

CREATORS

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EDITOR'S DESK

This issue of *Creators* is a collection of events and webinars organized & conducted by BioNest-IASST. Covering almost all the aspects of motivating innovation ecosystem like Success Stories of Women entrepreneurs, Global Bio-India Roadshow and National Innovation and Start-up Policy 2019 for Students and Faculty. This issue has also highlighted abstracts of poster presentations done on the occasion of National Science day by enthusiastic students, research scientists from IASST.

I extend my warmest thanks to the authors for their interest, enthusiasm and timely submission of lecture write-up and participation. As Editor of *Creators*, I anticipate that this issue would be of immense value and will be definitely useful to medical science personnel in their practice or thinking process. This collection will also offer a window for new perspectives and directions in the area of in the readers' mind for long.

Editor

Prof. Ashis Kr. Mukherjee
DIRECTOR-IASST, Ghy-35

Editorial Team:

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

Online Webinars of February-2021

Principles of Confocal Microscopy & Its application in Biomedical Field

BioNest-IASST has organized an online Workshop on “Principles of Confocal Microscopy and its Biomedical Application.” on 18th February 2021, Thursday from 11 am to 1 pm. It was co-organized by Leica Microsystems. Dr. Tania Paul Das-Manager (S&T) of BioNest-IASST welcomed the participants and introduced Mr. Sujoy Dey who is the Leica Application Specialist and also the orator of the workshop. The workshop initiated with the opening statement of the Director of IASST- Dr. Ashis Kr. Mukherjee. Almost 65 participants registered to attend the workshop. During the session, participants understood the essence of using Confocal Microscope and also the Working Principle & Variants of Confocal microscope. Live-cell imaging by 'Stellaris Confocal Microscope' was demonstrated and the workshop ended with the Q&A round. Dr. Devasish Chowdhury, Associate Professor, Physical Science Division(IASST) gave the vote of thanks to the whole team of Leica Microsystems and Team BioNest-IASST for organizing the Workshop.

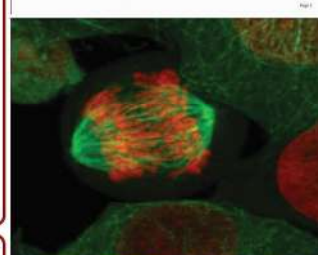
About: A traditional simple microscope creates a murky and fuzzy image of 3-dimensional objects, because light from all areas of the object, not just the plane of focus, enters the microscope. This problem has been solved by the confocal scanning laser microscope (CSLM), or simply, confocal microscope. This microscope is used in life sciences, semiconductors, and materials science. In the 1950s, Marvin Minsky first developed the confocal microscope at Harvard University.

Principle: A confocal microscope uses laser beams instead of lights. The laser beams are released from their source and then focused onto a fluorescent stained sample. The fluorochrome stained sample will be excited and then it will emit fluorescent lights. These fluorescent lights will travel back into the objective lens through the same path that the laser travels. Confocal microscope produces a very low-intensity light, so the light is amplified by a photomultiplier tube (PMT). Photomultipliers have the ability to amplify a faint signal around one million times without introducing a single noise. After that, the PMT releases an electrical signal, which is then converted into an image by using a computer.

Applications: Used for the examination of various eye diseases, used for qualitative analysis, and quantification of endothelial cells of the cornea, used in cases of keratomycosis. It is also widely used in the pharmaceutical industry to control the quality and uniformity of the drug distribution. It is also used for optical scanning and recovery of damaged historical audio.

Advantages: It creates a high-resolution 3D image of the specimen and both living and fixed cells can be used. It can be used in the collection of serial optical sections and illuminates uniformly across the focus points.

Disadvantages: Confocal Microscopes are very expensive and it contains a limited number of excitation wavelengths, with very narrow bands.



Global Bio India Roadshow

BioNest-IASST at Guwahati, Assam has organizing a curtain raiser Roadshow event: “Global Bio-India 2021 (Transforming lives)- A mega international congregation of biotechnology stakeholders organized by DBT and BIRAC.” on 25th February | Thursday | 11:00-13:00. The acclaimed speakers of the event were: Dr. Shikha Taneja Malik, Program Manager, National Biopharma Mission, BIRAC, Dept of Biotechnology, GoI and Dr. Mrutyunjay Suar, CEO, KIIT TBI, Director General, KIIT University, Bhubaneswar. The THEME of the event was: KHOJJ (Knowledge Harnessing and Orientation from Job Seekers to Job Givers).

