

CREATORS

NEWSLETTER OF BIONEST-IASST

In Association with ISVEC

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FROM EDITOR'S DESK

It is my immense pleasure to join as the Director of the *Institute of Advance Study in Science and Technology* (IASST), Guwahati, one of the premier centers for research functioning as an autonomous research Institute under the aegis of the Department of Science and Technology, Ministry of Science and Technology, Govt. of India. The IASST has a clear mandate and vision to become a center for excellence in cutting-edge areas of research of international standard and creation of trained manpower for advanced scientific knowledge to augment the scientific research as well as to serve the society. It is a matter of great pleasure to

note that IASST has made substantial progress to reassure and support the high quality research and innovation, development of technology and scientific manpower, in addition to taking key initiatives for the welfare of the society by endorsing several outreach activities. It has been recently realized that prioritization of the research area as per the indigenous and nation's need (*think globally but act locally*), and promotion of value-added applied research to improve the economic development of the country are of utmost necessity; therefore, start-up prospects has been given enormous importance. To fulfill this noble mission, an innovative scheme 'IASST Societal Venture and Entrepreneurship Consortium' (ISVEC) the primary objective of which is to test the proof-of-concept of technologies developed by research scholars and scientists of IASST was initiated. In the future, ISVEC may also take initiatives to assess the technologies developed in other Institutes of NE India on a commercial basis. In addition, the institute welcomes various other related activities under ISVEC for the benefit of prospective entrepreneurs and also giving the best possible efforts to generate internal revenues. To nurture Bio-entrepreneurship, BioNest (Bio incubators Nurturing Entrepreneurship for Scaling Technologies) was founded by BIRAC, Govt. of India. One of the major objectives of BioNest program is to provide financial support for establishment of BIRAC-BioNest Facility at Institute of Advanced Study in Science and Technology. The project aims at creating a robust mechanism for translation of technology and encourages transformation in the culture of bio-entrepreneurship in North-East India.

The IASST has been discharging its scientific societal responsibility and is committed to the development of the weaker and underprivileged section of the society. During the next few years, some of our imperious and self-effacing initiatives would be to strengthen our association with numerous foremost National and International Universities/institutes and industries on research, encouraging interdisciplinary research, formulation of future strategies to tackle the problem of VUCA (volatile, uncertain, complex, and ambiguous) world among the research scholars, and promotion of social awareness including ethical, cultural, health, globalization, and technology revolution and intensification of an outreach program to encourage, train, and enable local people to assure community responsibility leading to the long-term development of all the sections of the society. This newsletter is one of the activity that was carried out under ISVEC now being promoted by BioNest to apprise the activities of BioNest as well as keep connected to the different stakeholders in entrepreneurship ecosystem.



Editor: Dr. Ashis Kr. Mukherjee, DIRECTOR-IASST.

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Dr. Devasish Choudhury, Dr. Tania Paul Das, Dr. T.D. Goswami, Mr. Minku Das, Mr. Nayan Talukdar

ABOUT BIONEST-IASST

Bio-NEST program under BIRAC provides support to establish bio-incubators either as a standalone entity or as a part of the academia. Owing to this, the BioNest –IASST is nestled in Institute of Advanced Study in Science and Technology (IASST) to justify the concept of incubator wherein Innovation & Entrepreneurship, Networks & Collaboration, Resource management & Outreach will be taken care of for emerging Biotech/Life Science Startup Ventures.

It shall thrive to provide instrumentation platforms for Small and Medium scale industries (SME's), Academic Institutions & hospitals, to further their research programs in biotechnology, life sciences and biomedical sciences.

In addition, BioNest-IASST will offer short term industrial training courses as well as facilities to Ph.D/M.Sc/B.Tech/M.Tech Biotech students to carry out their dissertation and project work.

The BioNest-IASST building is spread around 10,000 sq. ft area in the CIF of IASST comprising of incubation spaces for Biotech startups, R&D Labs, Bootstrapping area and Common Instrumentation Facility to kick-start their operations. BioNest-IASST will provide a 3-5 year incubation facility for start-ups and also the required infrastructure for the new company to work independently thereafter. Technological assistance and support will be imparted all the way through the maturation phases of the start-ups until their progression into a fully fledged company. BioNest-IASST will execute the hand-holding to the start-ups with respect to Intellectual property rights, Regulatory and Venture capital support along with funding support from DST, DBT and BIRAC, Government of India.

