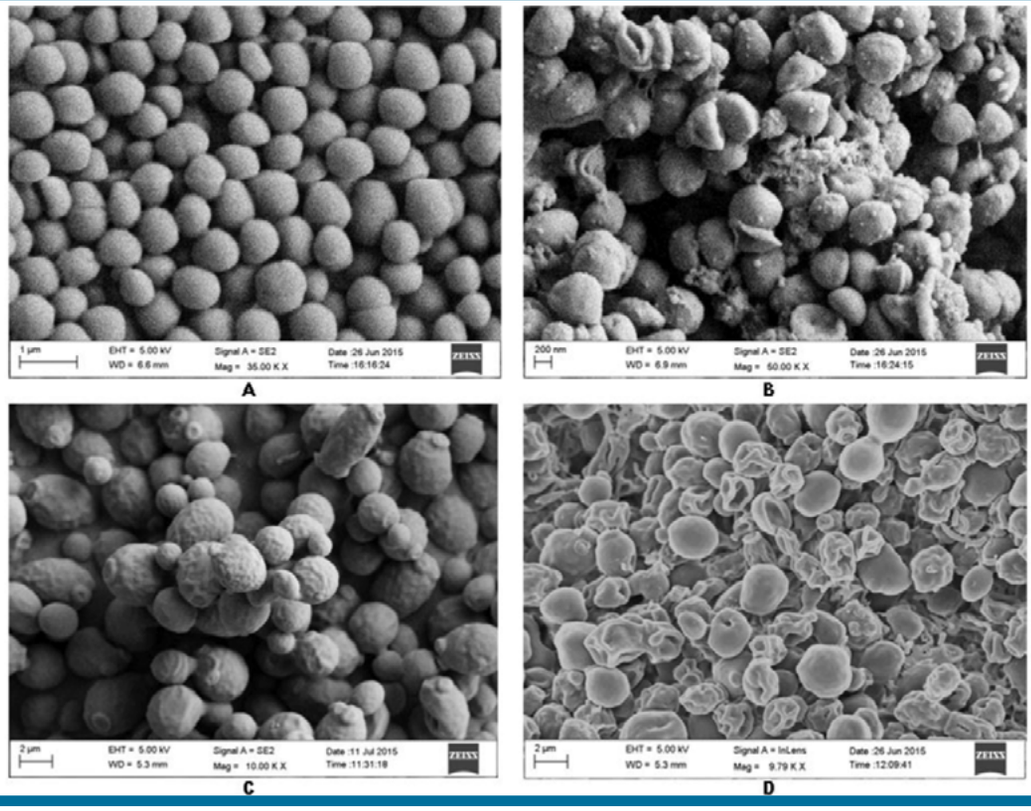


Figure 44: Scanning electron micrograph showing the effect of 1×MIC ethyl acetate extract of Kz-24 against MRSA ATCC 43300 (A) without treatment, (B) treatment with EA-Kz-24; and against *C. albicans* MTCC227 (C) without treatment, (D) treatment with EA-Kz-24

Twenty-four actinobacterial isolates tested positive for at least one of the polyketide synthase type I, polyketide synthase type II or non-ribosomal peptide synthase genes within their genome. Their secondary metabolite pathway products were predicted to be involved in the production of ansamycin, benzoisochromanequinone, and streptogramin using DoBISCUIT database. This study establishes that actinobacteria isolated from the poorly explored Indo-Burma mega-biodiversity hotspot may be an extremely rich reservoir for production of biologically active compounds for human welfare.

(ii) Possibility of Reducing Chemical Inputs in Tea Plantation through the Application of Endophytic Bacteria and Actinobacteria

We have isolated 46 endophytic actinobacteria associated with *Camellia* spp. and related genera, *Eurya* based on morphological characteristics of the isolates. 16S rRNA gene sequence analysis showed that the isolates represented nine actinobacterial genera, *Nocardia, Amycolatopsis, Streptomyces, Pseudonocardia, Kribbella, Actinomadura, Microbispora, Rothia* and *Saccharomonospora*. *In-vitro* functional characterization of the isolates for plant growth promoting (PGP) traits revealed many potent PGP isolates such as, SA1 and S43 which showed all the tested PGP traits, i.e., phosphate solubilization, indole-3-acetic acid (IAA), ammonia, siderophore and chitinase production. Out of the 46 endophytic actinobacteria isolates, 21 showed inhibition against atleast one test fungal phytopathogen and, isolates SA25 and SA29 exhibited broad spectrum antifungal activity against all the tested phytopathogens. Most of the endophytic actinobacteria isolates having antifungal activity were positive for the presence of chitinase, Non-ribosomal peptides synthetase or Polyketide Synthase gene, suggesting the presence of distinctive mechanisms to inhibit the growth of pathogenic plant fungi. Amplified ribosomal DNA restriction analysis and BOX-PCR fingerprinting analysis of the potent isolates with antagonistic activity grouped the isolates into 5 and 4 separate clusters, respectively. Further detection of IAA production by the top ranked actinobacterial isolates namely, SA1, T1LA3 and S85 by using thin-layer chromatography (TLC), high-performance liquid chromatography (HPLC) and liquid chromatography-mass spectrometry (LC-MS) was done (Figure 45).

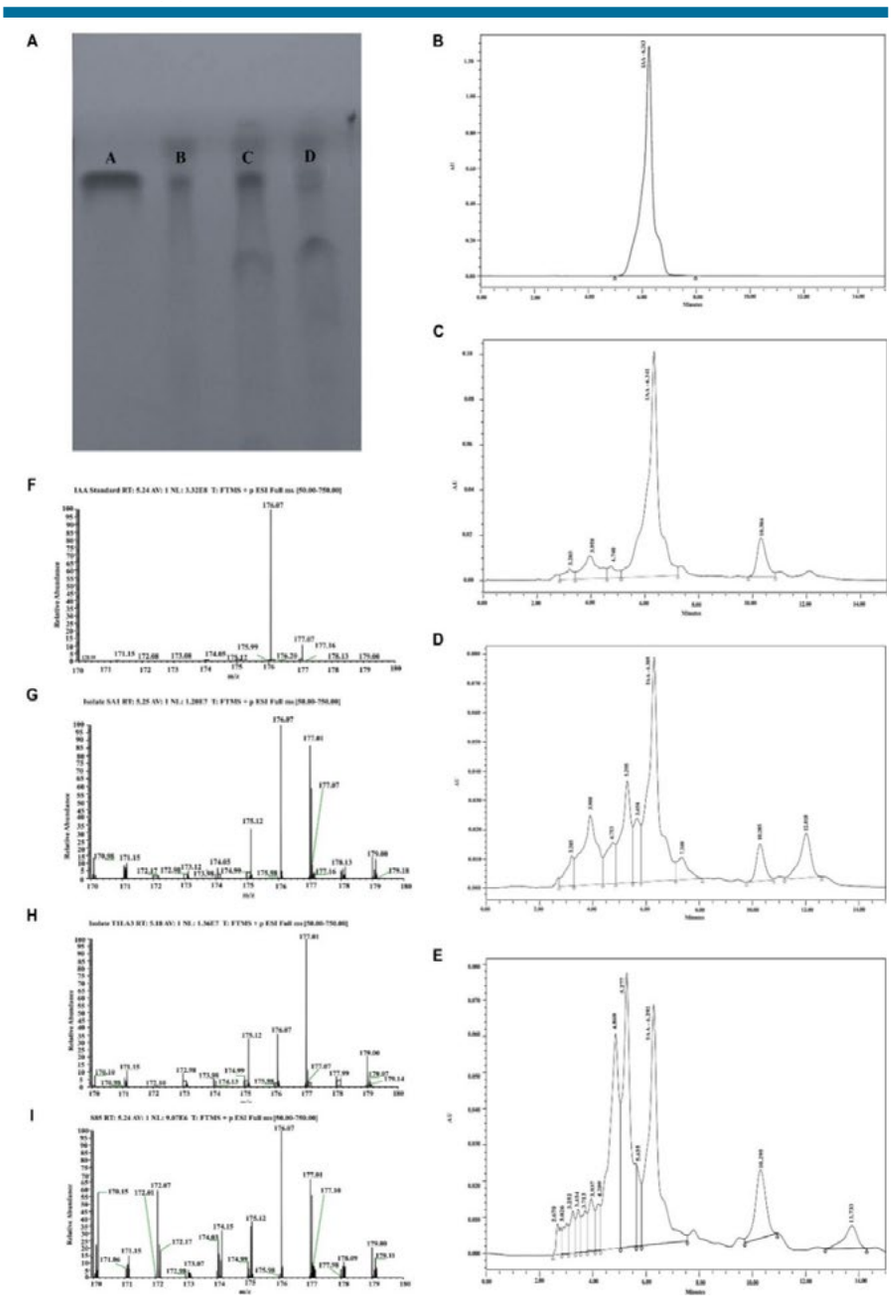


Figure 45: Detection orf IAA production by isolates, SA1, T1LA3, and S85 using chromatographic methods. (A) thin-layer chromatography (TLC) – A. standard IAA, B. SA1, C. T1LA3, and D. S85; High- performance liquid chromatography (HPLC) – (B) standard IAA, (C) SA1, (D) T1LA3, (E) S85; Liquid chromatography–mass spectrometry (LC-MS) - (F) standard IAA, (G) SA1, (H) T1LA3, (I) S85

Endophytic actinobacteria isolates, namely, SA1, T1LA3 and SA14 were further tested for their efficacy in promoting the growth of commercial tea clones, namely, TV1, TV9, TV18, and TV22 in

nursery conditions. All the endophytic isolates tested showed significant differences ($P \leq 0.05$) in terms of plant growth promoting parameters in the treated plants compared to untreated control and may, thus be, deemed as potential candidates for application in bioformulations for tea growth and fungal disease suppression.

In another research work, a total of 129 endophytic bacteria from six different Tea species were isolated and characterized for plant growth promoting traits such as indole-3-acetic acid (IAA), phosphate solubilization, ammonia production, biocontrol traits like siderophore and extracellular enzyme production. BOX-PCR fingerprinting was used to differentiate the various bacterial isolates obtained from six different tea species. 16S rRNA sequencing and BLAST analysis showed that these isolates belonged to different genera, such as *Bacillus*, *Brevibacterium*, *Lysinibacillus* and *Paenibacillus*. *Lysinibacillus* sp. S24 showed the highest phosphate solubilization and IAA acid production efficiency of 268.4±14.3 µg ml^{-1} and 13.5±0.5 µg ml^{-1}, respectively. *Brevibacterium* sp. S91 showed the highest ammonia production of 6.2±0.5 µmol ml^{-1}. Chitinase, cellulase, protease and pectinase activities were shown by by 4.6%, 34.1%, 27.13% and 13.14%, of the total isolates, respectively. Similarly, 41% of the total isolates were positive for 1-aminocyclopropane-1-carboxylic acid (ACC) deaminase activity. Further, the potent PGP bacterial isolates, S24 and S91 were able to enhance the vegetative parameters such as dry/ fresh weight of root and shoot of tea plants in nursery conditions. The exploration of tea endophytic bacterial community is suitable for the development of bioformulations for an integrated nutrient management and thus sustainable crop production and decreasing the hazardous effects of chemical fertilizers on the environment and human health.

E. Silkworm physiology, pathology and use of silk-based materials in biotechnological applications (Coordinator: Dr. Rahul Hepat)

Seri-Biotechnology lab research deals with the golden-silk producing species of Muga silkworm, Antheraeaassamensis and its interaction with pathogens in a broad sense. The interest is to understand how Muga silkworm respond to pathogens, but also how other factors (other pathogens, different host plant, etc.) can influence in the interaction. We do have strong interest in application of silk in biotechnological applications.

(i) Molecular and Biological Characterization of Cypovirus Isolated from Muga Silkworm, Antheraea Assamensis Helfer

In this study, we have isolated and characterized a virus isolated from infected Muga silkworm during rearing on som plantation in the IASST campus (Figure 45). We have extracted occlusion bodies (OBs) from dead insect cadavers and purified OB's. Subsequently, the purified OB's was then analysed for their ultrastructure by using scanning and transmission electron microscopy. The size and shape of the virions closely resembled with cypoviruses, a double stranded RNA virus which infects many lepidopteran insects including silkworms. Thereafter, we named the virus as, Antheraea assamensis cytoplasmic polyhedrosis virus (AaCPV). The physiological function of AaCPV was also studied, infection by AaCPV dramatically affects weight loss, growth retardation, and change in tegument coloration, death to pupation, reduced cocoon size and emergence of healthy adult in A. assamensis. We are now characterizing all the viral segments of AaCPV and investigating mechanism of viral proliferation and interaction between silkworm and AaCPV in a genome-wide transcriptomic analysis.

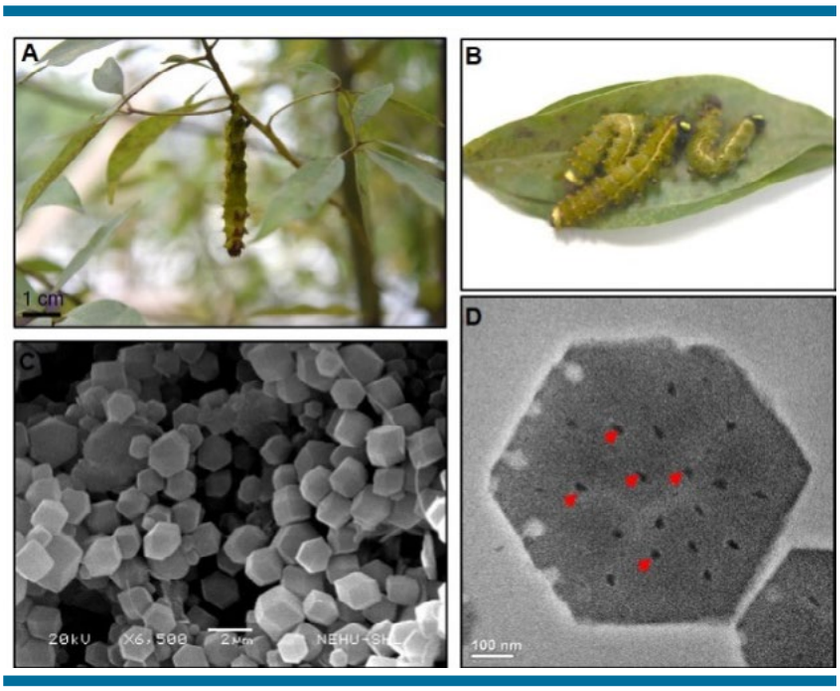


Figure 46: Structural and ultrastructural characterization of the novel cypovirus isolated from Antheraea assamensis showing typical of virus infection. (A) Dead A. assamensis silkworm stuck on the branch with viral symptoms. (B) Dead larvae showing typical pasty increment and change of tegument color (C) Scanning electron microscopy of purified polyhedral bodies (OB's from dead infected larval cadaver. (D) Transmission electron micrographs of OB's in transversal sections showing icosahedral virus particles (indicated with red arrow heads)

(ii) Nanoparticles-Based Immune Booster to Combat Viral Infection in Muga Silkworm, Antheraea Assamensis Helfer

We have developed cost-effective, environment friendly and stable TiO_2 nanoparticle based formulation immune booster to combat deadly AaCPV infection in A. assamensis. We have successfully synthesized and characterized TiO_2 nanoparticles using sol-gel method. The average particle sizes of the NPs powder ranged is 17± 8 nm after 3 h of incubation. The structure, morphology of the obtained TiO_2 NPs was characterized by XRD, SEM and TEM as shown in Figure 47a-f. The absorption spectrum of TiO_2 is in Figure 47g. To understand effect on TiO_2 NPs on silkworm survival after AaCPV infection, we reared first to third instar larvae of Muga on som trees and from fourth instar, silkworms were reared in control or experimental zones, and each zone had 2 groups with 14 larvae in each group for the determination of mortality and cocoon quality. The larvae of theexperimental zones were continuously fed with TiO_2 NPs at 5 mg/L until moulting. The larvae of the control zones were fed with som leaves which treated with sterile water. The treatment was given three-times in a day by spraying on som leaves in the field. Newly moulted 5th instar larvae were fed leaf disc (20 mm) with occlusion bodies (OB's) containing AaCPV (1 $\times 10^6$ polyhedral/larva) in the laboratory. After confirming larvae have eaten entire leaf disc, then released on som tree. Finally, average mortalities of control and experimental group were recorded. Preliminary results indicate that TiO_2 NPs significantly improve survival rate of Muga silkworms (Figure 47h). Also the experimental group does not show apparent infection in the worms but control larvae with apparent infection of silkworm at 120 h. We are further validating our results so that we can see its potential for commercialization in the market.

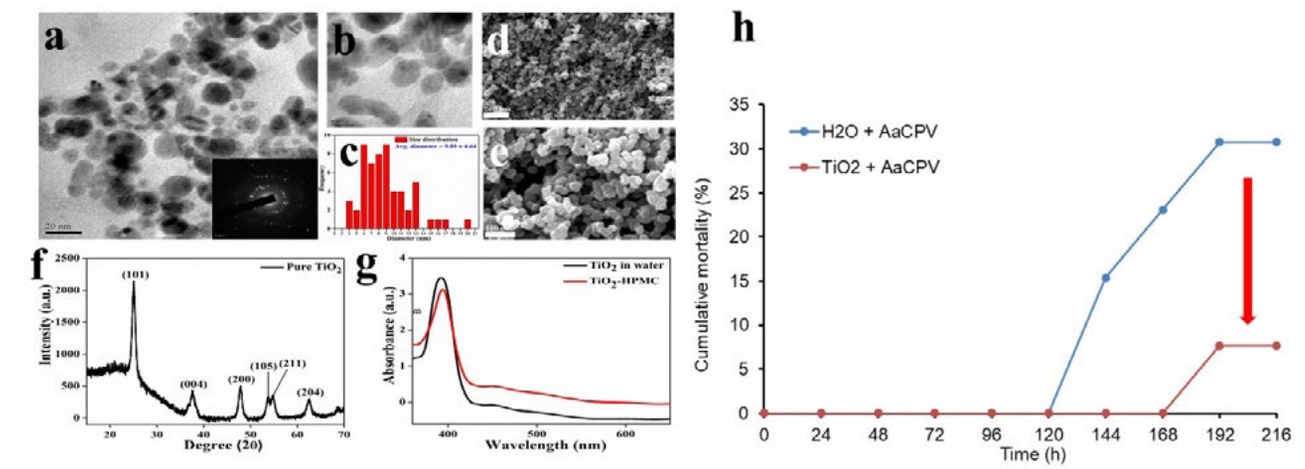


Figure 47: Characterization of TiO_2 NPs synthesized by sol-gel method. HR-TEM images at different magnifications (a & b) and narrow size distribution (c) of TiO_2 NPs with Avg. diameter= 9.89 ± 4.64 nm. SEM images at different magnifications depict surface morphology of TiO_2 NPs (d & e). (f) XRD of as-synthesized TiO_2 NPs showing pure crystalline anatase phase. (g) UV-Vis absorption spectra of TiO_2 in water and TiO_2 in HPMC solvent showing absorption band in visible light range around 395 nm. The results are agreement with *Sci Rep* 7, 17662 (2017). (h) Cumulative mortality of AaCPV infection in Muga silkworms. Blue polylines represent the experimental group, and red polylines represent the control group. X-axis is the time after AaCPV infection, and Y-axis is the cumulative morality (%)

F. Microbes and Microbiota for Food and Health (Coordinator: Dr. Wahengbam Romi)

Human Microbiome as a Therapeutic Target for Improving Women Health

In our continued effort to study the reproductive tract microbiome and its implication in the reproductive health outcome, we characterized the vaginal microbiota of healthy and premature natural menopausal women. No significant variation (p> 0.05) in the community structure of the vaginal microbiota during the menstrual cycle was observed in the controlwomen with no or little changes in the α-diversity (species richness, diversity indices and evenness), indicating a relatively stable vaginal microbiota during the menstrual cycle. Inter-women variation in the vaginal microbiota was considerably more than the intra-women variation during the cycle and was more or less individualized.

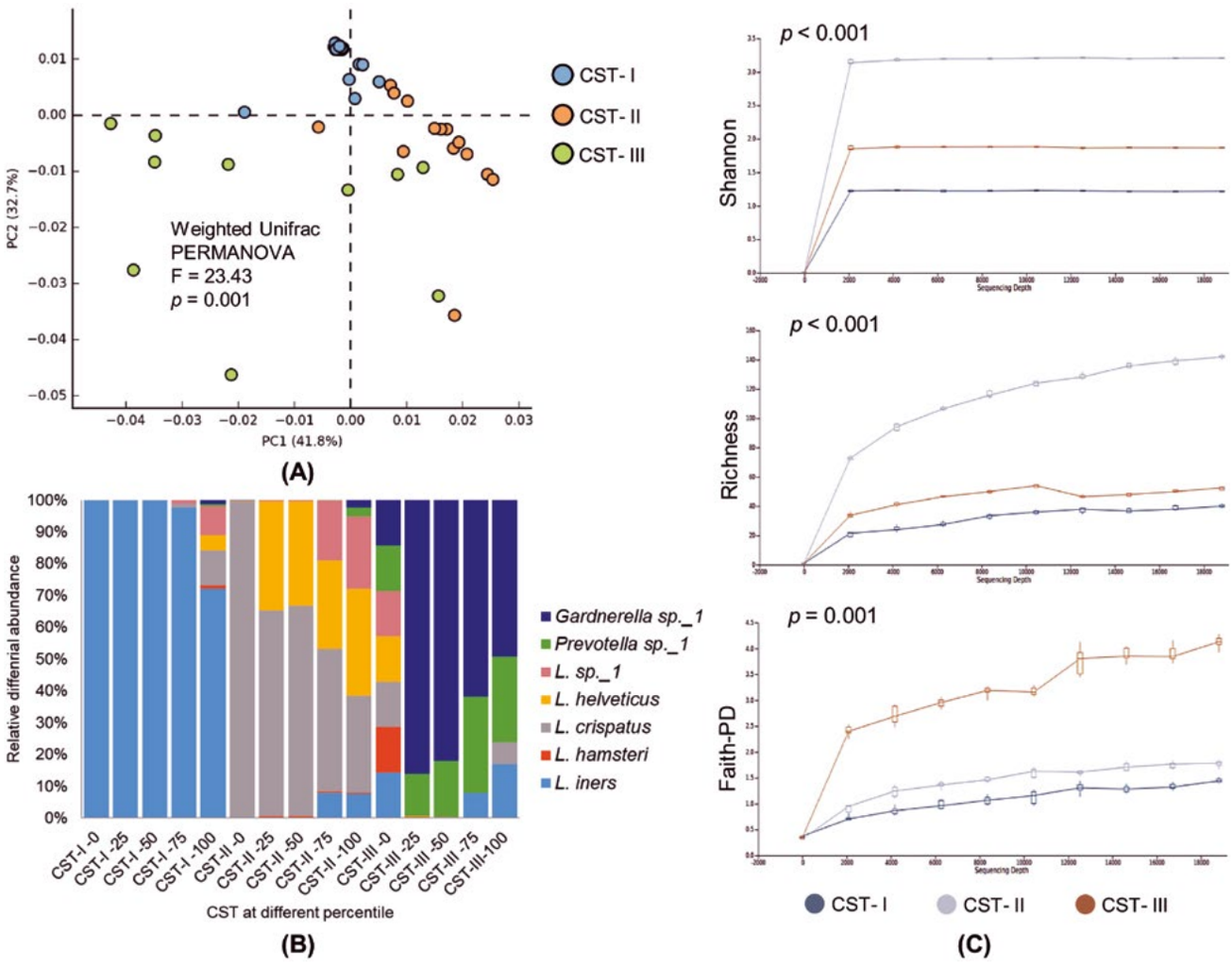


Figure 48: PCA plot showing CSTs of the vaginal microbiota (A), bar chart showing the differential abundances of the CSTs (B), and rare faction curve showing the difference in α-diversity between the CSTs (C)

The vaginal microbiota of reproductive-age women was dominated by *Lactobacillus*spp. In-depth analysis revealed that the vaginal microbiota existed in three community state types (CSTs), which were characterized by differential microbiota abundant and diversity (Figure 48). Among the *Lactobacillus* species, clustering of the microbiota profiles revealed that the most frequently detected were *Lactobacillus iners*, *Lactobacillus crispatus*, and *Lactobacillus helveticus*. CST-I (>50% abundance by *L. iners*, low diversity) mainly occurred in the normal healthy vaginal microbiota. In comparison, the vaginal microbiota of menopausal women was dominated by CST-II (>50% abundance by *L. crispatus*,*L. helveticus*, *Lactobacillus* sp., high diversity) and CST-III (>50% abundance by non-*Lactobacillus* species, high diversity). The vaginal microbiota was highly conserved in terms of the CST type. This conserved community composition and structure were not influenced by any of the reproductive indicators, including the menstrual cycle, suggesting thatcrucial microbial function might be conserved among the communities despite differences in the species composition.

G. Biomaterials and Tissue Engineering (Coordinator: Dr. Rajiv Borah)

Development of Hybrid Electroactive Biomaterials for Peripheral Nerve Regeneration

The work focuses on various strategies to develop aligned/microchannel structured electroconductive nerve guidance channels mimicking the microstructures of peripheral nerve for electrically stimulated nerve regeneration (Figure 49A). It involves use of natural fibroin protein of *Bombyx mori (BM)* and *Antheraea assama (AA)* silk endemic to North-East India to fabricate the smart nerve guidance channels.

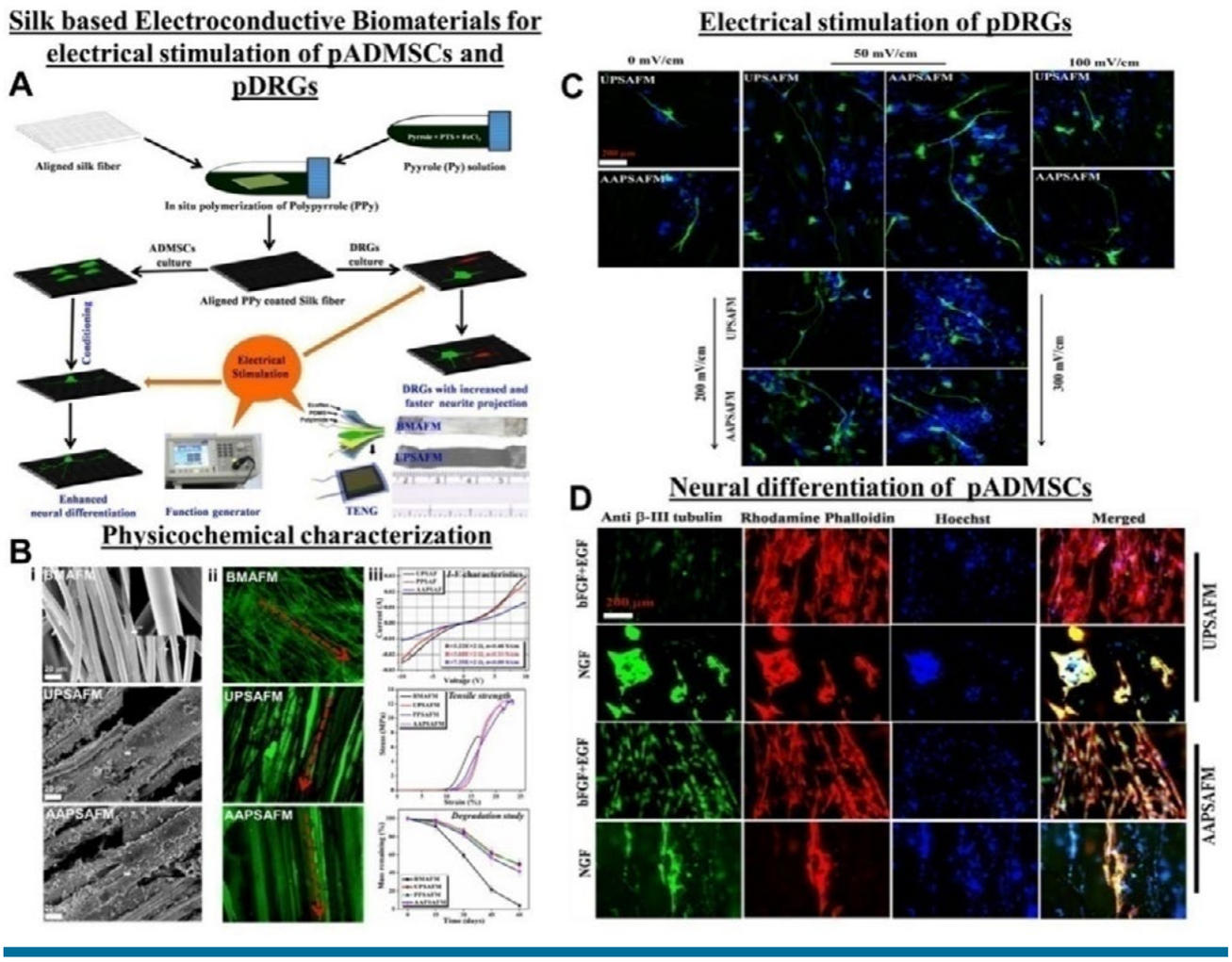


Figure 49: A. Schematic representation of ongoing work to fabricate aligned electroconductive biomaterials for neural applications. **B.** Physiochemical characterization of BMSF aligned fibrous mat (BMAFM), uncoated PPy:Silk aligned fibrous mat (UPSAFM) and AASF coated PPy:Silk aligned fibrous mat (AAPSAFM) showing their morphology, electrical conductivity, tensile strength and biodegradability results. **C.** Representative beta-tubulin immunocytochemistry results of unstimulated and electrically stimulated primary dorsal root ganglions (DRGs) grown on the electroconductive biomaterials for 7 days, countersigned with hochest. ES has been carried out at 50, 100, 200 and 300 mV with a frequency of 500 Hz and pulse width of 1 ms for 1 h for three consecutive days. **D.** Beta-tubulin Immunostaining of adipose derived mesenchymal stem cells (ADMSCs) cultured on the electroconductive biomaterials for 21 days to evaluate the neural differentiation potential in differentiating media with growth factors such as basic fibroblast growth factor (bFGf), epidermal growth factor (EGF) and nerve growth factor (NGF). *Poly-L-lysine coated PPy:Silk aligned fibrous mat (PPSAFM) was also tested; however, it was not found cytocompatible enough with drugs

Bombyx mori silk fibroin (BMSF), being less-expensive, immuno-compatible and biodegradable, serves as one of the best biomaterials for tissue engineering. Moreover, the beneficial properties of *Antheraea assama* silk fibroin (AASF) protein, containing inherent cell binding arginine-glycine-aspartate (RGD) motif can be utilized for enhanced nerve regeneration. To confer speedy axonal growth, electrically conducting polymer, polypyrrole (PPy) has been introduced in the scaffold along with silk fibroin. These porous scaffolds besidesproviding structural support, can clear cellular and non-cellular debris and provide a clear pathway to regenerated axons. The BMSF fibers were coated with PPy nanoparticles with avg. diameter of 125 ± 25 nm followed by coating with AASFs. The highly aligned fibrous mats are electrically conductive, mechanically strong and biodegradable (Figure 48B).

The fabricated scaffolds demonstrated biocompatibility with adipose derived mesenchymal stem cells (ADMSCs) and primary dorsal root ganglions (DRGs) isolated from porcine. Representative results are presentedin (Figure 49C & D) showed increased neurite length of DRGs grown on the as-fabricated electroconductive scaffold under electrical stimulationand neural differentiation of ADMSCs.The scaffolds showed minimal immune response when evaluated with murine macrophage cells for IL1-beta release and nitric oxide (NO) estimation test.

RESEARCH OUTPUT

Extramural Projects

Completed Projects

Title of the project	Funding Agency; Total fund; Duration; PI/Coordinator	Goal
DBT's Scented Rice Program for the NE- "Microbial Roles in Yield Management of Scented Rice of North East India"	**Funding Agency:** DBT, New Delhi **Total Fund:** Rs. 121.22 lakh (IASST component of Rs.36.84 lakh) **Duration:** 2016-2019 **PI/Coordinator:** Dr. Narayan C. Talukdar	Endophytic bacterial diversity in four varieties of scented *joha* rice (SJR) and scented black rice (BSR) seeds of manipur were determined on the basis of morphological characteristics and 16s rDNA sequences and their growth promoting parameters determined *in-vitro*
Exploration and conservation of microbial resources prevalent in protected forest ecosystems and tea rhizosphere soil of Assam	**Funding Agency:** DBT, Govt. of India; **Total Fund**: Rs. 27.10 lakh; **Duration**: 2017-2020; **PI/Coordinator:** Dr. Debajit Thakur	Aim of this research is to explore Tea rhizobacteria from commercial tea estates and actinobacteria prevalent in protected forest ecosystems of Assam for plant growth promotion, and disease control. The microbial isolates are sent to Microbial Repository Centre (MRC), IBSD, Imphal for long term preservation

Ongoing Projects

Title of the project	Funding Agency; Total fund; Duration; PI/Coordinator	Goal
Development of an Integrated Multi-Omics Analysis Platform, and its Application to Elucidate the Differential Process of Silk Colouration in the Muga Silkworm Antheraea Assamensis Heifer	**Funding Agency:** DBT, New Delhi **Total Fund:** INR 1054.79 lakh **Duration:** 2018-2021 **PI/Coordinator:** Dr. Narayan C. Talukdar	Maingoal in this projectis to develop a platform for integrated analysis of omics data i.e., metabolomics, proteomics and rnaseq data of both the host-plants and variants of *A. Assamensis* and we hope to decipher the mechanisms of golden coloration of muga silk. The first and the fourth batch of *A.Assamensis* was reared in the*som* plantation of IASST, Guwahati, and the Lumami Campus of Nagaland University, Mokokchung, Nagaland During Oct-Nov, 2018. Silk glands from 5th instar larvae were collected for sampling for the transcriptomic analysis. In case of the 4th batch, silk glands of *Muga* Silk worm were collected from 2nd instar onward and total RNAs were extracted. The preliminary analysis of the transcripts of first batch revealed that the biological processes such as the co-factor metabolic process and chromosome organization were over-represented in *Mejankori* Plant Leaf Fed (MPLF) Silkworms, while the catabolic process and vesicle-mediated transport in *Som* plant leaf fed (SPLF) Worm. Interproscan analysis revealed that the serine protease, trypsin domain, and BTB/POZ were over-represented in the *MPLF* larvae, while the distribution of peptidase was high in splfworm along with Cytb561 and CBS domains
Application of Glycolipid Biosurfactant for General Welfare of Economically Important Crops with Special Reference to Management of Phytopathogenic Fungi	**Funding Agency:** DBT, Govt. of India **Total Fund:** Rs. 25.93 Lakh **PI/Coordinator:** Dr. Suresh Deka	This research will help to develop a biopesticide from glycolipid biosurfactant (particularly rhamnolipid) against plant pathogenic fungi of *Capsicum Chinense* (Bhut Jolokia) and *Zea Mays* (Maize).The Main Fungal Diseases of *Capsicum Chinense* are Die-Back Disease Caused by *Colletotricum Gleosporoides*, Stem Rot and Wilt Caused by *Sclerotinia Sclerotiorum* and Leaf Spot Caused by *Corynespora Cassicola* Similarly, The Main Fungal Diseases of *Zea Mays* are Maydis Blight (*Bipolaris Maydis*), Charcoal Rot (*Macrophomina Phaseolina*) and Banded Leaf & Sheath Blight (*Rhizoctonia Solani Sasakii*). The rhamnolipid biosurfactant produced by certain bacterial strains will be tested against these plant pathogenic fungi to develop formulations of biopesticide to control the diseases

Title of the project	Funding Agency; Total fund; Duration; PI/Coordinator	Goal
Unit of Excellence Project, 'Effect of Traditional Dietary Habits on Human Gut Microbes: Dairy Products of Nepali Population and Traditional Rice Beer of Tribes of Assam on Gut Bacterial Profile'	**Funding Agency:** DBT, New Delhi **Total Fund:** INR 133.14 Lakhs **Duration:** 2016-2019 **PI/Coordinator:** Dr. Mojibur R. Khan	The traditional rice beer varieties of mishing, ahom and bodo ethnic groups were studied. Also curds prepared from raw milk (a tradition followed in assam) and boiled milk were compared. Volunteers from mishing, ahom, bodo and nepali ethnic groups (total 682: consumers n=562 & non-consumers n=120) were recruited. NGS Data on 16 r-DNA amplicons of fecal metagenomics dna indicated that rice beer may have influential role in modulating the gut microbiota. A comparison on the bacterial profiles of various traditionally prepared curds indicated more diversity of lactic acid bacteria in the curds prepared from raw milk compared to those prepared from boiled milk as confirmed by analysis of the oligotypes. In animal model, rice beer treatment decreased anxiety and increased spatial memory
Advanced Level Institutional Biotechhub, "Establishment of Institutional Level Biotech Hubs (IBT Hubs) for North Eastern states of India."	**Funding Agency:** DBT, New Delhi; **Total Fund:** Rs. 121 Lakhs **Duration:** 2011-2019 **PI/Coordinator:** Dr. Mojibur R. Khan	Advanced level institutional biotech hub at iasst provided laboratory facility for the research scholars of iasst and the neighboring institutes. Training and workshops were arranged in the biotech hub for ug, pg and phd scholars. The facility has been used by 47 master, 35 PhD and 12 postdoctoral researchers who have published 14 research papers. The biotech hub hosted 12 conferences/workshops/training where 376 students/research scholars/faculties participated
Heritage Food and Beverage Research' Under 'SC/ST Development Programme at IASST	**Funding Agency:** DST under SEED scheme **Total Fund:** Rs. 1398 Lakhs **Duration:** 2020-2023 **PI/Coordinator:** Dr. Mojibur R. Khan (PI of component I)	(i) To develop method of production of fermented functional foods, beverages and edible insects with improved quality, safety and health benefits to combat malnutrition in rural SC-ST people and (ii) To develop bioeneterpreneurship in sc-st communities based on heritage food and beverage. This research aims for a holistic approach involving documentation of the itks (which form the basis for scientific validation and exploration of the resources), characterization of the fermentation mechanisms by the microbes, selection of superior microbial strains for standardization and development of fermentation technology for improved quality, safety, functionality and value addition, elucidation of the health promoting properties and the impact of the foods and their components on human health via modulation of gut-brain axis must be formulated to translate these itks into products and technologies for improving the societal health and economy of these communities
Optimization of Method of Red Wine Production Using Black Rice	**Funding Agency:** BIRAC under PACE scheme **Total Fund:** INR 36.33 Lakhs **Duration:** 2019-2021 **PI/Coordinator:** Dr. Mojibur R. Khan	A technique has been developed to produce antioxidant rich beverage resembling red wine (patentapplication no. 201931019623). Optimization of the fermentation process is ongoing. A company named 'Kryzmal super foods private limited' has approached IASST for its commercialization
PM10 and PM2.5 Related Health Effects in North-East India: Source Identification and Cohort Analysis	**Funding Agency:** DST, Govt. of India **Total Fund:** Rs. 18.402 **Duration:** 2019-2022 **PI/Coordinator:** Dr. Arundhuti Devi	This study has been focused on determination of the levels of fine particulate matter and trace metals in the particulates in several areas of assam in north eastern india and source apportionment with respect to industrial, vehicular, and refinery area. Chemical analysis and modelling have been proposed to be combined into yielding meaningful and interesting results in the field of air pollution study in this area

Title of the project	Funding Agency; Total fund; Duration; PI/Coordinator	Goal
Engineered Bioremediation Approaches for Onsite Treatment of Soil Contaminated with Crude Oil"	**Funding Agency:** DBT, Govt. of India **Total Fund:** Rs. 59.0596; **Duration:** 2019-2022 **PI/Coordinator:** Dr. Arundhuti Devi	This project addresses implementation of on-site bioremediation of soil contaminated with crude oil. Treatment of organic pollutants, like hydrocarbons, is a widely researched subject, and many lab-scale technologies have been presented. However, on-site success stories are limited. While concentrated efforts have been made to develop analytical methodologies for highly sensitive detection of these pollutants and to elucidate their eco-toxicological profiles mostly using in vitro and in vivo models, studies on remediation of environmental metrics such as soil, water contaminated with these pollutants are limited to bench scale research. Few available leads using either chemical or biological methods developed at lab scale lack the feasibility of implementation at field
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:** Rs. 74.152 lakhs **Duration:** 2019-2022 **PI/Coordinator:** Dr. Debajit Thakur	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 harbor 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, *Helopeltistheivora*and Development of Microbe-Based Bioformulation Against Major Tea Pests	**Funding Agency:** DBT, Govt. of India **Total Fund:** Rs. 27.446 lakhs **Duration:** 2019-2022 **PI/Coordinator:** Dr. Debajit Thakur	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
Bioinformatics infrastructure facility for Biology teaching through Bioinformatics.	**Funding Agency:** DBT, Govt. of India **Total Fund:** Rs. 54.30 lakh **Duration:** 2019-2022 **PI/Coordinator:** Dr. Debajit Thakur	Department of Biotechnology (DBT), Government of India funded to establish the Bioinformatics Infrastructure Facility at Institute of Advanced study in science and Technology in the year of 2011-2012. The Bioinformatics Centre provides services in the field of bioinformatics sequence analysis, metagenomics study, transcriptomic data analysis, molecular dynamics simulation and docking to researchers working in that field. Presently, the software's, 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, scientists of the entire north east as a whole.