A total of 38 participants registered for the event and Dr. Shikha Taneja Malik was successful in spreading awareness about various funding schemes of BIRAC. Dr. Mrutyunjay Suar gave an interactive talk on changing the mindset and building enabling ecosystem in NER.

Global Bio-India 2021, the largest Bio event, showcased opportunities in Indian Biotechnology sector to the world. Salient components of Global Bio-India 2021 included events such as Bio-partnering, Policy dialogues, CEOs Roundtable, Global Regulators Meet, Investors Meet & Exhibition Pavilions.

This mega international congregation of biotechnology stakeholders included representation from national & international bodies, Ministries, Industries, Bio-clusters, Research institutes, and others. In the three days program, The Day 1 of GBI-2021 has showcased Atmanirbhar Bharat Conclave wherein India's campaign 'Make in India' to provide resilience and self-sufficiency" to the country was focused. The session highlighted National Priorities, examples from India's experience in turning Covid pandemic challenges into opportunities for developing domestic innovation ecosystem gaining self-sufficiency in requirements. Bill and Melinda Gates Foundation (BMGF), Wellcome Trust and GAVI have positioned India as key vaccine developer and manufacturer. On Day 2, insights were provided on the phytopharmaceuticals and Traditional Knowledge from AYUSH perspective. Focus was on the opportunities of innovation from business and regulatory aspects, and process of drug development through Traditional systems as well as scope and challenges prevalent in this sector. As a part of the Blue Economy, the Department of Biotechnology (DBT) has developed a consortium programme/virtual centres of Marine Sciences with strong linkages proposed to the 'Advanced Marine Station for Ocean Biology', which is part of the Deep Ocean Mission of Ministry of Earth Sciences. Feasible strategies to support innovative technological interventions to tackle problems associated with Neglected Tropical Diseases (NTDs), Antimicrobial Resistance (AMR), and other infectious diseases in India was discussed on Day 3. Lastly a session was conducted on affordability and accessibility of medicines with quality. Though, the regulators and policy makers across world are finding innovative ways to enhance the quality of medicines by framing the regulatory approval processes transparent and more efficient, there is a need for collaboration for harmonizing regulations and policies across different nations.



National Science Day

National Science Day is celebrated in India on 28 February each year to mark the discovery of the Raman effect by Indian physicist Sir C. V. Raman on 28 February 1928. For his discovery, Sir C.V. Raman was awarded the Nobel Prize in Physics in 1930. It is well celebrated in IASST, Ghy-35 every year to commemorate the important contribution of science, scientists and scientific progressions in our life. It is celebrated to discuss all the issues and implement new technologies for the development in the field of science for human welfare. It gives an opportunity to the scientific minded citizens in India to encourage the people as well as popularize science and technology. The theme for National Science Day 2021 is "Future of STI: Impacts on Education, Skills, and Work". The theme has been chosen for the purpose of raising public appreciation of the scientific issues involved and the impacts science has on education, skill and work.

The event at IASST commenced with the floral tribute to the statue of Dr. C.V. Raman. The event was beautifully anchored by Miss. Swarnali Bhattacharjee. She welcomed the Guests of Honour - Prof. Ashis Kr. Mukherjee, (Director-IASST), Dr. Diganta Goswami (Registrar-IASST), Dr. Neelotpal Sen Sarma (Head R&D-IASST), Prof. M. C. Kalita, (Working President-Assam Science Society) and Dr. Jagadindra Ray Choudhury (General Secretary-Assam Science Society). The program initiated by felicitation of the guests by students of IASST followed by lighting the lamp ceremony which symbolizes that darkness of ignorance be swept away by dawn of knowledge. Followed by this honourable Director-IASST, Prof Ashis Kr. Mukherjee delivered a motivational inaugural speech. In his brief note he introduced about the significance of day and elaborated on its brief history. The world-famous 'Nobel Prize' in 1930 in physics was given to Dr. C.V. Raman and he was the first Asian to receive this award in physics. He was respectfully awarded with the 1st 'Bharat Ratna' award in 1954 and was also greatly honored with the greatest award of Russia 'Lenin Peace' in the year 1956.

The National Council for Science & Technology Communication made a proposal to the central government to observe National Science Day every year on 28th February and then in 1987 on February 28 the first National Science Day was observed countrywide.