Vision

To nurture innovation and foster entrepreneurship in and around NER

Mission

- Handholding of start- ups from ideation stage to incubation platform and unleashing to Industry setup by
- Proving an avenue for scaling up biosciences related technologies developed at NER.
- Providing a facility to establish businesses and develop ideas into commercial products.
- Mentoring of start –ups in technical, legal, commercial and financial matter.
- Translational intervention in the entrepreneurial ecosystem of NER.
- Economic development and equitable distribution of wealth in NER through bio-business.
- Gradually developing an institute for research and education of S&T based entrepreneurship at NER.

1ST WEBINAR

ORGANIZED BY BIONEST-IASST

A free webinar on “Bio-Entrepreneurship Ecosystem in NE” was organized on 11 November 2020 at 11 am onwards via Zoom. This talk was presented by Dr. Bula Choudhury who is Coordinating with entrepreneurs for setting up Biotech Venture by utilizing modern sophisticated equipment facilities of Guwahati Biotech Park as well as rich bioresources of North East Region of India from 2011 onwards. She is working as the Coordinating Officer (Honorary) for North Eastern Cell of National Research Development Corporation (NE Cell-NRDC), a DSIR Institute, Gol from 2017.

This talk was on exploration of the avenues available at North east region for would be Entrepreneurs who are interested in Developing Biomedical Technologies. The main focus of the webinar was on Innovations, Entrepreneurship status in Biotech and allied areas, Platforms available, Funding, Policies and Case studies.

With her talk she has given a vivid scenario of funding bodies that are willing to fund entrepreneurs and start-ups:

Examples of funding agencies that she mentioned during the webinar are as follows:

- National Innovation Foundation (NIF)
- Translational & Industrial Development program by DBT
- BIRAC-BIG/SBIRI/BIPP etc
- North East Bio-Startup
- Assam Startup-The NEST
- Science and Technology Intervention in North Eastern Region (STINER)
- North East Centre for Technology Application & Reach (NECTAR)
- Institute of Bioresources & Sustainable Development (IBSD)
- North East Agriculture Technology Entrepreneurs Hub (NEATeHub)
- And others like BISS, NSTEDB, WINER, BCIL etc



A glimpse of which is depicted below:

THE BIOTECHNOLOGY POTENTIAL OF ASSAM FOR BIOENTREPRENEURSHIP

- Assam is one of the biodiversity hot spot regions and is very rich in plant, animal and microbial resources.
- It is considered as the genetic centre of origin of citrus and bananas.
- The state has vast species diversity as well as commercial strength in rice, tea, bamboo, jute, ginger, citrus and several other commercial crops.
- Several hundred species of medicinal and aromatic plants grow naturally in Assam.
- The state is also rich in orchid and other ornamental plant species.
- The microbial resources of the state are enormous and have economic potential.
- Muga and Eri silk of Assam is a distinctive bio-based industry.
- Aquatic and forest bio-resources are the other major engines for economic growth of the State.
- Biotechnology will offer excellent opportunities in augmenting value creation, wealth and employment not only in many of these areas but also lead in new vistas for application in agriculture, medicine and industry.

• ASSAM BIOTECH POLICY/ WOMAN BIOTECHNOLOGY NETWORK PARK

INTERNSHIP/ PROJECT/ DISSERTATION OPPORTUNITY AT GUWAHATI BIOTECH PARK

Guwahati Biotech Park, a joint venture of DBT, Govt. of India and Govt. of Assam invites applications from students in Biotechnology and allied areas for Internship/dissertation program.