Title of the project	Funding Agency; Total fund; Duration; PI/Coordinator	Goal
Human Microbiome as A Therapeutic Target for Improving Women Health: Role of Vaginal and Gut Microbiota in the Onset and Pathogenesis of Premature Natural Menopause	**Funding Agency:** DST, Govt. of India **Total Fund:** Rs. 35 lakhs **Duration:** 2016-2021 **PI/Coordinator:** Dr. Wahengbam Romi	This study hypothesizes that temporal and spatial variation in the microbiome of reproductive-age (30 – 40 years) women correlate with the onset and pathogenesis of Premature Natural Menopause (PNM). We are adopting multiomics approach combined with reverse microbial culturomics to elucidate the role of gut and vaginal microbiome and microbial-derived metabolites in the onset and pathogenesis of pnm in indian women, assess their variation between individuals of different ethnicity, socio-economic strata, diet and nutritional status, and devise a model for prediction of PNM
Development of Hybrid Electroactive Biomaterials for Peripheral Nerve Regeneration	**Funding Agency:** DST, Govt. of India **Total Fund:** Rs. 35 Lakhs **Duration:** 2018-2023 **PI/Coordinator:** Dr. Rajiv Borah	Fabrication and optimisation of biocompatible, biodegradable, porous and mechanically stable hybrid 3d nanofibrous scaffolds with higher charge injection capacity (cic) and conductivity using electrically conducting polymers having sufficient charge injection (i.e. Electrochemical capacitance) incorporating highly conductive graphene based materials and fda approved non-conducting biocompatible polymers for stimulation and faster regeneration of damaged peripheral nerve. To build a self-powered electrical stimulation system by integrating as-synthesised highly conductive biomaterial scaffold with a portable, long lasting, small sized and weight triboelectric nanogenerator (teng) attachable to body for risk free nerve regeneration

Publications

In cited journals

Author(s)	Title	Journal name	Volume & Issue no./ Page No.	Month/ Year of Publication
Suruchi Aggarwal, Sanjay K. Banerjee, Narayan Chandra Talukdar, Amit Kumar Yadav	Post-Translational Modification Crosstalk and Hotspots in Sirtuin Interactors Implicated in Cardiovascular Diseases	Frontier in Genetics	11/356	March/ 2020
Garima Raj, Mohammad Shadab, Sujata Deka, Manashi Das, Jilmil Baruah, Rupjyoti Bharali, Narayan C. Talukdar	Seed Interior Microbiome of Rice Genotypes Indigenous to Three Agroecosystems of Indo-Burma Biodiversity Hotspot	BMC Genomics	20/ 924	December/ 2019
Suruchi Aggarwal, Narayan C. Talukdar, Amit K Yadav	Advances in Higher Order Multiplexing Techniques in Proteomics	Journal of Proteome Research	18/ 2360	May/ 2019
Siddhartha N. Borah, Suparna Sen, L. Goswami, A. Bora, K. Pakshirajan, and Suresh Deka	Rice Based Distillers Dried Grains with Solubles as A Low Cost Substrate for the Production of A Novel Rhamnolipid Biosurfactant Having Anti-Biofilm Activity Against Candida Tropicalis	Colloids And Surfaces B: Biointerfaces	182/ 110358	October/ 2019
Bhaskar Das and Suresh Deka	A Cost-Effective and Environmentally Sustainable Process for Phycoremediation of Oil Field Formation Water for Its Safe Disposal and Reuse	Scientific Reports, Nature Research	9/ 15232	October/ 2019
Madhurankhi Goswami and Suresh Deka	Plant Growth-Promoting Rhizobacteria—Alleviators of Abiotic Stresses in Soil: A Review	Pedosphere	30(1)/ 40–61	February/ 2020

Author(s)	Title	Journal name	Volume & Issue no./ Page No.	Month/ Year of Publication
S. Sen, S.N. Borah, R. Kandimalla, A. Bora, S. Deka	Sophorolipid Biosurfactant Can Control Cutaneous Dermatophytosis Caused by Trichophyton Mentagrophytes	Frontiers in Microbiology	11/ 329	March/ 2020
Santanu Das, Dibyayan Deb, Atanu Adak and Mojibur R. Khan	Exploring the Microbiota and Metabolites of Traditional Rice Beer Varieties of Assam and Their Functionalities	3 Biotech	9/ 174	April/ 2019
Tulsi K. Joishy, Madhusmita Dehingia and Mojibur R. Khan	Bacterial Diversity and Metabolite Profiles of Curd Prepared by Natural Fermentation of Raw Milk and Back Sloping of Boiled Milk	World Journal of Microbiology and Biotechnology	35/ 102	June/ 2019
Arun Kumar, Aiswarya Baruah, Masahiro Tomioka, Yuichi Iino, Mohan C. Kalita and Mojibur R. Khan	*Caenorhabditis Elegans*: A Model to Understand Host-Microbe Interactions.	Cellular and Molecular Life Sciences	9/ 1-21	October/ 2019
Roman Brunecky, Venkat Subramanian, John M. Yarbrough, Bryon S. Donohoe, Todd B. Vinzant, Todd A. Vanderwall, Brandon C. Knott, Yogesh B. Chaudhari, Yannick J. Bomble, Michael E. Himmel and Stephen R. Decker	Synthetic Fungal Multifunctional Cellulases for Enhanced BiomassConversion	Green Chemistry	22/ 478	October/ 2019
Priyanka Sarkar, Raghuram Kandimalla, Bhuwan Bhaskar, Rupjyoti Talukdar and Mojibur R. Khan.	Restoring the Alcoholic Gut	Journal of Gastroenterology and Hepatology	https:// onlinelibrary. wiley.com /toc/14401746 /2019/34/S3	December/ 2019
Manasee Choudhury, Elancheran Ramakrishnan & Dipali Devi	Identification and Characterization of Methyl Isoeugenol Compound from the Golden Yellow Hued Muga Silk Fiber of India	Journal of Natural Fibers	Doi: 10.1080/ 15440478.2019. 1686677	November/ 2019
Rashmi Rekha Baruah, Mohan Chandra Kalitab and Dipali Devi	Novel Non-Mulberry Silk Fibroin Nanoparticles with Enhanced Activity as Potential Candidate in Nanocarrier Mediated Delivery System	RSC Advances	10/ 9070	March/ 2020
Anurupa Goswami & Dipali Devi	Variations in the Metallic Ion Concentration in the Silk Gland and Cocoon of Silkworm Antheraea assamensis helfer	Biological Trace Element Research	196/285	November/ 2019
Priyanka Sharma and Debajit Thakur	Antimicrobial Biosynthetic Potential and Diversity of Culturable Soil Actinobacteria from Forest Ecosystems of Northeast India	Scientific Reports	10/ 4104	March/ 2020
Atlanta Borah and Debajit Thakur	Phylogenetic and Functional Characterization of Culturable Endophytic Actinobacteria Associated With *Camellia* spp. for Growth Promotion in Commercial Tea Cultivars	Frontiers in Microbiology	11/318	February/ 2020

Author(s)	Title	Journal name	Volume & Issue no./ Page No.	Month/ Year of Publication
Atlanta Borah and Debajit Thakur	Culturable Endophytic Bacteria of *Camellia* Species Endowed with Plant Growth Promoting Characteristics	Journal of Applied Microbiology	127(3)/ 825-844	September/ 2019
Khanindra Sharma, Suravi Kalita, Neelotpal Sen Sarma and Arundhuti Devi	Treatment of Crude Oil Contaminated Wastewater Via An Electrochemical Reaction	RSC Advances	10/ 1925–1936	January/ 2020
Jnanendra Upadhyaya, Trishnamoyi Das, Rajiv Borah, Kalyan Acharjya	Electrochemical Performance Evaluation of Polyaniline Nanofiber and Polypyrrole Nanotubes	Materials Today: Proceedings	In Press (DOI: 10.1016/j.matpr.2020.01.370)	January/ 2020
Rajiv Borah and Ashok Kumar	A Multifunctional Biomaterial for Promoting Proliferation of Primary Mesenchymal Stem Cells and Urease Immobilization	Journal of Biomaterials Science, Polymer Edition	In Press (pp.1-29)	February/ 2020
Rajiv Borah, Jnanendra Upadhyay, and Kalyan Acharjya	Functionalized Polyaniline: Chitosan Nanocomposites as A Potential Biomaterial	Materials Today: Proceedings	In Press (DOI: 10.1016/j.matpr.2020.01.583)	January/ 2020
Subrata K Pore, Anirban Ganguly, Samaresh Sau, Sudhakar Godeshala, Anantha K Kanugula, Ramesh Ummanni, Srigiridhar Kotamraju, and Rajkumar Banerjee	N-End Rule Pathway Inhibitor Sensitizes Cancer Cells to Antineoplastic Agents by Regulating XIAP and RAD21 Protein Expression	Journal of Cellular Biochemistry	121(1)/ 804-815	January/ 2020

Patent

Inventor(s)	Title	File No. for Enrollment	Provisional/Final Patent Grant No.	Issue No. of Patent Office
Narayan C. Talukdar, S. Goyari	A method for production of extracellular cellulolytic enzymes for efficient degradation of cellulose containing substrate	Patent Application No. 866/KOL/2014	Patent No. 330338 Date of Grant 27.01.2020	Issue No. - 37/2014
Suresh Deka and Bhaskar Das	Process for remediation of formation water for its safe disposal and/or reuse.	application No: 201931000192 A	Applied for	The Patent Office Journal No. 06/2019, Government of India, Page No. 5536, Patent

Contributions to World Database

Author (s)	Title	Database	Year
Manashi Das and N.C Talukdar	Shifting agriculture field's crop rhizosphere niches' 16s rRNA sequences representing diversity of endophytic bacteria	NCBI GenBank (total: 202 sequence) Accession numbers: MT378448 - MT378562, MT409522 - MT409577, MT415971 -MT416000	2020
Shabiha Nudrat Hazarika and Debajit Thakur	Assessment of endophytic bacteria prevalent in Tea (*Camellia sinensis*) and their effect on growth promotion and disease suppression	NCBI GenBank Accession numbers (total Acc. Nos.: 82: MN483270-MN483273, MN493977-MN493978, MN493874-MN493925 and MN577364-MN577389	2019

Presentation in Conferences/seminars

Invited talks

Faculty	Title	Programme Name	Date & Venue
Narayan C. Talukdar	Key note address – Bio-exploration for human welfare-an integrative approach	National Conference organized jointly by Assam Downtown University and the Society of Biological Chemist (India) North east Chapter, Jorhat	8th-9th November, 2019. Assam down town university, Guwahati
Suresh Deka	Rhamnolipid as a bio-pesticide for management of plant pathogenic fungi	National Conference on Recent Advances in Agriculture and Biomedical Research (RAABR-2020	Held on 6-7 March 2020 at Acharya Nagarjuna University, Guntur, AP
Debajit Thakur	Culturable microflora of Tea (*Camellia* sp.) endowed with plant growth promoting and antagonistic characteristics	National seminar on "Bioresources, conservation and management strategies for rural development"	22nd-23rdAugust 2019 University of Science and Technology, Meghalaya
Debajit Thakur	Exploration and functional characterization of culturable microflora associated with Tea for plant growth promotion and disease suppression.	National conference on "Bio exploration for human welfare-An integrative approach"	8th and 9th November 2019. Assam down town University, Panikhaiti-Guwahati-26

Contributory

Author(s)	Title	Conference name	Oral / Poster	Date & Venue
Manashi Das and Narayan C. Talukdar	Study On Mycorrhizal Fungi Diversity in The *Jhum* Field Soil Of Mizoram in Different Fallow Cycles	International Workshop on Nutrient Management in Shifting Cultivation in North-East India	Oral	22nd-24th January 2020, Mizoram University, Aijwal
Parijat Saikia,Narayan C.Talukdar and M. Kumar	Trace Elements and Personal Care Products (Ppcps) in the Sediment-Water Interface of Deepor *Beel*, An Urban Wetland of Assam, India	20th National Symposium On Environment, by Health Safety and Environment Group, BARC, Trombay, Mumbai & Discipline of Earth Sciences	Poster	13th-15th December 2019, IIT-Gandhinagar, Gujarat
Santanu Das	Effect of Traditional Rice Beer (*Poro Apong* and *Nogin Apong*) on the Gut Bacterial Profile of *Mishing* Population of Assam, India	'Exploring Human Host-Microbiome Interactions in Health and Disease' by Wellcome Genome	Poster	23rd- 25th October 2019, Wellcome Genome Campus, Hinxton, UK
Tulsi Joishy	Effect of Lifestyle and Fermented Dairy Products on Gut Microbiome of Its Consumers	EMBO Symposium – Human Microbiome: Resistance and Disease	Poster	9th -12th November 2019, NIBMG Kalyani, West Bengal
Santanu Das	Effect Of Traditional Rice Beer (*Poro Apong* and *Nogin Apong*) on the Gut Bacterial Profile of *Mishing* Population of Assam, India	EMBO Symposium – Human Microbiome: Resistance and Disease	Poster	9th -12th November 2019, NIBMG Kalyani, West Bengal
Priyanka Sarkar	Restoring the Alcoholic Gut	Asia Pacific Digestive Week (APDW) Conference	Oral	12th-15th December 2020, Kolkata
Priyanka Sarkar	Effect Of Alcoholic Beverages on Human Microbiome	Human Microbiome: Resistance and Disease	Poster	9th-12th November 2019, NIBMG, Kalyani, West Bengal
Priyanka Sarkar, Kandimalla Raghuram, Wahengbam Romi, Mohan C. Kalita, Rupjyoti Talukdar, Mojibur R. Khan	Effect of Alcoholic Beverages on Human Microbiome	IndiaEMBO Symposium-Human Microbiome: Resistance and Disease	Oral	9th - 12th November 2019, (NIBMG) Kalyani, India

Author(s)	Title	Conference name	Oral / Poster	Date & Venue
Shabiha Nudrat Hazarika and Debajit Thakur	Culturable Actinobacteria Prevalent in Tea (*Camellia Sinensis*) as Promising Source of Plant Growth Promotion and Antimicrobial Metabolites	National Conference on Phytochemicals and Microbial Bioactive Compounds- Role in Agriculture and Human Welfare	Oral	3rd-4th October 2019, Bangalore University, Karnataka
Shabiha Nudrat Hazarika and Debajit Thakur	Plant Growth Promoting Bacteria: A Strategy for Enhancing Growth and Protection to Tea Plants	International Conference on Biotechnology and Genetic Engineering (Biocon-2019)	Oral	28th-30th October 2019, Paris, France
Ananya Barman and Debajit Thakur	Identification, Characterization, and *In Vitro* Biocontrol of Pathogenic Fungi Associated with Blister Blight Lesions of Tea (*Camellia Sinensis*)	15th European Conference on Fungal Genetics	Poster	17th-20th February 2020, Rome, Italy
Archana Nath, Rajkumari Mazumdar and Debajit Thakur	Evaluation of the Antibacterial activity of the Forest derived Soil Actinomycetes *Streptomyces* sp. PBR21 Against Carbapenem Resistant Superbugs	60th Annual Conference of Association of Microbiologists of India (AMI)	Poster	15th-18th November 2020, Mahendragarh, Haryana

Conferences/Workshops/Meetings attended

Faculty/research scholar	Conference/Workshop/Exhibitions	Date & Venue
Dr. Suresh Deka	National Conference on Recent Advances in Agriculture and Biomedical Research (RAABR-2020	6-7 March 2020 at Acharya Nagarjuna University, Guntur, AP

Other Activities

Honors/Awards/Recognitions

Name	Particulars
Narayan C. Talukdar	Evaluated of Ph.D. thesis "Impact of slash-burning and plant species on soil microbial community and processes in *jhum* agro-ecosystem" of Ms Carolyn Zothansiami, Regd. No. CAU/71-A/11(PG) of the College of Post graduate studies, Umiam, Meghalaya.
Narayan C. Talukdar	Member of Tea Board India's Tea Research Liaison Committee (TRLC) upto February 10, 2022
Narayan C. Talukdar	Member, Academic Council of Assam Agricultural University for 2 years from 19.12.2019
Narayan C. Talukdar	Scientist member of the Committee constituted by the Hon'ble Chief Justice of Gauhati High Court to review and suggest functioning of TTRI and also to suggest the mode in which tea farming can be converted to organic tea farming.
Narayan C. Talukdar	Chairman, Executive Council, Tribal Sub Plan under DEED Division of DST, Govt of India for 3 years (2019-2021).
Narayan C. Talukdar	Member, Advisory and Steering Committee to frame policy documents on Scientific Social Responsibility constituted by DST, GOI (2019 - One year).
Narayan C. Talukdar	One of the two-member committee constituted by IITG and HRD Ministry, New Delhi to examine complaints of a IIT Professor.
Narayan C. Talukdar	Founder Member Secretary, North East Academy of Sciences, Guwahati Registration No.: RS/KAM(M)/263/T/42 of 2019-2020.
Suresh Deka	Session chair of Technical Session-II, National Conference on Recent Advances in Agriculture and Biomedical Research (RAABR-2020) held on 6-7 March 2020 at Acharya Nagarjuna University, Guntur, AP

Lectures delivered at other institutes

Name	Title	Date & Venue
Narayan C. Talukdar	Integration of teaching and research in higher education in the Induction training for faculties organized by Teaching and Learning Centre, TU	July 2, 2019. Teaching Learning Centre, TU, Tezpur
Mojibur R. Khan	Popular Talk on 'Gut Feeling on Darwinism'	6th March 2018, Assam Don Bosco University
Mojibur R. Khan	Techniques for Assessment of Gut Microbiota	21st April 2019, Gut Microbiota Summit for Gastroenterologists Held at Goa

Visits to national/international institutes/laboratories

Faculty/Research scholar	National/international institutes/laboratories	Date
Narayan C. Talukdar	Visit To Shahjalal University of Science and Technology, Sylhet as A Member of Team of NER Vcs and Directors in 1st International Convention of Vice Chancellors and Directors of North East India to Explore Collaboration Potential in Teaching, Research and Innovation Between NER Institutes/ Universities and Sylhet, Bangladesh	5th-7thApril 2019
Arundhuti Devi	National Environmental Engineering Research Institute; Nehru Marg, Nagpur 440020 (Maharashtra)	12th April, 2020
Mayanglambam Bidyarani Devi	Dr. Chetana Sachidananda, IGIB, Delhi, Training for Zebrafish Rearing, Handling and Their Breeding	1st -10th July, 2019
Dibya Jyoti Koiri	Meghalaya State Pollution Control Board, Meghalaya, Shillong	5th-7th November 2019

Chaired Sessions in Conference/Seminar

Faculty	Programme Name	Date & Venue
Narayan C. Talukdar	EC and GMW for TSP Scheme of Science for Equity Empowerment and Development (SEED) Division	1st-2nd August, 2019 Institute of Advanced Study in Science and Technology (IASST), Guwahati, Assam
Narayan C. Talukdar	EC for the TSP Scheme of Science for Equity Empowerment and Development (SEED) Division	24th-25th October, 2019 Administrative Staff College of India, New Delhi.
Narayan C. Talukdar	Review and on-the-site evaluation of DST, GOI and Research Councils, UK jointly funded research projects to tackle challenge in "*Bridging the Urban and Rural Divide (BURD)*'	4th August, 2019 Tezpur University
Narayan C. Talukdar	Inspire Fellowship Review Meet	6th-8th June, 2019 KIIT, Bhubaneswar, Odisha,

TRADITIONAL KNOWLEDGE BASED DRUG DEVELOPMENT AND DELIVERY

The traditional knowledge-based drug development & delivery programme focuses on the validation of selected traditional herbal plants/ formulations, which have been selectively preserved in our folklore by the traditional healers. One of the four hotspots of India, North East India is one of the richest repositories of medicinal and aromatic plants in the world. Research is targeted against metabolic syndrome, which includes diabetes, hypertension, central obesity, hyperlipidemia among others. Past research in the institute has validated claims of local healers on the therapeutic effect of herbs and formulation on diabetes and cardiovascular condition. In this translational research we have integrated the knowledge of experimental biology, natural and synthetic product chemistry, analytical chemistry, pharmacology, biochemistry and computational biology. With this cumulative approach, we have been able to validate traditional knowledge for developing therapeutic products for curing and prevention of metabolic syndrome and cardiovascular diseases. With state-of-the-art laboratory facility and high-end instruments, few other research of value in medical application is also being carried out.


Dr. Rajlakshmi Devi


Dr. Jagat Ch. Borah


Dr. Rosy Mondal


Juri Pathak


Dr. Suman Kr. Samanta


Dr. Partha Pratim Dutta


Dr. Asim Dutta


Sagar Barge


Bhaswati Kashyap


Simanta Bharadwaj


Paramita Choudhury


Deepsikha Swargiary


Devi Basumatary


Puspanjali Khound


Nonibala Gurumayum


Gurumayum Shalini Devi


Partha Pratim Sarma


Barsha Deka


Bandita Pathak


Plabita Baruah


Pranamika Sharma


Himangshu Sarma


Dipu Barman


Junmoni Nath


Semim Akhtar Ahmed


Abinash Nath


Gwhwm Basumatary


Haren Medhi


Sabin Kalita


Tarun Talukdar

A. Traditional Knowledge and Drug Discovery (Coordinator: Dr. Narayan Chandra Talukdar)

(i) *Premna herbacea* and its bioactive constituents alleviates insulin resistance and improves mitochondrial function in skeletal muscle cells

Premna herbacea (PH), a perennial herb, commonly known as *Mati-galdabin* in *Bodo* and *Mati-feurain* in Assamese community of India is known in traditional health care system and ayurvedic literature as an anti-diabetic plant. This research was conducted to validate the ethnic community claim and also to search for bio-actives in its leaves for activation of AKT as a novel therapeutic target in the treatment of T2DM through amelioration of insulin resistance (IR). In previous reports, we showed that methanolic extract of PH (MEPH) significantly decreased food intake ($P<0.001$), leptin level ($P<0.01$),BW ($P<0.05$), fasting blood glucose ($P<0.01$) and intraperitoneal glucose tolerance ($P<0.001$) in high fat – high fructose diet (HF-HFD) + MEPH fed rats compared to those in rats fed with only HF-HFD in both preventive and curative model. MEPH downregulated IRS1 (Ser307) and upregulated the expression of AMPK and AKT in the skeletal muscles drawn from rats of both the preventive and curative experiment. Results of experiments of the reporting year showed that the ethyl acetate fraction (EAPH) of MEPH and its major compound, isoverbascoside (ISOVER) enhanced glucose uptake activity in L6 myotubes via translocation of glucose transporter 4 (GLUT4). When free fatty acid (FFA) induced insulin resistant L6 skeletal muscle cells were exposed to ISOVER, a 2.06-fold increase in glucose uptake was observed with the upregulation of AKT and AMPK protein (Figure 50a-b). ISOVER phosphorylates AS160 subunit that translocate GLUT4 protein to plasma membrane, stimulating glucose uptake in skeletal L6 myotubes. Depletion of stress markers like JNK and IKKB due to ISOVER treatment perhaps promotes the activation of AKT and AMPK proteins (Figure 50c). Treatment with ISOVER at low dose (10 µg) is capable of mitigating reactive oxygen species (ROS) generation in insulin resistant L6 myotubes indicating that ISOVER possesses free radical scavenging potential and thereby combat the progression of oxidative stress in skeletal muscle cells and subsequent development of IR under diabetic conditions (Figure 50d-e).

Mitochondrial dysfunction in skeletal muscle has been associated with insulin resistance, obesity and diabetes, and may occur due to defects in insulin signal transduction pathways. Study of mitochondrial function with Sea horse XF analyser revealed that cells exposed to FFA restricted the ability of the mitochondria to function at its full potential, via significant reduction in reserve capacity, increase in proton leak and non-mitochondrial respiration. FFA exposure also lowered coupling efficiency of oxidative phosphorylation, thereby decreasing the fraction of respiration that was used to make ATP. Pre-treatment with ISOVER stimulated mitochondrial function by increasing mitochondrial spare respiratory capacity and reduction of non-mitochondrial respiration. Additionally, treatment with ISOVER elevated the maximum oxygen consumption rate which is an indication that ISOVER not only exhibits properties of an effective antioxidant but also increases mitochondrial function by combating IR induced oxidative stress in skeletal muscles. The restoration of glycolytic reserve and glycolytic capacity by treatment with ISOVER reflects a higher metabolic plasticity to maintain intracellular ATP content (Figure 50).

Altogether, these findings indicated that ISOVER isolated from ***P. herbacea*** is an effective antidiabetic agent and the mechanistic data showed that it ameliorated glucose uptake in skeletal muscle cells via AKT and AMPK phosphorylation and also by alleviating inflammatory protein p38MAPK (Thr180/Tyr182), pJNK (Thr183/Try185) and IKKB and reduction of oxidative stress.

(ii) Garcinol Content in Different *Garcinia L.* Species of Assam

The quality control and quality assurance (QC-QA) laboratory in IASST is supported by the Department of Biotechnology (DBT), Govt. of India and its main function is promotion of medicinal plant trade through testing for different quality parameters of medicinal plant products for the benefit of traders and other stakeholders. Laboratory analysis of the products involve determination of range of bioactive constituents and the concentration of the most active and therapeutic constituent, and also presence of adulterants. Result of analysis of one important medicinal plant of NE India in the genus *Garcinia* L. (Family: *Clusiaceae*)) is presented in this report. *Garcinia* genus comprises nearly 250 species distributed in tropical Asia, including 43 species and 6 varieties in India, of which 9 species are reported from Assam. *Garcinia* L. commonly known as 'thekera' by Assamese people has different traditional uses of its fruits in this region including treatment of constipation, piles, rheumatism, intestinal parasites, and use as a food flavoring agent and preservative. Garcinol is the main bioactive constituent in fruits of this plant. Fruits of 7 different species of *Garcinia* L. i.e. *G. Morella, G. pedunculata, G. lanceipholia, G. kydia, G. cowa, G. cuspida* and *G. sopsopia* were studied for variation in garcinol content by reverse phase HPLC using Waters 1525 HPLC system coupled with a UV–Vis diode array detector (254 nm). It was found that among the different species, *G. morella*, *G. pedunculata* and *G. lanceipholia* were found to contain garcinol in the concentration of 53.273 ± 0.756, 46.926 ± 0.435 and 3.850 ± 0.081 mg/g, respectively (Figure 52).

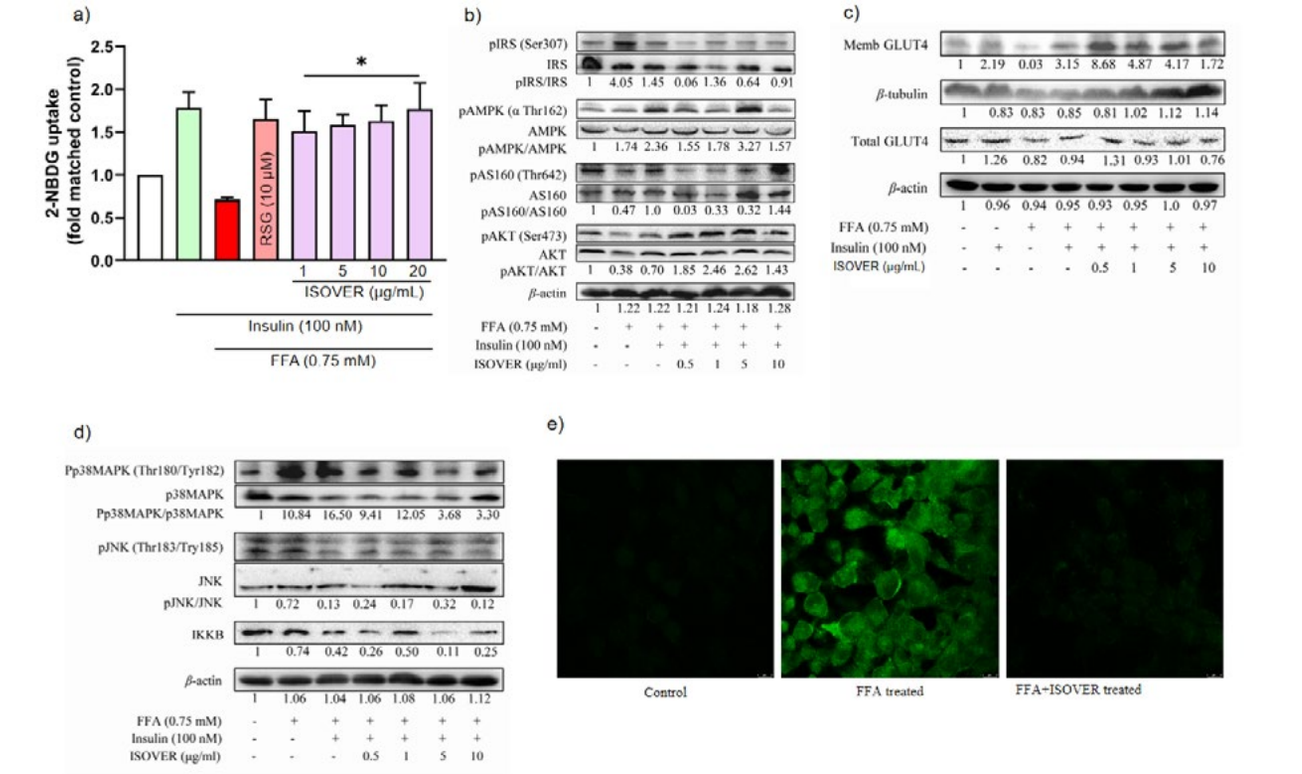


Figure 50: a) Effect of ISOVER on glucose transport in FFA induced skeletal muscle. L6 myotubes cells were treated with or without FFA in presence or absence of ISOVER, rosiglitazone (RSG) for 8 h, or with insulin for 30 min preceding the time of termination of the experiment. Data represents mean ± SEM of three independent experiments. *P < 0.01 vs Insulin plus FFA, **b)** Expression of different proteins in Western blot: ISOVER reduced the phosphorylation of IRS and increased the phosphorylation of AMPK and AKT in L6 myotubes. AS160, a downstream substrate of AMPK was also stimulated due to ISOVER treatment, **c)** Western blot of Membrane GLUT4 level under different treatments. Serum starved L6 myotubes were treated with and without FFA in presence or absence of ISOVER. Values in the western blot represents arbitrary unit of phosphorylated/non-phosphorylated protein, **d)** Effect of ISOVER on phosphorylation of p38MAPK, pJNK and IKKB. Downregulation of stress markers - p38MAPK, pJNK and IKKB due to treatment with ISOVER, **e)** Confocal microscopy image showing fluorescence intensity of L6 myotubes after 6 h treatment with FFA and FFA plus ISOVER.

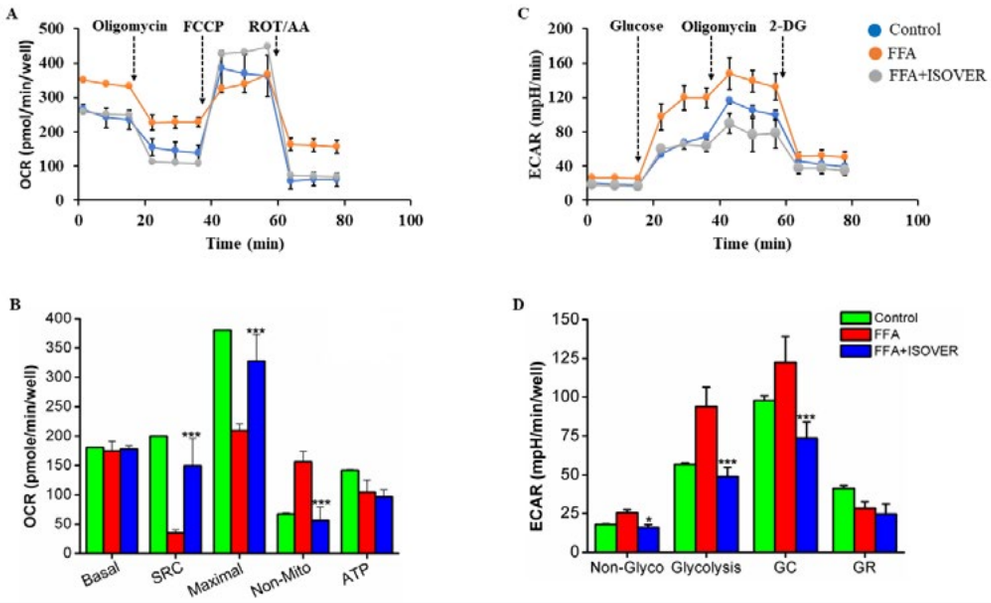


Figure 51: Mitochondrial respiration and glycolytic rate in insulin resistance L6 myotubes. L6 Myotubes were treated with 10 μg of ISOVER and 0.75 mM sodium palmitate (FFA) treatment for 6 h. The culture medium was replaced with XF assay 1 h prior to measurement of mitochondrial function. Oxygen consumption rates (OCR) were estimated as per manufacture instruction's. **A)** Seahorse XF cell mitochondrial stress test experiment displaying times of mitochondrial inhibitors addition to myotubes. **B)** Measured values of individual respiratory parameters of mitochondria (basal, spare respiratory capacity – SRC, maximal respiration-maximal, nonmitochondrial respiration – Non-Mito and ATP turn over). ISOVER exposure to FFA induced L6 myotubes significantly increased SRC and maximal compared to control FFA induced myotubes. **C)** XF24 extra-cellular acidification (ECAR) traces showing the glycolytic rate of L6 myotubes. Glucose, oligomycin and 2-DG was exposed sequentially and ECAR parameters, **D)** Measure of non-glycolytic acidification (Non-Glyco), glycolysis, glycolytic capacity (GC) and glycolytic reserve (GR). Data are means ± SEM three wells per condition. * P < 0.05, *** P < 0.001 vs FFA.

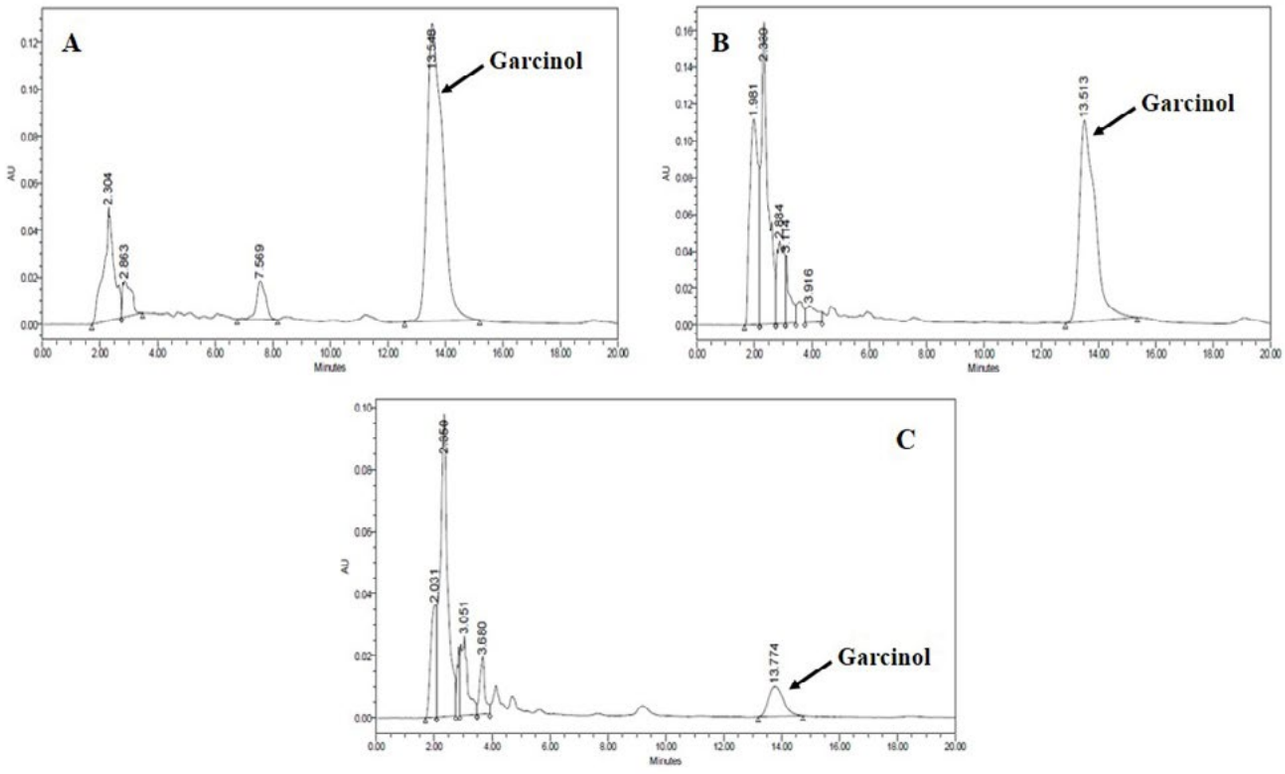


Figure 52: HPLC spectra of (**A**) *G. morella*, (**B**) *G. pedunculata* and (**C**) *G. lanceipholia*

B. Traditional knowledge based drug discovery (Coordinator: Dr. Rajlakshmi Devi)

(i) The Role of PI3K/AKT Signaling in Scented Rice Treated Type II Diabetic Model

PI3K/AKT is a hallmark pathway in obesity induced type II diabetes. Approximately 90% of insulin-stimulated glucose utilization occurs in skeletal muscle and plays an important role in regulating glucose metabolism and energy homeostasis. Insulin regulates skeletal muscle metabolism by promoting glucose transport, glycogen synthesis and protein synthesis through PI3K/AKT signaling pathway. AKT directly phosphorylates AS160, inducing GLUT4 translocation, which translocate to the plasma membrane from storagevesicles and transports glucose in skeletal muscle following stimulation of insulin and AKT. In a 24-week preventive study on wistar albino rats the rats were fed on a diet of High Fructose High Carbohydrate (HFHC). The treated group with 100 mg/kg body weight of methanolic extract of scented rice Kola Joha (KJ1) had significantly lower blood glucose (124.5±21.75) compared to the disease control group (433.73±8.02) and it almost came to the level of control group fed regular normal pellet (95±6.83), whereas the body weight increased in all groups similarly.