Prof. A.K. Mukherjee was delighted to host the program and opined that "IASST is the brainchild of Assam Science Society and since its inception in 1979 this institute has been making tremendous contribution for S&T in the state. It has been recently awarded for promotion and dissemination of Science to masses. He gave examples of other scientist like Sir. Jagadish Chandra Bose, Dr. Meghnad Saha, Satyendra Nath Bose, Acharya Prafulla Chandra Ray, Dr. Prasanta Chandra Mahalanobis and others who have made significant contribution but never complained about their remuneration. Therefore, Prof. A.K. Mukherjee advised the students and upcoming scientist that they should follow the 3D policy which is Devotion, Determination and Dedication to achieve their goal.

On the auspicious occasion of National Science Day 2021 BioNest-IASST took the opportunity to showcase the information repository of the recent activities of BioNest, Technology Transfer undertaken and Progress of the ongoing projects of IASST through the 6th edition of Newsletter "Creators" which is compiled and published by Bionest-IASST in association with ISVEC. The honorable dignitaries present there were requested to unveil the 6th Volume of the newsletter.

One of the honourable guest-Dr. M.C. Kalita (President of Assam Science Society) gave a small narration of the history of his association with IASST since 1984 when land acquisition process was undergoing for IASST's present campus. He was very delighted to announce that IASST has been recognized as the new institutional branch of Assam Science Society to aptly fulfill its vision & mission. He then highlighted some activities of ASS like conducting nature camps, working on river restoration and anti-superstition. Dr. Kalita also informed that A new radio science serial on artificial intelligence (AI) by Vigyan Prasar will be broadcasted on every Saturday in 19 languages which is sponsored by DST, GoI. The purpose was to motivate the students to think critically to solve the real life problems like health, environment and energy at personel, regional, national & global levels.

He opined that people should come forward to uplift scientific spirit in the NE region and students should be educated with knowledge and skill so that they can use information quickly, communicate effectively, work productively and contribute globally.

Followed by his Talk, Dr. Jagadindra Ray Choudhury gave a brief introduction on the most valuable books published by ASS and highlighted that more than 40 children books were incorporated in the encyclopedia of KK Handique Open University recently. He also narrated a motivation story of Subrahmanyam Chandrasekhar, nephew of CV Raman who was awarded the Nobel Prize for Physics in 1930 due to his perseverance and devotion towards work.

This session was then followed by Scientific Talks presented by invited Speakers.



Dr. Sachin Kumar
IIT Guwahati
The discovery of Hepatitis C Virus



Dr. Sanjeev Kalita
Gauhati University
The super massive Black Hole in the heart of our galaxy



Dr. B. Anand
IIT Guwahati
CRISPR-CAS System From Genome
Defense to Genetic Scissors

National Science Day

A Poster Presentation Competition was organized on the occasion of National Science Day 2021 on 28th February 2021 which saw active participation from the student community of IASST. The entries were evaluated by a committee of judges. The winning entries have been showcased here.

1st Prize E-Skin and the Possibilities

Sweety Biswasi, Bablu Basumatary, Shantanu Podder, & Jyotisman Bora

The novelty of E-Skin are: a) one-step plasma based process rather than other conventional methods; b) without being centro-symmetric, it shows pyroelectric behaviour. With the synthesized material a device is fabricated which exhibit pyro and piezo electric behaviour. Thus, due to the presence of the oxidized layer, the material also has a self-healing capacity as this layer can be formed at an oxidizing environment. Therefore, endless possibilities open up in the field of robotics, health applications as well as in prosthesis where e-skin can be applied for our betterment.

Bhargav Kakati, Debabrat Sharma, Payal Saha & Purbajyoti Bhagowati

Through this poster, general awareness about the magnitude of the current flood situation in Assam was presented. Some lesser known factors that trigger flood in Assam were highlighted. Machine learning models have the potential to capture intricate patterns from a large dataset. They can provide robust and skilful prediction of many climate variables. A reliable and cost effective early warning system can be brought to reality with the combined contribution of high resolution satellite data and machine learning algorithms.

2nd Prize There will be Flood!

3rd Prize A RESOURCEFUL WASTE MANAGEMENT IN MUSHROOM CULTIVATION!

Chandana Malakar, Nilam Sharma, Mehjabin Ali

In the initial step of Mushroom spawn production, the substrate (cereals like wheat, paddy) used as a medium for the spread of the mycelium of the respective mushroom species is boiled for a certain period. The residual water obtained after boiling the substrate is discarded as waste. The novelty of this study lies in the further usage of the residual waste water generated during boiling for the production of Biosurfactants. A 200 ml of bacterial inoculated waste water facilitated the production of 0.52 g of biosurfactant

A few moments of the National Science Day Celebration at IASST-Ghy-35 on 28th Feb 2021



Success Stories of Two Women Entrepreneurs



Dr. Swapnil Sinha
Co-founder & Director
BioAptagen Laboratories,
ARKUS Bioscience Pvt. Ltd.