- Eligible areas: Students pursuing BACHELOR/TECH/ M.TECH in Biotechnology and related areas. Microbial Techniques with Imaging, Molecular Biology (Six prospecting of Flora & Fauna, Biomolecule profiling, Micro propagation, Fermentation, Herbal Extraction and Application of Sophisticated Analytical Instruments. (Candidates list available at www.guwahatibiotechpark.com/india/interdissertation.html) (Please Specify)
- DURATION: 2 weeks, 3 months, 6 months and 9 months. (Rs. 1000 only per stipend)
- FACILITIES: Central Analytical Instrumentation Facility (CAIF), Bio prospecting Facility, Micropropagation Facility and Herbal extraction Facility.

SOME OF THE EQUIPMENT FACILITIES AT GBP

CHNS Analyser, Confocal Microscope, Waste water purification plant, GC-MS, LC-MS, Ultra Centrifuge

For more queries contact: guwahatibiotechpark@nic.in or guwahatibiotechpark@nic.in

Biotechnology Industry Research Assistance Council

A Government of India Enterprise

Vision: To Stimulate, foster and enhance the strategic research and innovation capabilities of the Indian biotech industry particularly SME's

BIRAC Support for taking discovery to product development

- BIG- Biotech Ignition Grant schemes
- SBIRI- Small Business Innovation Research Initiative
- BIPP- Biotechnology Industry Partnership Programme
- CRS- Contract Research Scheme

2ND WEBINAR

ORGANIZED BY BIONEST-IASST

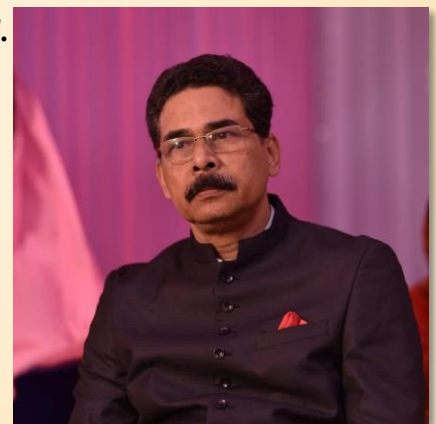
Team BioNest-IASST convened and organized a webinar on “Role of Engineers, MBAs & Scientists in High Tech BioStartups which was very well orated by Dr. Probodh Borah on 30th December 2020 at 11 am. He is the Head of the Department of Animal Biotechnology at College of Veterinary Science, Assam Agricultural University, Guwahati and coordinator of the BIF & State Biotech Hub.

Due to his vibrant personality, a total 77 participants from different Institutes like ICAR-NDRI, College of Veterinary Science, Gauhati University, VRDL, Assam Science and Technology University, Tezpur University, AEC, AIM and CSIR-NEIST along with IASST fraternity have enrolled for the Webinar and made it a success.

The Webinar commenced with the inaugural statement by our Honourable Director-Dr. Ashis Kr. Mukherjee which was followed by the interesting webinar flooded with useful information for establishing a connecting link between the ecosystems of Engineers-Scientists-MBAs.

Some key points of his talk were as follows:

1. **Success Story of Kiran Mazumdar Shaw, Biocon Pvt. Ltd.**
2. **Difference between Startups & Entrepreneurs**
3. **MBA programs for Health Care & Biotech**
4. **Application of Artificial Intelligence in Pharma**
5. **Use of Machine learning in Covid 19.**
6. **Source of funding for early stage**
 - **BIRAC SRISTI GYTI**
 - **University Innovation Clusters**
 - **BIRAC AcE Fund**
 - **Early Translation Accelerator (ETA)**
 - **Technology Business Incubator (TBI)**



A glimpse of which is depicted below:

Engineer's Role in the Biopharmaceutical Supply Chain

- **Biopharmaceuticals are the fastest-growing segment** of the pharmaceutical industry, with global sales that are **projected to grow to \$445 billion by 2019.**
- Future growth and success of the biopharmaceutical industry will depend on a highly educated and trained workforce, with **engineers playing a critical role in driving innovation.**
- Products include monoclonal antibodies, vaccines, and cell-and gene-based therapies—a quickly emerging product line.
- Engineers are an integral part of the entire product life cycle and occupy many different roles.
- **Engineers, for example, play a fundamental part in the design and construction of facilities.**