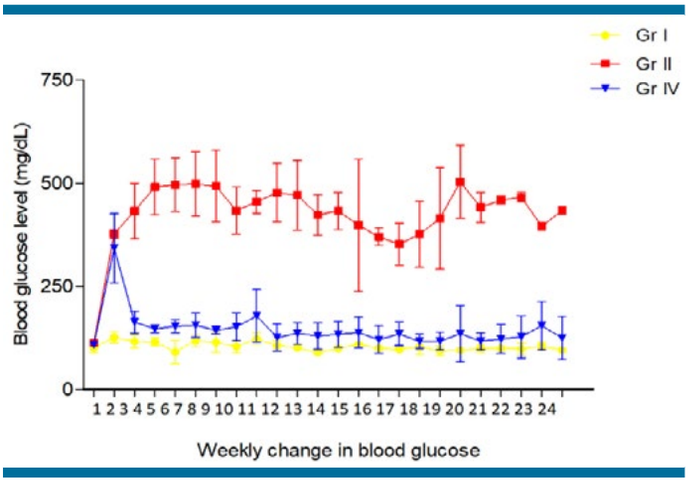


Figure 53: Blood glucose changes over a period of 24 weeks. Gr1 (Normal control), GrII (Diseased control), GrIV (Treated with Kola Joha) mg/kg BW.

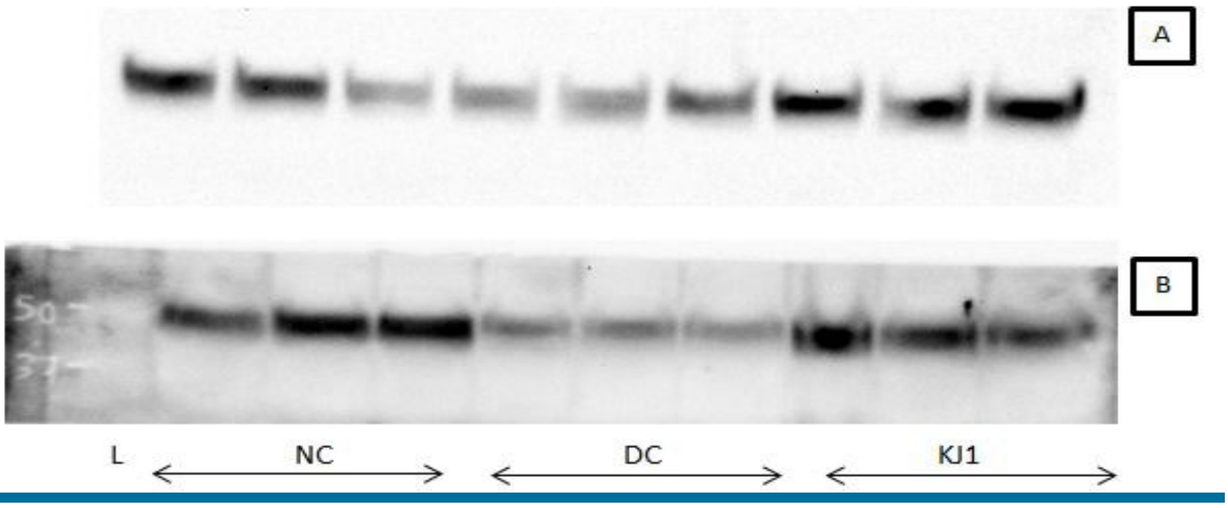


Figure 54: Western blotting analysis of protein. (A) AKT in three groups NC (Normal control), DC (Diseased control), KJ (Treated with 100 mg/kg bw) of Kola Joha. L is the protein ladder. (B) β-Actin in three groups NC (Normal control), DC (Diseased control), KJ (Treated with 100 mg/kg bw) of Kola Joha. L is the protein ladder.

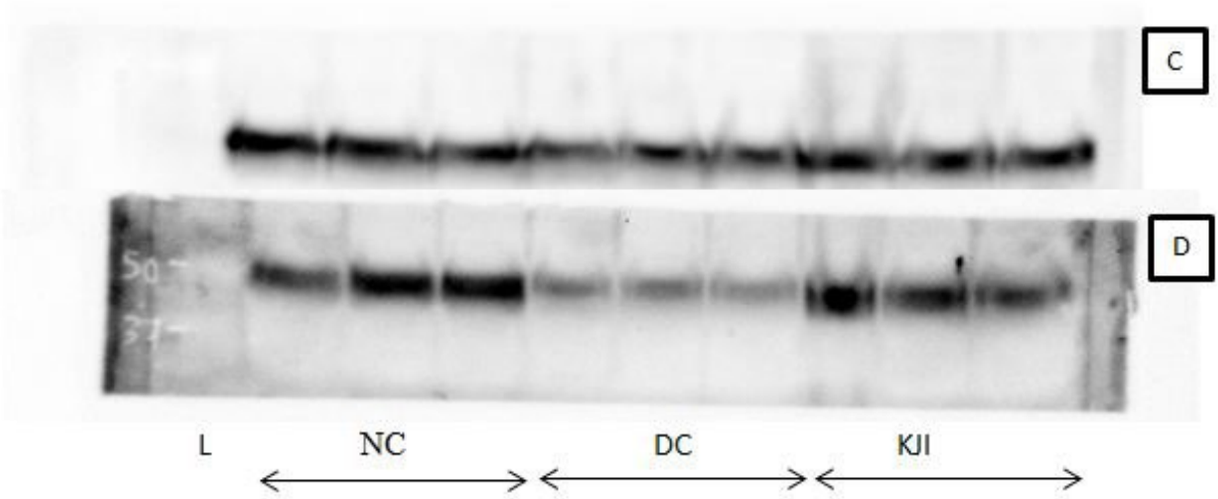


Figure 55: Western blotting analysis of protein. (C). p-AKT in three groups NC (Normal control), DC (Diseased control), KJ (Treated with 100 mg/kg bw) of Kola Joha. L is the protein ladder. (D). β-Actin in three groups NC (Normal control), DC (Diseased control), KJ (Treated with 100 mg/kg bw) of Kola Joha. L is the protein ladder.

The result from the glucose uptake studies on palmitic acid stressed L6 myotubes have shown significant result of the methanolic extract of KJ1 in uptake of 2NBDG. Thus, scented rice has a significant role in hyperglycemia. Therefore, the study was designed to study the detailed molecular mechanism in insulin resistance leading to hyperglycemia. The western blot analysis of the marker protein AKT and p-AKT in the skeletal muscle revealed that the treated group with 100 mg/kg body weight KJ1 has higher ratio of p-AKT/AKT then the diseased controlled group. The loading control was selected as β-Actin. The study is still under process and awaits further analysis.

(ii) To Evaluate the Effects of Bioactive Fraction of *Garcinia Pedunculata* Roxb. In Diabetes Induced Cardiac Dysfunction in Wistar Rats

Diabetes in general increases the risk of cardiovascular diseases. Heart failure is one of the leading causes of death in diabetic patients. In the long run, diabetic heart undergoes structural and functional changes resulting in left ventricular hypertrophy, reduced ejection volume, microvascular changes which act as the diagnostic measures for a distinct type of cardiomyopathy, called diabetic cardiomyopathy. Clinically, diabetic cardiomyopathy usually manifests the earlier onset of left ventricular diastolic dysfunction than systolic dysfunction. Diastolic dysfunction

characterized by increased ventricular wall stiffness, and increased diastolic relaxation time is pre-valent at early stages of the cardiomyopathy. A very few drugs are available for the treatment of this disease but their prolonged uses are also developing some concerning side-effects due to which there is a growing inclination towards the use of traditional herbal medicines as a safer substitute. From time immemorial plants have been explored by mankind for their medicinal properties. One such plant of interest is *Garcinia pedunculata* Roxb. (GP) reported to have beneficial medicinal properties. From different biochemical assays, it was found that the chloroform fraction (GC) of GP extract was having antioxidant, alpha-glucosidasse, alpha- amylase and lipase enzyme inhibiting properties along with high levels of phenolic and flavanoid contents.

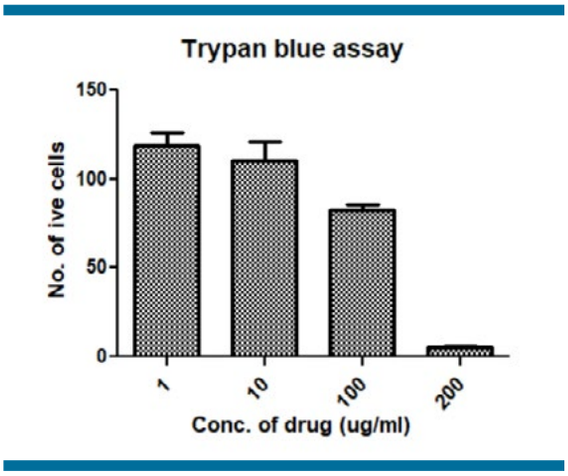


Figure 56: Cell viability assay (Trypan blue) for toxicity study with different concentration of extracts

For studying the effect of GC in diabetes induced cardiac dysfunction, H9c2 cardiomyocyte cell-line was sourced from the cell repository of National Centre for Cell Science (NCCS), Pune, India. The cell-line was grown in Dulbecco's Modified Eagle's medium (DMEM), supplemented with 10% Fetal Bovine Serum (FBS) and 0.5% antibiotic – antimycotic solution. The cell line was subcultured in tissue cultureflasks and was allowed to attain confluency at 37° C inpresence of 5% CO_2 in humidified atmosphere in a CO_2 incubator.

For study of diabetes induced cardiac dysfunction, Free fatty acids (FFA) model development is going on using 6:1 Palmitic acid: BSA, the cells. Presence of high plasma FFA condition is one of the key characteristics of type 2 diabetes; hence we established a cell culturemodel of lipotoxicity by culturing H9c2 rat cardiac cells in high-FFA medium *in vitro*.

C. Phytopharmaceuticals (Coordinator: Dr. Jagat C Borah)

The North East Region of India is a genetic treasure house of plant, animal and microbial resources. The region is one of the 12 mega-biodiversity rich zones of the world and forms a distinctive part of the Indo-Burma Hotspot. There is a need to put these invaluable plant genetic resources to use for the economic growth of the region in particular and to the nation in general, through scientific interventions. In recent years, due to the renewed interest in herbal products globally, inclusion of Indian medicinal plants in US and EU pharmacopeias, there are opening up of new directions.

Taking a clue of the global trends and opportunities in plant-based medicines, in India, DCGI promulgated guidelines for Phytopharmaceutical drug development (similar to US-FDA botanical guidance) in 2015. This new regulation has given a new hope for innovations and development of new drugs from botanicals in a scientific way and would help in the global acceptance of the use of herbal products by modern medical profession.

Our group is contributing towards mitigation of diabetes and its complications by investigation traditionally used medicinal plants. Work is focused on translational research towards the development of phytopharmaceutical drug and/or lead molecules and/or Investigational New Drug (IND) from ethno-medicinal plants for Treatment of Diabetes Mellitus type 2 and its complications.

Anti-Diabetic Potential of Traditionally used Medicinal Plant Wendlandia Glabrata D.C. and Procyanidin A2 Isolated thereof

Wendlandia glabrata is one of the most significantly used traditional medicinal plants in the North Eastern Region of India and primarily used part is tender shoots. Although traditional medicine has intrinsic utility, the lack of proper research and scientific evaluation has limited the translational potential. The study was aimed to evaluate the anti-diabetic efficacy of traditionally used *W glabrata* and to isolate active anti-diabetic constituent(s). α-glucosidase inhibitory potential was evaluated for the methanolic extract and fractions of tender shoots. Active anti-diabetic constituent Procyanidine A2 (PCA2) was isolated from most potent ethyl acetate fraction using silica gel column and flash chromatograpgy and further purified by HPLC. *In vivo* studies were performed by inducing diabetes in Swiss albino mice by single intraperitoneal injection of 150 mg/kg of streptozotocin (freshly dissolved in 0.1M citrate buffer, pH 4.5) and were divided into six groups of six animals each. Normal control (Gr I), diabetic control (Gr. II), positive control, metformin (Gr. III) and other three groups were treated with PCA2 (orally) at

three different doses of 10, 25 and 50 mg/kg b.w. Blood glucoselevels (tail prick) were monitored weekly using ACCU-CHEK Active. Glucose-6-phosphatase expression was studied by western blotting and *m*RNA expression in qRT-PCR.

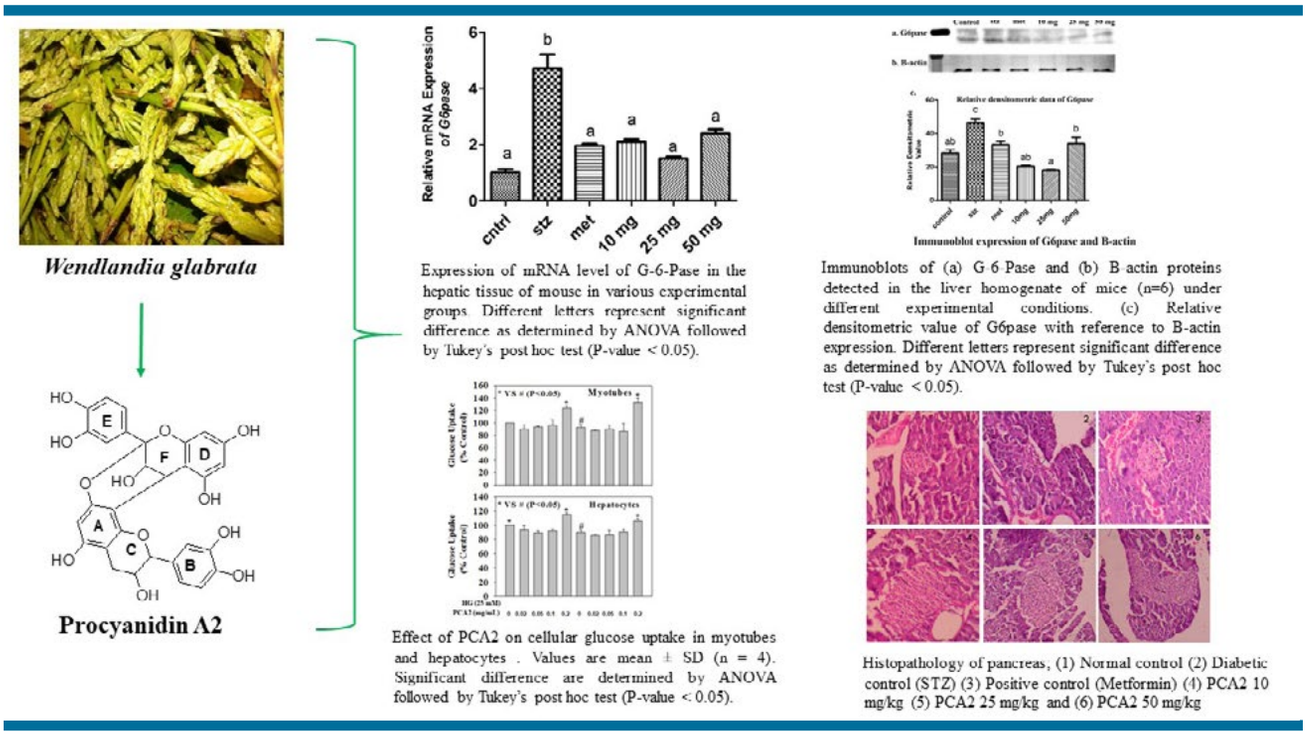


Figure 57: Procyanidin A2, anti-diabetic condensed tannin extracted from *Wendlandia glabrata* reduces elevated *G-6-Pase* and *mRNA* levels in diabetic mice and increases glucose uptake in CC1 hepatocytes and C1C12 myoblast cells

Phyto-chemical investigation on the active anti-diabetic constituent(s) of the tender shoots of *W glabrata*yielded PCA2 with significant inhibition of α-glucosidase (IC_{50} 0.46 ± 0.01 μM) making it potential sourcefor postprandial management of DM type 2. The study has also demonstrated PCA2 as a potent anti-diabetic agent that reducedtheblood glucose level to normal and lowered elevated levels of SGOT and SGPT in STZ induced diabetic mice and also exhibits significant Glucose-6-Phosphatase (G-6-Pase) inhibitory activities and increases glucose uptake in both **CC1 hepatocytes and C2C12 myoblast cells (Figure 57).**

The investigation and subsequent results confirm the anti-diabetic potential of traditionally used *W glabrata* and PCA2 isolated there of**. The study revealed that easily available** tender shoots of *W glabrata* could were used to make specific dietary recommendations for consumption for affordable management of diabetes.

D. Cancer Genomics, Mutation Detection and Comprehensive Monitoring of Head and Neck Cancer in North East India by Liquid Biopsy Approach (Coordinator: Dr. Rosy Mondal)

Head and neck cancer (HNC) accounts for 4% of all cancers and it is the eighth leading cause of cancer death worldwide. Liquid biopsy is a minimally invasive detection method for molecular biomarkers in body fluids which may serve as a novel tool in management of head and neck cancer. Blood contains two types of cancer-derived materials that are susceptible to detailed molecular analysis: intact circulating tumour cells (CTCs) and cell-free circulating DNA (cfDNA). The detection of biomarkers using cfDNA is one of the promising non-invasive methods. These can serve as potential biomarkers for early detection of tumour, prognosis and disease recurrences. Liquid biopsy has the advantages of non-invasive, rapid, precise and especially real-time. The biological samples were collected from GMCH and Ayursundra Hospital, Guwahati with written consent from the patients before surgical interventions or therapeutic treatments. The blood samples were processed, the plasma cfDNA and genomic DNA from preselected regions of tumour tissue and blood was extracted with respective Qiagen Kit based protocol. The isolated genomic DNA from tissue, blood and cfDNA from plasma was quantified by using Qubit4 Fluorometer. The concentrations (ng/μl) of genomic DNA from blood, tissue and cfDNA from plasma ranges between 23.9-189.0, 15.9-240.0, 1.33-6.13, respectively.

Development of Pipeline for the Identification and Annotation of Variants (SNP) in Cell-Free DNA, Tumor DNA and Blood DNA by Next Generation Sequencing Approach

We have processed 11 cancers patient's samples for sequencing using Ion torrent platform. We used Ion AmpliSeq™ Cancer Hotspot panel covering 2,800 COSMIC mutations. Out of 2800 mutations, we detected 1884 SNVs in our analysis. Among them 2 SNVs were consistent across all the patients in this study. The pipeline involves QC, mapping, annotation and gene enrichment analysis. The mutations were in exonic region of the gene and non-synonymous in nature. Our analysis revealed that the mutations affected Androgen Receptor Signaling Pathway, MAPK signaling, DNA damage response and TGF-beta Receptor Signaling Pathway. Network analysis showed the protein interacts with MDM2, BCL2L1, MDM4, CDKN1A, ATM, CREBBP.

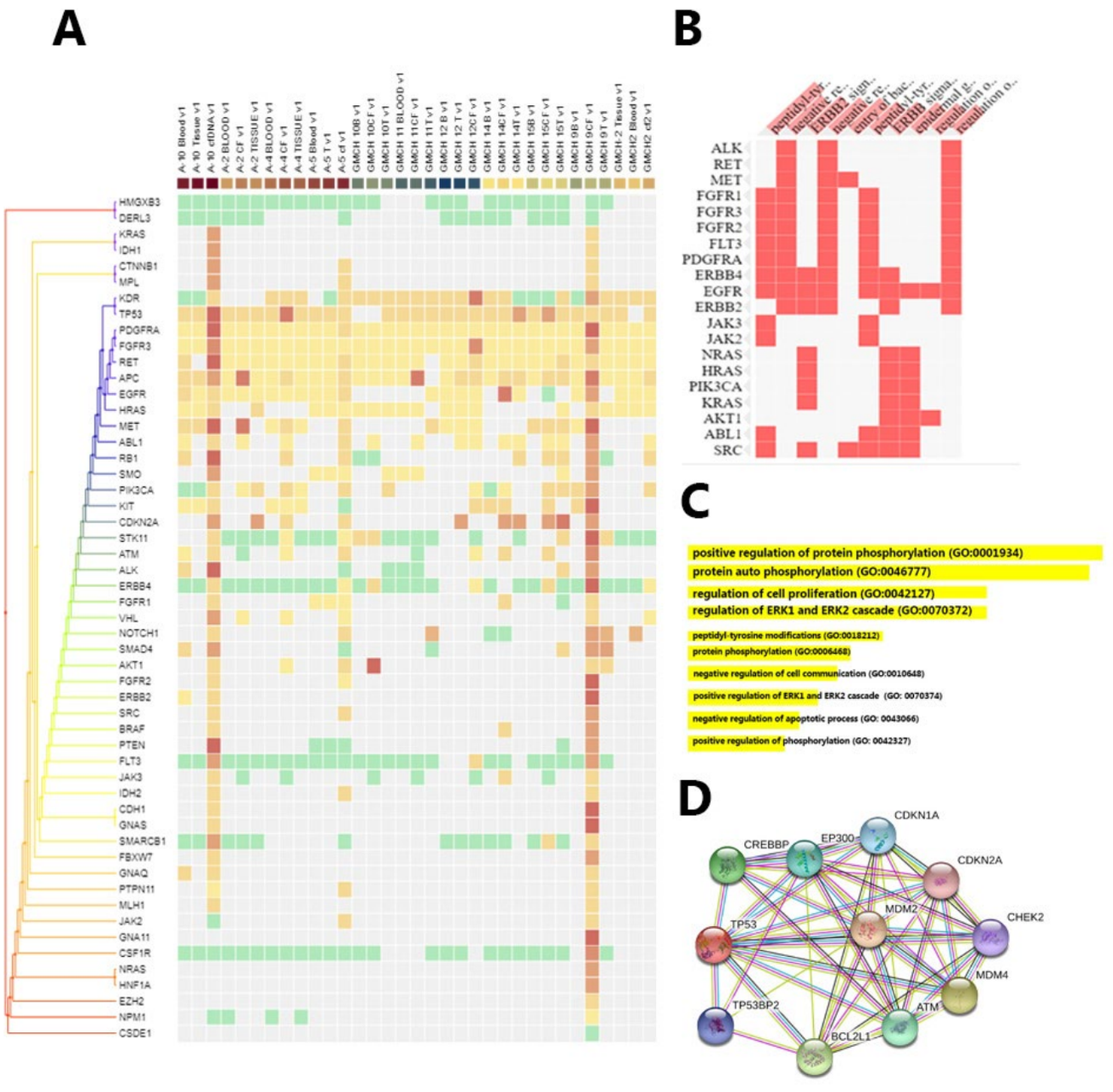


Figure 58: (A) Heatmap analysis of detected mutations across samples. (B & C) Clustergram and Enrichment analysis of the genes. (D) Interaction analysis of identified genes

E. Development of MicroRNA-based Breast Cancer Therapeutics (Coordinator: Dr. Subrata Kumar Pore)

Breast cancer (BC) is the second leading cause of cancer-related deaths in women worldwide. Among different subtypes of BC, triple-negative breast cancer (TNBC) is most aggressive, invasive, and highly metastatic, yet there are few therapeutic options to treat TNBC. Molecular chaperon, Heat shock protein 90 (Hsp90) plays a major role in breast cancer by chaperoning many of its client proteins like ER, PR, AR, EGFR, p53 etc. which are involved in breast cancer development and progression. Inhibition of Hsp90 results in degradation of its client proteins which leads to the cell-cycle arrest, apoptosis and subsequent cancer cell death in vitro and tumour growth inhibition in vivo. In recent years, microRNAs (miRs) have drawn interest as epigenetic modulators of gene expression. miRs regulate gene expression through mRNA degradation, translation repression and chromatin modification. The present study investigates the involvement of Hsp90-targeted miRNAs in breast cancers, especially in TNBC and to develop miRNA-based therapeutics.

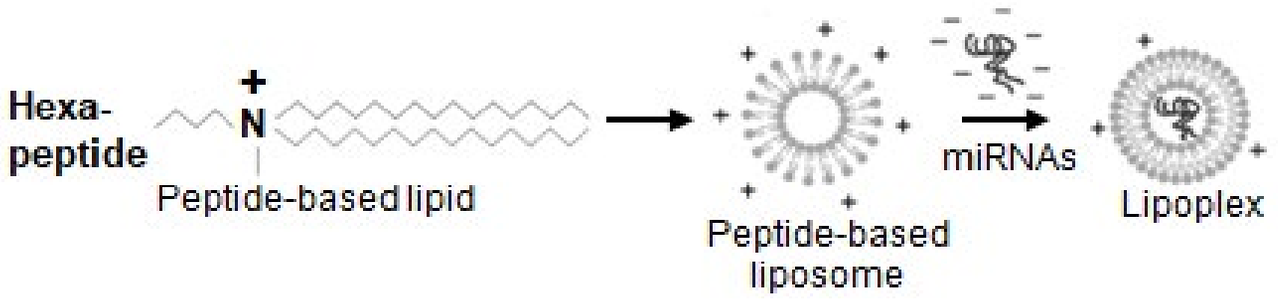


Figure 59: Schematic diagram of peptide-based liposomal delivery system for miRNA (oligonucleotides) delivery

The TCGA data analysis shows several miRs are positively and negatively correlated with the Hsp90 expression in different subtypes of cancer patients. For example, miR-21-3p, miR-23a-5p etc are positively correlated with both Hsp90AA1 and Hsp90AB1 genes significantly whereas, miR-29a-3p, miR-214-5p are negatively correlated. The specific primers have been generated to see the expression of these miRs in different subtypes of breast cancer cells upon up-regulation and down-regulation of Hsp90. Further studies are going on.

For the cancer cell targeting delivery of genetic materials like miRs, peptide-based delivery systems are being developed. EGFR is a cell surface receptor expressed in many cancers including TNBC. Specific small hexa-peptide is being modified synthetically to make bilayer liposome. Upon successful development of cancer cell targeting liposomal delivery system, anticancer properties will be evaluated in-vitro and in-vivo animal models.

RESEARCH OUTPUT

Extramural Projects

Completed Projects

Title of the Project	Funding Agency; Total fund; Duration; PI/Coordinator	Goal
Integrating Herbal Medicine of NER with Contemporary Approaches in Develop Therapeutic Strategies for Metabolic Syndrome	**Funding Agency**: DBT, New Delhi; **Total fund**: INR 2455.793 lakh; **Duration**: 2017-2019; **PI/Coordinator**: Dr. Narayan C. Talukdar **Co-PI:** Dr. Rajlakhmi Devi	Type-2 diabetes (T2DM) is a complex metabolic disorder characterised by hyperglycaemia stirring from insufficiency in insulin secretion, action, or both. This study explored several ethno-medicinal knowledge based herbs and authenticated and discovered bioactive principle in them. This project was instrumental in building significant infrastructure for traditional knowledge based drug discovery research in IASST, training manpower and establishing research collaboration between NE and main land India laboratories.
Chemical profiling of Joha and Black rice of NER for nutritional, nutraceutical parameters and aroma compounds.	**Funding Agency**: DBT, Govt. of India **Total fund**: INR 102.14 lakh; **Duration**: 2016-2019; **PI/Coordinator**: Dr. Rajlakhmi Devi	Isolation, characterization and quantification of phytochemicals in different scented rice of Assam and development of value added products for health benefit

Ongoing projects

Title of the project	Funding Agency; Total fund; Duration; PI/Coordinator	Goal
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" Under DBT's Twinning Programme for NER	**Funding Agency**: DBT, New Delhi; **Total fund**: Rs. 85.95 lakh; **Duration**: 2018-2021 **PI/Coordinator**: Dr. Narayan C. Talukdar, Dr. Jagat Chandra Borah	The objectives of this project were to evaluate the anti-diabetic efficacy of traditionally used W. glabrata and to isolate active anti-diabetic constituent(s).
Setting up a Quality Control (QC) and Quality Assurance (QA) Laboratory Facility for the Phytopharmaceutical Mission for North East India.	**Funding Agency**: DBT, New Delhi; **Total fund**: Rs. 190.59 lakh; **Duration**: 2018-2021; **PI/Coordinator**: Dr. Narayan C. Talukdar	The objective of this project is to create QA-QC facility for herbals as per regulatory guidelines of the National Accreditation Board for Testing and Calibration Laboratories (NABL), Food Safety and Standards Authority of India (FSSAI) and ministry of ayush. Based on various literature surveys, deliberations and discussion with stakeholders, about 77 medicinal plants of ner were compiled. Botanical reference standards based on extent of trade have been procured. Floor plan of the laboratory prepared as per NABL standards with technical support from private entities, and laboratory equipment purchase getting completed. Microbial contaminant load analysis and garcinol content estimation in *Garcinia* species of Assam were carried out following SOP as the test runs before the facility is opened for analysis of samples of customers.

Title of the project	Funding Agency; Total fund; Duration; PI/Coordinator	Goal
Characterization of high value phytochemicals of Anti-diabetic and immunomodulatory properties in North-Eastern banana varieties.	**Funding Agency**: DBT, Govt. of India **Total fund**: Rs. 38 lakhs **Duration**: 2019-2022; **PI/Coordinator**: Dr. Rajlakshmi Devi	To study the antioxidant and anti-hyperlipidemic property of few selected medicinal plants used by the tribal population of Goalpara district, Assam.
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 **Total fund**: Rs. 20 lakhs **Duration**: 2018-2021; **PI/Coordinator**: Dr. Rajlakshmi Devi	To study the antioxidant and anti-hyperlipidemic property of few selected medicinal plants used by the tribal population of Goalpara district, Assam, focusing primarily on the *Clerodendrum* genus.
Phytopharmaceutical Development of *Ficus semicordata* Buch.-Ham. ex Sm. as per regulatory guidelines of DCGI.	**Funding Agency**: DBT, Govt. of India **Total fund**: Rs.197.288 lakh **Duration**: 2018-2021 **PI/Coordinator**: Dr. Jagat C Borah	For development of Phytopharmaceutical Drug in collaboration with CSIR and Industry.
Molecular and biochemical studies on indigenous medicinal plants from the North East India including *Urginea Indica* (Bon Pollundu) and *Dactyloscapnos scandens* for the development of potential anti-diabetic formulation".	**Funding Agency**: DBT, Govt. of India Total Fund: Rs.95.168; Duration: 2019-2022 **PI/Coordinator**: Dr. Jagat C Borah	Development of potential anti-diabetic formulation.
DST-INSPIRE Faculty Award "Cell -free nucleic acids as non -invasive for cancer detection."	**Funding Agency**: DST, Govt. of India: **Total fund**: ₹35 Lakhs; **Duration**: 2015-2020; **PI/Coordinator**: Dr. Rosy Mondal	The research aims to detect the presence and fractions of circulating cell free DNA (cfDNA) in plasma of head and neck cancer patients and to determine the feasibility of deep sequencing approach in cancer detection. It also aims to determine if cfDNA copy number variation can be used to dynamically monitor response to therapy in cancer.
Early Detection and Comprehensive Monitoring of Head and Neck Cancer using Liquid Biopsy approach: A Study from Northeast India	**Funding Agency**: DBT, Govt. of India **Total fund:** Rs. 58.4 Lakhs; **Duration**: 2019-2022 **PI/Coordinator**: Dr. Rosy Mondal	The development of non-invasive liquid biopsy approach, utilizing cfDNA biomarkers, for efficient screening and comprehensive monitoring of HNSCC.
Developmentof Hsp90-regulating microRNA-based therapeutics for breast cancer.	**Funding Agency**: DBT, Govt. of India **Total fund**: Rs: 40 lakhs Duration: **PI/Coordinator**: Dr. Subrata K. Pore	Identifying Hsp90-regulating microRNAs and the mechanisms of Hsp90 regulation in different subtypes of breast cancer Development of breast cancer therapeutics using targeted peptide-based liposomal delivery of Hsp90-regulating microRNAs Developing small molecule inhibitors of miRNAs involved in breast cancer progression through Hsp90 upregulation

Publications

In cited journals

Author(s)	Title	Journal Name	Volume & Issue no./page no.	Month/ Year of Publication
Parul Kamboj, Narayan Chandra Talukdar, Sanjay K. Banerjee	Therapeutic Benefit of Dillenia indica in Diabetes and Its Associated Complications	Journal of Diabetes Research	2019/ 4632491	December/ 2019
Subrata K Pore, Anirban Ganguly, Samaresh Sau, Sudhakar Godeshala, Anantha K Kanugula, Ramesh Ummanni, Srigiridhar Kotamraju, and Rajkumar Banerjee	N-End Rule Pathway Inhibitor Sensitizes Cancer Cells to Antineoplastic Agents by Regulating XIAP and RAD21 Protein Expression in Biodiversity	Journal of Cellular Biochemistry	121(1)/804	January 2020
Momita Das, Raghuram Kandimalla, Bhaskarjyoti Gogoi, Krishna Nayani Dutta, Paramita Choudhury, Rajlakshmi Devi, Partha Pratim Dutta, Narayan Chandra Talukdar, Suman Kumar Samanta	Mahanine, A Dietary Phytochemical, Represses Mammary Tumor Burden in Rat and Inhibits Subtype Regardless Breast Cancer Progression Through Suppressing Self-Renewal of Breast Cancer Stem Cells	Pharmacological Research	146/104330	June 2019
Himadri Kalita, Ankita Hazarika, Rajlakshmi Devi	Withdrawal of High-Carbohydrate High-Fat Diet Alters Status of Trace Elements to Ameliorate Metabolic Syndrome in Rat	Canadian Journal of Diabetes	44(4)/317	October 2019
Sima Kumari, Parmeshwar B. Katare, Ramakrishnan Elancheran, Hina L. Nizami, Bugga Paramesha, Sudheer Arava, Roshan Kumar, Yashwant Kumar, Rajlakshmi Devi, Sanjay K. Banerjee, Dinesh Mahajan and Partha Pratim Sarma	*Musa Balbisiana* Fruit Rich in Polyphenols Attenuates Isoproterenol- Induced Cardiac Hypertrophy in Rats via Inhibition of Inflammation and Oxidative Stress	Oxidative Medicine and cellular Longevity	2020/7147498	January/2020
Yunush Sheikh, Maibam Beebina Chanu, Gopinath Mondal, Prasenjit Manna, Asamanja Chattoraj, Dibakar Chandra Deka, Narayan Chandra Talukdar, Jagat Chandra Borah	Procyanidin A2, an Anti-Diabetic Condensed Tannin Extracted from *Wendlandia Glabrata*, Reduces Elevated G-6-Pase and mRNA Levels in Diabetic Mice and Increases Glucose Uptake	RSC advances	9(13)/17211	July/2019

Patents

Inventor(s)	Title	File No. For Enrollment	Provisional/Final Patent Grant No.	Issue No. of Patent Office
S. Kumari, S.K. Banerjee, R. Devi, D. Mahajan, Y. Kumar	Method of preparing nutraceutical and pharmaceutical products based on *Musa balbisiana* and uses thereof	No. 201911015320 (16-4-2019)	Nil	Nil

Inventor(s)	Title	File No. For Enrollment	Provisional/Final Patent Grant No.	Issue No. of Patent Office
Sagar R. Barge, Bhaswati Kashyap, Barsha Deka, Simanta Bharadwaj, Shilpi Saikia, Raghuram Kandimalla, Partha Pratim Dutta, Ankita Hazarika, Aprajita Ghosh, Suman K Samanta, Jagat C Borah, Yeshwant Kumar, Renu Goel, Ajay Kumar, Sanjay K Banerjee, and Narayan C. Talukdar	A herbal extraction from *Lysimachia Candida* for treatment of Obesity and related hyperglycemia and a method for its extraction	No.201931019887A (14-06-2019)	Nil	Nil

Presentation in Conferences/Seminars

Invited Talks

Faculty	Title	Programme Name	Date & Venue
Narayan C. Talukdar	Resource Person lecture-Preventive and curative effect of *Premna herbacea* and its active compound in high fat-high fructose diet induced rat and palmitate induced L6 cell line	The brain storming session on the "Potential Leads for Drug Development from plants of NER, India" in the 7th International Congress of the Society for ethno-pharmacology	16th Feb, 2020 at the School of Pharmaceutical Education and Research, Jamia Hamdard, New Delhi
Rajlakshmi Devi	Development of multi targeted therapy from the North Eastern medicinal plants to treat metabolic syndrome.	GSES- 2019 and 64th Annual Technical Session of ASS.	28th -29th June 2019 at Cotton University, Assam.
Rajlakshmi Devi	"Social Responsibility of Scientists: Pathways and Outcomes"	NIAS-DST Women Scientists Course	10th-14th February 2020 at IISC Bangalore.
Jagat C Borah	Natural Product Research and Phytopharmaceuticals	"Recent discoveries in medicinal and aromatic plants research and its sustainable development in North East India" (REDIMAP 2019)	29th-30thAugust 2019 at ADP College, Nagaon.
Jagat C Borah	Integrating traditional medicine into modern medicine: An approach towards Phytopharmaceuticals	Workshop on "Renewable Resources & Sustainable Technologies"- organized by the Assam Science and Technology University (ASTU)Department of Chemical Engineering, Assam Engineering College, TEQIP-III, MHRD, Government of India.	4th&5th September, 2019. Institution of Engineers (India), Assam State Centre, Guwahati
Jagat C Borah	Phytopharmaceuticals: A New Class of Drug from Plant	Science Academies' Lecture Workshop on "Medicinal Chemistry and Natural Products: Approaches Towards New Drug Discovery"	25th-27thSeptember, 2019. Rajiv Gandhi University (RGU), Arunachal Pradesh
Jagat C Borah	Application of Chromatography for Natural Product Isolation	Science Academies' Lecture Workshop on "Medicinal Chemistry and Natural Products: Approaches Towards New Drug Discovery"	25th-27thSeptember, 2019. Rajiv Gandhi University (RGU), Arunachal Pradesh
Jagat C Borah	Linking Indigenous Knowledge to Modern Research Activities: An Approach Towards Phytopharmaceuticals	International Conference on Emerging Trends in Chemical Sciences (ETCS 2020)	13th-15thFebruary, 2020. Department of Chemistry, Gauhati University, Guwahati-781014, Assam

Contributory

Author(s)	Title	Conference name	Oral / Poster	Date & Venue
Anower Hussain, Shamshad Alam, Kausar Mahmud Ansari, Ashu Bhan Tiku & Anand Ramteke	Flower Extract of *Nyctanthes Arbor-Tristis* Targets Cell Cycle Regulators and Inhibits Proliferation, Invasion and Migration of Prostate Cancer Cells	International Symposium on Emerging Trends & Challenges in Cancer Chemopreventio, Diagnosis & Therapeutics	Poster	17th-18th February 2020, Tezpur University, Assam
Bhaswati Kashyap, Seydur Rahman, Jagat Chandra Borah, Narayan C. Talukdar	*Antidesma acidum* stimulates glucose uptake in skeletal muscle cells via AKT/ AMPK pathway of glucose metabolism.	8th Annual Conference of International Chemical Biology Society (ICBS-2019).	Poster	2nd-4thNovember 2019. CSIR-Indian Institute of Chemical Technology, Hyderabad.
Seydur Rahman and Narayan C. Talukdar	Propolis: A potential natural product for treatment of human breast cancer"	8th Annual Conference of International Chemical Biology Society (ICBS-2019).	Poster	2nd -4thNovember 2019. CSIR-Indian Institute of Chemical Technology, Hyderabad
Paramita Choudhury	Nutraceutical potential of Aromatic rice (Joha) on *in vivo* type II diabetic model system.	8th Annual Conference, ICBS, 2019	Poster	2nd-4thNovember 2019 at IICT, Hyderabad, India
Partha Pratim Sarma	Characterization and identification of bioactive compound(s) from the seeded banana variety *Musa balbisiana*.	8th Annual Conference, ICBS, 2019	Poster	2nd-4thNov, 2019 at IICT, Hyderabad, India
Nonibala Gurumayum	Antioxidant, anti Glycation and glycolytic enzyme inhibitory potential of *Musa balbisiana* colla seeds	International conference on drug discovery	Poster	29th February-2nd March 2020, at BITS Pilani, Hyderabad campus. Hyderabad.
Puspanjali Khound	Anti-Glycation and Antioxidant Potential ofClerodendrum Glandulosum Lindl. In The Leaf Extract And Its Fractions	International conference on drug discovery	Poster	29th February-2nd March 2020, at BITS Pilani, Hyderabad campus. Hyderabad.
Swarnali Bhattacharjee	The protective effect of *Garcinia pedunculata* Roxb. extract on isoproterenol-induced cardiotoxicity in rats	National symposium on recent trends in zoological sciences (nsrtzs 2020)	Oral	28th-29thFebruary 2020, held at NEHU, Shillong
Yunus Sheikh, Prasenjit Manna, Narayan C. Talukdar, Dibakar Deka and Jagat C Borah	Anti-diabetic efficiency of Procyanidin A2 isolated from W. Glabrata DC.	International Conference on Emerging Trends in Chemical Sciences (ETCS 2020)	Poster	13th-15thFebruary 2020
Pranamika Sarma, Sagar Barge, Prasenjit Manna, Narayan C. Talukdar and Jagat C Borah	Antihyperglycemic effects of an enriched water fraction of Wendlandia glabrata: In vivo study in STZ induced diabetic rats.	International Conference on Emerging Trends in Chemical Sciences (ETCS 2020)	Poster	13th-15thFebruary 2020

Other Activities

Awards/Recognitions/Achievements:

Name	Particulars
Narayan C. Talukdar	Panelist for the brain storming session on the "Potential Leads for Drug Development from plants of NER, India" under phytopharmaceutical mission of DBT in the 7th International Congress of the Society for Ethnopharmacology organized by the School of Pharmaceutical Education and Research, Jamia Hamdard, New Delhi on 16th Feb, 2020.
Narayan C. Talukdar	Chief guest lecture on the Freshers' cum Farewell Day, 2019 in the Govt. Ayurvedic college & Hospital on 6.12.2019

Name	Particulars
Rajlakshmi Devi	External examiner for M.Sc 4th semester on 10-09-19, Biotechnology Dept. Gauhati University
Rajlakshmi Devi	Evaluator for scientific models, Regional Science Museum, Khanapara, 9th December 2019
Rajlakshmi Devi	External Expert for Ph.D viva-voce, 27-09-17/ Dept of Biotechnology, NIT, Arunachal Pradesh
Rajlakshmi Devi	Coordinator of Vigyan Jyoti on 19th Feb 2020, Jawahar Navodaya Vidyalaya (JNV), Nalbari
Jagat C Borah	External examiner for final year B.Tech on 21-05-2019/ Dept of Biotechnology, NIT, Arunachal Pradesh
Jagat C Borah	External examiner for viva-voce for M.Sc 4th semester on 31-08-2019/ Department of Biotechnology, Gauhati University, Assam
Jagat C Borah	External examiner for viva-voce for M.Sc 4th semester on 19-09-2019/ Department of Biotechnology, Gauhati University, Assam
Jagat C Borah	External examiner for practical examination for M.Sc 1st semester on 19-12-2019/ Department of Biotechnology, Gauhati University, Assam
Anowar Hussain	Best poster award in the International Symposium on Emerging Trends & Challenges in Cancer Chemoprevention, Diagnosis & Therapeutics, held on 18-18th Feb, 2020 at Tezpur University, Assam, India


ACADEMIC
ACTIVITIES

MANPOWER GENERATION

List of Ph.D. Awardees

Name of Student	Name of Supervisor	Title of the Thesis	Award giving University
Abhijit Boruah	Prof. H. Bailung	Investigation on characteristics of strongly coupled dusty plasma in capacitively coupled radio frequency discharge	Gauhati University
Pallabi Pathak	Prof. H. Bailung	Studies on the characteristics of Peregrine soliton in multicomponent plasma with negative ions.	Gauhati University
Bikash Sharma	Dr. Arup R. Pal	A study on the applicability of atmospheric pressure glow discharge plasma for growth of carbon nanostructures	Gauhati University
Ashim Chandra Bhowal	Dr. Sarathi Kundu	Conformation, morphology, optical and electrical behaviors of pure and nanomaterials mixed macromolecular thin films	Gauhati University
Hrishikesh Talukdar	Dr. Sarathi Kundu	Studies on structural, optical and electrical properties of polyelectrolyte thin films	Gauhati University
Parijat Borgohain	Dr. Munima B. Sahariah	A Theoretical Study on Disordered Heusler Alloy	Gauhati University
Ujjal Saikia	Dr. Munima B. Sahariah	A Theoretical Study on Layered Nanocomposites	Gauhati University
Ms. Kangkana Bora	Dr. Lipi B. Mahanta	Development of a Decision Support System for detection of malignancy in cervix using Pap smear images	Gauhati University
Mrs. Chandrawali Kalita	Dr.Arundhuti Devi	Evaluation of Antioxidant and Antimicrobial activities of selected edible *Bambuseae* species available in North-East India and their application in biosynthesis of metal nano-particles	Gauhati University
Priyanka Sarkar	Dr. M. R. Khan	Effect of alcoholism on human gut microbiota and comparison with that of colorectal cancer patients	Gauhati University

COMPETITIVE SUMMER STUDENTS PROGRAM

The competitive Summer Students Program (SSP) was introduced during the year 2017-18 with provision of Rs. 3000/-PM stipend. Since its inception year, there is a huge participation of students from all over India. The seat allocations are 40% for North-East India and 60 % for the students from the rest of the country.

Name and Affiliation	Supervisor	Topic	Duration
Aman Singh Katariya IISER Mohali	Dr. H. Bailung	Study of plasma discharges and probe I-V characteristics	7th May-7th July, 2019
Anmol Arya IISER Mohali	Dr. Sumita Sharma	Study of basic characterisation and phase transition in dusty plasma	7th May-7th July, 2019
Anupam Dutta VIT University, Vellore	Dr. Rosy Mondal	Basic molecular biology techniques	10th May-10th July, 2019
Anupam Sonowal IIT, Roorkee	Dr. R. Devi	Total phenolic content and anti-oxidant activity of Musa balbisiana Colla	15th May-15th July, 2019
Anurag Protim Saikia Mizoram University, Aizawl	Dr. L. B. Mahanta	Study on image processing methods for architectural level segmentation of normal and abnormal oral biopsy tissue samples	20th June-20th August, 2019

Name and Affiliation	Supervisor	Topic	Duration
Bishal Boro IIT, Roorkee	Dr. A. Devi	Assessment of physico-chemical parameters and heavy metal content in soil across India	21st May-9th July, 2019
Gitartha Das VIT University, Vellore	Dr. M. R. Khan	Study on the effect of potential probiotic bacterium on developmental process of Drosophila melanogester	6th May-10th July, 2019
Goutam Debnath ICFAI University, Tripura	Dr. Sumita Sharma	Fundamental study of plasma generation and diagnostics in laboratory	20th May-20th July, 2019
Jugal Barman Amity University, Gwalior	Dr. W. Romi	Impact of different cell lysis principles on extraction of vaginal metagenomic DNA	31st May-30th July, 2019
Kalyan Shandilya Gauhati University	Dr. M. B. Saharia	Understanding the molecular dynamics simulation techniques	27th June-27th August, 2019
Kingshuk Panda VIT University, Vellore	Dr. W. Romi	ARDRA-based investigation of lactic acid bacteria from an unreported fermented buttermilk - GHOL	14th May-13th July, 2019
Manash Pratim Sarma Brahmaputra College	Dr. Biswajit Choudhury	MgO nanosheets for UV photocatalytic applications	25th June-25th August, 2019
Megha Jaiswal BHU, Varanasi	Dr. M. R. Khan	Study of bacteria in enhancing lifespan of C. elegans	29th May-28th July, 2019
Mrinalini Bhagawati Pondicherry University	Dr. Soumyadeep Nandi	Identification and annotation of differentially expressed genes in Antheraea assamensis fed on different host plants	6th May-6th July, 2019
Navarun Das NIT Silchar	Dr. L. B. Mahanta	Multiclass classification of OSC cell images using deep convolutional neural networks	19th May-18th July, 2019
Neha Sinha Dr. D Y Patil Biotech & Bioinformatics Inst., Pune	Dr. Debajit Thakur	Assessment of plant growth promoting and antagonistic potential of endophytic bacteria in tea (Camellia sinensis)	1st June-31st July, 2019
Nidhi Patawari BHU, Varanasi	Dr. N. C. Talukdar	Endophytic bacteria in the Kola Joha rice seeds and their colonization pattern	27th May-26th July, 2019
Paran Baruah Annamalai University, Chidambaram	Dr. J. C. Borah	Bioactivity guided fractionation and chemical fingerprinting of folklore medicine	19th May-18th July, 2019
Priyabrata Mishra BIT, Mesra	Dr. G. Choudhury	Study of different concepts of renewal theory, point pattern analysis and comparison of the distributions of 2 point datasets	9th May-28th June, 2019
Sakshi Saraswat Pondicherry University	Dr. Soumyadeep Nandi	In silico prediction and analysis of new and potent WDRS-WIN-Site inhibitors	10th May-10th July, 2019
Seema Narzary BIT, Mesra, Ranchi	Dr. A. Devi	Assessment of ground water quality of certain selected sites of Noonmati, Assam (IOCL Guwahati)	6th May-5th July, 2019
Shubham Shishodia BIT, Mesra	Dr. Devashish Choudhury	Clay-Azobenzene nanocomposite with varied electrochemical properties	5th May-5th July, 2019
Upama Das Gauhati University	Dr. S. Kundu	Nanoparticles formation inside a polymer matrix	27th June-14th August, 2019

Summer Internship/ Winter Internship /Dissertation Program/ M.Sc. / B. Tech projects/training courses offered at IASST

Name and Affiliation	Program	Supervisor	Topic	Duration
Saponjeet Borah	M.Sc.	Dr. Neelotpal Sen Sarma	Bio-synthesis, Characterisation and application of Gold nanoparticle and Graphite Quantum Dot	2 Months
Bidyashree Neog	MBA	Dr. Neelotpal Sen Sarma	A Study on the Exploring the Potential of Commercialization of Ammonia Sensor Device and the Promotional Strategy of this Device	2 Months
Kangkan Sarma	MBA	Dr. Neelotpal Sen Sarma	A Study onthe Exploring the Potential of Commercialization of Sulfur Dioxide and Picric Acid Sensor Device and the Promotional Strategy of these Devices	2 Months

Name and Affiliation	Program	Supervisor	Topic	Duration
Angshuman Thakuria	B. Tech.	Dr. Devasish Chowdhury	Polysaccharide Based Nanocomposite as an alternative Packaging Material	December 2019- January 2020
Sweta Mahanta	B.Tech.	Dr. Devasish Chowdhury	Functionalized Graphene/Graphene oxide as additives in Nano-lubricants	December 2019- January 2020
Nilikesh Lahkar	B.Tech.	Dr. Devasish Chowdhury	Functionalized Graphene/Graphene oxide as additives in Nano-lubricants	December 2019- January 2020
Prasuryya Borah	M.Sc.	Dr. Devasish Chowdhury	Detection of Amines using Carbon dot prepared from Betalain extract	December 2019 to March 2020
Parlie Dutta	M.Tech.	Dr. Devasish Chowdhury	Physical study of interaction at Nano-Bio Interface	January-June 2019
Rasna Saikia	M.Tech.	Dr. Devasish Chowdhury	Fabrication of antimicrobial Nano Bio-composite	January – May 2019
Sauraja Sarkar	B. Tech.	Dr. A. R. Pal	Study of vacuum system	January 1-15, 2020
Barnali Medhi	M. Tech.	Dr. A. R. Pal	Deposition of copper nitride thin films by DC magnetron sputtering	January-June, 2019
Ms. Monika Narzary	M.Sc.	Prof. H. Bailung, Dr. Kamatchi Sankaranarayanan	Effect of cold atmospheric pressure plasma on biomolecules	January-March, 2020
Bhaswati Sarma	M.Sc.	Dr. Biswajit Choudhury	Fabrication of Ag decorated MgO Nanostructure	June-July 2019
Kaushik Sarkar	M.Sc.	Dr. Biswajit Choudhury	Synthesis of C_3N_4 /MgO nanocomposite	June-July 2019
Bhagyashree Deka	M.Sc.	Dr. Biswajit Choudhury	An in-Situ Colloidal Deposition of Au Nanoparticles On MgO	June-July 2019
Hrishikesh Sarma	M.Sc.	Dr. Biswajit Choudhury	Hydrothermal Synthesis of Two- Dimensional MoS_2 Nanosheets	January (1 month), 2020
Jayanta Talukdar	M.Sc.	Dr. Biswajit Choudhury	Fabrication of Plasmonic Gold Decorated Ceria Nanocrystals for Photocatalytic Applications	January-March 2020
Suleman Siddiq	M.Tech.	Dr. Biswajit Choudhury	Fabrication of CeO_2 Nanorods using Hydrothermal route	February-June 2020
Asahan Ali	M.Sc.	Dr. N. C. Talukdar	*Joha* rice seed interior bacteria in hydroponic raised seedlings and culture liquid	11/2 months
Sweety Basumatary	M.Sc.	Dr. N. C. Talukdar	*Joha* rice seed interior bacteria in hydroponic raised seedlings and culture liquid	11/2 months
Bijit Das	MBA	Dr. N. C. Talukdar	Plant growth promoting activities of endophytic bacteria of scented *joha* rice seed interior	2 months
FanadaFarhana	MBA	Dr. N. C. Talukdar	Plant growth promoting activities of endophytic bacteria of scented black rice seed interior	2 months
Ashutosh Singh	B.Tech.	Dr. Rajlakshmi Devi	To study the various micronutrients (trace elements) present in various rice samples To analyse the antioxidant potential in invitro model system	1 month
Debopriya Choudhury	B.Sc.	Dr. Rajlakshmi Devi	To study and compare nutritional and antioxidant properties of Garcinia Pedunculata Roxb under different dying conditions	2 month
Debarati Dutta	B.Sc.	Dr. Rajlakshmi Devi	Nutritional profiling of Candy prepared from scented rice variety and Garcinia sp. From NE India.	1 month
Anusri Dhar	B.Sc.	Dr. Rajlakshmi Devi	Quantification of phytochemical content and antioxidant potential of Clerodendrum colebrookianum leaf collected in different months to understand the variation.	1 month

Name and Affiliation	Program	Supervisor	Topic	Duration
Bastab Bikash Gogoi	M.Sc.	Dr. Rajlakshmi Devi	Evaluation of nutritional and pharmacological properties of Musabalbisiana peels.	1 month
AshmitaSaha	M.Sc.	Dr. Rajlakshmi Devi.	To study the enzyme inhibition potential and phytochemical constitutents of *Clerodendrumglandulosum* leaf extract collected in different month	1 month
Chandrawali Sharma	M.Sc.	Dr. Rajlakshmi Devi.	To study the antioxidant activity of *Clerodendrumglandulosum* leaf extract collected in different month	1 month
Ms. Onima Taki	B.Tech.	Dr. Jagat C Borah	Natural Products Extraction and Chemical Fingerprinting Analysis	2 months
Ms. Bhanita Barman	M.Sc.	Dr. Jagat C Borah	Chemical fingerprinting of Methanolic Extract of *Taxus baccata*	1 month
Ms.Ritumoni Kalita	M.Sc.	Dr. Jagat C Borah	Extraction and Chemical analysis of Natural Product	1 month

PLACEMENT OF IASST SCHOLARS AT OTHER INSTITUTES

List of lab members appointed in other national/International laboratories abroad

Name of the Member	Name of Supervisor	Position and current laboratory
Abhijit Boruah	Dr. H. Bailung	Awarded PDF at Institute for Plasma Research, Gandhinagar, Gujarat, India
Pallabi Pathak	Dr. H. Bailung	Awarded PDF at Institute for Plasma Research, Gandhinagar, Gujarat, India
TonujDeka	Dr. H. Bailung	Selected as Assistant Professor in Sipajhar College, Assam
Yoshiko Bailung	Dr. H. Bailung	Selected as Assistant Professor in Goalpara College, Assam
Dr. Robinson Jose	Dr. Devasish Chowdhury	Research Associate, NAHEP CAAST, College of Agriculture, Kerala Agriculture University Padannakad, Kasaragod - 671314, Kerala, India
Dr. Manash Jyoti Deka	Dr. Devasish Chowdhury	Assistant Professor,B.P Chaliha College, Nagarbera, Kamrup, Assam
Dr. Ujjal Saikia	Dr. Munima B. Sahariah	Postdoctoral fellow Max Planck institute of Iron research, Dusseldorf, Germany
Dr. Prantik Sharma	Dr. N. C. Talukdar	Asstt Professor (Botany), Nagaon college
Dr.RinkumoniKalita	Dr. N. C. Talukdar	Asstt. Professor (Botany), BiswanathCharali college
Dr. Parijat Saikia	Dr. N.C.Talukdar	Assam Rural Infrastructure and Agricultural Services Society (ARIASP) as District Environment Coordinator (DEC)
Dr. Kishore Deka	Dr. N. C. Talukdar	Asstt. Prof., Mongoldoi college
Mr. Dibyayan Deb	Dr. M. R. Khan	Programme manager, Department of Biotechnology (DBT), GOI, New Delhi

PLACEMENTS AT IASST FROM OTHER INSTITUTES

List of lab members who are from other national/international laboratories and had joined IASST

Name of the Member	Name of Supervisor	Earlier laboratory
Dr. Kishore Deka	Dr. N. C. Talukdar	Botanical Survey of India, Kolkata
Ms. Bandita Pathak	Dr. N. C. Talukdar	Sikkim Central University, Gangtok, Sikkim
Ms Plabita Baruah	Dr. N. C. Talukdar	Dept. of Chemistry, Cotton University, Guwahati
Mr. Dipumoni Barma	Dr. N. C. Talukdar	Dept. of Biotechnology, Assam University, Silchar
Ms. Deepmala Devi	Dr. N. C. Talukdar	Plant Molecular Biology Lab, NEHU, Shillong

KNOWLEDGE RESOURCE CENTER

The Knowledge Resource Center (KRC) of IASST continues to act as a core center for the dissemination of specialized information services using modern tools to the scientific community involved in the research and development activities of Basic and Applied Plasma Physics, Advanced Material Sciences, Traditional Knowledge-Based Drug Development and Delivery, Bio-Diversity & Eco-system Research, Mathematical and Computational Sciences. The Center also continued its services to the faculty members, research scholars, students of colleges, universities, and research institutions located in Northeast India. The center continued to provide Inter-Library Resource-Sharing Services (ILRSS) through the National Knowledge Resource Consortium (NKRC) platform under CSIR and DST institutes of India. The article request made by the scientific community of the institute fulfilled through ILRSS. KRC also provided articles to the member library against their queries. The Knowledge Resource Center (KRC) of IASST is a member of the National Knowledge Resource Consortium (NKRC), National Digital Library (NDL), Developing Library Network (DELNET), and Current Science Association (CSA). The KRC's collection includes 7600 books, 2185 bound periodicals, 110 theses, 184 dissertations, 639 non-book material (CD, DVD, etc.), 453 research papers (journal articles and chapter in the book). The KRC has an Institutional Repository (IR) viz., DSpace Digital Library of IASST accessible through the institute's WiFi and LAN connections, providing access to the digital resources published by the institute. In 2019-2020, the services and activities were improvised, with 139 new books procured maintaining on user-driven focused. Four hundred fifty books circulated, reprographic services a total of 76,710 pages as print and Xerox provided, 951 pages of scan have done for users. Since the relocation of KRC in the last year, students from the outside educational and research institutes visited KRC in a short duration. They used the services and resources of KRC. .

MEETING/ CONFERENCE/ SEMINAR/ WORKSHOP/ TRAINING COURSE/ SYMPOSIUM ORGANIZED

Brainstorming Meeting on Quality Control

A Brainstorming meeting for Setting up of a Quality Control (QC) and Quality Assurance (QA) Laboratory at IASST

A brainstorming meeting was held on 17th May 2019 in IASST after implementation of the project entitled "Setting up Quality Control (QC) and Quality Assurance (QA) Laboratory Facility for the Phytopharmaceutical Mission for North East India." Apart from the project members, three eminent experts from industry and academia, namely, Prof. S. S. Handa (Former Director, CSIR-IIIM, Jammu), Dr. Arvind Saklani (Sami Labs Limited, Bangalore) and Dr. Rahul Singh (Emami Ltd., Kolkata) have participated in the meeting. They have made several observations and recommendations/suggestions during the session to prepare a roadmap for the effective implementation of the project. Along with the other suggestions, they have recommended taking guidance from consultants for laboratory design and construction, having experience designing NABL and ISO laboratories. It was also suggested to make a priority list of commercially important medicinal plants of North East India and maintain a repository of Botanical Reference Standard (BRS) and Phytochemical Reference Standard (PRS). A bioassay component in the project was also suggested to be included and to build a separate bioassay laboratory facility for the same. According to their recommendations/suggestions, the works were planned and implemented as per the project objective.

Quarterly Workshop on Hindi

The officials of IASST, Guwahati are encouraged to use Hindi as a medium of communication as well as implement Hindi language for noting, drafting. In order to make each individual of IASST an efficient communicator of Hindi language, a quarterly workshop on Hindi was organized on 14th June2019. The participation of forty-six (46) nos. of employees in the workshop has made the event successful. The concluding session was addressed by Mr. K C Basfore, Senior Manager, Official Language, SBI, Guwahati

Mr. K. C. Basfore, Senior Manager, Official Language, SBI, Guwahati delivering lecture in Seminar hall.

Presentation of summer trainee

Summer trainee of 2019 enrolled in different research divisions of IASST gave their project completion presentation on 25th June 2019. The research works of the trainees are evaluated by the respective research guides and other faculty members.

Summer trainee presenting their research work before Director and faculties of IASST

Seminar and Training on HPTLC and HPTLC-MS

With due approval of Director-IASST, Ancrhrom enterprises (I) Pvt. Ltd. conducted a seminar cum demonstration on High performance thin layer chromatography (HPLTC) and HPLTC-mass spectroscopy (MS). The training was held on 26thJune, 2019 in IASST premises. The engineer gave a talk on the applications of HPTLC for phytochemical analysis, biomedical analysis, herbal drug quantification, analytical analysis, finger print analysis. HPTLC-MS, HPTLC-FTIR and HPTLC-Scanning Diode Laser made HPTLC a power analytical tool in the field of analysis.

Assam Science Society Meeting

Assam Science Society (ASC) and IASST jointly organized the "Technical Committee meeting" of ASC on 14thJuly 2019. The program was chaired by Prof. M.C. Kalita of Gauhati University and the Director of IASST was present as guest of honour. The president and secretary of ASC elaborated the importance of the meeting in their speeches. Nearly forty members from different regional branches of ASC participated in the meeting.

Technical committee meeting of Assam Science Society at IASST

Meeting on Tribal Sub-plan scheme

Science for equity, empowerment, and development (SEED) with participation of IASST organized a meeting on 1st and 2nd August 2019 to discuss tribal sub-plan scheme.


A tribal sub-plan committee meeting at IASST conference hall

Wall Magazine

The first edition of IASST wall magazine named "Vijnanam" was inaugurated on 6th September 2019 by the Director, IASST. The students of IASST, under the mentorship of Dr. Biswajit Choudhury, designed the lay out of the wall magazine. The students and faculties of IASST composed beautiful scientific articles, poem, and stories on the paper and contributed total 14 articles for the magazine.

Inaugural event of the first edition of IASST Wall Megazine "Vijnanam" in IASST auditorium

Science Explorer Series and Outreach Programme for northeast students and researchers organized at IASST Guwahati

The Institute of Advanced Study in Science and Technology (IASST), Guwahati and the Wellcome Trust/ DBT India Alliance has jointly organizing a Science Explorer Series and a session on Biomedical Research and Funding Opportunities in India on 28th November 2019 in IASST campus, targeting students and researcher from northeast Institutes.


Director, IASST delivering the inaugural speech of Welcome Trust/DBT India Alliance Explorer series

About 300 participants from 29 different institutes/Universities and Colleges of northeast India attended the event. The first half of the programme was known as Explorer series where public talks we delivered by few renowned scientist, clinician of the country delivered talks. These Public science talks were specially designed to inspire students, researchers and young scientists to value science and ignite the excitement in science. The Scientist Explorers encourage to act with the spirit of enquiry, push boundaries, and pursue big ideas. The speakers shared their scientist's journey from chasing the unknown to the eureka moment packs the punch of a compelling story. Speakers of the explorer series were: -

(1) Dr. Rupjyoti Talukdar, Asian Institute of Gastroenterology, Hyderabad; Clinical researcher; pancreatic diseases; gut biology

(2) Prof. Akhilesh Pandey, Director, Institute of Bioinformatics, Bengaluru; molecular medicine; clinical diagnostics; proteomics.

(3) Dr. Sreelaja Nair, TIFR, Mumbai; developmental biology

(4) Dr. Suparna Ghosh-Jerath, Indian Institute of Public Health, New Delhi; nutrition research

There a very positive feedback from the participants and invited guests on the explorer series as well as about the discussion session.

Ph.D. orientation program

The newly joined Ph.D. students with institutional and national fellowships had an interactive session with the Director and faculties from of IASST on 24th February 2020. The agenda of this orientation program was to provide information about the research facilities of IASST, aware them of the laboratory safety rules, and how to pursue their research objectives with original ideas.

Newly joined Ph.D. students participated in orientation program

Demonstration on picosecond spectroscopy

A demonstration on picosecond time resolved spectroscopy was held at central instrumentation facility center of IASST on 24th February 2020.

Initiative taken for prevention of COVID-19

In view of novel coronavirus (COVID-19) outbreak in the country, the Director, IASST formed a committee to discuss and took necessary action to control containment measures for COVID-19. During this crisis the institute has taken several initiatives to control spread of COVID-19. To minimize risk of COVID-19, IASST has decided that entry of vendors, shipping agents, construction workers was not allowed to enter in IASST during lockdown period. In case of IASST labors and essential staffs was allowed after proper preventive screening at the main gate. The IASST advised faculties, staff, and students who have visited latest COVID-19 affected area for conference/ symposia, meetings any other personal gathering both internationally and nationally and upcoming future travels have to report registrar. Further, they have been advised not to travel outside of state. IASST recommended that

personnel who recently visited COVID-19 affected areas in last 1 month and the persons who came in contact with them should follow quarantine/self isolation for at least 14 days to prevent transmission of COVID-19. The COVID-19 control committee of IASST recommended individuals of the IASST follow frequent hand hygiene, respiratory etiquette and self-isolation when they ill. The individual who develops flu-like symptoms should be immediately separated from others and sent home (not by using public transport).

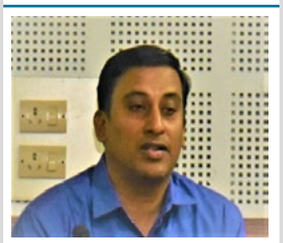
Faculties and Research Scholars of IASST taking preventive measures against COVID-19

The institute has been providing hand-washing facilities and keeping alcohol based-hand sanitizers at reception, canteen, hostels, coffee machine and other common areas. The IASST has made compulsory to wear face mask every time as preventive measure. Moreover, The IASST encouraged social awareness through communication to staff of COVID-19 through instruction and information by placing posters in different locations of the institute. At reception, big-screen LCD has been used to spread information on COVID-19. The IASST advised that no meetings, seminars, conferences, workshops, training program will be conducted in the IASST. In addition, gymnasium, sport complex, hostels should be shut down during this epidemic.

EMINENT SCIENTISTS/ PERSONALITIES WHO VISITED IASST AND DELIVERED LECTURE

Date	Photo	Name of Visitor/ Speaker & Affiliation	Title of Talk/Lecture
16th May 2019		**Prof. S. S. Handa** Former Director CSIR-IIIM Jammu	Phytopharmaceutical Drug Discovery / Development & Regulatory Aspects
28th June 2019		**Dr. Asamanja Chattoraj** Associate Professor, Kazi Nazrul University, Asansol, West Bengal	Artificial Light at Night (ALAN) is an ALARM to the Life Style: A Chronobiological Approach to Zebrafish Ovarian Physiology
30th July 2019		**Dr. Goutam Bhattacharyya** K&S Partners	Innovation & IP (Patent): Classroom to Boardroom
09th August 2019		**Prof. Manas Kamal Bhuyan** Professor & Associate Dean IPM, Dept. of Electronics & Electrical Engineering, IIT Guwahati	Computer Vision and Its Applications
21st August 2019		**Dr. P. V. A. Padmanabhan** Director (Technology Development), PSN College of Engineering &Technology, Tirunelveli, Tamil Nadu	Recent trends and Emerging opportunities in Thermal Plasma Technology
17th September 2019		**Dr. Rakesh Maurya** Former Chief Scientist, CSIR-CDRI, Lucknow	Application of Traditional Knowledge in Search of Potential Leads for Drug Discovery Research

Date	Photo	Name of Visitor/ Speaker & Affiliation	Title of Talk/Lecture
23rd September 2019		**Dr Gopal C Kundu** Dean Academics & Scientist-G, National Centre for Cell Science, Pune, (NCCS-Pune)	Understanding the Tumor Heterogeneity and Development of Patient Derived Xenograft (PDX) Models for screening of Novel Drugs in Breast Cancer
30th September 2019 .		**Dr. Rakesh Maurya** Former Chief Scientist, CSIR-CDRI, Lucknow.	Herbal medicine processing including collection, extraction, fractionation, isolation, characterization and commercialization
30th September 2019		**Dr. RK Vij** Director of School of Petroleum Technology (SPT), Pandit Dindayal Petroleum University (PDPU), Ahmedabad	
10thOctober 2019		**Dr. Somenath Garai** NIT Tiruchirappalli	Mimicking the bio-functions inside the i-cells: A convenient model for studying rehabilitated kinetics under confinement
14th October 2019		**Dr. Saranjit Singh** NIPER Mohali	He talked about marketing and authenticity of laboratory drugs, Purity of drugs and its impact on Indian economy
14th October 2019		**Prof. GPS Raghava** IIT Delhi	He delivered a talk on his work on bioinformatics and how he is trying to take his work free of cost to people like developing open source software.
21st October 2019		**Dr. Arun Sharma** Director General, NECTAR	Use of bamboo as potential fabric and on flood control as two separate discussions.

Date	Photo	Name of Visitor/ Speaker & Affiliation	Title of Talk/Lecture
3rd November 2019		**Prof. B.N. Goswami** Former Director, Indian Institute of Tropical Meteorology (IITM), Pune	Presidential remark- Talked about bringing in talent from outside to rejuvenate North East research Institutes
3rd November 2019		**Dr, (Mrs.) Lakshmi Goswami** Gynaecologist & Obstetrician	Talked about the rightward shift of the Indian politics and society
3rd November 2019		**Prof. Renee M. Borges** Professor, IISc., Bangalore	Life in and around microcosms, constraints and challenges
3rd November 2019		**Prof. Vijay K. Chaudhary** Professor, Department of Biochemistry, University of Delhi	Antibodies: ek naam anek kaam
3rd November 2019		**Prof. Pradip Chandra Deka** Vice- Chancellor, Shri Padmapat Singhania University, Udaipur, Rajasthan	Talked about developing research in Science and Technology in North East region
15th November2019		**Dr. N. Meenakshisundaram** Assistant Professor, Department of Physics, Vivekananda College, Madurai, Tamil Nadu	Phosphorene antidot nanoribbons- a novel 2D material for nanoscale applications

Date	Photo	Name of Visitor/ Speaker & Affiliation	Title of Talk/Lecture
6th December 2019		**Dr. Dinesh Chandra Khara** Post-doctoral research fellow in the field of DNA Nanotechnology and single-molecule fluorescence spectroscopy at Ben-Gurion University of the Negev, Israel	DNA Nanotechnology: Molecular Motors and Machines
3rd January2020		**Dr. Rakesh Maurya** Former Chief Scientist, CSIR-CDRI, Lucknow and currently consultant, Natural Product Chemistry, IASST	Application of Traditional Plants in the Management of Stress
20th January 2020		**Sri Arup Banerjee** Scientist / Engineer-SG, Head of Sensor and Focal Plane Systems Division, Space Application Center, Indian Space Research Organization (ISRO)	Optical imaging detectors, depth sensor and Hyperspectral Imager for ISRO missions - Chandrayaan-1 and 2
21st January 2020		**Professor T. G. Sitharam** Director, IIT Guwahati	Technology, innovation and ideas for water resources management
22nd January2020		**Mr. Abhijit Mondol** Representative from MAS Biosystems	SLEE and LEICA Ultra-Thin Microtome
22nd January2020		**Dr. Shabnam Das Kar** MD, FMNM, Director Medical Education, Medical Centre, Calgary.AB, Canada	Microbiome, Blood Glucose and T2D
24th January2020		**Dr. Bani Kanta Sarma** New Chemistry Unit, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore	Carbonyl-Carbonyl nO ® p* and nN (amide) ® p*/s* Interactions in Small Molecules, Peptides and Peptidomimetics

Date	Photo	Name of Visitor/ Speaker & Affiliation	Title of Talk/Lecture
27th January 2020		**Prof. Rajender S. Sangwan** Director Academy of Scientific & Innovative Research (AcSIR)	No title available [possible collaboration with Academy of Scientific & Innovative Research (AcSIR)]
5th March 2020		**Mr. Anirban Sanyal** Sales and Application Manager, TEM sample preparation unit of Leica microsystem.	Ultramicrotome with cryo-attachment unit

VISITS OF EXPERTS TO IASST

Tezpur University Team Visit

A four-member team from Tezpur University visited the institute on 1st May, 2019. The members were Prof. Ramesh Deka, Department of Chemistry, Prof. Dhrub K. Bhattacharyya, Dean, Academic Affairs, Prof. Niranjan Karak, Dean, Research and Development, and Prof. Nilakshi Das, Head-of Department (HoD), Physics, Tezpur University. The purpose of the visit was to explore the possibilities of having collaboration with IASST and starting a Ph.D. program.

Scientists of IASST in discussion with the officials of Tezpur University

International Organization for Standardization (ISO) Team Visit

A team from ISO visited IASST on 27th May 2019 for inspection providing ISO certificate to IASST.

Scientists of IASST providing scientific demonstration to ISO team members

European Delegation Team Visit

A team of European Research & Innovation officials visited IASST on 2nd April 2019 to discuss their interest in collaborative research with the North Eastern States research & academic community and to explore opportunities for international collaboration/exchange. The delegation consists of the Science, Technology & Innovation counsellors, attachés and directors of institutes from European countries, headed by Ms. Tania Friederichs, Head of Research & Innovation, EU Delegation to India, in total about 12 persons.

The Director, IASST honouring the officials of European Research Team

International Organization for Standardization (ISO) Team Visit

A team from ISO visited IASST on 29th May 2019 for inspection and allotment of ISO certificate.

ISO team visit to IASST

Visit of MLA, Assam under Paschim Guwahati Constituency

Mr. Ramen Kalita, MLA Assam, visited IASST 6th August 2019. On his visit, he lauded the research work being carried out by the scientific staff and research scholars of the institutes in the physical sciences, environmental sciences, and life sciences. He appreciated the efforts made to widen the scope of research activities in the institute. Subsequently, he visited the various infrastructural facilities for research with laboratories and the museum of the institute.

The Director IASST falicitating the Honorable MLA, Mr. Ramen Kalita. The scientists of IASST demonstrating the research activities to the minister.

ONGC Team Visit

A team of ONGC visited IASST including the institute labs and other facilities on 14th September 2019 for funding a research project to IASST.