MBA Graduates Spark Innovation in Biotech and Healthcare

- As innovations in healthcare create new solutions with the potential to reduce disease and extend lives, **more managers are needed** to steer their drive to market.
- New services are being opened in the storage of patient data and remote monitoring, and new products launched such as improved communication systems and diagnostic testing.
- **Big data in particular is opening up new career opportunities in management.**
- **Demand for big data is fuelling the creation of new master's degrees in business analytics.**

Health IT Analytics

Top 5 Use Cases for Artificial Intelligence in Medical Imaging

- **Identifying cardiovascular abnormalities**
- **Detecting fractures and other musculoskeletal injuries**
- **Aiding in the diagnosis neurological diseases**
- **Flagging thoracic complications and conditions**
- **Screening for common cancers**

Recent Activities of BioNest-IASST

The saplings of ghost pepper, also known as Bhut jolokia was distributed on 23rd December 2020 for cultivation at two villages- Satargaon and Bakarapara, Near Rani, Guwahati which were adopted by IASST.

The Bhut jolokia is an interspecific hybrid chili pepper cultivated in North-east India. It is a hybrid of *Capsicum chinense* and *Capsicum frutescens* and is known as the world's hottest chilli pepper.

Along with this, sapling of red pumpkin (Scientific name: *Cucurbita maxima*) was also distributed to the villagers which they can grow and sell in the market for their own profits.

The event was represented by Dr. Ashis Kr. Mukherjee (Honorable Director), Dr. Diganta Goswami (Registrar), Dr. Neelotpal Sen Sarma (Associate Professor-II PSD), Dr. Lipi B Mahanta (Associate Professor-II CCNS) and Dr. Tania Paul Das (Manager -S&T of BioNest-IASST). The sapling distribution programme was well organized by Mr. Prakash K. Kachari under the vigilance of Prof. Nalin Kr. Mohan (Consultant Tribal Area Development Program and Former Director of Extension Education and Chief Scientist at Assam Agriculture University).

A few clicks of the moment are as follows:



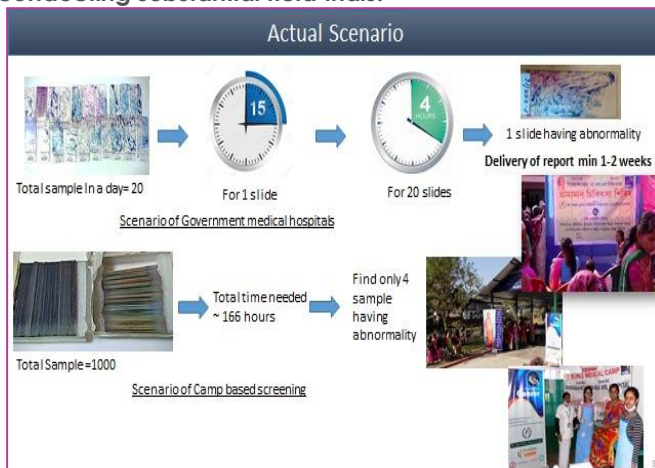
TECHNOLOGY TRANSFER BY IASST ON TRADITIONAL RICE BEVERAGE.