The research scholars and scientists of IASST during interaction with ONGC team members

SCIENTIFIC TALK, LECTURE DELIVERED BY IN-HOUSE FACULTIES

Date	Name of Visitor/ Speaker	Affiliation	Title of Talk/Lecture	Photo
18th October 2019	Dr. Subir Biswas	Assistant Professor-II	Spectroscopic Measurements of Magnetic-field Distributions in a Relativistic Self-Magnetic-Pinch Diode	
18th October 2019	Dr. Kamatchi Sankaranarayanan	Assistant Professor-II	Multi-Tasking Ionic Liquids: From Protein Stability to Nanomaterial Synthesis	
25th October 2019	Dr. Santu Das	Assistant Professor-II	Application of hydroelasticity in science and technology - an overview	
25th October 2019	Dr. Rahul Hepat	Assistant Professor-II	When Parasitic Wasps Hijacked Viruses: gene expression control of Polydnaviruses	
15th November 2019	Dr. Biswajit Chowdhury	Assistant Professor- II	Seeing the Nano world with Transmission Electron Microscope	

PROMOTING LABORATORY EXPERIENCE-BASED SCIENCE TEACHING & LEARNING

IASST Laboratory visit programme for the students of schools, colleges and universities of North-East India

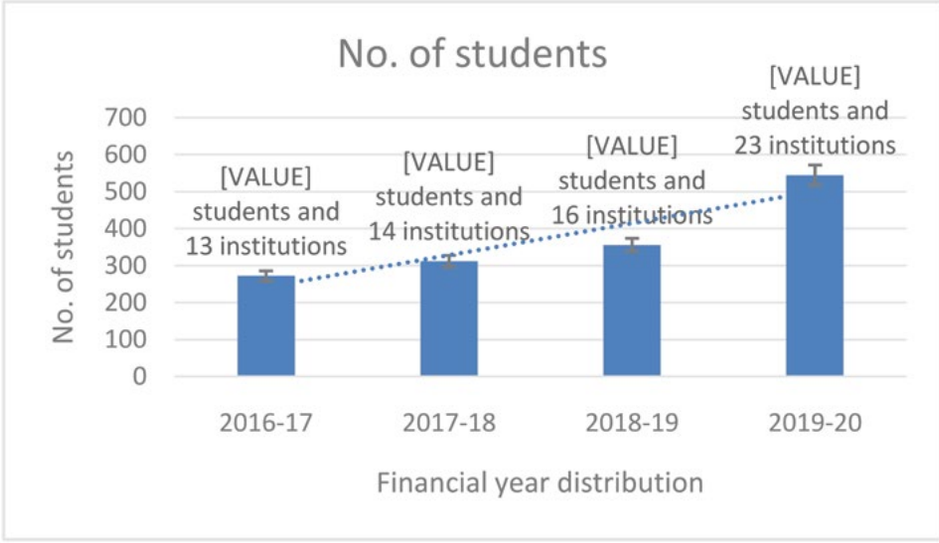
During the year, IASST hosted 23 batches of student visitors from schools, colleges, and universities of Northeast India. Nearly 545 students and 303 teachers visited IASST during this period. The students were exposed to the range of research activities and infrastructure facilities in different laboratories of the institute. In the laboratories, students were shown and explained the functioning of the sophisticated equipment such as SEM, GC-MS, confocal microscope. Lectures were delivered by the scientists on theoretical aspects of research under different programs followed by a demonstration. It was always a great deal of enthusiasm visible in the face of the visiting students. IASST is optimistic that this experience will have long-lasting impression and help build science as their career goal. The detail of the visit is listed below-

Date of visit	Name of School / College and standard of students	No. of visitors			Program visited
		Teachers	Students	Total	
26th April 2019	DK College, Mirza, Assam	1	4	5	TKBDDD-Traditional Knowledge Based Drug Development and Delivery, BDER-Bio-Diversity and Eco-system Research
30thApril 2019	Palashbari Girls High School, Palashbari, Assam	2	26	28	All labs
17th May 2019	Rani High School, Rani, Assam	6	95	101	Vermicompost unit, Mushroom production room, All life sciences labs, Environmental Chemistry Lab, CIF- Central Instrumentation Facility, BAPP-Basic and Applied Plasma Physics
24th May 2019	Nowgong College, Nagaon, Assam	2	9	10	All labs
7th June 2019	Uparhali Girls Highschool (Class IX), Assam	4	76	80	BAPP-Basic and AMS- Advanced Material Sciences, Mushroom facility, vermicomposting facility
26th Augus t2019	Assam Don Bosco University, Sonapur, Assam	3	36	39	AMS- Advanced Material Sciences, TKBDDD-Traditional Knowledge Based Drug Development and Delivery, BDER-Bio-Diversity and Eco-system Research
29th July 2019	Gravity Study Circle, Puranigudam, Nagaon, Assam	47	5	52	BAPP- Basic and Applied Plasma Physics, AMS- Advanced Material Sciences
23rd August 2019	BSF Senior Secondary School, Umpling, Shillong, Meghalaya	99	4	103	Biotech Hub, BDER-Bio-Diversity and Eco-system Research, TKBDDD-Traditional Knowledge Based Drug Development and Delivery, BAPP-Basic and Applied Plasma Physics, AMS-Advanced Material Sciences
3rd September 2019	Tihu College, Tihu, Assam	40	1	41	Biotech Hub, BDER-Bio-Diversity and Eco-system Research, TKBDDD-Traditional Knowledge Based Drug Development and Delivery
6th September 2019	Guwahati College, Guwahati, Assam	20	5	25	TKBDDD-Traditional Knowledge Based Drug Development and Delivery and SEM (Scanning Electron Microscope)

Date of visit	Name of School / College and standard of students	No. of visitors			Program visited
		Teachers	Students	Total	
12th September 2019	Cotton University Outreach Programme with 3 schools of Tihu Tihu High School (10 students and 1 teacher), Tihu Girls' School (11 students and 2 teachers), Sankardev Sishu Niketan(10 students and 1 teacher). 1 representative from Cotton University also came, Dr. Tarali Kalita	31	5	36	BAPP- Basic and Applied Plasma Physics, AMS-Advanced Material Sciences
25th September 2019	B.N. College, Dhubri, Assam	26	2	28	BAPP- Basic and Applied Plasma Physics, AMS-Advanced Material Sciences, Biotech Hub, TKBDDD-Traditional Knowledge Based Drug Development and Delivery, BDER-Bio-Diversity and Eco-system Research
23rd October 2019	DK College, Mirza, Assam (3 teachers and 30 students), Pub Kamrup College, Baihata Chariali, Assam (1 teacher and 24 students) and Science College, Kokrajhar, Assam (2 teachers and 38 students)	3+1+2= 6 teachers	30 + 24+ 38= 92	98	BAPP-Basic and Applied Plasma Physics, AMS-Advanced Material Sciences, MCS- Mathematical and Computational Science, BDER-Bio-Diversity and Eco-system Research, TKBDDD-Traditional Knowledge Based Drug Development and Delivery
2nd November 2019	Public outreach Programme Pragjyotish College, Guwahati, Assam (1 teacher and 8 students) Handique Girls College, Guwahati, Assam (1 teacher and 14 students) Pandu College, Guwahati, Assam (2 teachers and 20 students) Regent's Academy of North East, Guwahati (1 teacher and 21 students) Arya Vidyapeeth College, Guwaqhati, Assam (1 teacher and 23 students) Assam Science and Technology University, Guwahati, Assam (1 teacher and 3 students)	7	89	96	Visited all the laboratories of IASST
7th November 2019	Kendria Vidyalaya Narengi, Narengi, Guwahati, Assam	2	39	41	BDER-Bio-Diversity and Eco-system Research, TKBDDD-Traditional Knowledge Based Drug Development and Delivery
8th November 2019	Kanimara High School, Sarthebari-Tihu Rd, Patacharkuchi, Assam	5	32	37	BAPP- Basic and Applied Plasma Physics, AMS-Advanced Material Sciences, Biotech Hub, TKBDDD-Traditional Knowledge Based Drug Development and Delivery, BDER-Bio-Diversity and Eco-system Research

Date of visit	Name of School / College and standard of students	No. of visitors			Program visited
		Teachers	Students	Total	
8th November 2019	Department of Botany, Sipajhar College, Sipajhar, Assam	1	12	13	BDER-Bio-Diversity and Eco-system Research, TKBDDD-Traditional Knowledge Based Drug Development and Delivery
22nd November 2019	Royal Global University, Guwahati, Assam	1	13	14	BDER-Bio-Diversity and Eco-system Research to teach their students how to handle some key equipments.

BAPP-Basic and Applied Plasma Physics, **AMS**-Advanced Material Sciences, **MCS**- Mathematical and Computational Science, **BDER**-Bio-Diversity and Eco-system Research, **TKBDDD**-Traditional Knowledge Based Drug Development and Delivery, **CIF**- Central Instrumentation Facility



Growth in no. of visiting institutions and students to IASST laboratories in the last four financial years

Visit of students from schools

Participation to showcase IASST in national events

During the year April 2019-March 2020, IASST participated in 6 exhibitions throughout the country and displayed silk varieties in NE India, selective sensor for ammonia detection, microbial antifungal formulation, production process for Rhamnolipid Biosurfactant and agar wood oil production technique developed in IASST, Hybrid nanomaterial, plasma coating on bell surface were also displayed. A glimpse of the research activities under different programme and technologies and innovations of the institute were also presented in the different exhibitions listed below-

Date	Name of the exhibition	Place	Organizer
19th June 2019-21st June 2019	Vibrant North-East 2019	Manipur	Organised by Delhi-based NGO, Centre for Agriculture and Rural Development (CARD), the 'Vibrant North East 2019' is supported by the North Eastern Council, Department of Science and Technology, Ministry of Home Affairs, Ministry of Commerce and Industry and All India Farmers Alliance.
5th -8th November 2019	IISF (India International Science Festival) Lucknow 2019	Kolkata	Ministry of Science and Technology, Government of India; Ministry of Earth Sciences, Government of India; Department of Biotechnology, Government of India; ISRO, Vigyan Prasar, AICTE, DRDO, ICMR, Government of India, Indian Council of Agricultural Research, CSIR
3rd-7th January 2020	107th edition of Indian Science Congress (ISC)	Bangalore	Indian Science Congress &University of Agricultural Sciences, Bangalore, Karnataka

Visitors at IASST stall during 107th edition of Indian Science Congress (ISC) held at Bangalore


OTHER
ACTIVITIES

IASST'S SCIENTIFIC SOCIAL RESPONSIBILITY

Adoption of Scheduled Tribe Village for Socio-Economic Development

Phase I. Adoption of Schedule Tribe Village for Socio- Economic Development

The IASST launched the tribe village development program in two tribal villages, namely Bakarapara and Kallapara, under Rani development block, Kamrup district. The villages are situated at a distance of 20 km from the Institute. These villages are selected considering their poor economic conditions (mostly under BPL), low-literacy rates, and limited income source for their livelihood. The program was proposed in the last part of 2016 and activated in 2017.

Considering the status of both the villages, the following scientific Interventions taken

The institute has taken all the initiatives to motivate and train the beneficiaries selected for different ventures (activity) at the institute campus and respective villages.

Technology intervention and development

The following technology intervention undertaken with minimum input supply and considering the available resources in the villages.

Eri rearing

A large number of women of both the villages accepted the Eri rearing as one of the major sources of income for their livelihood. In the last three batches, 44 farm women involved in Eri rearing and earned Rs. 250202/-in total. (Cocoon & larvae @ of cocoon ranging Rs. 800/- to 950/- per Kg & larvae ranging Re. 0.50/- to Re. 1/- per piece)

Eri rearers of Bakrapara village (Rani)

IASST extended all support by supplying Eri eggs, food (era leaves) and by providing marketing support

Mushroom Cultivation

More than 54 farm ladies involved in mushroom cultivation. In a total of Rs. 245440/- earned by the farmers. A group of ladies expressed their interest in mushroom cultivation and trained by the IASST mushroom experts. The entire spawn used for the mushroom cultivation had been produced in the IASST laboratory and supplied to the growers.

Farm ladies involved in Mushroom Cultivation works

Black Rice

In 2019, 5 Kg of black rice seeds were supplied to the village for cultivation. IASST extended all technical supports for farming. In the last *Kharif* season (2019), 22 Farmers involved in black rice cultivation and harvested 4996 Kg in paddy valued Rs. 249,800/-. The variety is gaining popularity because of its high value and market demands; in the coming season expected, more than 60% of the farmers would be involved in black rice cultivation.

Vermi-Compost

Six farmers from Kallapara and Bakarapara village trained at the IASST campus and supplied necessary inputs. At present, two farmers are actively associated in vermi-composting.

Tapioca (*Manihot esculenta*)

Tapioca was also introduced on an experimental basis among the villagers of Kallapara and Bakarapara (Rani). The response is highly encouraging. The leaves of tapioca were used as food for the Eri worm and the underground part i.e., *the tubers* used as food by the farmers and pigs and the left oversold out by the beneficiaries. The total number of recipients was 39, and the total quantity of tapioca harvested at the end of the cultivation season was 290 kg valued Rs. 8,700 @ Rs.30 per kg.

Social Activities in the adopted villages

3rd Village Day was observed on 26th December 2019, at the Bakarapara village. On the eve, the villagers arranged sports competition among the gents and ladies, art competition among the children, fashion shows, and other games among the ladies. They also arranged a cultural show participated by the children, boys and girls, farmers, and ladies. All the villagers attended the program with full enthusiasm.

The IASST initiated the concept of Village Day and arranged the first Village Day on 26th December 2017.

Traditional Rabha folk dance performed by the villagers on the Village Day

New intervention

1. More than six-hundred lemon seedlings are seeded in the adopted villages as a horticultural crop. Bio-fencing is built-up to protect vegetables, crops from monkeys.
2. To overcome the shortage of Eri leaves during the Eri rearing season, the institute has planted more than 300 Kessaru (*Heteropanax fragrans)* seedlings in both the villages.

Phase II: - VILLAGE ADOPTION PROGRAM

IASST has identified Satargaon (Rani) village under the II phase of socio-economic development (Tribal village) program. Satargaon village may be considered as one of the remote villages in the state. The people live without electricity, drinking water supply, IT connectivity (No mobile/Internet), and high school facilities. Moreover, crops produced in the village are prone to wild elephants and monkeys. The benchmark survey implies that all the households of the village are below the poverty level (BPL).

Panoramic view (the entrance) of the Satargaon village

IASST has conducted several meetings with the villagers to undertake a suitable agricultural program for the villagers' livelihood. As a first step, in the later part of 2019 distributed seedlings of Bhot Jolokia (322 numbers) and Assam Lemon (600 numbers). Both the crops are the horticultural cash crops and non-friendly to monkeys and elephants. A model has also been designed to protect vegetable crops from monkeys by eco-friendly Assam lemon bio-fencing.

The World Yoga Day (21st June 2019) was observed at the village in the presence of the director IASST and staff members. The in-charge of Azara public health center, Yoga experts, and members from nearby villages participated.

World Yoga Day inauguration by the Director, IASST and Yoga training by the Instructor

IASST celebrated the 71st Republic Day (26thJanuary 2020) at the village with the presence of the Director IASST and staff members. The Director, IASST in the presence of villagers inaugurated the renovated village Community Hall. IASST is looking forward to develop the livelihood of Satargaon villagers.

71st Republic Day Flag Hoisting (Hoisted by the Director, IASST) and Sports Competitions

EVENTS AND CELEBRATIONS

Inauguration of Mini Sports Complex facility

A newly constructed two storey sports facility building equipped with modern equipments for physical exercises had been inaugurated on 19th June 2019. This mini sports complex has facilities for Gymnasium and indoor sports like Badminton, Table Tennis. Director Dr. Narayan C. Talukdar and Prof. Heremba Bailung gave motivational speeches to the students and employees about the importance of sports and physical activity in our daily life and urged everyone to get benefitted from this facility.

Inauguration of Mini Sports Complex

Celebration of International Day of Yoga

A scene of Yoga Practice conducted by Mrs. Kioti Akka from Isha Foundation (left); IASST family members participated in the Yoga practice (right)

5th International Day of Yoga was organised in the seminar hall of IASST on 21st June 2019. Dr. Narayan Chandra Talukdar, Director, IASST delivered the welcome speech. Volunteers from Isha Foundation conducted a yoga and meditation session (UPA Yoga) in audio-video format. Faculty members, research scholars and staff members of IASST participated in the whole program enthusiastically.

Free Health Check-up Camp

Health check-up camp inside IASST

In order to create a fit and healthy IASST family, IASST in association with Hayat Hospital (Lalganesh, Guwahati) conducted a free health check-up camp on 16th July 2019 for the faculty members, research scholars and staff members of IASST. Medicine, Cardiology and Diabetology, doctors having specialization on these fields were available for consultation on this day and tests like Random blood sugar, Blood pressure, ECG, Hb1AC, Lung function were also performed on spot. This health camp benefitted the faculty members, research scholars and staff members of the institute.

Independence Day

IASST celebrated the 73rd Independence Day in its campus with a day-long program. The celebration started with unfurling of the national flag by the Director, Dr. Narayan Chandra Talukdar, which was followed by the national anthem. Director also gave a short address to the gathering and spoke on the significance of Independence Day in this current time.

A short speech competition on the topic "Contribution of North-East India in India's Struggle for Independence" was organized among the children of employees and nearby locality and among research scholars. A small cultural program was alsoorganized and a patriotic movie was screened in the auditorium. Breakfast and lunch were also served to everyone present in the celebration.

National Flag Hoisting Ceremony on the occasion of 73rd Independence Day and Students participating in "Short speech Competition"

Inauguration of Renovated/Upgraded Block of Knowledge Resource Center (KRC)

The Director, IASST, inaugurated the newly renovated/upgraded block of Knowledge Resource Center (KRC), IASST, on 20th August 2019 on the ground floor of the Academic and Administration building of IASST. It was a simple yet graceful ceremony. KRC has recently undergone a massive uplifting, renovation, and up-gradation process aimed at modernization, improvement, and expansion of the KRC facilities, services and encouraged all to be benefitted. All the faculty members, research scholars, and administrative staff of the institute have attended the function.

Director IASST delivering speech on the occasion of inauguration of Renovated/Upgraded block of KRC (left); A front of view inside the KRC (right)

Teachers' Day Celebration

Teachers' Day was celebrated on 5th September 2019 with a great joy and vigour by the research scholars and faculty members of IASST. The event was started by paying tribute to Dr. Sarvepalli Radhakrishnan. On this

occasion, the research scholars arranged some minor games and fun activities among the faculty members. Several research scholars performed songs and dances on stage and entertained the audience. In order to express love and respect to their supervisors, the research scholars gifted them saplings.

Teacher's day celebration inside IASST auditorium

Hindi Pakhawada

On 13th September, 2019 the Director of IASST inaugurated the Hindi Pakhawada. Different activities were organised as part of this Hindi Pakhawada among research scholars, faculty members, and employees from 14th September to 27th September, 2019. Noting drafting competition for employees were organized. The other events were: Hindi dictation and essay writing competition; Hindi hand writing competition; Hindi poem recitation competition; quiz competition, drawing completion and story writing competition. On 24th September, Timahi Hindi workshop was organised and Mr. Mohan Koirala, Assistant Director (OL), Bharhamaputra Board delivered a talk on topic Official language implementation while writing in Hindi (Noting, Drafting, Letters etc.) without grammatical mistake.

On 27th September a meeting was organised in auditorium for closing ceremony of the Hindi Pakhawada and prizes were distributed to winners of various competitions. Mr. Dinkar Kumar, Former editor Sentinel Hindi & free-lance journalist (Dainik Navjivan) Guwahati attended this meeting and delivered a speech on topic 'why we celebrate Hindi Diwas on 14th Sept. every year and importance of translation work.

Some Captured Moments from the Hindi Pakhwada Program at IASST

Swachh Bharat Abhiyan

Pursuant to the Hon'ble Prime Minister's call on "Swachh Bharat" (Clean India) campaign and directive from the Department of Science and Technology, Govt. of India, faculties, students and staff members of IASST actively took part in cleaning activities of IASST campus and its surroundings.

Members of IASST taking part in the Swachh Bharat Abhiyan

Kati Bihu Celebration

IASST observed *Kati Bihu*, also known as *Kongali Bihu* on Friday, 18th October 2019 at IASST" s adopted village, Bakarapara, Rani by lighting the Earthen Lamp in the paddy field harvested by the villagers praying for a good harvest. This ritual of "dia" lighting is believed to protect the grain from sucking insects. Light trapping of insect has been one of the scientific methods of insect pest control in agricultural practices across all cultures.

IASST staff and villagers of Bakarapara, Rani lighting "dia" (Kati bihu) in the field at the transition of flowering to grain filling stage

Vigilance Awareness Week

IASST observed Vigilance Awareness Week from 28th October to 2rd November 2019 for six days with "Integrity Pledge" led by Dr. N. C. Talukdar, Director, IASST. Mr. R.K. Shivanna, Deputy SP, Central Bureau of Investigation, ACB & EO-V, Guwahati, the chief guest of the function who delivered talk on the theme of this vigilance week "integrity- 'Imandari ek Jivanshaili'. Mr. Shivanna dealt with the various issues associated with investigation of corruption in office and public life and measures to eradicate corruption. He stressed on role of people eradicating corruption inside and outside the systems and role in making and contribution in building a New India.

IASST fraternity taking integrity pledge on Vigilance Awareness Week, Mr. R. K. Shivanna delivering a speech at IASST auditorium, Mr. R. K. Shivanna, Deputy SP, CBI, ACB and EO-V Guwahati

Rashtriya Ekta Diwas (National Unity Day)

IASST observed Rashtriya Ekta Diwas, also known as National Unity Day, on October 31, 2019 to commemorate the 144th birth anniversary of Sardar Vallabhbhai Patel, the Iron Man of India. On this occasion, all members of IASST participated in the pledge taking ceremony as per communication from Department of Science and Technology, Govt. of India.

Director IASST administering the Integrity pledge to the IASST fraternity on Rashtriya Ekta Diwas, also known as National Unity Day, on October 31, 2019

Public Outreach and Curtain Raiser Programme as part of IISF 2019 on 2nd November 2019

The IASST organized a day-long Public Outreach and Curtain Raiser Programme (POSEP) its campus at Paschim Boragaon, Guwahati, on 2nd November 2019, as part of India International Science Festival, IISF during 5th -8th November 2019. This one-day program was held to attract the students of schools and colleges to science education and enlighten them into the field of research in the future. With this goal, the institute invited 9th and 11th standard students from 12 schools and colleges with in-total 175 students. In the program, approximately 30-50 guests participated. The event began with an inaugural speech by the Director, IASST, followed by the screening of IISF and IASST documentaries. A statement on IISF was delivered by Dr. Pravir Asthana, Head of Scientific Divisions, Dept. of Science and Technology, Govt. of India and Mr. Rajib Sharma, Secretary, NE Prant, Vijnana Bharati and a press meet. Brief speeches were also delivered by Dr. Heremba Bailung and Dr. Devashish Chowdhury of IASST. A valedictory function and a vote of thanks were conduct at the end of the event.

Photos (clockwise from top to bottom): Dr. Pravir Asthana, Head of Scientific Divisions, Dept. of Science and Technology, Govt. of India delivering a lecture in the Public Outreach and Curtain Raiser Programme on 2nd November 2019; Prof. Heremba Bailung, IASST showing a plasma device to student participants on the occasion of Public Outreach and Curtain Raiser Programme; IASST scholars showing lab facility and different lab techniques of IASST

41st Foundation Day of IASST, 2019

IASST celebrated its 41st Foundation Day on 3rd November 2019 in its premises at Boragaon. It was a day-long programme which began with hoisting with IASST's flag, followed by invocation and lighting of the lamp. The invited guests of eminence were- Dr. (Mrs.) Lakshmi Kumari Goswami, Gynaecologist and Obstetrician, Tezpur, Assam; Prof. Pradip Chandra Deka, VC, Sir Padampat Singhania University, Udaipur; Mr. K. S. Lahkar, Chairman Cum Managing Director, Econ Design & Project Services Pvt. Ltd., Guwahati; Prof. Vijay Kumar Chaudhary, Dept. of Biochemistry, Delhi University; Prof. Renee M. Borges, Center for Ecological Sciences, IISc. Bangalore. The presidential remark of the programme was delivered by Prof. B. N. Goswami, Former Director, Indian Institute of Tropical Meteorology (IITM), Pune.

Photos (from to bottom clockwise): IASST family members participating Flag hoisting ceremony on the occasion of Foundation Day; IASST family members taking part in the Marthan race on the occasion of Foundation Day; IASST family members taking part in the volleyball competetion on the occasion of Foundation Day; Dr. (Mrs.) Lakshmi Kumari Goswami, Gynaecologist and Obstetrician, Tezpur, Assam lightening the lamp on the occasion of Foundation Day; Prof. Pradip Chandra Deka, VC, Sir Padampat Singhania University, Udaipur delivering lecture on the occasion of Foundation Day; An Assamese comedy group performed their programme in the cultural evening on the occasion of Foundation Day.

Professor Vijay Kumar Choudhury of Dept. of Biochemistry, Delhi University, delivered the 1st lecture entitled- "Antibodies-Ek naam, anek kaam". Professor Renee M. Borges of Center for Ecological Sciences, IISc, Bangalore delivered her speech on "Life in and around microcosms: Constraints and Challenges".

Also, IASST takes the opportunity to facilitate eminent personalities from Assam Dr. (Mrs) Lakshmi Goswami, Gynecologist & Obstetrician, Tezpur; Prof. Pradip Ch. Deka, VC, Sir Padampat Singhania University, Udaipur; Mr. K. S. Lahkar, Chairman cum Managing Director, Econ Design & Project Services Pvt. Ltd.

Ph.D. degree recipients of IASST for 2019-20 were also facilitated on this occasion.

Prof. Vinod Kumar Jain, VC, Tezpur University, gave Presidential remark in this meeting.

A cultural program was organized for the evening. Many research scholars and family members of IASST displayed their artistic skills in dance, music, and entertained the diverse audiences.

In this same cultural program, IASST took the privilege to facilitate Mrs. Sudakshina Sharma, the eminent and legendary singer of Assam. She also mesmerized the audience with her melodious songs.

An invited rock/fusion music band of Assam "NORTHEAST BREEZE" performed, and a comedy group from Assam "KHISHIRI" entertained the youthful audience throughout the evening.

Various sports events/competitions were organized on the occasion of the Foundation Day celebration beforehand, the main event of 3rd November. Research scholars, faculty members, and employees of IASST took part in different sports events, including Football, Cricket, Volleyball, Kabaddi, Badminton, Table Tennis, Carrom, Chess, Marathon Race, 100 meter race, Marble Race, Tug of War, Musical chair. They created a vibrant environment in the campus.

Glimpses of celebration of Foundation Day 2019

Celebration of New Year's Day 2020

To celebrate the New Year's Day, a get together meeting was organized in the auditorium on 1st January 2020. The staff members and research scholars of IASST shared their New Year's hopes and aspiration in this get together meeting. Director Dr. N. C Talukdar interacted with the audience and gave guidance on various activities of research, administration.

Director addressing IASST fraternity on New Year's Day

Republic Day Celebrations

IASST celebrated the 71th Republic Day with the unfurling of the National Flag followed by the national anthem on 26th January 2020. Director Dr. N. C. Talukdar gave a motivational speech to the audience to work hard in their respective fields for raising the quality and standards of the institute and towards building a stronger and better India.

After this event at IASST, a tour was organised to one of the adopted villages of IASST named Satargaon near Rani in Kamrup district. IASST employees, faculty members, research scholars took part in this tour and celebrated Republic Day with the residents of Satagaon village. Director Dr. N. C. Talukdar and village head of Satargaon Mr. Paddu Ram Rabha hosted the national flag, followed by inaguration of Nabajyoti Club of Satargaon and plantation drive around the club. Dr. Nalin Mohan, Consultant (Tribal area development program of IASST) also addressed the villagers and explained about various possibilities of economically beneficial activities and how IASST can guide the villagers in those activities.

Some fun games like tug of war, tekeli breaker, 100 meters race, musical chair were organized among childrens, ladies and gents of the village and winners were encouraged with prizes.

(From top left) Dr. N C Talukdar, Director delivering speech on Republic Day at IASST, Celebration of Republic Day at Satargaon, Plantation in surrounding of Nabajyoti club of Satargaon, Villagers taking part in games

DEVELOPING SUPPORT NETWORK

Memorandum of Association (MoU) Signing

During the year IASST engaged itself in building of support network with organizations and experts in the area through formal MoUs, interactions with institutional heads and participation in exchange programmes.

MoU between IASST and KAZI NAZRUL UNIVERSITY (KNU), West Bengal

An MoU was signed between IASST and the Kazi Nazrul University, Asansol- 713 340, West Bengal, India on 25th September 2019, for enhancing the teaching, learning, collaboration of research work and research experience of students and faculty in both the institutions in order to improve upon the quality of human resources available especially in Assam and the North-Eastern region of India.

MoU between IASST and University of Science and Technology, Meghalaya

An MoU was signed between IASST and the University of Science and Technology, Ri-Bhoi, Baridua, Meghalaya, Meghalaya, India on 30th September 2019, for enhancing the teaching, learning, collaboration of research work and research experience of students and faculty in both the institutions.

MoU between IASST and NEIST, Jorhat, Assam

An MoU was signed between IASST and the North Eastern Institute of Science and Technology (NEIST), Jorhat, India on 31st October 2019, for collaboration of research work and research experience among the scientists and research scholars both the institutions.

MoU between IASST and Pandit Deendayal Petroleum University, Gandhinagar

An MoU was signed between IASST and the Pandit Deendayal Petroleum University, Gandhinagar, India on 19th December 2019, for collaboration of research work and research experience among the scientists and research scholars both the institutions.

MoU between IASST and Indian Institute of Chemical Technology (IICT), Hyderabad

An MoU was signed between IASST and the Pandit Deendayal Petroleum University, Gandhinagar, India on 21st January 2020, for collaboration of research work and research experience among the scientists and research scholars both the institutions.

SUPERANNUATION OF IASST EMPLOYEE

Mrs. Saraswati Bora

On 30th September 2019, a farewell meeting was organized to bid farewell to Mrs. Saraswati Bora, Superintendent on account of her superannuation. Mrs. Bora was given a warm felicitation and the faculty, research scholars and staff members of IASST in their speech appreciated Mrs. Bora's contribution to the institute and wished her good health and prosperous life.

Dr. Ashwini Bezbaruah

On 30th September 2019, the IASST family members bid farewell to Dr. Ashwini Bezbaruah, Consulting Medical Officer (CMO) informally as Dr. Bezbaruah couldn't attend the farewell meeting due to the sudden demise of his father on that day. Dr. Bezbaruah served this institute as CMO more than 5 years and provided health services to the family members of IASST. He resigned from this post due to responsibility of full-time services to another hospital. The staffs of IASST congratulate Dr. Bezbaruah for his full-time job.

Mr. Arup Jyoti Deka

On 30th September 2019, IASST family bid farewell to Mr. Arup Jyoti Deka, Accounts Assistant. He leaves the job of IASST for joining other organization. Mr. Deka was felicitated and showered with praise through speech by staff members of IASST for his sincere services to the institute over a span of more than 3 years. The staffs of IASST congratulate him for his new assignment.

Mr. Nripen Goswami

On 31st December 2019, a farewell meeting was organized for Mr. Umesh Deka, Multi-Tasking Staff (MTS) on account of his superannuation. Mr. Deka was given a warm felicitation. The faculty, research scholars and staff members of IASST in their speech appreciated Deka's contribution to the institute and wished him good health and prosperous life.

Dr. Narayan Chandra Talukdar

On 29th February 2020, a meeting was held for charge handover by Dr. N C Talukdar, Director, IASST due to his superannuation on this date.

Mr. Prabodh Kumar Deka

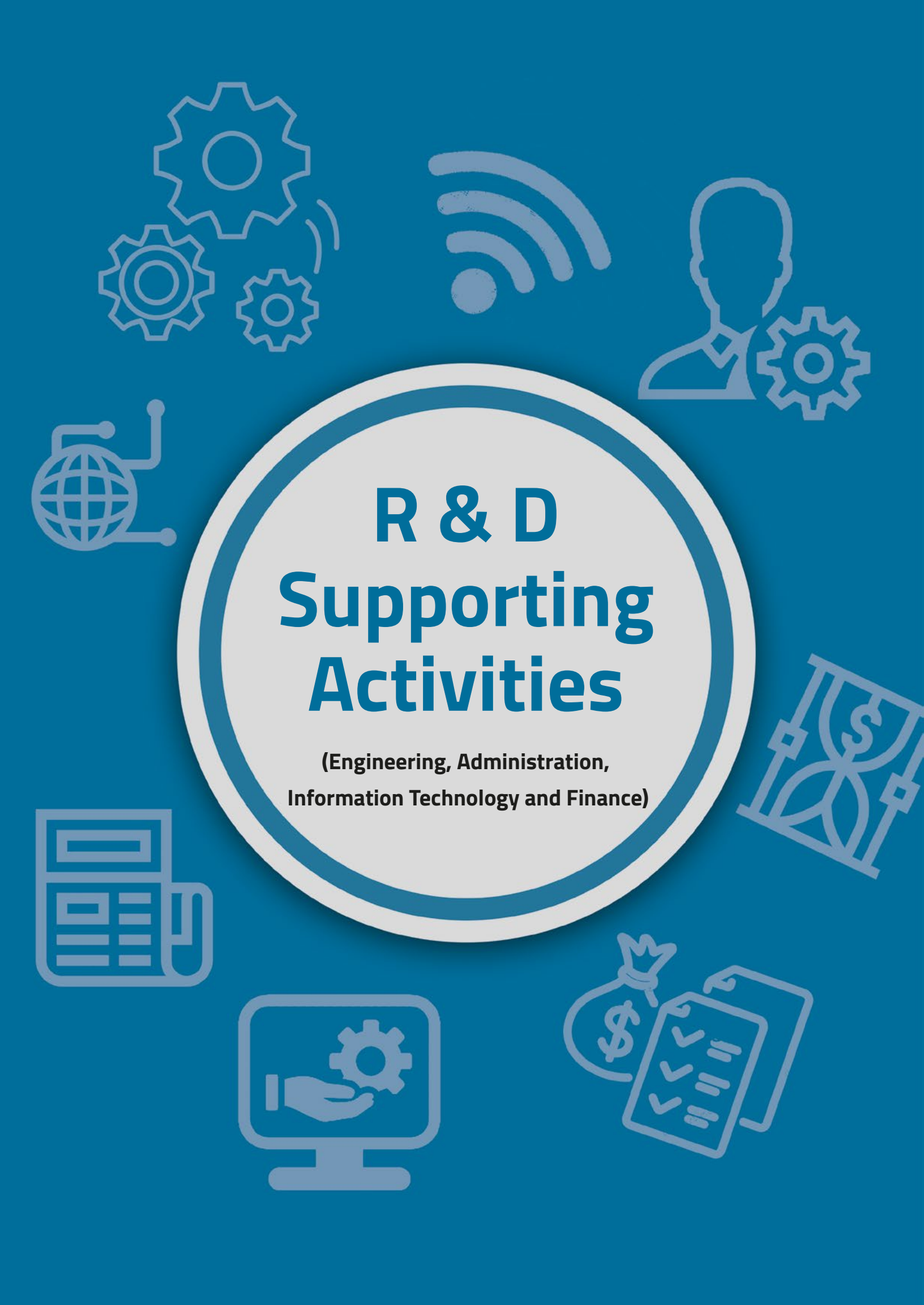
On 31st March 2020, a meeting was held for charge handover by Mr. P. K. Deka, Section Officer, IASST due to his superannuation on this date

IN MEMORY OF THOSE WHO SERVED IASST

Obituary for the Demises

Madan Chandra Kalita, age 50 years, passed away on 26th December 2019. Madan Chandra Kalita was working with IASST from year 1991 as a multi-tasking staff with utmost sincerity and devotion. A condolence meeting was held on 27th December. Dr. Heramba Bailung, Dr. Suresh Deka, Dr. Arundhuti Devi and Dr. Diganta Goswami delivered condolence message. Faculty members praised him for all the qualities he had as a person. Two minutes of silence were observed for eternal peace of the deceased soul. IASST family paid sincere sympathy to family and friends of the deceased.

Phatik Baishya, age 46 years, passed away on 2nd January 2020. Phatik Baishya was working with IASST from year 2004 as a driver with utmost sincerity and devotion. A condolence meeting was held on 3rd January in IASST. The employees, faculty members praised him for all the qualities he had as a person. Two minutes of silence were observed for eternal peace of the deceased soul.


R & D
Supporting
Activities
(Engineering, Administration,
Information Technology and Finance)

Administrative Staff


Prof. Dharmeswar Das


Dr. Diganta Goswami


Dr. Dhruba Sharma


Pradyut Borkataki


Prabodh Kr. Deka


Rajesh Sharma


Suresh Sarma


Rabin Ch. Kalita


Ramen Mahanta


Gora Gupta


Munindra Singh


Saraswati Bora


Dwijendra Deka


Lelin Gogoi


Kumud Baishya


Prabhat Barma


Diganta Das


Nabajyoti Choudhury


Dr. Anil Kumar


Ksh. Sharmina Devi


Pinky Taye


Hemanta Sharma


Nirmali Devi


Sanjubi Sharma


Moonmee Deka


Nimai Hazam


Phatik Baishya


Madhabi Das


Sarala Deka


Binay Kr. Choudhury


Niren Sarma


Lakshmi Kanta


Satish Das


Ratul Baishya


Nripen Ch. Goswami


Munna Basfor


Pradip Das


Lachman Thapa


Pranab Talukdar


Bimal Das


Ajay Baishya


Manindra Deka


Anima Baishya


Prakash Kr. Kachari


Mehjabin Ali


Rinki Das


Pallavi Konwar


Uddipta Deka


B Devi


Prasanta Das

Technical & Support Staff


Dr. Tarini Dev Goswami


Montu Deka


Jayanta Borthakur


Nayan Talukdar


Md. Mahammad


Debajit Deka


Bikash Jyoti Das


Subhrojit Sengupta


Madhuram Kalita


Mukta Ram Kumar


Kumud Patgiri


Dinesh Ch. Deka


Sankar Daimari


Dijoraj Roy Choudhury


Uddipta Deka

A. MEETINGS AND ACTIVITIES OF VARIOUS COMMITTEES

A.1 Governing Council Meetings

Twelfth meeting of the Governing Council, IASST

The twelfth meeting of the Governing council of IASST was held on 13th July 2019 in the Conference hall of IASST, Guwahati under the chairmanship of Professor Abhay Karandikar Director, IIT Kanpur.

Prof. Abhay Karandikar, Director, IIT Kanpur chairing the 12th GC meeting of IASST

The major recommendations/approval of the meeting were-

1. Approval of all the recommendations of 11th GC meeting of IASST held on 27/02/2019
2. In principle approval of creation of thirteen nos. of post including the post of Jr. Hindi Translator
3. Ratification of appointment of one post of Associate Professor II and five posts of Asstt. Professor II
4. Approved the proposal of providing 5000 sq.ft area of the newly constructed CIF building for setting up QC/QA lab
5. Recommnded for granting of two year tenure extension to Dr. N. C.Talukdar, Director. In case the extension of tenure is not approved, process of recruitment of new Director should be started.

Thirteenth meeting of the Governing Council of IASST

Professor Abhay Karandikar, Director, IIT Kanpur and Chairman, GC, IASST chaired the 13th Governing Council meeting of IASST Guwahati held in the Technology Bhawan, DST, New Delhi on 15th February, 2020.

A group photo of members and invitees of 13th GC meeting of IASST held in the Technology Bhawan, DST, New Delhi

The major recommendations/approval of the meeting were-

1. Approval of all the recommendations of the 12th Finance committee meeting held on 10th January, 2020.
2. Ratification/approval of promotion of six nos. of Scientist under Modified Flexible Complementing Scheme (MFCS)
3. Approved recruitment against two posts of Asstt. Prof. II and one post of Assoc. Prof. II
4. Approved revision of MoA, Rules and Regulations and Byelaws of IASST as per Model MoA, Rules and Regulations and Byelaws prepared and circulated by DST, New Delhi
5. Approved the proposal of amendment of educational and other qualifications in the Recruitment Rules for the Director, IASST

A.2 Finance Committee Meeting

Twelfth Meeting of the Finance Committee of IASST

The twelfth meeting of Finance Committee of IASST, Guwahati was held in the Technology Bhawan, department of Science and Technology, Govt. of India, New Delhi on 10.01.2020.

Major recommendations of the Committee were:

1. Recommended for allocation of 4.00 crores under GIA Capital head additionally along with balance amount of GIA for the year 2019-20.
2. Recommended budget estimate of *₹40.60 crores for the financial year 2020-21*
3. Recommended budget estimate amounting *₹1.75 crores for setting up of Extension Centre of IASST at Kokilabari farm, BTC, Assam.*

A scene from the 12th FC meeting of IASST held in the Technology Bhawan, DST, New Delhi

A.3 Building Works Committee (BWC) Meetings

20th, 21st, 22nd and 23rd BWC meetings were held on 24th April, 2019, 30th May, 2019, 15th July, 2019 and 20th August 2019 respectively. Major decisions/deliberations of these meetings were-

1. Determination of the contract with Mr. Bhaskar Baruah for the work "Design and build Turnkey project of Animal House Facility".
2. Approval of awarding the contract of balance work of Animal House Facility project to M/S Navrup India, Guwahati
3. Approval of awarding the work of Preparation of DPR for upgradation of power supply to the 33/0.433kv substation to the Dept. of Electrical Engineering, Assam Engineering College, Guwahati

A.4 Vigilance, RTI, Women Cell and Its Activities During 2019-20 in IASST

The institute has a part-time Vigilance Officer appointed by the Department of Science and Technology, Govt. of India, New Delhi who deals with all vigilance matter pertaining to IASST, Guwahati. The Vigilance Officer furnishes certain reports/returns to the Chief Vigilance officer on regular basis. The vigilance officer is not directly associated in decision making or finalization of tenders/purchase and audit matters. No vigilance case is pending or contemplated against any employees of IASST during 2019-2020. The Vigilance Awareness week was observed in the institute during Oct 28-Nov2, 2019.

The institute has a Central Public Information Officer (CPIO) who furnishes information under Right to Information Act (RTI) 2005. During the year 2019-20 six (6) nos. of application under RTI Act 2005 were received online and replies were sent both online and in hard copies. The institute submitted all the RTI quarterly returns for the year 2019-20 in the Central Information Commission (CIC) RTI Annual Return Information System. The institute submitted the Transparency Audit of Disclosures u/s 4 of the Right to Information Act 2005 to the CIC in February, 2020.

IASST has a Women Cell constituted for woman welfare and to attend different problems/inconveniences of women employees in IASST which also acts as Internal Complaints Committee (ICC) to deal with Sexual Harassment of Women at Workplace. No complaints were filed to the Women Cell during the year 2019-20.

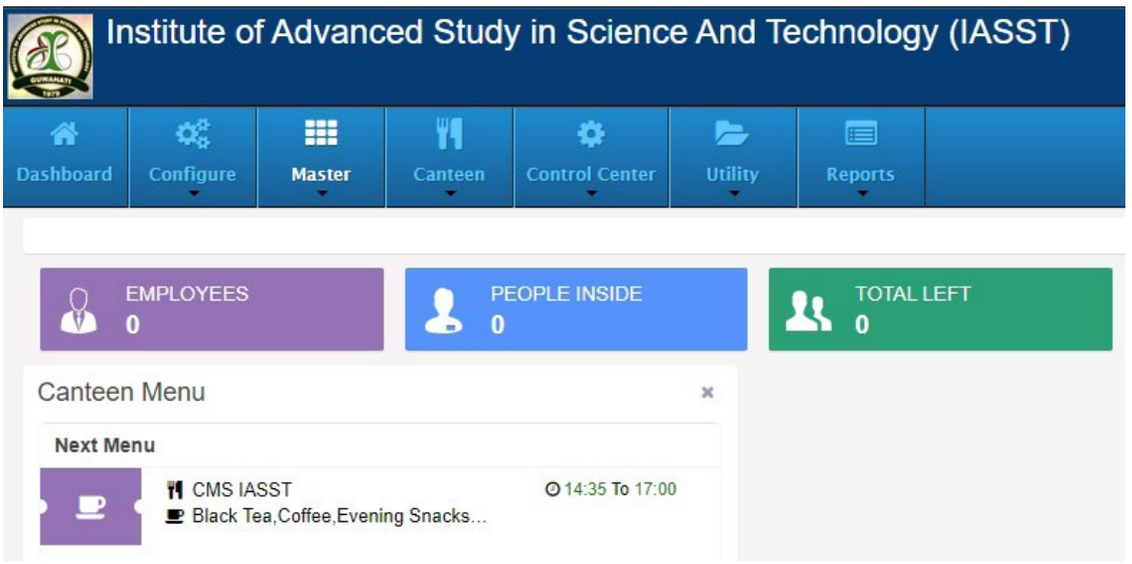
B. MAJOR ADMINISTRATIVE, IT AND ENGINEERING ACTIVITIES

B.1 Information Technology, e-governance and e-finance promotion in IASST

For smooth operation of the institute, IASST introduced the following new facilities related to IT during the year 2019-20.

Upgradation of Centralized Storage: - IASST has expanded its raw storage capacity of centralized storage to 20TB from 10TB by installing a drive enclose along with required number of disks in existing storage. A total cost of Rs. 4,98,000/- was involved in the process.

Smart Canteen Management System: - A web based smart canteen management system with point of sale (POS) has been installed at IASST. This system replaced traditional paper coupons by integrating institute RFID based identity card (ID) which can be used as prepaid card for purchase of canteen food. Total cost involved in the process was Rs. 2,84,566/-.



Smart Canteen System of IASST

Aadhaar based biometric attendance system (ABAS): - Following the footsteps of 'Digital India' Programme which includes implementation of a common Biometric Attendance System (BAS) along with Aadhaar authentication, a total 5 numbers of ABAS devices have been installed across the campus. Most of the employees are enrolled to this system and started to give their attendance in this system from August 2019.

Redesigning of IASST website: - Following the standards guidelines for Indian Government Websites (GIGW), IASST started redesigning and development of its website along with a user friendly Content Management System (CMS) as per GIGW guidelines. The work is at the verge of completion and expected to be completed by May, 2020. The work for redesigning and maintenance of the website of IASST involves cost amounting ₹ 5, 77,500/-.

Status of GeM purchasing: - During the year 2019-20, items of value more than Rs. **33** Lakhs have been purchased via Government e-marketplace (GeM).

B.2 Civil infrastructure creation during the year 2019-20

Academic Staff quarter building

To provide housing facility mostly for Scientists, one residential complex comprising of three buildings having 6 units of Type IV quarter, 5 units of Type V quarter and 8 units of Studio Apartment are under construction. The

buildings are G+2 storied with provision of car parking. The work was allotted to M/S Bimal Agarwala, Guwahati at a work value of Rs. 710.00 lakhs. The work is in completion stage.

Scientific Staff residence of IASST

Observatory building

As a part of recreational facility for the children, an Observatory is constructed in the Bio Conservation Hub (BCH) of IASST. The work was allotted to M/S Bimal Kumar Agarwala Guwahati. The work started on 02/05/2019 and completed on 20/03/2020. Total cost involvement in the project is Rs. 70, 52,158/-.

Observatory Building

Animal House Facility building

The Animal House Facility is for advanced animal experimentation for both IASST scientists and research scholars and scientists of other institutes of North Eastern region on payment basis. The design and build project was executed by M/S Bhaskar Baruah and M/S Navrup India (balance work) at a contract value of ₹325.00 lakh. The construction is provisionally completed on 21/01/2020.

Front view of the Animal House Facility building

Central Instrumentation Facility (CIF) and Drug Development Centre building

To house the sophisticated instruments under Central Instrumentation Facility (CIF) and to accommodate Drug Development centre this building was planned and designed. The building consists of G+2 RCC having total floor area of 3800 Sq.m. Along with housing of sophisticated instruments like TEM, FESEM, XRD, AFM, NMR, and various other equipments. Drug development centre the building houses Incubation centre and Quality Control and Quality Assurance Lab. The project was executed by the contractor M/S Bhaskar Baruah at a total cost of Rs. 1400 lakh. Construction started on 01/06/2017 and provisionally completed on 19/10/2019.

A view of the newly constructed Central Instrumentation Facility (CIF) building

North east Map civil work

The physical features of North East India containing hills, plains, forests and mighty Brahmaputra River is built in a small area to give a real and aesthetic three dimensional look of the map of the region. This work was executed by M/S Sanjay Kalita at a total cost of ₹11, 37,141/-. The execution started on 15-04-2019 and ended on 09/09/2019.

Aerial view of the North East Map

B.3 Staff Welfare Measures

IASST has been persistently carrying out several welfare measures and introducing new measures time to time for welfare of the employees of IASST

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 for 3 days a week for consultation in the institute as well as in his 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, Gorchuk, 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, Guwahat-31 and (7) Panacea Medical Research and Diagnostic, Bhangagarh, Guwahati. Out of these, Hayat Hospital, Arya Hospital, Ayursundra Superspcialty Hospital and Panacea provide medical facility to beneficiaries on credit basis. 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.

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. In addition to this there is a private canteen operating by a House wife of the Institute complex for serving foods and beverages.

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.

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.

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 new 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 girl's 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 Superintendent of the SSH and PS to the Director also reside in the campus in their respective quarters. 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. The Academic Staff quarter building consisting of 6 nos. of Type IV, 5 nos. of Type V and 8 nos. of Studio Apartment is almost ready for occupation.

B.4 Different Government policies adopted in IASST

Reservation Policy

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

Official Language Policy

The institute is paying emphasis on implementation of provisions of Official Language Act and the rules made and instructions issued thereunder. 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 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. Four nos. of Hindi workshop and four nos. of Official Language Implementation committee meeting were also organized in the institute during 2019-20. The institute is also celebrating Hindi Diwas in every year with great zeal to popularize Hindi as a "Rajbhasa".

B.5 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 training graduate 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. Besides, the internal source of income generation during 2019-20 is highlighted in the following table.

Source of Income	Amount (₹)
Laboratory Instrument uses charge	3,58,800.00
Sale Proceeds of institute products	6,77,865.00
Other Receipts (tender paper charge, bank interest etc.)	27,05,94100
Hostel/guest house receipt	23,00,92900
Total	**60,43,535.00**


FINANCIAL
STATEMENTS

INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY
PASCHIM BORAGAON, GUWAHATI - 781035

AUDIT REPORT FOR THE YEAR ENDED
31ST MARCH, 2020

K P SARDA & COMPANY
CHARTERED ACCOUNTANTS

SC – 11, Parmeshwari Building, 2nd Floor
Chatribari Road, Guwahati – 781 001
Ph: 0361-2512159, 2634672 Fax: 0361-2634672
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वित्त एवं लेखा अधिकारी
Finance & Accounts Officer
आई.ए.एस.एस.टी, पश्चिम बड़ागाव
IASST, Paschim Boragaon
गुवाहाटी-35:असम:भारत
Guwahati-781035: Assam:India

Registrar
Institute of Advanced Study
in Science & Technology
Paschim Boragaon
Guwahati-35, Assam, India

निदशक/Director
आई.ए.एस.एस.टी, पश्चिम बड़ागाव
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K P SARDA & COMPANY
CHARTERED ACCOUNTANTS

INDEPENDENT AUDITOR'S REPORT

TO
THE MEMBERS
THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY
GUWAHATI

We have audited the accompanying Financial Statements of **The Institute of Advanced Study in Science & Technology, Paschim Boragaon, Garchuk, Guwahati** which comprise the Consolidated Balance Sheet as at 31st March, 2020, the Consolidated Receipts and Payments Account and the Consolidated Income and Expenditure Account for the year then ended, and a summary of significant accounting policies and other explanatory information.

Management's Responsibility for Financial Statements :

Management is responsible for the preparation of these financial statements that give a true and fair view of the financial position and financial performance of the society in accordance with the Accounting Standards generally accepted in India. This responsibility includes the design, implementation and maintenance of internal control relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from misstatement, whether due to error or fraud.

Auditor's Responsibility :

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with the Standards on Auditing issued by the Institute of Chartered Accountants of India. Those standards require that we comply with ethical requirements and plans and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the society's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of the accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Cond..P/2

K P Sarda & Co. Guwahati Chartered Accountants

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Chatribari Road, Guwahati - 781001, Assam
http://kpsardaco.org.in

वित्त एवं लेखा अधिकारी
Finance & Accounts Officer
आई.ए.एस.एस.टी, पश्चिम बड़ागाव
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Guwahati-781035: Assam:India

Registrar
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Paschim Boragaon
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K P SARDA & COMPANY
CHARTERED ACCOUNTANTS

Opinion:

In our opinion and to the best of our information and according to the explanations given to us, the financial statements give the information required by the Act in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India :

(a) In the case of the Balance Sheet, of the state of affairs of the Society, as on 31st March, 2020;

(b) In case of the Income and Expenditure Account of the Income/Expenditure of Society for the year ended 31st March, 2020;

(c) In case of the Receipts and Payment Account of the Receipts/Payments of Society for the year ended 31st March,2020

We further report that:

(a) We have obtained all the information and explanations to the best of our knowledge and belief were necessary for the purpose of our audit;

(b) In our opinion, proper books of account, as required by law have been kept by the Society so far as appears from our examination of those books;

(c) The Balance Sheet, the Receipts and Payments Account and the Income and Expenditure Account dealt with by this Report are in agreement with the books of account.

For K.P. Sarda & Co.
Chartered Accountants
FRN : 319206E

K. P. Sarda & Co. Guwahati Chartered Accountants

(CA. K P Sarda)
Partner
Membership No.054555

UDIN : 20054555AAAAFW5408
Place : Guwahati
Date : 29/07/2020

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+91 361 2512159, 2634672
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वित्त एवं लेखा अधिकारी
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IASST, Paschim Boragaon
गुवाहाटी-35:असम:भारत
Guwahati-781035:Assam:India

THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

CONSOLIDATED BALANCE SHEET AS ON 31ST MARCH, 2020

PARTICULARS	Schedule	Amount (₹) 2019-20	Amount (₹) 2018-19
CAPITAL FUND & LIABILITIES			
Capital Fund	1	833,976,338.28	707,168,018.11
Reserve & Surplus	2	4,572.00	77,492.00
Earmarked Funds	3	73,888,714.67	23,651,463.32
Current Liabilities and Provisions	4	116,874,521.88	167,491,788.01
TOTAL :		**1,024,744,146.83**	**898,388,761.44**
ASSETS			
Fixed Assets	5	799,492,784.62	682,812,786.60
Investments	6	65,530,329.56	10,077,181.00
Current Assets, Loans and Advances	7	159,721,032.65	205,498,793.84
TOTAL :		**1,024,744,146.83**	**898,388,761.44**

NOTES ON ACCOUNT - SCHEDULE "8"

In terms of our report of even date annexed hereto.

For K P Sarda & Co.
Chartered Accountants
FRN : 319206E

K. P. Sarda & Co. Guwahati Chartered Accountants

(CA. K P Sarda)
Partner
Membership No. 054555

Place : G u w a h a t i
Date : 29/07/2020
UDIN : 20054555AAAAFW5408

वित्त एवं लेखा अधिकारी
Finance & Accounts Officer
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Guwahati-35, Assam, India

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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

CONSOLIDATED INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2020

EXPENDITURE		Amount (₹)	INCOME		Amount (₹)
DST GENERAL FUND :			**DST GENERAL FUND :**		
General Expenses	64,070,096.11		Revenue Grant	209,929,000.00	
Salary & Allowances	127,349,358.00		Penal Interest	387.00	
Institutional Projects	544,611.00	191,964,065.11	Interest From Advance	121,832.00	
			Bank Interest	17,907.00	
MISCELLANEOUS & OTHERS :			Other Income	2,067,112.00	212,136,238.00
Mess Expenditures	1,818,635.00				
Bank Charges	21,285.96	1,839,920.96	**MISCELLANEOUS & OTHERS :**		
			Bank Interest	341,431.00	
Surplus transferred to			Income Tax Refund	15,558.00	
a) Unutilised Grant	17,964,934.89		Round off	0.30	
b) Capital Fund	9,828,060.15		Interest on Investment	1,186,518.00	
c) Benevolent Fund	102,080.00	27,895,075.04	Other Income	5,876,231.05	
			Mess Dues	2,041,004.76	
			Contribution to Employees Benevolent Fund	102,080.00	9,562,823.11
		221,699,061.11			221,699,061.11

NOTES ON ACCOUNT - SCHEDULE "8"

In terms of our report of even date annexed hereto.

For K P Sarda & Co.
Chartered Accountants
FRN : 319206E

K. P. Sarda & Co. Guwahati Chartered Accountants

(CA. K P Sarda)
Partner
Membership No. 054555

Place : G u w a h a t i
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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

CONSOLIDATED RECEIPTS & PAYMENTS ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2020

RECEIPTS		Amount (₹)	PAYMENTS		Amount (₹)
To **OPENING BALANCE :**			By **DST GENERAL FUND :**		
Cash in Hand	20,000.00		General Expenses		68,274,720.11
Cash at Bank (As per Schedule 7)	69,923,519.58	69,943,519.58	Capital Expenses		166,168,803.00
			Salary & Allowances		130,371,543.00
" **Grant- in-Aid**			" **EXTRAMURAL PROJECTS :**		
Capital Grant	155,470,436.00		Contingency		3,298,553.71
Revenue Grant (Annexure "F")	313,162,058.00	468,632,494.00	Consumables		12,084,007.50
			Overheads		1,643,601.00
			Salary		35,080,032.00
" **OTHER RECEIPTS :**			Travel		1,805,144.00
Bank Interest	2,198,200.00		Training		416,896.00
Interest on Investment	1,186,518.00		Miscellaneous		57,822.00
Penal Interest	387.00		Equipments		12,473,654.02
Other Income	7,945,793.35				
Mess Dues	2,041,004.76		" **MISCELLANEOUS & OTHERS :**		
Interest from Advance	121,832.00	13,493,735.11	Mess Expenditures		1,818,635.00
			Employees Benevolent Fund		175,000.00
" Earnest Money Received		111,400.00	Bank Charges		21,285.96
" Maturity value of STDR		45,275,175.00	" Investments		100,000,000.00
" Income Tax Refund		15,558.00	" Repayment of advance		6,972,814.00
" Security Deposits		4,844,421.00	" Inter Fund Transfer		1,050,000.00
" Contribution to Employees Benevolent Fund		102,080.00	" **CLOSING BALANCE :**		
			Cash in hand	20,000.00	
			Cash at Bank (As per Schedule 7)	68,708,685.39	68,728,685.39
" Inter Fund Transfer		1,050,000.00			
" Repayment of advance		6,972,814.00			
		610,441,196.69			610,441,196.69

We have verified the above statement of Receipts & payments Account of the Institute of Advanced Study in Science & Technology, Paschim Boragaon, Guwahati - 781 035, Account - Plan for the period from 1st April 2019 to 31st March, 2020 from the Books of Accounts and vouchers produced before us.

For K P Sarda & Co.
Chartered Accountants
FRN : 319206E

(CA. K P Sarda)
Partner
Membership No. 054555

UDIN : 20054555AAAAFW5408
Place : G u w a h a t i
Date : 29/07/2020

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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

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SCHEDULE - 1 : :: CAPITAL FUND ::

	Amount(₹) 2019-20	Amount (₹) 2018-19
Opening Balance	707,168,018.11	644,347,469.72
Add : Contribution towards Capital Fund (Addition to Fixed Assets)	217,857,867.02	146,838,869.80
Add : Surplus for the year	9,828,060.15	7,175,577.59
Add : Upgrading	300,262.00	0.00
Add : Transferred from Unutilised Grant	0.00	0.00
	935,154,207.28	798,361,917.11
Less : Depreciation for the year	101,177,869.00	91,193,899.00
	833,976,338.28	**707,168,018.11**

SCHEDULE - 2 : :: RESERVES & SURPLUS ::

	Amount(₹) 2019-20	Amount (₹) 2018-19
IASST Employees Benevolent Fund (664178)	4,572.00	77,492.00
	4,572.00	**77,492.00**

SCHEDULE - 4 : :: CURRENT LIABILITIES AND PROVISIONS ::

		Amount(₹) 2019-20	Amount (₹) 2018-19
CURRENT LIABILITIES :			
Unutilised Grant in Aid	(As per Annexure "A")	93,927,772.69	138,350,268.82
Earnest Money		1,249,798.00	1,138,398.00
Security Deposit Payabl	(As per Annexure "B")	15,615,527.23	10,771,106.23
Other Current Liabilitie	(As per Annexure "C")	6,081,423.96	17,232,014.96
		116,874,521.88	**167,491,788.01**

SCHEDULE - 6 : :: INVESTMENTS ::

	Amount(₹)
Opening Balance	10,077,181.00
Add : Investment made during the year	100,000,000.00
Add : Interest Accrued	1,914,841.56
Less : TDS	0.00
Less : Matuity value of STDR	45,275,175.00
Less : Interest received during the year	1,186,518.00
Balance as on 31/03/2020	**65,530,329.56**

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SCHEDULE - 7 : :: CURRENT ASSETS, LOANS & ADVANCES ::

		Amount(₹) 2019-20	Amount(₹) 2018-19
(A) CURRENT ASSETS :			
Cash in hand		20,000.00	20,000.00
Balance with Banks	**Account No.**		
SBI Khanapara Branch	(943972)	1,387,269.27	158,215.28
SBI Khanapara Branch - Workshop	(943723)	336,365.83	181,366.83
Bank of Baroda - Travel	(000441)	382,757.49	163,176.29
SBI Garchuk - International Conference	(635294)	26,292.00	12,335.00
SBI - IASST Corpus Fund	(943064)	151,664.53	209,149.53
SBI Garchuk Branch - Project	(260721)	57,685,909.82	42,695,018.75
SBI - Herbal Medicine N.C. Talukdar	(862670)	2,278,725.91	937,247.43
SBI - IASST Employees Benevolent Fund	(664178)	9,723.00	80,217.00
SBI - Students & Scientist Home (IASST)	(412886)	703,997.48	479,212.79
SBI G.U. Branch - Upgrading	(131613)	65,504.86	48,670.86
Bank of Baroda - Overhead/Miscellaneous	(000466)	4,869,498.22	24,354,135.06
HDFC Bank- Project	(120592)	810,976.98	604,774.76
	TOTAL (A)	68,728,685.39	69,943,519.58
(B) LOANS, ADVANCES & OTHER ASSETS :			
Crest Award		343,770.00	343,770.00
TDS		126,315.00	126,315.00
Inter Fund Transfer (IASST Fund to Herbal Medicine)		0.00	1,050,000.00
Advances against Expenditure of Grants (Annexure "D")		25,507,629.28	21,233,625.28
Advances against Fixed Assets (Annexure "E")		59,793,308.02	100,607,425.02
Advance from Extramural Project to Overhead		4,877,495.00	11,850,309.00
Advance from Core Fund (LC/TT,Misc. Account)		343,829.96	343,829.96
	TOTAL (B)	90,992,347.26	135,555,274.26
	TOTAL (A+B)	**159,721,032.65**	**205,498,793.84**

K. Barua & Co. Guwahati Chartered Accountants

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SCHEDULE - 3 : :: EARMARKED FUNDS ::

Particulars	Salary	Contingency	Travel	Consumables	Training	Overhead	Misc.	Bank Interest	Refund Against Advance (Receipt)	Refund	Total(₹)
a) **Opening Balance**	**9,923,909**	**2,048,151**	**659,870**	**3,333,695**	**1,037,555**	**157,767**	**2,062,448**	**4,428,068**	**0**	**0**	**23,651,463**
b) **Addition to the Funds**											
i) Grants	63,492,719	5,804,691	4,346,559	27,589,338	448,258	1,493,493	58,000	0	0	0	103,233,058
ii) Other Receipts	0	0	0	0	0	0	2,450	1,780,673	0	0	1,783,123
	63,492,719	**5,804,691**	**4,346,559**	**27,589,338**	**448,258**	**1,493,493**	**60,450**	**1,780,673**	**0**	**0**	**105,016,181**
TOTAL (a+b)	**73,416,628**	**7,852,842**	**5,006,429**	**30,923,033**	**1,485,813**	**1,651,260**	**2,122,898**	**6,208,741**	**0**	**0**	**128,667,644**
c) **Payment towards objectives of Funds**	35,080,032	3,298,554	1,805,144	12,084,008	416,896	1,643,601	57,822	0	0	0	54,386,056
d) **Advances**											
PY Advance Adjusted	0	81,560	150,000	145,261	248,000	0	0	0	0	0	**624,821**
CY Advance Given	80,000	151,948	0	0	0	0	0	0	0	0	**231,948**
	80,000	**70,388**	**-150,000**	**-145,261**	**-248,000**	**0**	**0**	**0**	**0**	**0**	**-392,873**
e) **Current Liabilities**											
PY Liability Adjusted	0	0	0	0	0	0	0	0	0	0	**0**
CY Liability Created	0	0	0	0	0	0	0	0	0	0	**0**
	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
f) **Expenditure towards objectives of Funds (c-d+e)**	35,000,032	3,228,166	1,955,144	12,229,269	664,896	1,643,601	57,822	0	0	0	**54,778,929**
g) **Adjustment of Refund**	0	0	0	0	0	0	0	0	0	0	0
h) **Net Balance as at the year end (a+b-f-g)**	**38416596.4**	**4624676.1**	**3051285.2**	**18693764.3**	**820917.0**	**7659.0**	**2065075.9**	**6208740.8**	**(0.0)**	**(0.0)**	**73888714.7**

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SCHEDULE - 5 : **:: FIXED ASSETS ::**

PARTICULARS OF DEPRECIATION ALLOWABLE AS PER THE IT ACT, 1961 IN RESPECT OF EACH ASSET OR BLOCK OF ASSETS, AS THE CASE MAY BE, IN THE FOLLOWING FORM

Particulars	W.D.V on 01/04/19	Additons/(Deletion) >180 days	Additons/(Deletion) <180 days	Total	Depreciation	W.D.V on 31/03/20
Block "A" : 0%						
Land	0.00	0.00	0.00	0.00	0.00	0.00
Block "B" : 10%						
Building & Site Development	430,010,616.66	46,063,493.00	108,881,461.00	584,955,570.66	53,051,484.00	531,904,086.66
Furniture & Fixtures	32,374,792.45	1,543,868.00	702,106.00	34,620,766.45	3,426,972.00	31,193,794.45
Block "C" : 15%						
Equipments	198,858,396.47	31,715,694.00	20,606,521.02	251,180,611.49	36,131,603.00	215,049,008.49
Air Conditioner	4,272,399.00	426,635.00	171,000.00	4,870,034.00	717,680.00	4,152,354.00
Refrigerator	9,178.00	0.00	0.00	9,178.00	1,377.00	7,801.00
Projector	66,961.00	0.00	0.00	66,961.00	10,044.00	56,917.00
Vehicles	5,684,492.00	448,400.00	0.00	6,132,892.00	919,934.00	5,212,958.00
Plant & Machinery	0.00	204,014.00	1,690.00	205,704.00	30,729.00	174,975.00
Block "D" : 40%						
Library	2,119,759.00	0.00	196,604.00	2,316,363.00	887,224.00	1,429,139.00
Computer	9,413,885.02	4,275,343.00	2,621,038.00	16,310,266.02	5,999,899.00	10,310,367.02
Printer & Xerox Machine	1,202.00	0.00	0.00	1,202.00	481.00	721.00
Computer Software	1,105.00	0.00	0.00	1,105.00	442.00	663.00
	682,812,786.60	84,677,447.00	133,180,420.02	900,670,653.62	101,177,869.00	799,492,784.62

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Sarda & Co. Guwahati Chartered Accountants

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SCHEDULE " 8 " : SIGNIFICANT ACCOUNTING POLICES :

1. **ACCOUNTING CONVENTION :**

   The Financial Statements are prepared on the basis of historical cost convention, unless otherwise stated and on the Accrual method of Accounting.

2. **REVENUE RECOGNITION :**

   (a) Income on Interest bearing securities and Term Deposits is recognised on accrual basis as and when these are realised.

   (b) Income other than Interest Income are recognised on Cash basis.

3. **INVESTMENTS :**

   Term deposits with Banks are taken as Investments and valued at accrual basis.

4. **FIXED ASSETS :**

   Fixed Assets are stated at cost of acquisiton, inclusive of inward freight, duties and taxes and incidental and direct expenses related to acquisiton less depreciation.

5. **DEPRECIATION :**

   (a) Depreciation on Fixed assets purchased/acquired/ constructed out of Government Grants is charged on WDV Method as per the rates specified under the Income Tax Act, 1961.

   (b) Depreciation is charged to Capital Fund by way of reducing the net value of Fixed Assets.

6. **GOVERNMENT GRANTS/SUBSIDIES :**

   Revenue Grants are shown on realisation basis and expenditure thereof is charged to appropriate revenue heads. In the case Capital Grant, the Capital Fund is credited to the extent of the amount of acquisition of fixed assets and the balance remains in Unutilised Grant.

K. Barua & Co. Guwahati Chartered Accountants

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NOTES ON ACCOUNTS :

(i) No provision has been made in respect of Leave Salary.

(ii) Purchase of consumable items during the year are treated as expenditure and charged to revenue.

(iii) In the opinion of the Management, the Current Assets, Loans and Advances have a value on realisation equal or atleast to the aggregate amount shown in the Balance Sheet.

(iv) Balances under Current Liabilities, Loans and Advances are subject to conformation /reconciliation /adjustments, if any.

(v) No provision is made for Contingent Liability, except for cases where provision needs to be made, based on expert opinion.

(vi) Previous years figure have been rearranged and regrouped wherever considered necessary to facilitate comparison.

(vii) Any Surplus balance that remains in Income & Expenditure A/c after adjusting the Revenue Expenditure with the Revenue Grant and Other Income is transferred to Unutilised Grant and Capital Fund accordingly.

(viii) Bank Interest received in SBI Khanapara (DST) during the year is not recognised as Income instead shown as Current Liability because it will be refunded to DST, Govt. of India.

(ix) Any surplus of revenue grant alongwith other income over revenue expenditure of Extramural Projects is transferred to earmarked fund and it isn't included in the preparation of the Consolidated Income & Expenditure Account.

K. Barua & Co. Guwahati Chartered Accountants

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आई.ए.एस.एस.टी, पश्चिम बड़ा गाव
IASST, Paschim Boragaon
गुवाहाटी-35:असम:भारत
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Annexure "A" - Unutilised Grant		**Amount(₹)**
Opening Balance		138,350,268.82
Add : Capital Grant received during the year	155,470,436.00	
Add : Unutilised Revenue Grant for the year	17,964,934.89	173,435,370.89
		311,785,639.71
Less : Contribution towards Capital Fund (Addition to Fixed Assets)		217,857,867.02
Closing Balance		93,927,772.69

Annexure "B" - Security Deposit Payable	
Works & Service	652,401.00
Security Deposit (SSH)	19,392.23
Building & Site Development	14,943,734.00
	15,615,527.23

Annexure "C" - Other Current Liabilities	**Amount(₹)**
Payable to Core Fund	3,821.00
Payable against Equipments	17,565.00
Advance from Extramural Project to Overhead	4,877,495.00
Advance from DST to Project	343,829.96
Bank Interest Refundable to DST, Govt. of India	786,513.00
Employee Provident Fund	52,200.00
	6,081,423.96

K. P. Agarwala & Co. Guwahati Chartered Accountants

वित्त एवं लेखा अधिकारी
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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

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Annexure "D" - Advance against expenditure on grant : Amount(₹)

Current year unadjusted advance :

	Project	DST General	Total	
Salary	0.00	5,241,835.00	5,241,835.00	
Empowerment of SC/ST	0.00	52,000.00	52,000.00	
Works and Services	0.00	673,789.00	673,789.00	
Contingency	151,948.00	163,367.00	315,315.00	
Travel	80,000.00	1,379,243.00	1,459,243.00	
Consumables	0.00	49,372.00	49,372.00	
Training & Conference	0.00	844,536.00	844,536.00	8,636,090.00

Earlier years unadjusted advance :

	Project	DST General	Total	
Salary	0.00	7,629,665.00	7,629,665.00	
Contingency	78,200.00	545,867.00	624,067.00	
Travel	217,992.00	34,180.00	252,172.00	
Consumables	102,068.00	1,381,304.28	1,483,372.28	
Empowerment of SC/ST	0.00	0.00	0.00	
Training & Conference	112,500.00	1,422,381.00	1,534,881.00	
Works and Services	0.00	5,343,382.00	5,343,382.00	
Outsourcing	4,000.00		4,000.00	16,871,539.28

TOTAL : **25,507,629.28**

Annexure "E" - Advance against Fixed Assets :

Current year unadjusted advance :

	Project	DST General	Total	
Building & Site Development	0.00	2,055,248.00	2,055,248.00	
Computer & Peripherials	0.00	437,653.00	437,653.00	
Plant & Mahinery	0.00	54,360.00	54,360.00	
Equipment	0.00	853,040.00	853,040.00	3,400,301.00

Earlier years unadjusted advance :

	Project	DST General	Total	
Building & Site Development	0.00	18,431,848.00	18,431,848.00	
Computer & Peripherials	0.00	1,027,115.00	1,027,115.00	
Furniture & Fixture	0.00	94,324.00	94,324.00	
Equipment	0.00	36,839,720.02	36,839,720.02	56,393,007.02

59,793,308.02

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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

ANNEXURE : "F"

DETAILS OF GRANT-IN-AID FOR THE FINANCIAL YEAR 2019-20

SI.	Particulars	Capital Grant (₹)	Revenue Grant (₹)	Amount(₹)
1	DST General Fund	148,608,000.00	209,929,000.00	358,537,000.00
2	Bio Informatics	1,000,000.00	966,036.00	1,966,036.00
3	Birac (N C Talukdar)	0.00	18,747,000.00	18,747,000.00
4	Culture Collection - D. Thakur	0.00	805,179.00	805,179.00
5	DBT RA (Ananaya Barman)	0.00	134,880.00	134,880.00
6	DBT RA (Kamal Das)	0.00	616,980.00	616,980.00
7	DBT RA (Kaustavmoni)	0.00	235,907.00	235,907.00
8	DBT RA (Rabinson)	0.00	67,440.00	67,440.00
9	DBT Scented Rice Programme (N C Talukdar)	0.00	1,078,000.00	1,078,000.00
10	DBT Scented Rice Programme (R Devi)	0.00	2,404,000.00	2,404,000.00
11	DBT-JRF (Arun Kumar)	0.00	419,880.00	419,880.00
12	DBT-JRF (Chandana Malakar)	0.00	479,400.00	479,400.00
13	Dev. Of nano particle - Poultry Salmonellosis	0.00	229,000.00	229,000.00
14	Empowerment (R Devi)	1,292,836.00	2,061,040.00	3,353,876.00
15	Evaluation of Antioxide (R Devi)	0.00	656,520.00	656,520.00
16	Expert Committee Meeting SC	0.00	1,273,098.00	1,273,098.00
17	Exploration & Conservaton (D Thakur)	3,000,000.00	1,281,496.00	4,281,496.00
18	Herbal Medicine	0.00	12,043,000.00	12,043,000.00
19	IASST Fund	0.00	919,183.00	919,183.00
20	INSPIRE Faculty (Anamika Kalita)	0.00	2,417,939.00	2,417,939.00
21	INSPIRE Faculty (B Choudhury)	0.00	2,451,949.00	2,451,949.00
22	INSPIRE Faculty (Rajib Borah)	0.00	2,764,000.00	2,764,000.00
23	INSPIRE Faculty (Rosy Mondal)	0.00	2,615,335.00	2,615,335.00
24	INSPIRE Faculty Award (Wahengbam Romi)	0.00	2,291,704.00	2,291,704.00
25	INSPIRE Fellow (Bidyut Chutia)	0.00	505,576.00	505,576.00
26	INSPIRE Fellow (Ibnul Farid)	0.00	483,304.00	483,304.00
27	INSPIRE Fellow (Kangkana Bora)	0.00	76,064.00	76,064.00
28	INSPIRE Fellow (Manju K Jaiswal)	0.00	451,520.00	451,520.00
29	INSPIRE Fellow (Palash Jyoti Baruah)	0.00	881,232.00	881,232.00
30	INSPIRE Fellow (Purbajyoti Bhagabaty)	0.00	507,200.00	507,200.00
31	INSPIRE Fellow (Rakesh Rusel Khanikar)	0.00	471,936.00	471,936.00
32	INSPIRE Fellow (Sanjib Sau)	0.00	451,520.00	451,520.00
33	INSPIRE Fellow (Sarojini Devi)	0.00	451,520.00	451,520.00
34	INSPIRE Fellow (Sazzadur Rahman)	0.00	423,680.00	423,680.00
35	INSPIRE Fellow (Subhankar Pandit)	0.00	471,936.00	471,936.00
36	INSPIRE Fellow (Sweety Biswas)	0.00	447,808.00	447,808.00
37	INSPIRE Fellow (Tulsi Joshi)	0.00	530,671.00	530,671.00
38	INSPIRE Fellow (Y bailung)	0.00	537,438.00	537,438.00
39	INSPIRE Fellow Review Meeting	0.00	700,000.00	700,000.00
40	Lady Tata (Paramita Choudhury)	0.00	399,600.00	399,600.00
41	Non Collinear (M B Saharia)	1,000,000.00	520,500.00	1,520,500.00
42	NPDF (Archana Nath)	0.00	1,015,893.00	1,015,893.00
43	NPDF (Bhaskar Das)	0.00	1,015,893.00	1,015,893.00
44	NPDF (Kaushik Bhattachajee)	0.00	1,015,600.00	1,015,600.00
45	NPDF (Parijat saikia)	0.00	440,000.00	440,000.00
46	Optimisation (M R Khan)	93,600.00	977,100.00	1,070,700.00
47	Physico Sensor	0.00	647,073.00	647,073.00
48	Phytoparmaceutical (Jagat Borah)	0.00	924,542.00	924,542.00
49	Plasma Based Synthesis (A R Pal)	0.00	700,000.00	700,000.00
50	Plasma modified (J Chutia)	0.00	226,620.00	226,620.00
51	R Devi (Banana)	0.00	733,448.00	733,448.00
52	Ramalingaswami (S Nandi)	0.00	811,122.00	811,122.00
53	Ramalingaswami (Subrata Pore)	0.00	2,472,000.00	2,472,000.00
54	ST-SC (M R Khan)	0.00	25,611,800.00	25,611,800.00
55	Understanding Mecha (D Thakur)	200,000.00	741,496.00	941,496.00
56	Women Scientist (Rictika Das)	276,000.00	630,000.00	906,000.00
		155,470,436.00	313,162,058.00	468,632,494.00

K. Barua & Co Guwahati Chartered Accountants

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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

BALANCE SHEET OF EXTRAMURAL PROJECTS AS ON 31ST MARCH, 2020

PARTICULARS	Schedule	Amount (₹) 2019-20	Amount (₹) 2018-19
CAPITAL FUND & LIABILITIES			
Capital Fund	1	85,140,818.76	80,736,418.74
Earmarked Funds	2	73,888,714.67	23,651,463.32
Current Liabilities and Provisions	3	28,387,491.60	40,509,924.62
TOTAL :		**187,417,025.03**	**144,897,806.68**
ASSETS			
Fixed Assets	4	85,140,818.76	80,736,418.74
Investments	5	35,530,329.56	77,181.00
Current Assets, Loans and Advances	6	66,745,876.71	64,084,206.94
TOTAL :		**187,417,025.03**	**144,897,806.68**

NOTES ON ACCOUNT - SCHEDULE "7"

In terms of our report of even date annexed hereto.

For K P Sarda & Co.
Chartered Accountants
FRN : 319206E

K. P. Sarda & Co. Guwahati Chartered Accountants

(CA. K P Sarda)
Partner
Membership No. 054555

Place : G u w a h a t i
Date : 29/07/2020
UDIN : 20054555AAAAFW5408

वित्त एवं लेखा अधिकारी
Finance & Accounts Officer
आई.ए.एस.एस.टी, पश्चिम बड़ागाव
IASST, Paschim Boragaon
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निदेशक/Director
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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

RECEIPTS & PAYMENTS ACCOUNT OF EXTRAMURAL PROJECTS FOR THE YEAR ENDED 31ST MARCH 2020

RECEIPTS		Amount (₹)	PAYMENTS		Amount (₹)
To **OPENING BALANCE :**			By **EXPENDITURES :**		
Cash in Hand	0.00		Contingency		3,298,553.71
Cash at Bank (As per Schedule 6)	44,237,040.94	44,237,040.94	Consumables		12,084,007.50
			Overheads		1,643,601.00
			Salary		35,080,032.00
" **Grant- in-Aid**			Travel		1,805,144.00
Capital Grant	6,862,436.00		Training		416,896.00
Revenue Grant (Annexure "D")	103,233,058.00	110,095,494.00	Miscellaneous		57,822.00
			" **FIXED ASSETS :**		
" Bank Interest		1,052,349.00	Equipments		12,473,654.02
" TA Grant		0.00	" Investment in STDR		80,000,000.00
" Maturity value of STDR		45,275,175.00	" Inter Fund Transfer		1,050,000.00
" Other Receipt		2,450.00	" **CLOSING BALANCE :**		
			Cash in hand	0.00	
" Inter Fund Transfer		1,050,000.00	Cash at Bank (As per Schedule 6)	60,775,612.71	60,775,612.71
" Repayment of advance		6,972,814.00			
		208,685,322.94			208,685,322.94

We have verified the above statement of Receipts & payments Account of Extramural Projects of the Institute of Advanced Study in Science & Technology, Paschim Boragaon, Guwahati - 781 035, Account - Plan for the period from 1st April 2019 to 31st March, 2020 from the Books of Accounts and vouchers produced before us.