The northeast (NE) India is a vibrant hotspot of ethnic diversity with rich cultural practices. With more than 300 ethnic communities, NE India is a place for more than 150 different types of fermented foods and beverages. The traditionally prepared rice beverage is indispensable part of dietary culture of the people of NE India. Being an important component for socializing, such beverages are consumed in festivals, marriages, gatherings and even in funerals. Beyond basic nutrition, they have been known to confer health benefits like immune modulation, improved digestion and reduce the risk of metabolic disorders. Group of researchers led by Dr. Mojibur Khan from the Institute of Advanced Study in Science and Technology (IASST), Guwahati has been trying to unveil how consumption of this beverage affects the overall health using different research models. Subsequently, the results indicated that the beverages modulate the microbes residing in the intestinal tract. The fermentation process brings biochemical changes in the beverages resulting into a composite of nutraceuticals and healthy bacteria known as probiotics. Though this beverage is consumed by a substantial population in this region, the process remains a traditional culinary practice and a quality-controlled uniform product is away from the market. Consequently, due to lack of scientific interventions and commercialization, the availability of the beverage with ethnic flavor and taste remains confined to a smaller fraction of population. Considering this and the commercial aspects of such beverages in countries like Japan, China, Korea, Indonesia etc., the group tried to optimize the fermentation process using several indigenous rice varieties under hygienic laboratory conditions. Interestingly, the beverage prepared using aromatic black rice of Manipur showed promising biochemical properties and a patent was filed for the process by Dr. Khan and his Ph.D. student Mr. Bhuwan Bhaskar. The research was funded by Biotechnology Industry Research Assistance Council (BIRAC) under the Promoting Academic Research Conversion to Enterprise (PACE) scheme. Under this research, a pilot scale fermentation process was optimized for the production of a beverage. The anthocyanins in the wine give the attractive color and the fermentation process brings appealing taste and aroma. Also, it is rich in antioxidant content (Cyanidin and Delphinidin) and is organoleptically identical to red wine. Several biochemical properties were analyzed in IASST as well as in other laboratories including FSSAI. The beverage was also subjected to sensory analysis with volunteers to evaluate the consumer choices as well as market accountability. The results indicated a considerable demand and commercialization of the beverage was of utmost need. In this regard, IASST has taken a noble initiative to bring such artisanal drinks to the supermarkets with technical collaboration with Golden Beverages. Professor Ashis K. Mukherjee, Director, IASST officially transferred this novel technology by signing a MoU with Golden Beverages represented by Dr. Diganta Goswami, Registrar, IASST and Mr. Hamendra Chandra Das and Dr. Rahul Deori from Golden Beverages for pilot scale production of this rice-beverage. The event was witnessed by Dr. Devasish Chowdhury, BioNest-IASST where pilot scale production of this traditional beverage will be initiated. This will boost the economy of the region by providing jobs to unemployed youths of the region.



Trailblazers in fast tracking the Diagnosis of Cancers using Artificial Intelligence!

Recently Dr. Lipi B. Mahanta -Associate Professor-II Centre for Computational & Numeric Studies of Institute of Advanced Study in Science and Technology (IASST), Guwahati received a funding from a Special Call of Biotech Ignition Grant for NER, supported by BIRAC. The funding is for developing and designing a robust fully automated software-based solution using Pap smear images to detect abnormal growth or development of tissues in the cervix — the lower part of the uterus that connects to the vagina. The current work has been recently published in the journal 'Tissue and Cell'. This technology was previously shortlisted by M/s Numaligarh Refineries Limited for funding under its CSR activities. Cervical cancer is one of the most prevalent cancers among women in North-East India. Compared to the 2018 incidence rate of 13.1 worldwide and 14.7 in India, in NE, it is more than 24.3, thus posing an alarming health problem for the region. With the unavailability of adequate treatment facilities, patients have to move to urban cities, mainly New Delhi, Mumbai, and Chennai. Having taken on the challenge in and around 2012, a survey by Dr. Lipi B Mahanta and her team revealed that lack of availability of automated systems hampered timely diagnosis of the disease. It was evident to Dr. Mahanta that an effective early diagnosis structure called for a software that would be rapid, accurate, robust, and which could be delivered at the doorstep. Pap Smear is the most popular technique for early diagnosis of cervical cancer. Diagnosis is done by critically analysing the slides prepared from the smear collections, under a microscope. In India, the slides are prepared using two methods: conventional as well as Liquid Based Cytology (LBC). The researchers put together a database of two types of indigenous Pap smear images databases, one each for conventional and Liquid Based Cytology (LBC) and used it to create algorithms with the images of different qualities, being prepared by different technicians and captured from different microscopes. The algorithms helped develop robust software to detect cervical cancer. Hypothesizing that the software will be sturdier if based on an indigenous dataset, rather than publicly available datasets of patients belonging to other countries, one was generated with help from Dr. B. Borooah Cancer Institute, Gauhati Medical College and Hospital, Ayursundra Healthcare Pvt. Ltd, and ASMI in Guwahati, and from Babina Diagnostics in Imphal, Manipur. The Bethesda system for Pap Smear diagnosis was adopted by the group. The team then adopted two AI approaches, Machine Learning and Deep Learning. Applying the first approach on the conventional dataset, the group reported a novel algorithm for automatic segmentation of cervical cells, removing debris like inflammatory cells and red blood cells from a whole slide image, including improvement towards dealing with poor stained images which are some of the major challenges faced by researchers. The group achieved 96.5% accuracy using an ensemble machine learning algorithm where shape, colour and texture features of the Pap smear images were analysed for automated classification of cervical dysplasia. Exercising the second approach, the team reported one of the earliest studies, using the conventional dataset, proposing a novel classification technique adopting a modified Convolutional Neural Network. Having created a significant LBC dataset by then, the team next explored very recent state-of-the-art deep learning techniques like simultaneous instance segmentation and classification algorithms for efficient Pap smear image interpretation, analysis, and prediction on it. The team has developed a novel classification algorithm, with 98.8% accuracy, which can identify the pre-cancerous and cancer lesions while precisely localizing the cervical cells, removing the debris including overlapping cells and then finally classifying them based on the Bethesda system nomenclature, to maintain uniformity with the current reporting system. The team plans to create a pocket-friendly diagnostic kit, to be hosted and marketed on a web-based platform, after conducting substantial field trials.