K. P. Sarda & Co. Guwahati Chartered Accountants

For K P Sarda & Co.
Chartered Accountants
FRN : 319206E

UDIN : 20054555AAAAFW5408
Place : G u w a h a t i
Date : 29/07/2020

(CA. K P Sarda)
Partner
Membership No. 054555

वित्त एवं लेखा अधिकारी
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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

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SCHEDULE - 1 : :: CAPITAL FUND ::

	Amount(₹) 2019-20	Amount (₹) 2018-19
Opening Balance	80,736,418.74	87,329,028.22
Add : Contribution towards Capital Fund (Addition to Fixed Assets)	17,934,869.02	7,618,215.52
	98,671,287.76	94,947,243.74
Less : Depreciation for the year	13,530,469.00	14,210,825.00
	85,140,818.76	**80,736,418.74**

SCHEDULE - 3 : :: CURRENT LIABILITIES AND PROVISIONS ::

		Amount(₹) 2019-20	Amount (₹) 2018-19
CURRENT LIABILITIES :			
Unutilised Grant in Aid	(As per Annexure "A")	26,957,698.64	38,030,131.66
Earnest Money		1,068,398.00	1,068,398.00
Inter Fund Transfer (Herbal Medicine to IASST)		0.00	1,050,000.00
Other Current Liabilities	(As per Annexure "B")	361,394.96	361,394.96
		28,387,491.60	**40,509,924.62**

SCHEDULE - 4 : :: FIXED ASSETS ::

	Amount(₹)
Equipment as on 01/04/2019	80,736,418.74
Add : Addition on or before 03/10/2019	998,539.00
Add : Addition after 03/10/2019	16,936,330.02
Less : Depreciation for the year	13,530,469.00
Equipment as on 31/03/2020	85,140,818.76

SCHEDULE - 5 : :: INVESTMENTS ::

	Amount(₹)
Opening Balance	77,181.00
Add : Investment in Fixed Deposit during the year	80,000,000.00
Add : Interest Accrued	728,323.56
Less : TDS	0.00
Less : Maturity value of STDR	45,275,175.00
Balance as on 31/03/2020	**35,530,329.56**

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SCHEDULE - 6 : :: CURRENT ASSETS, LOANS & ADVANCES ::

		Amount(₹) 2019-20	Amount(₹) 2018-19
(A) CURRENT ASSETS :			
Balance with Banks	**Account No.**		
SBI Garchuk Branch - Project	(260721)	57,685,909.82	42,695,018.75
SBI - Herbal Medicine N.C. Talukdar	(862670)	2,278,725.91	937,247.43
HDFC Bank	(120592)	810,976.98	604,774.76
	TOTAL (A)	60,775,612.71	44,237,040.94
(B) LOANS, ADVANCES & OTHER ASSETS :			
Crest Award		343,770.00	343,770.00
TDS		2,291.00	2,291.00
Inter Fund Transfer (Herbal Medicine to IASST Fund)		0.00	1,050,000.00
Advance to Overhead A/c		4,877,495.00	11,850,309.00
Advances against Expenditure of Grants (Annexure "C")		746,708.00	1,139,581.00
Advances against Equipments		0.00	5,461,215.00
	TOTAL (B)	5,970,264.00	19,847,166.00
	TOTAL (A+B)	**66,745,876.71**	**64,084,206.94**

K. Dutta & Co. Guwahati Chartered Accountants

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SCHEDULE - 2 :

:: EARMARKED FUNDS ::

	Particulars	Salary	Contingency	Travel	Consumables	Training	Overhead	Misc.	Bank Interest	Refund Against Advance (Receipt)	Refund (Payment)	Total(₹)
a)	**Opening Balance**	**9,923,909**	**2,048,151**	**659,870**	**3,333,695**	**1,037,555**	**157,767**	**2,062,448**	**4,428,068**	**0**	**0**	**23,651,463**
b)	**Addition to the Funds**											
	i) Grants	63,492,719	5,804,691	4,346,559	27,589,338	448,258	1,493,493	58,000	0	0	0	103,233,058
	ii) Other Receipts	0	0	0	0	0	0	2,450	1,780,673	0	0	1,783,123
		63,492,719	**5,804,691**	**4,346,559**	**27,589,338**	**448,258**	**1,493,493**	**60,450**	**1,780,673**	**0**	**0**	**105,016,181**
	TOTAL (a+b)	**73,416,628**	**7,852,842**	**5,006,429**	**30,923,033**	**1,485,813**	**1,651,260**	**2,122,898**	**6,208,741**	**0**	**0**	**128,667,644**
c)	**Payment towards objectives of Funds**	35,080,032	3,298,554	1,805,144	12,084,008	416,896	1,643,601	57,822	0	0	0	54,386,056
d)	**Advances**											
	PY Advance Adjusted	0	81,560	150,000	145,261	248,000	0	0	0	0	0	**624,821**
	CY Advance Given	80,000	151,948	0	0	0	0	0	0	0	0	**231,948**
		80,000	**70,388**	**-150,000**	**-145,261**	**-248,000**	**0**	**0**	**0**	**0**	**0**	**-392,873**
e)	**Current Liabilities**											
	PY Liability Adjusted	0	0	0	0	0	0	0	0	0	0	**0**
	CY Liability Created	0	0	0	0	0	0	0	0	0	0	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
f)	**Expenditure towards objectives of Funds (c-d+e)**	35,000,032	3,228,166	1,955,144	12,229,269	664,896	1,643,601	57,822	0	0	0	**54,778,929**
g)	**Adjustment of Refunc**	0	0	0	0	0	0	0	0	0	0	0
h)	**Net Balance as at the year end (a+b-f-g)**	**38416596.4**	**4624676.1**	**3051285.2**	**18693764.3**	**820917.0**	**7659.0**	**2065075.9**	**6208740.8**	**(0.0)**	**(0.0)**	**73888714.7**

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K. Barua & Co. Guwahati Chartered Accountants

THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

SCHEDULE " 7 " : SIGNIFICANT ACCOUNTING POLICES :

1. **ACCOUNTING CONVENTION :**

   The Financial Statements are prepared on the basis of historical cost convention, unless otherwise stated and on the Accrual method of accounting.

2. **REVENUE RECOGNITION :**

   (a) Income on Interest bearing securities and Term Deposits is recognised on accrual basis as and when these are realised.

   (b) Income other than Interest Income are recognised on Cash basis.

3. **INVESTMENTS :**

   Term Deposits with Banks are taken as Investments and valued at accrual basis.

4. **FIXED ASSETS :**

   Fixed Assets are stated at cost of acquisiton, inclusive of inward freight, duties and taxes and incidental and direct expenses related to acquisiton less depreciation.

5. **DEPRECIATION :**

   (a) Depreciation on Fixed assets purchased/acquired/ constructed out of government grants is charged on WDV Method as per the rates specified under the Income Tax Act, 1961.

   (b) Depreciation is charged to Capital Fund by way of reducing the net value of Fixed Assets.

6. **GOVERNMENT GRANTS/SUBSIDIES :**

   (a) Revenue grants are shown realisation basis and expenditure thereof is charged to appropriate revenue heads. In the case Capital Grant, the Capital Fund is credited to the extent of the amount of acquisition of Fixed Assets and the balance remains in Unutilised Grant.

वित्त एवं लेखा अधिकारी
Finance & Accounts Officer
आई.ए.एस.एस.टी, पश्चिम बड़ागाव
IASST, Paschim Boragaon
गुवाहाटी-35:असम:भारत
Guwahati-781035: Assam:India

K.P. Kakoty & Co. Guwahati Chartered Accountants

Registrar
Institute of Advanced Study
in Science & Technology
Paschim Boragaon
Guwahati-35, Assam, India

निदेशक/Director
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NOTES ON ACCOUNTS :

(i) Any surplus of Revenue Grant alongwith Other Income over Revenue Expenditure is transferred to Earmarked Fund.

(ii) No provision has been made in respect of Leave Salary.

(iii) Purchase of consumable items during the year are treated as expenditure and charged to revenue.

(iv) In the opinion of the Management, the Current assets, Loans and Advances have a value on realisation equal or atleast to the aggregate amount shown in the Balance Sheet.

(v) Balances under Current Liabilities, Loans and Advances are subject to conformation /reconciliation /adjustments, if any.

(vi) No provision is made for Contingent Liability, except for cases where provision needs to be made, based on expert opinion.

(vii) Previous years figure have been rearranged and regrouped wherever considered necessary to facilitate comparison.

(viii) As projects are earmarked funds, its transactions have not been included in the preparation of Consolidated Income & Expenditure Account.

K. Barua & Co. Guwahati Chartered Accountants

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Annexure "A" - Unutilised Grant		**Amount(₹)**
Opening Balance		38,030,131.66
Add : Capital Grant received during the year		6,862,436.00
		44,892,567.66
Less : Contribution towards Capital Fund (Addition to Fixed Assets)		17,934,869.02
Closing Balance		26,957,698.64

Annexure "B" - Other Current Liabilities		**Amount(₹)**
Payable against Equipment		17,565.00
DST General Fund		
Bank of Baroda - Conference (000918)	107,090.00	
SBI Garchuk - Seminar (888433)	64,830.00	
HDFC Bank	171,909.96	343,829.96
		361,394.96

Annexure "C" - Advance against expenditure on grant :		**Amount(₹)**
Current year unadjusted advance :		
Contingency	151,948.00	
Salary	80,000.00	
Consumables	0.00	
Training & Conference	0.00	231,948.00
Earlier years unadjusted advance :		
Contingency	78,200.00	
Travel	217,992.00	
Consumables	102,068.00	
Training & Conference	112,500.00	
Outsourcing	4,000.00	514,760.00
TOTAL :		**746,708.00**

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ANNEXURE : "D"

DETAILS OF GRANT-IN-AID OF EXTRAMURAL PROJECTS FOR THE FINANCIAL YEAR 2019-20

Sl.	Name of the Project	Capital Grant (₹)	Revenue Grant (₹)	Amount(₹)
1	Bio Informatics	1,000,000.00	966,036.00	1,966,036.00
2	Birac (N C Talukdar)	0.00	18,747,000.00	18,747,000.00
3	Culture Collection - D. Thakur	0.00	805,179.00	805,179.00
4	DBT RA (Ananaya Barman)	0.00	134,880.00	134,880.00
5	DBT RA (Kamal Das)	0.00	616,980.00	616,980.00
6	DBT RA (Kaustavmoni)	0.00	235,907.00	235,907.00
7	DBT RA (Rabinson)	0.00	67,440.00	67,440.00
8	DBT Scented Rice Programme (N C Talukdar)	0.00	1,078,000.00	1,078,000.00
9	DBT Scented Rice Programme (R Devi)	0.00	2,404,000.00	2,404,000.00
10	DBT-JRF (Arun Kumar)	0.00	419,880.00	419,880.00
11	DBT-JRF (Chandana Malakar)	0.00	479,400.00	479,400.00
12	Dev. Of nano particle - Poultry Salmonellosis	0.00	229,000.00	229,000.00
13	Empowerment (R Devi)	1,292,836.00	2,061,040.00	3,353,876.00
14	Evaluation of Antioxide (R Devi)	0.00	656,520.00	656,520.00
15	Expert Committee Meeting SC	0.00	1,273,098.00	1,273,098.00
16	Exploration & Conservaton (D Thakur)	3,000,000.00	1,281,496.00	4,281,496.00
17	Herbal Medicine	0.00	12,043,000.00	12,043,000.00
18	IASST Fund	0.00	919,183.00	919,183.00
19	INSPIRE Faculty (Anamika Kalita)	0.00	2,417,939.00	2,417,939.00
20	INSPIRE Faculty (B Choudhury)	0.00	2,451,949.00	2,451,949.00
21	INSPIRE Faculty (Rajib Borah)	0.00	2,764,000.00	2,764,000.00
22	INSPIRE Faculty (Rosy Mondal)	0.00	2,615,335.00	2,615,335.00
23	INSPIRE Faculty Award (Wahengbam Romi)	0.00	2,291,704.00	2,291,704.00
24	INSPIRE Fellow (Bidyut Chutia)	0.00	505,576.00	505,576.00
25	INSPIRE Fellow (Ibnul Farid)	0.00	483,304.00	483,304.00
26	INSPIRE Fellow (Kangkana Bora)	0.00	76,064.00	76,064.00
27	INSPIRE Fellow (Manju K Jaiswal)	0.00	451,520.00	451,520.00
28	INSPIRE Fellow (Palash Jyoti Baruah)	0.00	881,232.00	881,232.00
29	INSPIRE Fellow (Purbajyoti Bhagabaty)	0.00	507,200.00	507,200.00
30	INSPIRE Fellow (Rakesh Rusel Khanikar)	0.00	471,936.00	471,936.00
31	INSPIRE Fellow (Sanjib Sau)	0.00	451,520.00	451,520.00
32	INSPIRE Fellow (Sarojini Devi)	0.00	451,520.00	451,520.00
33	INSPIRE Fellow (Sazzadur Rahman)	0.00	423,680.00	423,680.00
34	INSPIRE Fellow (Subhankar Pandit)	0.00	471,936.00	471,936.00
35	INSPIRE Fellow (Sweety Biswas)	0.00	447,808.00	447,808.00
36	INSPIRE Fellow (Tulsi Joshi)	0.00	530,671.00	530,671.00
37	INSPIRE Fellow (Y bailung)	0.00	537,438.00	537,438.00
38	INSPIRE Fellow Review Meeting	0.00	700,000.00	700,000.00
39	Lady Tata (Paramita Choudhury)	0.00	399,600.00	399,600.00
40	Non Collinear (M B Saharia)	1,000,000.00	520,500.00	1,520,500.00
41	NPDF (Archana Nath)	0.00	1,015,893.00	1,015,893.00
42	NPDF (Bhaskar Das)	0.00	1,015,893.00	1,015,893.00
43	NPDF (Kaushik Bhattachajee)	0.00	1,015,600.00	1,015,600.00
44	NPDF (Parijat saikia)	0.00	440,000.00	440,000.00
45	Optimisation (M R Khan)	93,600.00	977,100.00	1,070,700.00
46	Physico Sensor	0.00	647,073.00	647,073.00
47	Phytoparmaceutical (Jagat Borah)	0.00	924,542.00	924,542.00
48	Plasma Based Synthesis (A R Pal)	0.00	700,000.00	700,000.00
49	Plasma modified (J Chutia)	0.00	226,620.00	226,620.00
50	R Devi (Banana)	0.00	733,448.00	733,448.00
51	Ramalingaswami (S Nandi)	0.00	811,122.00	811,122.00
52	Ramalingaswami (Subrata Pore)	0.00	2,472,000.00	2,472,000.00
53	ST-SC (M R Khan)	0.00	25,611,800.00	25,611,800.00
54	Understanding Mecha (D Thakur)	200,000.00	741,496.00	941,496.00
55	Women Scientist (Rictika Das)	276,000.00	630,000.00	906,000.00
		6,862,436.00	103,233,058.00	110,095,494.00

K. P. Rda & Co. Guwahati Chartered Accountants

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FINANCIAL STATEMENTS

THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

	Project Name	Opening Balance	Grant -in-Aid (a)	Interest (b)	Inter Transfer (c)	Maturity of STDR (d)	TA Grant (e)	Misc. Receipts (f)	Advance (g)	Total Receipts (h) = (a+b+c+d+e+f+g)	Salary
1	Plasma Based Synthesis (A R Pal)	689,861.00	700,000.00	0.00	0.00	0.00	0.00	0.00	0.00	700,000.00	429,136.00
2	Androgen	-25,353.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Aquatic Biodiversity	-17,308.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	DBT-JRF (Arun Kumar)	4,667.00	419,880.00	0.00	0.00	0.00	0.00	0.00	0.00	419,880.00	370,500.00
5	Bharalu River	-579,338.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Bio Informatics	21,509.00	1,966,036.00	0.00	0.00	0.00	0.00	0.00	0.00	1,966,036.00	356,774.00
7	Biosurfactance	16,809.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Biotech Hubs	752,985.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	588,232.00
9	Brain storming	-80,259.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Brain storming meeting-3	-50,888.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	CSIR	-73.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	CSIR (Neelam, Gitumoni, Yogesh)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Culture Collection - D. Thakur	188,596.00	805,179.00	0.00	0.00	0.00	0.00	0.00	0.00	805,179.00	367,165.00
14	DBT -Crest (D Devi)	-142,289.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	DBT RA (Ananaya Barman)	445,245.00	134,880.00	0.00	0.00	0.00	0.00	0.00	0.00	134,880.00	535,680.00
16	DBT-JRF (Chandana Malakar)	30,457.00	479,400.00	0.00	0.00	0.00	0.00	0.00	0.00	479,400.00	479,400.00
17	INSPIRE Fellow (Ibnul Farid)	40,456.00	483,304.00	0.00	0.00	0.00	0.00	0.00	0.00	483,304.00	452,400.00
18	DBT RA (Kamal Das)	180,993.00	616,980.00	0.00	0.00	0.00	0.00	0.00	0.00	616,980.00	708,639.00
19	DBT RA (Kaustavmoni)	156,925.00	235,907.00	0.00	0.00	0.00	0.00	0.00	0.00	235,907.00	204,240.00
20	DBT RA (Rabinson)	140,875.00	67,440.00	0.00	0.00	0.00	0.00	0.00	0.00	67,440.00	204,240.00
21	DBT Scented Rice Programme (N C Talukdar)	-108,182.70	1,078,000.00	0.00	0.00	0.00	0.00	0.00	0.00	1,078,000.00	534,503.00
22	DBT Scented Rice Programme (R Devi)	-259,513.20	2,404,000.00	0.00	0.00	0.00	0.00	0.00	0.00	2,404,000.00	1,491,918.00
23	Dev. Of Antigrated (Soumyadeep Nandi)	3,678,064.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	311,855.00
24	Dev. Of nano particle - Poultry Salmonellosis	343,805.10	229,000.00	0.00	0.00	0.00	0.00	0.00	0.00	229,000.00	121,394.00
25	Diabetic Neuropathic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	DST (J Medhi)	-63,015.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	Education	-33,598.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	Effect of Traditional Dietary MR Khan (New)	1,578,139.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	Electronic Alloys magnetic	-5,362.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	Engineered Bioremediation (A Devi)	1,785,760.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	619,720.00
31	Feasibility study copper alloy (H Bailung)	891,358.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600,000.00
32	Flora & Fauna	-50,567.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	Food colour	-1,153.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	Glycolipid	940,731.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	359,191.00
35	Govt of Assam	-140,113.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	Head & Neck Cancer (Rosy Mondal)	2,410,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	263,226.00
37	Herbal Medicine	937,147.25	12,043,000.00	113,097.00	0.00	0.00	0.00	0.00	0.00	12,156,097.00	3,381,318.00
38	Image Processing (Tabassum Y)	-0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	INSPIRE Faculty (Anamika Kalita)	1,363,336.00	2,417,939.00	0.00	0.00	0.00	0.00	0.00	0.00	2,417,939.00	1,782,000.00
40	INSPIRE Faculty (Sagar Sarma)	909,412.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	INSPIRE Faculty (B Choudhury)	323,510.00	2,451,949.00	0.00	0.00	0.00	0.00	0.00	0.00	2,451,949.00	1,017,883.00
42	INSPIRE Fellow (Bidyut Chutia)	142,472.00	505,576.00	0.00	0.00	0.00	0.00	0.00	0.00	505,576.00	409,000.00
43	INSPIRE Fellow (Kangkana Bora)	5,051.00	76,064.00	0.00	0.00	0.00	0.00	0.00	0.00	76,064.00	70,722.00
44	INSPIRE Fellow (Palash Jyoti Baruah)	-32,866.00	881,232.00	0.00	0.00	0.00	0.00	0.00	0.00	881,232.00	595,600.00
45	INSPIRE Fellow (Purbajyoti Bhagabaty)	194,000.00	507,200.00	0.00	0.00	0.00	0.00	0.00	0.00	507,200.00	445,440.00
46	INSPIRE Fellow (Rakesh Rusel Khanikar)	-15,417.00	471,936.00	0.00	0.00	0.00	0.00	0.00	0.00	471,936.00	437,326.00
47	INSPIRE Faculty (Rosy Mondal)	6,584.00	2,615,335.00	0.00	0.00	0.00	0.00	0.00	0.00	2,615,335.00	1,851,622.00
48	INSPIRE Fellow (Subhankar Pandit)	-8,601.00	471,936.00	0.00	0.00	0.00	0.00	0.00	0.00	471,936.00	448,920.00
49	INSPIRE Fellow (Sweety Biswas)	-8,901.00	447,808.00	0.00	0.00	0.00	0.00	0.00	0.00	447,808.00	447,424.00
50	INSPIRE Fellow (Tulsi Joshi)	18,780.00	530,671.00	0.00	0.00	0.00	0.00	0.00	0.00	530,671.00	527,800.00
51	INSPIRE Fellow (Y bailung)	-45,286.00	537,438.00	0.00	0.00	0.00	0.00	0.00	0.00	537,438.00	494,044.00
52	Intestinal Microbiota	-48,071.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
53	Jhumming	1,720.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
54	PAP Smear Images (L B Mahanta)	256,395.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	222,120.00
55	Lady Tata (Paramita Choudhury)	0.00	399,600.00	0.00	0.00	0.00	0.00	0.00	0.00	399,600.00	369,600.00
56	Molecular & Biochemical Studies (J Boruah)	556,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	177,871.00
57	Muga cultivation (ASTEC)	502,230.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
58	Nano Material & Bimaterials	7,532.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
59	NPDF (Archana Nath)	95,399.00	1,015,893.00	0.00	0.00	0.00	0.00	0.00	0.00	1,015,893.00	514,516.00

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	Project Name	Opening Balance	Grant -in-Aid (a)	Interest (b)	Inter Transfer (c)	Maturity of STDR (d)	TA Grant (e)	Misc. Receipts (f)	Advance (g)	Total Receipts (h) = (a+b+c+d+e+f+g)	Salary
60	NPDF (Ashim Kr Dutta)	189,894.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	55,000.00
61	NPDF (Bhaskar Das)	74,533.00	1,015,893.00	0.00	0.00	0.00	0.00	0.00	0.00	1,015,893.00	765,600.00
62	NPDF (Kaushik Bhattachajee)	146,010.00	1,015,600.00	0.00	0.00	0.00	0.00	0.00	0.00	1,015,600.00	695,200.00
63	NPDF (Parijat saikia)	160,072.00	440,000.00	0.00	0.00	0.00	0.00	0.00	0.00	440,000.00	319,000.00
64	NPDF (Rinkumoni)	227,948.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	62,097.00
65	NPDF (Rupamoni Thakur)	54,115.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66	NPDF (Seydur Rahman)	131,775.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,000.00
67	NPDF Fellowship (Abdul Barik)	36,269.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22,979.00
68	Oxidative degradation	-171,901.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
69	Physico Sensor	-87,445.00	647,073.00	0.00	0.00	0.00	0.00	0.00	0.00	647,073.00	399,871.00
70	Plasma modified (J Chutia)	0.00	226,620.00	0.00	0.00	0.00	0.00	0.00	0.00	226,620.00	0.00
71	PM 10 & PM 2.5 (A Devi)	585,040.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	264,600.00
72	Polymer Based Sensors	-568.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
73	Proton Exchange	-137,261.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74	QA & QC (N C Talukdar)	10,796,028.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,067,531.00
75	R Devi (Banana)	995,256.00	733,448.00	0.00	0.00	0.00	0.00	0.00	0.00	733,448.00	121,703.00
76	Ramalingaswami (S Kundu)	-0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
77	Ramalingaswami (S Nandi)	62,334.00	811,122.00	0.00	0.00	0.00	0.00	0.00	0.00	811,122.00	641,177.00
78	Ramanujan Fellow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
79	NPDF (Sailendra Gayri)	1,419.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80	ST People Arunachal Pradesh (N C Talukdar)	644,300.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	220,000.00
81	Structure of Enzymes	11,306.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
82	Women Scientist (Sumita Kumari)	515,282.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	587,258.00
83	Tissue Repairs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
84	UGC Grant (MD Shadab)	2,170.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
85	VRP (A K Sahu)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
86	INSPIRE Faculty Award (Wahengbam Romi)	-127,358.00	2,291,704.00	0.00	0.00	0.00	0.00	0.00	0.00	2,291,704.00	1,930,560.00
87	Non Collinear (M B Saharia)	0.00	1,520,500.00	0.00	0.00	0.00	0.00	0.00	0.00	1,520,500.00	0.00
88	ST-SC (M R Khan)	0.00	25,611,800.00	0.00	0.00	0.00	0.00	0.00	0.00	25,611,800.00	0.00
89	Empowerment (R Devi)	0.00	3,353,876.00	0.00	0.00	0.00	0.00	0.00	0.00	3,353,876.00	0.00
90	Inspire Fellow (Manju K Jaiswal)	0.00	451,520.00	0.00	0.00	0.00	0.00	0.00	0.00	451,520.00	0.00
91	Inspire Faculty (Rajib Borah)	0.00	2,764,000.00	0.00	0.00	0.00	0.00	0.00	0.00	2,764,000.00	1,284,162.00
92	Birac (N C Talukdar)	0.00	18,747,000.00	0.00	0.00	0.00	0.00	0.00	0.00	18,747,000.00	0.00
93	Women Scientist (Rictika Das)	0.00	906,000.00	0.00	0.00	0.00	0.00	0.00	0.00	906,000.00	178,065.00
94	Evaluation of Antioxide (R Devi)	0.00	656,520.00	0.00	0.00	0.00	0.00	0.00	0.00	656,520.00	140,360.00
95	Inspire Fellow (Sazzadur Rahman)	0.00	423,680.00	0.00	0.00	0.00	0.00	0.00	0.00	423,680.00	403,680.00
96	Understanding Mecha (D Thakur)	0.00	941,496.00	0.00	0.00	0.00	0.00	0.00	0.00	941,496.00	115,775.00
97	Optimisation (M R Khan)	0.00	1,070,700.00	0.00	0.00	0.00	0.00	0.00	0.00	1,070,700.00	540,971.00
98	Phytoparmaceutical (Jagat Borah)	0.00	924,542.00	0.00	0.00	0.00	0.00	0.00	0.00	924,542.00	188,207.00
99	Expert Committee Meeting SC	0.00	1,273,098.00	0.00	0.00	0.00	0.00	0.00	0.00	1,273,098.00	
100	Ramalingaswami (Subrata Pore)	0.00	2,472,000.00	0.00	0.00	0.00	0.00	0.00	0.00	2,472,000.00	1,066,500.00
101	Inspire Fellow Review Meeting	0.00	700,000.00	0.00	0.00	0.00	0.00	0.00	0.00	700,000.00	168,000.00
102	Exploration & Conservaton (D Thakur)	0.00	4,281,496.00	0.00	0.00	0.00	0.00	0.00	0.00	4,281,496.00	106,046.00
103	Inspire Fellow (Sanjib Sau)	0.00	451,520.00	0.00	0.00	0.00	0.00	0.00	0.00	451,520.00	303,920.00
104	Inspire Fellow (Sarojini Devi)	0.00	451,520.00	0.00	0.00	0.00	0.00	0.00	0.00	451,520.00	220,554.00
105	IASST Fund	12,227,172.75	919,183.00	939,252.00	1,050,000.00	45,275,175.00	0.00	2,450.00	0.00	48,186,060.00	8,797.00
	Total	44,237,040.94	110,095,494.00	1,052,349.00	1,050,000.00	45,275,175.00	0.00	2,450.00	0.00	157,475,468.00	35,080,032.00

वित्त एवं लेखा अधिकारी
Finance & Accounts Officer
आई.ए.एस.एस.टी., पश्चिम बड़ागाव
IASST, Paschim Boragaon
गुवाहाटी-35:असम:भारत
Guwahati-781035: Assam:India

Registrar
Institute of Advanced Study
in Science & Technology
Paschim Boragaon
Guwahati-35, Assam, India

K. Barua & Co.
Guwahati
Chartered Accountants

निदेशक/Director
आई.ए.एस.एस.टी., पश्चिम बड़ागाव
IASST, Paschim Boragaon
गुवाहाटी-35:असम:भारत
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FINANCIAL STATEMENTS

THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

	Project Name	Expenditure (i)								Investment in STDR	Inter Transfer	Advance to Overhead A/c	Closing Balance
		Contingency	Equipment	Travel	Consumable	Meeing/Training	Overhead	Misc.	Refund				
1	Plasma Based Synthesis (A R Pal)	59,697.00	328,302.00	0.00	124,892.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	447,834.00
2	Androgen	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-25,353.00
3	Aquatic Biodiversity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-17,308.00
4	DBT-JRF (Arun Kumar)	20,970.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33,077.00
5	Bharalu River	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-579,338.00
6	Bio Informatics	9,770.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,621,001.00
7	Biosurfactance	1,770.00	0.00	1,224.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13,815.00
8	Biotech Hubs	6,800.00	0.00	0.00	0.00	0.00	45,608.00	0.00	0.00	0.00	0.00	0.00	112,345.00
9	Brain storming	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-80,259.00
10	Brain storming meeting-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-50,888.00
11	CSIR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-73.00
12	CSIR (Neelam, Gitumoni, Yogesh)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Culture Collection - D. Thakur	13,830.00	0.00	0.00	165,949.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	446,831.00
14	DBT -Crest (D Devi)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-142,289.00
15	DBT RA (Ananaya Barman)	4,157.00	0.00	0.00	39,397.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	891.00
16	DBT-JRF (Chandana Malakar)	20,317.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10,140.00
17	INSPIRE Fellow (Ibnul Farid)	7,246.00	0.00	16,046.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48,068.00
18	DBT RA (Kamal Das)	51,772.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37,562.00
19	DBT RA (Kaustavmoni)	8,833.00	0.00	168,467.00	10,120.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,172.00
20	DBT RA (Rabinson)	4,050.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00
21	DBT Scented Rice Programme (N C Talukdar)	96,915.00	0.00	36,064.00	75,280.00	0.00	100,000.00	0.00	0.00	0.00	0.00	0.00	127,055.30
22	DBT Scented Rice Programme (R Devi)	9,742.00	0.00	52,642.00	569,590.00	0.00	50,000.00	0.00	0.00	0.00	0.00	0.00	-29,405.20
23	Dev. Of Antigrated (Soumyadeep Nandi)	54,497.00	1,434,710.00	54,017.00	276,843.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,546,142.00
24	Dev. Of nano particle - Poultry Salmonellosis	1,770.00	0.00	1,586.00	167,518.00	0.00	6,000.00	0.00	0.00	0.00	0.00	0.00	274,537.10
25	Diabetic Neuropathic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	DST (J Medhi)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-63,015.00
27	Education	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-33,598.00
28	Effect of Traditional Dietary MR Khan (New)	12,146.00	0.00	24,971.00	1,438,438.00	7,363.00	0.00	0.00	0.00	0.00	0.00	0.00	95,221.56
29	Electronic Alloys magnetic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-5,362.00
30	Engineered Bioremediation (A Devi)	44,515.00	0.00	21,250.00	29,133.00	0.00	100,000.00	0.00	0.00	0.00	0.00	0.00	971,142.00
31	Feasibility study copper alloy (H Bailung)	3,500.00	0.00	397,365.00	77,892.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-187,399.00
32	Flora & Fauna	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-50,567.00
33	Food colour	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1,153.00
34	Glycolipid	19,370.00	0.00	19,332.00	190,396.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	352,442.00
35	Govt of Assam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-140,113.00
36	Head & Neck Cancer (Rosy Mondal)	21,976.00	846,000.00	0.00	468,199.00	0.00	100,000.00	0.00	0.00	0.00	0.00	0.00	710,599.00
37	Herbal Medicine	132,210.00	8,998,624.02	133,303.00	3,480,197.50	6,780.00	605,000.00	0.00	0.00	0.00	1,050,000.00	-6,972,814.00	2,278,625.73
38	Image Processing (Tabassum Y)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	INSPIRE Faculty (Anamika Kalita)	37,671.00	45,429.00	0.00	418,974.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,497,201.00
40	INSPIRE Faculty (Sagar Sarma)	1,770.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	907,642.00
41	INSPIRE Faculty (B Choudhury)	1,770.00	0.00	13,118.00	191,624.00	0.00	35,000.00	0.00	0.00	0.00	0.00	0.00	1,516,064.00
42	INSPIRE Fellow (Bidyut Chutia)	23,709.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	215,339.00
43	INSPIRE Fellow (Kangkana Bora)	9,105.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,288.00
44	INSPIRE Fellow (Palash Jyoti Baruah)	38,230.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	214,536.00
45	INSPIRE Fellow (Purbajyoti Bhagabaty)	17,356.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	238,404.00
46	INSPIRE Fellow (Rakesh Rusel Khanikar)	24,489.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-5,296.00
47	INSPIRE Faculty (Rosy Mondal)	59,954.00	82,000.00	0.00	125,431.00	0.00	35,000.00	0.00	0.00	0.00	0.00	0.00	467,912.00
48	INSPIRE Fellow (Subhankar Pandit)	2,794.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,621.00
49	INSPIRE Fellow (Sweety Biswas)	7,294.00	0.00	0.00	7,670.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-23,481.00
50	INSPIRE Fellow (Tulsi Joshi)	13,037.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8,614.00
51	INSPIRE Fellow (Y bailung)	17,981.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-19,873.00
52	Intestinal Microbiota	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-48,071.00
53	Jhumming	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,720.00
54	PAP Smear Images (L B Mahanta)	1,770.00	0.00	38,699.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-6,194.00
55	Lady Tata (Paramita Choudhury)	29,997.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00
56	Molecular & Biochemical Studies (J Boruah)	10,764.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	367,365.00
57	Muga cultivation (ASTEC)	1,770.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	500,460.00
58	Nano Material & Bimaterials	7,080.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	452.00
59	NPDF (Archana Nath)	25,588.00	0.00	39,300.00	100,958.00	0.00	50,000.00	0.00	0.00	0.00	0.00	0.00	380,930.00

Finance & Accounts Officer
आई.ए.एस.एस.टी, पश्चिम बड़ागाव
IASST, Paschim Boragaon

Registrar
Institute of Advanced Study in Science & Technology
Paschim Boragaon
Guwahati-35, Assam, India

निदेशक/Director
आई.ए.एस.एस.टी, पश्चिम बड़ागाव
IASST, Paschim Boragaon

Guwahati

THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

	Project Name	Expenditure (i)								Investment in STDR	Inter Transfer	Advance to Overhead A/c	Closing Balance
		Contingency	Equipment	Travel	Consumable	Meeing/Training	Overhead	Misc.	Refund				
60	NPDF (Ashim Kr Dutta)	608.00	0.00	0.00	132,464.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,822.00
61	NPDF (Bhaskar Das)	40,058.00	0.00	2.00	157,018.00	0.00	50,000.00	0.00	0.00	0.00	0.00	0.00	77,748.00
62	NPDF (Kaushik Bhattachajee)	19,925.00	0.00	0.00	146,014.00	0.00	50,000.00	0.00	0.00	0.00	0.00	0.00	250,471.00
63	NPDF (Parijat saikia)	98,914.00	0.00	0.00	53,959.00	0.00	35,493.00	0.00	0.00	0.00	0.00	0.00	92,706.00
64	NPDF (Rinkumoni)	13,169.00	0.00	0.00	32,700.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	119,982.00
65	NPDF (Rupamoni Thakur)	1,770.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52,345.00
66	NPDF (Seydur Rahman)	1,770.00	0.00	0.00	102,491.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16,514.00
67	NPDF Fellowship (Abdul Barik)	1,770.00	0.00	0.00	9,750.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,770.00
68	Oxidative degradation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-171,901.00
69	Physico Sensor	0.00	0.00	0.00	28,867.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	130,890.00
70	Plasma modified (J Chutia)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	226,620.00
71	PM 10 & PM 2.5 (A Devi)	20,881.00	0.00	20,270.00	98,160.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	181,129.00
72	Polymer Based Sensors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-568.00
73	Proton Exchange	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-137,261.00
74	QA & QC (N C Talukdar)	60,472.00	217,350.00	312,159.00	920,941.00	55,602.00	0.00	0.00	0.00	0.00	0.00	0.00	7,161,973.00
75	R Devi (Banana)	23,036.08	155,110.00	61,625.00	666,232.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	700,997.92
76	Ramalingaswami (S Kundu)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.00
77	Ramalingaswami (S Nandi)	249,780.00	0.00	-24,271.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6,770.00
78	Ramanujan Fellow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
79	NPDF (Sailendra Gayri)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,419.00
80	ST People Arunachal Pradesh (N C Talukdar)	8,649.00	0.00	27,353.00	214,624.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	173,674.00
81	Structure of Enzymes	1,770.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9,536.00
82	Women Scientist (Sumita Kumari)	1,770.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-73,745.82
83	Tissue Repairs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
84	UGC Grant (MD Shadab)	1,770.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	400.00
85	VRP (A K Sahu)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
86	INSPIRE Faculty Award (Wahengbam Romi)	42,631.00	100,164.00	38,326.00	129,689.00	0.00	35,000.00	0.00	0.00	0.00	0.00	0.00	-112,024.00
87	Non Collinear (M B Saharia)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,520,500.00
88	ST-SC (M R Khan)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25,611,800.00
89	Empowerment (R Devi)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,353,876.00
90	Inspire Fellow (Manju K Jaiswal)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	451,520.00
91	Inspire Faculty (Rajib Borah)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,479,638.00
92	Birac (N C Talukdar)	9,988.00	0.00	10,794.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18,726,218.00
93	Women Scientist (Rictika Das)	3,074.00	0.00	0.00	0.00	0.00	70,000.00	0.00	0.00	0.00	0.00	0.00	654,861.00
94	Evaluation of Antioxide (R Devi)	24,000.00	0.00	0.00	0.00	0.00	35,000.00	0.00	0.00	0.00	0.00	0.00	457,160.00
95	Inspire Fellow (Sazzadur Rahman)	18,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,000.00
96	Understanding Mecha (D Thakur)		0.00	0.00	0.00	0.00	30,000.00	0.00	0.00	0.00	0.00	0.00	795,721.00
97	Optimisation (M R Khan)	50,775.00	265,965.00	39,655.00	482,648.00	0.00	61,500.00	0.00	0.00	0.00	0.00	0.00	-370,814.00
98	Phytopharmaceutical (Jagat Borah)	27,380.00	0.00	0.00	321,403.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	387,552.00
99	Expert Committee Meeting SC	1,173,098.00	0.00	0.00	0.00	0.00	100,000.00	0.00	0.00	0.00	0.00	0.00	0.00
100	Ramalingaswami (Subrata Pore)	19,311.00	0.00	0.00	628,487.00	0.00	50,000.00	0.00	0.00	0.00	0.00	0.00	707,702.00
101	Inspire Fellow Review Meeting	315,851.00	0.00	219,597.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-3,448.00
102	Exploration & Conservaton (D Thakur)	1,000.00	0.00	2,500.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,171,950.00
103	Inspire Fellow (Sanjib Sau)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	147,600.00
104	Inspire Fellow (Sarojini Devi)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	230,966.00
105	IASST Fund	129,351.63	0.00	79,750.00	59.00	347,151.00	0.00	57,822.00	0.00	80,000,000.00	0.00	0.00	-20,209,697.88
	Total	3,298,553.71	12,473,654.02	1,805,144.00	12,084,007.50	416,896.00	1,643,601.00	57,822.00	0.00	80,000,000.00	1,050,000.00	-6,972,814.00	60,775,612.71

Finance & Accounts Officer
आई.ए.एस.एस.टी, पश्चिम बड़गाव
IASST, Paschim Boragaon
गुवाहाटी-35:असम:भारत

Registrar
Institute of Advanced Study
in Science & Technology
Paschim Boragaon
Guwahati-35, Assam, India

निदेशक/Director
आई.ए.एस.एस.टी, पश्चिम बड़गाव
IASST, Paschim Boragaon
गुवाहाटी-35:असम:भारत
781035:Assam:India

Sarda & Co.
Guwahati
Chartered Accountants

FINANCIAL STATEMENTS

THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

BALANCE SHEET OF DST GENERAL FUND AS ON 31ST MARCH, 2020

PARTICULARS	Schedule	Amount (₹) 2019-20	Amount (₹) 2018-19
CAPITAL FUND & LIABILITIES			
Capital Fund	1	663,617,042.74	542,274,345.44
Current Liabilities and Provisions	2	83,404,922.05	115,038,341.16
TOTAL :		**747,021,964.79**	**657,312,686.60**
ASSETS			
Fixed Assets	3	659,819,556.41	540,984,359.41
Current Assets, Loans and Advances	4	87,202,408.38	116,328,327.19
TOTAL :		**747,021,964.79**	**657,312,686.60**

NOTES ON ACCOUNT - SCHEDULE "5"

In terms of our report of even date annexed hereto.

For K P Sarda & Co.
Chartered Accountants
FRN : 319206E

K. P. Sarda & Co. Guwahati Chartered Accountants

(CA. K P Sarda)
Partner
Membership No. 054555

Place : G u w a h a t i
Date : 29/07/2020
UDIN : 20054555AAAAFW5408

वित्त एवं लेखा अधिकारी
Finance & Accounts Officer
आई.ए.एस.एस.टी, पश्चिम बड़ागाव
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Registrar
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Guwahati-781035:Assam:India

1

THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

INCOME AND EXPENDITURE ACCOUNT OF DST GENERAL FUND FOR THE YEAR ENDED 31ST MARCH 2020

EXPENDITURE		Amount (₹)	INCOME	Amount (₹)
Expenditure on Grants			Revenue Grant	209,929,000.00
Salary (Details 1)		127,349,358.00	Penal Interest	387.00
Contingency (Details 2)		21,402,336.11	Interest From Advance	121,832.00
Consumables (Details 3)		9,581,958.00	Bank Interest	17,907.00
Training & Conference		1,276,591.00	Other Income	2,067,112.00
Travelling		2,423,063.00	Round Off	0.30
Honorarium/Consultancy Fees		2,647,863.00		
Security Service		2,417,335.00		
Works and Services (Details 4)		24,320,950.00		
Institutional Projects (Details 5)		544,611.00		
Surplus transferred to				
a) Unutilised Grant	17,964,934.89			
b) Capital Fund	2,207,238.30	20,172,173.19		
		212,136,238.30		212,136,238.30

NOTES ON ACCOUNT - SCHEDULE "5"

In terms of our report of even date annexed hereto.

For K P Sarda & Co.
Chartered Accountants
FRN : 319206E

K. P. Sarda & Co. Guwahati Chartered Accountants

(CA. K P Sarda)
Partner
Membership No. 054555

Place : G u w a h a t i
Date : 29/07/2020
UDIN : 20054555AAAAFW5408

वित्त एवं लेखा अधिकारी
Finance & Accounts Officer
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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

RECEIPTS AND PAYMENTS ACCOUNT OF DST GENERAL FUND FOR THE YEAR ENDED 31ST MARCH 2020

RECEIPTS		Amount (₹)	PAYMENTS		Amount (₹)
To **OPENING BALANCE :**			By **SALARY & ALLOWANCES :**		
Cash in hand	20,000.00		Salary	94,524,864.00	
Cash at Bank (As per Schedule 4)	724,242.93	744,242.93	N.P.S Contribution	13,248,368.00	
			Gratuity Fund Premium	11,034,523.00	
" **GRANT-IN-AID :**			Benevolent Fund	95,000.00	
From Ministry of Science and Technology			Children Education Allowances	1,422,000.00	
Department of Science & Technology, New Delhi			Medical Expenses	2,755,843.00	
			Leave Travel Concession	1,217,966.00	
Capital Grant :			Leave Encashment Retirement	4,562,748.00	
AI/IASST/CAP/003/2019/1	9,652,000.00		EPF Contribution	1,223,384.00	
AI/IASST/CAP/003/2019/2	6,435,000.00		Telephone, Internet & Newspaper	186,847.00	
AI/IASST/CAP/003/2019/3	57,869,000.00		Uniform Allowances	100,000.00	130,371,543.00
AI/IASST/CAP/003/2019/4	14,791,000.00				
AI/IASST/CAP/003/2019/5	59,861,000.00	148,608,000.00	" **GENERAL EXPENDITURE :**		
			Contingency	21,407,650.11	
Revenue Grant :			Consumables	11,016,037.00	
AI/IASST/GEN/003/2019/1	11,828,000.00		Works and Services	25,532,145.00	
AI/IASST/SAL/003/2019/1	40,104,000.00		Training & Conference	1,736,854.00	
AI/IASST/SAL/003/2019/2	14,122,000.00		Travelling	2,257,503.00	
AI/IASST/GEN/003/2019/2	7,671,000.00		Honorarium/Consultancy Fees	2,647,863.00	
AI/IASST/SAL/003/2019/3	54,611,000.00		Security Service	2,417,335.00	
AI/IASST/GEN/003/2019/3	29,111,000.00		Institutional Projects	488,643.00	
AI/IASST/SAL/003/2019/4	21,767,000.00		Bank Interest refund to GOI	770,690.00	68,274,720.11
AI/IASST/GEN/003/2019/4	9,722,000.00				
AI/IASST/SAL/003/2019/5	14,512,000.00		" **CAPITAL EXPENDITURE :**		
AI/IASST/GEN/003/2019/5	6,481,000.00	209,929,000.00	Equipments	2,931,217.00	
			Library	196,604.00	
" **INTEREST :**			Computer & Peripherals	7,396,648.00	
Bank Interest (other than Core Budget)	17,907.00		Air Conditioner	597,635.00	
Bank Interest (DST Core Fund)0	786,513.00		Vehicles	448,400.00	
Interest From Advance	121,832.00		Furniture & Fixtures	2,265,420.00	
Penal Interest	387.00	926,639.00	Plant and Machinery	260,064.00	
			Building & Site Development	152,072,815.00	166,168,803.00
" Security Deposits		4,844,421.00			
			" **CLOSING BALANCE :**		
" Other Income		2,067,112.30	Cash in hand	20,000.00	
			Cash at Bank (As per Schedule 4)	2,284,349.12	2,304,349.12
		367,119,415.23			367,119,415.23

We have verified the above statement of Receipts & payments Account of the DST General Fund of Institute of Advanced Study in Science & Technology, Paschim Boragaon, Guwahati - 781 035, Account - Plan for the period from 1st April 2019 to 31st March, 2020 from the Books of Accounts and vouchers produced before us.

UDIN : 20054555AAAAFW5408
Place : G u w a h a t i
Date : 29/07/2020

For K P Sarda & Co.
Chartered Accountants
FRN : 319206E

(CA. K P Sarda)
Partner
Membership No. 054555

THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

SCHEDULE - 1 : :: CAPITAL FUND ::

	Amount(₹) 2019-20	Amount (₹) 2018-19
Opening Balance	542,274,345.44	471,370,023.16
Add : Contribution towards Capital Fund (Addition to Fixed Assets)	199,922,998.00	139,220,654.28
Add : Upgrading	300,262.00	0.00
Add : Surplus for the year	2,207,238.30	1,289,986.00
	744,704,843.74	611,880,663.44
Less : Depreciation for the year	81,087,801.00	69,606,318.00
	663,617,042.74	**542,274,345.44**

SCHEDULE - 2 : :: CURRENT LIABILITIES AND PROVISIONS ::

		Amount(₹) 2019-20	Amount (₹) 2018-19
CURRENT LIABILITIES :			
Unutilised Grant in Aid	(As per Annexure "A")	66,970,074.05	100,320,137.16
Security Deposit Payable	(As per Annexure "B")	15,596,135.00	10,751,714.00
Other Current Liabilities	(As per Annexure "C")	838,713.00	3,966,490.00
		83,404,922.05	**115,038,341.16**

SCHEDULE - 4 : :: CURRENT ASSETS, LOANS & ADVANCES ::

		Amount(₹) 2019-20	Amount(₹) 2018-19
(A) CURRENT ASSETS :			
Cash in hand		20,000.00	20,000.00
Balance with Banks	**Account No.**		
SBI Khanapara Branch	(943972)	1,387,269.27	158,215.28
SBI Khanapara Branch - Workshop	(943723)	336,365.83	181,366.83
Bank of Baroda - Travel	(000441)	382,757.49	163,176.29
SBI Garchuk - International Conference	(635294)	26,292.00	12,335.00
SBI - IASST Corpus Fund	(943064)	151,664.53	209,149.53
	TOTAL (A)	2,304,349.12	744,242.93
(B) LOANS, ADVANCES & OTHER ASSETS :			
Advance to Extramural Project			
Bank of Bank - Conference (000918)		107,090.00	107,090.00
SBI Garchuk - Seminar (888433)		64,830.00	64,830.00
HDFC Bank for LC/TT		171,909.96	171,909.96
Advances against Expenditure of Grants	(Annexure "D")	24,760,921.28	20,094,044.28
Advances against Fixed Assets	(Annexure "E")	59,793,308.02	95,146,210.02
	TOTAL (B)	84,898,059.26	115,584,084.26
	TOTAL (A+B)	**87,202,408.38**	**116,328,327.19**

K. Agarwala & Co. Guwahati Chartered Accountants

THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

SCHEDULE - 3 :

:: FIXED ASSETS ::

PARTICULARS OF DEPRECIATION ALLOWABLE AS PER THE IT ACT, 1961 IN RESPECT OF EACH ASSET OR BLOCK OF ASSETS, AS THE CASE MAY BE, IN THE FOLLOWING FORM

Particulars	W.D.V on 01/04/19	Additons/(Deletion) >180 days	Additons/(Deletion) <180 days	Total	Depreciation	W.D.V on 31/03/20
Block "A" : 0%						
Land	0.00	0.00	0.00	0.00	0.00	0.00
Block "B" : 10%						
Building & Site Developmei	378,383,696.66	46,063,493.00	108,881,461.00	533,328,650.66	47,888,792.00	485,439,858.66
Furniture & Fixtures	31,917,665.00	1,543,868.00	702,106.00	34,163,639.00	3,381,259.00	30,782,380.00
Block "C" : 15%						
Equipments	113,244,349.73	30,717,155.00	3,670,191.00	147,631,695.73	21,869,490.00	125,762,205.73
Air Conditioner	4,272,399.00	426,635.00	171,000.00	4,870,034.00	717,680.00	4,152,354.00
Refrigerator	9,178.00	0.00	0.00	9,178.00	1,377.00	7,801.00
Projector	66,961.00	0.00	0.00	66,961.00	10,044.00	56,917.00
Vehicles	1,554,159.00	448,400.00	0.00	2,002,559.00	300,384.00	1,702,175.00
Plant and Machinery	0.00	204,014.00	1,690.00	205,704.00	30,729.00	174,975.00
Block "D" : 40%						
Library	2,119,759.00	0.00	196,604.00	2,316,363.00	887,224.00	1,429,139.00
Computer	9,413,885.02	4,275,343.00	2,621,038.00	16,310,266.02	5,999,899.00	10,310,367.02
Printer & Xerox Machine	1,202.00	0.00	0.00	1,202.00	481.00	721.00
Computer Software	1,105.00	0.00	0.00	1,105.00	442.00	663.00
	540,984,359.41	83,678,908.00	116,244,090.00	740,907,357.41	81,087,801.00	659,819,556.41

वित्त एवं लेखा अधिकारी
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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

SCHEDULE " 5 " : SIGNIFICANT ACCOUNTING POLICES :

1. **ACCOUNTING CONVENTION :**

   The Financial Statements are prepared on the basis of historical cost convention, unless otherwise stated and on the Accrual method of accounting.

2. **REVENUE RECOGNITION :**

   (a)Income on Interest bearing securities and Term Deposits is recognised on accrual basis as and when these are realised.

   (b) Income other than Interest Income are recognised on Cash Basis.

3. **INVESTMENTS :**

   Term deposits with Banks are taken as Investments and valued at accrual basis.

4. **FIXED ASSETS :**

   Fixed Assets are stated at cost of acquisiton, inclusive of inward freight, duties and taxes and incidental and direct expenses related to acquisiton less depreciation.

5. **DEPRECIATION :**

   (a) Depreciation on Fixed assets purchased/acquired/ constructed out of Government Grants is charged on WDV Method as per the rates specified under the Income Tax Act, 1961.

   (b) Depreciation is charged to Capital Fund by way of reducing the net value of Fixed Assets.

6. **GOVERNMENT GRANTS/SUBSIDIES :**

   Revenue Grants are shown as income on realisation basis and expenditure thereof is charged to appropriate revenue heads. In the case Capital Grant, the Capital Fund is credited to the extent of the amount of acquisition of Fixed Assets and the balance remains in Unutilised Grant.

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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

NOTES ON ACCOUNTS :

(i) No provision has been made in respect of Leave Salary.

(ii) Purchase of consumable items during the year are treated as expenditure and charged to revenue.

(iii) In the opinion of the Management, the Current Assets, Loans and Advances have a value on realisation equal or atleast to the aggregate amount shown in the Balance Sheet.

(iv) Balances under Current Liabilities, Loans and Advances are subject to conformation /reconciliation /adjustments, if any.

(v) No provision is made for Contingent Liability, except for cases where provision needs to be made, based on expert opinion.

(vi) Previous years figure have been rearranged and regrouped wherever considered necessary to facilitate comparison.

(vii) Bank Interest received in SBI Khanapara during the year is not recognised as Income instead shown as Current Liability because it will be refunded to DST, Govt. of India.

(viii) Any surplus balance that remains in Income & Expenditure A/c after adjusting the Revenue Expenditure with the Revenue Grant and Other Income is transferred to Unutilised Grant.

K. P. Sinha & Co. Guwahati Chartered Accountants

वित्त एवं लेखा अधिकारी
Finance & Accounts Officer
आई.ए.एस.एस.टी, पश्चिम बड़ागाव
IASST, Paschim Boragaon
गुवाहाटी-35:असम:भारत
Guwahati-781035: Assam:India

Registrar
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in Science & Technology
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Guwahati-35, Assam, India

निदशक/Director
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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

Annexure "A" - Unutilised Grant

	Amount(₹)
Opening Balance	100,320,137.16
Add : Capital Grant received during the year	148,608,000.00
Add : Unutilised Revenue Grant for the year	17,964,934.89
	266,893,072.05
Less : Contribution towards Capital Fund (Addition to Fixed Assets)	199,922,998.00
Closing Balance	66,970,074.05

Annexure "B" - Security Deposit Payable

	Amount(₹)
Works & Service	652,401.00
Building & Site Development	14,943,734.00
	15,596,135.00

Annexure "C" - Other Current Liabilities

	Amount(₹)
Bank Interest Refundable to DST, Govt. of India	786,513.00
Employee Provident Fund	52,200.00
	838,713.00

K. P. Kakoty & Co. Guwahati Chartered Accountants

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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

Annexure "D" - Advance against expenditure on grant :

		Amount(₹)
Current year unadjusted advance :		
Salary	5,241,835.00	
Empowerment of SC/ST	52,000.00	
Contingency	163,367.00	
Training & Conference	673,789.00	
Works and Services	1,379,243.00	
GST Receivable	49,372.00	
Consumables	844,536.00	8,404,142.00
Earlier years unadjusted advance :		
Salary	7,629,665.00	
Empowerment of SC/ST	0.00	
Contingency	545,867.00	
Training & Conference	1,422,381.00	
Works and Services	5,343,382.00	
Travel	34,180.00	
Consumables	1,381,304.28	16,356,779.28
TOTAL :		**24,760,921.28**

Annexure "E" - Advance against Fixed Assets :

		Amount(₹)
Current year unadjusted advance :		
Building & Site Development	2,055,248.00	
Computer & Peripherials	437,653.00	
Plant & Machinery	54,360.00	
Equipment	853,040.00	3,400,301.00
Earlier years unadjusted advance :		
Building & Site Development	18,431,848.00	
Computer & Peripherials	1,027,115.00	
Furniture & Fixture	94,324.00	
Equipment	36,839,720.02	56,393,007.02
		59,793,308.02

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K. Barua & Co. Chartered Accountants Guwahati

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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

Details of Income & Expenditure

Details 1 : Salary and Allowances :

	Amount(₹) 2019-20	Amount(₹) 2018-19
General Fund :		
Salary	90,453,726.00	79,320,824.00
N.P.S Contribution	13,237,291.00	10,256,338.00
Gratuity Fund Premium	11,034,523.00	6,914,595.00
Benevolent Fund	95,000.00	0.00
NSDLS Service Charges	11,077.00	11,072.00
Children Education	1,422,000.00	1,631,190.00
Medical Expenses	3,694,200.00	2,327,520.00
Leave Travel Concession	882,307.00	564,184.00
Leave Encashment	335,659.00	2,654,830.00
Leave Encashment (Retirement)	4,562,748.00	0.00
EPF Contribution	1,160,674.00	1,119,470.00
EPFO Service Charge	66,067.00	49,032.00
Fellowship	254,094.00	0.00
Summer Traineeship	0.00	265,096.00
Labour and Wages	64,360.00	2,320,763.00
Telephone, Internet & Newspaper	186,847.00	157,652.00
Non Productive Linked Bonus	296,252.00	0.00
Overtime Allowances	349,691.00	0.00
Transport Allowance	9,500.00	0.00
Warden Allowance	71,700.00	0.00
Uniform Allowances	100,000.00	124,924.00
	128,287,716.00	107,717,490.00

Details 2 : Contingency Expenses :

	Amount(₹) 2019-20	Amount(₹) 2018-19
General Fund :		
Meeting Expenses	1,568,480.00	2,677,890.00
Advertisement	542,867.00	1,908,582.00
Postage	151,523.00	259,914.00
Electricity & Power	9,984,922.00	9,813,100.00
Audit Fee	41,300.00	41,300.00
Telephone Charges	36,066.00	85,041.00
Repairs & Maintenance - Vehicle	1,951,898.00	2,042,601.00
Printing & Stationery	2,259,365.00	2,725,406.00
Computer Stationery	549,500.00	665,699.00
Hospitality	2,616,805.00	3,202,137.00
Conveyance	79,599.00	88,779.00
Legal Fees	1,017,432.00	156,930.00
Newspapers & Periodicals	71,458.00	99,625.00
Sitting Fees	608,415.00	0.00
Bank Charges	12,485.11	12,554.38
Initiative for Income Generation	0.00	166,248.00
	21,492,115.11	23,945,806.38

Details 3 : Laboratory Consumables :

	Amount(₹) 2019-20	Amount(₹) 2018-19
General Fund :		
Laboratory Gas Refilling	159,184.00	271,959.00
Chemicals & Glassware	7,381,917.00	8,369,583.12
Sample Analysis	321,706.00	202,796.82
Sample Collection	1,139,921.00	41,116.00
Renewal/Other Fee Payments	211,096.00	670,394.00
Experimental Animal Maintenance	368,134.00	512,020.00
	9,581,958.00	10,067,868.94

K. Poddar & Co. Guwahati Chartered Accountants

FINANCIAL STATEMENTS

THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

Details of Income & Expenditure

Details 4 : Works & Services :	Amount(₹) 2019-20	Amount(₹) 2018-19
General Fund :		
Repairing & Maintenance (Equipment)	6,593,512.00	6,986,279.16
Gardening & Landscaping	330,853.00	241,336.00
Repairing & Maintenance (Electrical)	772,230.00	2,132,739.00
Repairing & Maintenance (General)	16,282,500.00	12,582,314.00
Repairing & Maintenance (SSH)	341,855.00	951,454.00
	24,320,950.00	**22,894,122.16**

Details 5 : Institutional Projects :	Amount(₹) 2019-20	Amount(₹) 2018-19
General Fund :		
Commercialisation of Research Output	0.00	10,760.00
Empowerment of SC/ST People (Horticulture at Rani)	385,586.00	767,658.00
Empowerment of SC/ST (Silkworm Expenditure)	78,899.00	0.00
Institutional Projects Production of Candy	42,366.00	32,681.00
Protective & Decorative Coating on Bell Metal	37,760.00	65,942.00
	544,611.00	**877,041.00**

K. Barua & Co. Guwahati Chartered Accountants

वित्त एवं लेखा अधिकारी
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K P SARDA & COMPANY
CHARTERED ACCOUNTANTS

GFR 12 - A
[See Rule 238 (1)]

FORM OF UTILIZATION CERTIFICATE
FOR AUTONOMOUS BODIES OF THE GRANTEE ORGANIZATION

UTILIZATION CERTIFICATE FROM 1st APRIL, 2019 TO 31st March, 2020
in respect of recurring/non recurring
GRANTS-IN-AID/ SALARIES/CREATION OF CAPITAL ASSETS

1. **Name of the Scheme** : The Institute of Advanced Study in Science & Technology

2. **Whether recurring or non-recurring grants** : Recurring and Non-Recurring Grants

3. **Grants position at the beginning of the Financial year :**

   (i) Cash in Hand/Bank : 7,44,242.93
   (ii) Unadjusted Advances : N/A
   (iii) Total : Nil

4. Details of grants received, expenditure incurred and closing balances : (Actuals)

Unspent	Interest	Interest	Sanction	Sanction	Amount (Rs.)	Total	Expenditure	Closing
1	2	3			4	5	6	7
744,242.93	2,993,751.30	770,690.00	Annexure: I	Annexure: I	358,537,000.00	361,504,304.23	359,199,955.11	2,304,349.12

Grant-in-aid-General	Grant-in-aid-Salary	Grant-in-aid-Creation of Capital Assets	Total
67,504,030.11	130,371,543.00	161,324,382.00	359,199,955.11

5 Details of grants position as on : 31/03/2020

(i) Cash in Hand/Bank : 23,04,349.12
(ii) Unadjusted Advances : N/A
(iii) Total : Nil

Note:
(1) During the FY 2019-20 Institute has earned Rs.8,04,420.00.00 as Interest and Rs.21,89,331.30.00 as Other Receipt. Utilisation Certificate does not have the provision for showing of Other Receipt seperately and therefore this amount is added in interest

(2) Closing Balance includes 5nos. of bank balance which are SBI Khanapara Core fund A/c Rs.13,87,269.27/-, SBI Khanapara

Certified that I have satisfied myself that the conditions on which grants was sanctioned have been fulfilled/are being fulfilled and that I have exercised following checks to see that the money was actually utilized for the purpose for which it was sanctioned :

(1) The main accounts and other subsidiary accounts and registers (including assets registers) are maintained as prescribed in the relevent Act/Rules/Standing instructions (mentioned the Act/Rules) and have been duly audited by designated auditors. The figures depicted above tally with the audited figures mentioned in financial statements/ accounts.

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kpsarda@gmail.com
K P SARDA & COMPANY CHARTERED ACCOUNTANTS
SC-11, Parmeshwari Building, 2nd Floor
Chatribari Road, Guwahati - 781001, Assam
http://kpsardaco.org.in

वित्त एवं लेखा अधिकारी
Finance & Accounts Officer
आई.ए.एस.टी., पश्चिम बड़ागाव
IASST, Paschim Boragaon
गुवाहाटी-35:असम:भारत
Guwahati-781035: Assam:India

K. P. Sarda & Co. Guwahati Chartered Accountants

Registrar
Institute of Advanced Study in Science & Technology
Paschim Boragaon
Guwahati-35, Assam, India

निदेशक/Director
आई.ए.एस.एस.टी, पश्चिम बड़ागाव
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K P SARDA & COMPANY
CHARTERED ACCOUNTANTS

(2) There exists internal controls for safeguarding public funds/assets, watching outcomes and achievements of physical targets against the financial inputs, ensuring quality in assset creation etc and the periodic evaluation of internal controls is exercised to ensure their effectiveness.

(3) To the best of our knowledge and belief, no transactions have been entered that are in violation of relevant Act/ and scheme

(4) The responsibilities among the key functionaries for execution of the scheme have been assigned in clear terms and are not general in nature.

(5) The expenditure on various components of the scheme was in the proportions authorized as per the scheme guidelines and terms and conditions of the grants-in-aid.

For K P Sarda & Co.
Chartered Accountants
FRN : 319206E

UDIN : 20054555AAAAFX166
Place : G u w a h a t i
Date : 29/07/2020

(Pradyut Borkataki)
Chief Finance Officer
Head of the Finance

(H. Bailung)
Head of the Organisation

(CA. Kailash Prasad Sarda)
Partner
Membership No. 054555

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HE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOG

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

Grants-in-Aid received for the year 2019-20

Annexture: I

Sl. No.	Sanction Letter No.	Date	Amount (₹)
1	AI/IASST/GEN/003/2019/1	26/04/2019	11,828,000.00
2	AI/IASST/CAP/003/2019/1	26/04/2019	9,652,000.00
3	AI/IASST/SAL/003/2019/1	26/04/2019	40,104,000.00
4	AI/IASST/SAL/003/2019/2	27/06/2019	14,122,000.00
5	AI/IASST/CAP/003/2019/2	26/06/2019	6,435,000.00
6	AI/IASST/GEN/003/2019/2	26/06/2019	7,671,000.00
7	AI/IASST/SAL/003/2019/3	29/08/2019	54,611,000.00
8	AI/IASST/GEN/003/2019/3	27/09/2019	29,111,000.00
9	AI/IASST/CAP/003/2019/3	27/09/2019	57,869,000.00
10	AI/IASST/SAL/003/2019/4	23/12/2019	21,767,000.00
11	AI/IASST/GEN/003/2019/4	23/12/2019	9,722,000.00
12	AI/IASST/CAP/003/2019/4	23/12/2019	14,791,000.00
13	AI/IASST/SAL/003/2019/5	30/01/2020	14,512,000.00
14	AI/IASST/CAP/003/2019/5	27/02/2020	59,861,000.00
15	AI/IASST/GEN/003/2019/5	27/02/2020	6,481,000.00
	Total		**358,537,000.00**

K. Sharda & Co. Guwahati Chartered Accountants

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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

Annexure: II

HEADWISE EXPENDITURE DETAILS OF CORE BUDGET ACTIVITIES DURING THE FY 2019-20

Major Head	Subhead	Amount	Total
Salary & Allowances			130,371,543.00
	Salary	94,134,710.00	
	N.P.S Contribution	13,237,291.00	
	Gratuity Premium	11,034,523.00	
	Benevolent Fund	95,000.00	
	NSDLS Service Charges	11,077.00	
	Children Education	1,422,000.00	
	Medical Expenses	2,755,843.00	
	Leave Travel Concession	882,307.00	
	Leave Encashment	335,659.00	
	Leave Encashment Retirement	4,562,748.00	
	EPF Contribution	1,157,317.00	
	EPFO Service Charge	66,067.00	
	Fellowship (Inters)	254,094.00	
	Labour and Wages	64,360.00	
	Telephone, Internet & Newspaper	186,847.00	
	Warden Allowance	71,700.00	
	Uniform Allowances	100,000.00	
GENERAL			67,015,387.11
	Contingency	21,407,650.11	
	Consumables	11,016,037.00	
	Works and Services	25,532,145.00	
	Training & Conference	1,736,854.00	
	Travelling	2,257,503.00	
	Honorarium/Consultancy Fees	2,647,863.00	
	Security Service	2,417,335.00	
	Institutional Projects		488,643.00
CAPITAL			161,324,382.00
	Equipments	2,931,217.00	
	Library	196,604.00	
	Computer & Peripherals	7,396,648.00	
	Air Conditioner	597,635.00	
	Vehicles	448,400.00	
	Furniture & Fixtures	2,265,420.00	
	Plant and Machinery	260,064.00	
	Building & Site Development	147,228,394.00	
Grand Total			**359,199,955.11**

वित्त एवं लेखा अधिकारी
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K. P. Agarwala & Co.
Chartered Accountants
Guwahati

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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

BALANCE SHEET OF Miscellaneous, SSH, Upgrading, Benevolent & Corpus Fund AS ON 31ST MARCH, 2020

PARTICULARS	Schedule	Amount (₹) 2019-20	Amount (₹) 2018-19
CAPITAL FUND & LIABILITIES			
Capital Fund	1	85,218,476.78	84,157,253.93
Reserves & Surplus	2	4,572.00	77,492.00
Current Liabilities and Provisions	3	5,082,108.23	11,943,522.23
TOTAL :		90,305,157.01	96,178,268.16
ASSETS			
Fixed Assets	4	54,532,409.45	61,092,008.45
Investments	5	30,000,000.00	10,000,000.00
Current Assets, Loans and Advances	6	5,772,747.56	25,086,259.71
TOTAL :		90,305,157.01	96,178,268.16

NOTES ON ACCOUNT - SCHEDULE "7"

In terms of our report of even date annexed hereto.

For K P Sarda & Co.
Chartered Accountants
FRN : 319206E

K. P. Sarda & Co. Guwahati Chartered Accountants

(CA. K P Sarda)
Partner
Membership No. 054555

Place : G u w a h a t i
Date : 29/07/2020
UDIN : 20054555AAAAFW5408

वित्त एवं लेखा अधिकारी
Finance & Accounts Officer
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निदेशक/Director
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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

CONSOLIDATED INCOME & EXPENDITURE ACCOUNT OF Miscellaneous, SSH, Upgrading, Benevolent & Corpus Fund FOR THE YEAR ENDED 31ST MARCH 2020

EXPENDITURE		Amount (₹)	INCOME		Amount (₹)
Mess Expenditures		1,818,635.00	**OTHER RECEIPTS :**		
			Bank Interest	341,431.00	
Bank Charges		21,285.96	Income Tax Refund	15,558.00	
			Interest on Investment	1,186,518.00	
Surplus transferred to			Other Income	5,876,231.05	
a) Benevolent Fund	102,080.00		Mess Dues	2,041,004.76	9,460,742.81
b) Capital Fund	7,620,821.85	7,722,901.85			
			Contribution to Employees Benevolent Fund		102,080.00
		9,562,822.81			9,562,822.81

NOTES ON ACCOUNT - SCHEDULE "7"

In terms of our report of even date annexed hereto.

For K P Sarda & Co.
Chartered Accountants
FRN : 319206E

K. P. Sarda & Co. Guwahati Chartered Accountants

(CA. K P Sarda)
Partner
Membership No. 054555

Place : G u w a h a t i
Date : 29/07/2020
UDIN : 20054555AAAAFW5408

वित्त एवं लेखा अधिकारी
Finance & Accounts Officer
आई.ए.एस.एस.टी, पश्चिम बड़ागाव
IASST, Paschim Boragaon
गुवाहाटी-35:असम:भारत
Guwahati-781035: Assam:India

Registrar
Institute of Advanced Study in Science & Technology
Paschim Boragaon
Guwahati-35, Assam, India

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THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

PASCHIM BORAGAON, GARCHUK, GUWAHATI- 781035

CONSOLIDATED RECEIPTS & PAYMENTS ACCOUNT OF Miscellaneous, SSH, Upgrading, Benevolent & Corpus Fund FOR THE YEAR ENDED 31ST MARCH 2020

RECEIPTS		Amount (₹)	PAYMENTS	Amount (₹)
To **OPENING BALANCE :**			By **EXPENDITURES :**	
Unspent as on 31/03/2019		24,962,235.71	Mess Expenditures	1,818,635.00
			Investment in STDR	20,000,000.00
" **OTHER RECEIPTS :**				
Bank Interest	341,431.00		" Repayment of advance	6,972,814.00
Interest on Inve	1,186,518.00			
Other Income	5,876,231.05		" Bank Charges	21,285.96
Mess Dues	2,041,004.76	9,445,184.81		
			" Employees Benevolent Fund	175,000.00
" Income Tax Refund		15,558.00		
			" **CLOSING BALANCE :**	
" Earnest Money		111,400.00	Unspent as on 31/03/2020	5,648,723.56
" Contribution to Employees Benevolent Fund		102,080.00		
		34,636,458.52		34,636,458.52

For K P Sarda & Co.
Chartered Accountants
FRN : 319206E

K. P. Sarda & Co. Guwahati Chartered Accountants

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Partner
Membership No. 054555

JDIN : 20054555AAAAFW5408
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SCHEDULE - 1 : :: CAPITAL FUND ::

	Amount(₹) 2019-20	Amount (₹) 2018-19
Opening Balance	84,157,253.93	85,648,418.34
Add : Surplus for the year	7,620,821.85	5,885,591.59
Add : Contribution towards Capital Fund (Addition to Fixed Assets)	0.00	0.00
Add : Transferred from Unutilised Grant	0.00	0.00
	91,778,075.78	91,534,009.93
Less : Depreciation for the year	6,559,599.00	7,376,756.00
	85,218,476.78	**84,157,253.93**

SCHEDULE - 2 : :: RESERVES & SURPLUS ::

	Amount(₹) 2019-20	Amount (₹) 2018-19
IASST Employees Benevolent Fund (664178)	4,572.00	77,492.00
	4,572.00	**77,492.00**

SCHEDULE - 3 : :: CURRENT LIABILITIES AND PROVISIONS ::

CURRENT LIABILITIES :	Amount(₹) 2019-20	Amount (₹) 2018-19
Advance from Extramural Projects	4,877,495.00	11,850,309.00
Security Deposit (SSH)	19,392.23	19,392.23
Earnest Money (Misc./Overhead)	181,400.00	70,000.00
Payable to core fund	3,821.00	3,821.00
	5,082,108.23	**11,943,522.23**

SCHEDULE - 5 : :: INVESTMENTS ::

	Amount(₹)
Opening Balance	10,000,000.00
Add : Investment made during the year	20,000,000.00
Add : Interest Accrued during the year	1,186,518.00
Less : Interest received during the year	1,186,518.00
Balance as on 31/03/2020	**30,000,000.00**

SCHEDULE - 6 : :: CURRENT ASSETS, LOANS & ADVANCES ::

CURRENT ASSETS :		Amount(₹) 2019-20	Amount(₹) 2018-19
TDS Receivable		124,024.00	124,024.00
Balance with Banks	**Account No.**		
SBI - IASST Employees Benevolent Fund	(664178)	9,723.00	80,217.00
SBI - Students & Scientist Home (IASST)	(412886)	703,997.48	479,212.79
SBI G.U. Branch - Upgrading	(131613)	65,504.86	48,670.86
Vijaya Bank - Overhead/Miscellaneous	(000466)	4,869,498.22	24,354,135.06
TOTAL :		**5,772,747.56**	**25,086,259.71**

K. Sarda & Co. Guwahati Chartered Accountants

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SCHEDULE - 4 : **:: FIXED ASSETS ::**

PARTICULARS OF DEPRECIATION ALLOWABLE AS PER THE IT ACT, 1961 IN RESPECT OF EACH ASSET OR BLOCK OF ASSETS, AS THE CASE MAY BE, IN THE FOLLOWING FORM

Particulars	W.D.V on 01/04/19	Additons/(Deletion >180 days	<180 days	Total	Depreciation	W.D.V on 31/03/20
Block "A" : 10%						
Building & Site Developmer	51,626,920.00	0.00	0.00	51,626,920.00	5,162,692.00	46,464,228.00
Furniture & Fixtures	457,127.45	0.00	0.00	457,127.45	45,713.00	411,414.45
Block "C" : 15%						
Equipments	4,877,628.00	0.00	0.00	4,877,628.00	731,644.00	4,145,984.00
Vehicles	4,130,333.00	0.00	0.00	4,130,333.00	619,550.00	3,510,783.00
	61,092,008.45	0.00	0.00	61,092,008.45	6,559,599.00	54,532,409.45

K. Barua & Co. Guwahati Chartered Accountants

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SCHEDULE " 7 " : SIGNIFICANT ACCOUNTING POLICES :

1. **ACCOUNTING CONVENTION :**

   The Financial Statements are prepared on the basis of historical cost convention, unless otherwise stated and on the Accrual method of accounting.

2. **REVENUE RECOGNITION :**

   (a) Income on interest bearing securities and term deposits is recognised on accrual basis as and when these are realised.

   (b) Income other than interest income are recognised on cash basis.

3. **INVESTMENTS :**

   Term deposits with Banks are taken as investments and valued at accrual basis.

4. **FIXED ASSETS :**

   Fixed Assets are stated at cost of acquisiton, inclusive of inward freight, duties and taxes and incidental and direct expenses related to acquisiton less depreciation.

5. **DEPRECIATION :**

   (a) Depreciation on Fixed assets purchased/acquired/ constructed out of government grants is charged on WDV Method as per the rates specified under the Income Tax Act, 1961.

   (b) Depreciation is charged to Capital Fund by way of reducing the net value of fixed assets.

Guwahati Chartered Accountants

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NOTES ON ACCOUNTS :

(i) No provision has been made in respect of Leave Salary.

(ii) Purchase of consumable items during the year are treated as expenditure and charged to revenue.

(iii) In the opinion of the Management, the Current Assets, Loans and Advances have a value on realisation equal or atleast to the aggregate amount shown in the Balance Sheet.

(iv) Balances under Current Liabilities, Loans and Advances are subject to conformation /reconciliation /adjustments, if any.

(v) No provision is made for Contingent Liability, except for cases where provision needs to be made, based on expert opinion.

(vi) Previous years figure have been rearranged and regrouped wherever considered necessary to facilitate comparison.

(vii) Any surplus balance that remains in Income & Expenditure A/c after adjusting the expenditure with the income is transferred to Capital Fund.

K. P. Agarwala & Co. Guwahati Chartered Accountants

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PASCHIM BORAGAON,GUWAHATI- 781035

RECEIPTS & PAYMENTS ACCOUNT OF OVERHEAD/MISCELLANEOUS FUND FOR THE YEAR ENDED 31ST MARCH 2020

RECEIPTS		Amount (₹)	PAYMENTS	Amount (₹)
To **OPENING BALANCE :**			By **EXPENDITURES :**	
Unspent as on 31/03/2019		24,354,135.06	" Investment in STDR	20,000,000.00
" **OTHER RECEIPTS :**			" Bank Charges	1,976.89
Bank Interest	316,005.00			
Interest on Investmer	1,186,518.00		" Loan Repayment	6,972,814.00
Other Income	5,876,231.05	7,378,754.05	(Herbal Medicine)	
" Security Deposit		111,400.00	" **CLOSING BALANCE :**	
			Unspent as on 31/03/202	4,869,498.22
		31,844,289.11		31,844,289.11

For K P Sarda & Co.
Chartered Accountants
FRN : 319206E

K. P. Sarda & Co. Guwahati Chartered Accountants

(CA. K P Sarda)
Partner
Membership No.054555

UDIN : 20054555AAAAFW5408
Place : G u w a h a t i
Date : 29/07/2020

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PASCHIM BORAGAON,GUWAHATI- 781035

RECEIPTS & PAYMENTS ACCOUNT OF STUDENT AND SCIENTIST HOME FUND FOR THE YEAR ENDED 31ST MARCH 2020

RECEIPTS		Amount (₹)	PAYMENTS		Amount (₹)
To **OPENING BALANCE :**			By **EXPENDITURES :**		
Unspent as on 31/03/2019		479,212.79	Hospitality Expenditur	1,818,635.00	
			Bank Charges	19,309.07	1,837,944.07
" **OTHER RECEIPTS :**					
Bank Interest	21,724.00		" **CLOSING BALANCE :**		
Mess Dues	2,041,004.76	2,062,728.76	Unspent as on 31/03/2020		703,997.48
		2,541,941.55			2,541,941.55

For K. P. Sarda & Co.
Chartered Accountants
FRN : 319206E

K. P. Sarda & Co. Guwahati Chartered Accountants

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RECEIPTS & PAYMENTS ACCOUNT OF UPGRADING FUND FOR THE YEAR ENDED 31ST MARCH 2020

RECEIPTS	Amount (₹)	PAYMENTS	Amount (₹)
To **OPENING BALANCE :**		By **EXPENDITURES :**	0.00
Unspent as on 31/03/2019	48,670.86		
" **OTHER RECEIPTS :**			
Bank Interest	1,276.00	" **CLOSING BALANCE :**	
Income Tax Refund	15,558.00	Unspent as on 31/03/2020	65,504.86
	65,504.86		65,504.86

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RECEIPTS & PAYMENTS ACCOUNT OF EMPLOYEES BENEVOLENT FUND FOR THE YEAR ENDED 31ST MARCH 2020

RECEIPTS	Amount (₹)	PAYMENTS	Amount (₹)
To **OPENING BALANCE :**		By **EXPENDITURES :**	
Unspent as on 31/03/2019	80,217.00	Employees Benevolent Fund	175,000.00
" Contribution to Employees Benevolent Fund	102,080.00	" **CLOSING BALANCE :** Unspent as on 31/03/2020	9,723.00
Bank Interest	2,426.00		
	184,723.00		184,723.00

For K. P. Sarda & Co.
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Semaphore Technologies Pvt. Ltd.

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