OTHER UPCOMING PROJECT/PRODUCT IN THE PIPELINE

- IASST has done novel R&D in Gut-microbiome. This has paved the way for developing customised pre-biotic and pro-biotic.
- Some pioneering R&D has taken place at IASST on health benefits of some varieties of Garcinia, which are indigenous to NER. Now efforts are on for using these varieties of Garcinia in making such edible products, which may satisfy the necessary parameters for successful commercialization while retaining the health benefits. One of such attempts was made by the 5 alumnus of IASST, by making edible candies in the brand name 'Garcilona'.
- Scientists of IASST have developed a surgical suture material from fibers of ramie (*Boehmeria nivea*) plant, and working towards creation of viable products from the technology. The surgical suture is expected to be of low cost and bio-degradable.
- Highly valued agarwood oil, which is usually produced in nature via plant-parasite interaction on the plants of *Aquilaria* genus which are indigenous to NER, has been produced at lab-flask scale at IASST using biotechnological process. This lab scale successful project is now at the incubation centers for developing commercially viable technology at pilot scale.
- IASST is working on developing an anti-diabetic herbal formulation with M/s Emami Ltd. as the industrial partner. The project work entitled "Phytopharmaceutical development of *Ficus semicordata* Buch.-Ham. ex Sm.", is being carried out as per the regulatory guidelines of DCGI.
- A method of converting tea waste into activated carbon using natural activating agent has been developed at IASST. This activated carbon has potential use for water purification, dye absorption, and other toxicant absorption.
- To prevent rusting of copper based alloys, like bell metal and brass, a technology has been developed and patented using plasma based technology. The technology is currently undergoing the process of optimization for commercial scale coating.

List of Achievements

1. Dr. Lipi B. Mahanta has qualified for the special Call of Biotech Ignition Grant (BIG) for North East Region (NER).
2. Dr. Ananya Barman, Post-Doctoral Fellow, IASST, working with Dr. Debojit Thakur, Associate Professor, LSD, IASST have submitted proposal entitled "Bioprospection of Microbial metabolites of a Tea Rhizobacteria BTA27 for Tea (*Camelia sinensis* L Kuntze) blister blight control." For the first call of BIRAC Regional Techno Entrepreneurship Promotion Center (BRTC) at KIIT-TBI-Bionest. Under the Category 2* meant for Ph.D. Scholars and post doctoral fellows she has been recently awarded the 2nd position. The program was on promotion of Innovation and Entrepreneurship ecosystem across East and North East under the heading: Mapping the Change makers of North East Region of India.
3. Dr. Lipi B. Mahanta, Associate Professor, CCNS, IASST submitted a proposal entitled "Oral Scanner- an automated system to detect oral dysplasia" under the Category 4* meant for Startups. She has been awarded the 3rd position under the first call of BRTC- Mapping the Change makers of North East Region of India.

Contact us for "Nurturing your Dreams into reality"!

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