When I was doing my postdoctoral research at Colorado State University, I read a quote from Apple co-founder, Steve Jobs; "Have the courage to follow your heart and intuition. They somehow know what you truly want to become". Most of the people fail to hear their inner voice that tells them exactly what they are best at and the purpose of their existence. During my sophomore year at University I started interacting more with Professor M. Y. Khan who taught us protein chemistry and enzymology course and that was when I knew what I love doing the most. I loved creation, I loved innovation and I never wanted to follow the status quo. The only way I know to get started is by training myself with the skill set needed to convert the ideas into reality. I went on to pursue my doctoral studies at CDRI, Lucknow from 2003 to 2008 in population genetics. I handled voluminous genetics data and did loads of statistics and I never realized then, but 10 years later when I had to manage huge NGS (Next Generation Sequencing) data for developing one of the products of my company, the statistics training in PhD became instrumental and I did the data analysis with ease and perfection. For the next four years I went on with my postdoctoral research in Canada and USA and I started metamorphosing. My vision got more focused and my choices became more defined. I started working on the idea that single stranded DNA can be used as diagnostic tool during my time at NIPER-Guwahati. But still the idea was at infancy and required more development. I did the initial laboratory R&D for three years and my project at NIPER was over. I decided that it's the time to go on entrepreneurial path and start my venture. I was again clueless, I didn't have capital and no infrastructure support. I applied for Biotechnology Ignition Grant (BIG) sponsored by BIRAC in 2017 for product development and I terribly failed in my first attempt. They were good advices and real-life experiences but what I gathered the reason of my failure was I did not understand my product the way I am supposed to. For next six months, I kind of built a 'professional bond' with my innovation; 'DNA Aptasensor based kit for early detection of Urinary Tract Infection (UTI)'. I studied the pain-point and unmet need my product is addressing. I met urologists across the city to understand the loopholes in the present UTI diagnostics. I collected the data on market size and competition. Even though I was novice in terms of marketing strategy after I am done with my POC (proof-of-Concept), I had full confidence that there will be takers of my product after the prototyping. I got the BIG in 2018 and we incorporated our first company, BioAptagen Laboratories Pvt. Ltd. in September 2018. Since then, our company is developing affordable and point-of-care DNA Aptasensor based products for disease diagnosis like UTI, Cardiac failure and Vitamin D3 deficiency. Our center-stage product, the UTI detection kit will go to clinical trials in mid-2021 & we are hoping to hit market next year.

I have a very short entrepreneurship journey since 2019 and I feel it's all about three golden rules; identifying the opportunity, conceptualizing the idea/solution and teaming up with best people who transform your innovation into real product for real customers. Recently we incorporated our second company, ARKUS Bioscience & Biosolution which is first of its kind in entire North-East region, providing cutting edge hands-on training to science graduates and school kids through our flagship educational programs like 'Nurture Youth' and 'LabCrate' in state-of-art laboratories.

Entrepreneurship is a difficult road even more challenging for women where every day they have to set priorities between work and life. In my short journey I can advise all the upcoming entrepreneurs to keep intact your focus and have faith in your skills and what you innovate. No education no professional decision is ever wasted, it is all about connecting dots in your present tracing backwards and you realize everything falls in place.

"SUCCESS STORIES OF WOMEN ENTREPRENEURS & THEIR JOURNEY"

Date: 8th March | Day: Monday | Time 2 - 3 pm

Dr. Swapnil Sinha
Director
BioAptagen Lab. Pvt. Ltd.
IIT Guwahati Research Park,
Guwahati

Ms. Anamika Baruah
Director
Foundation for
Advancement of Essential
Diagnostics (FAED),
IIT Guwahati Research
Park, Guwahati

INTERNATIONAL
Women's
3.17
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Contact Us: Dr. Tanis Paul Das, Manager (S & T)
Website: <https://iastt.gov.in> Phone No: 0361-2270995 Ext. 251
Email: Ms. Nimesha.Laishram@gmail.com, tanispa@iastt.res.in



Ms. Anamika Baruah
Director,
Foundation for
Advancement of
Essential Diagnostics
(FAED)
Guwahati Biotech Park,
IIT Guwahati

Initially, I met Dr. Mustafa Barbhuiyan, a Clinical Chemist Scientist and Clinical Biochemist from Assam working in the USA where he proposed Foundation for Advancement of Essential Diagnostics (FAED) which was his dream since his PhD days in India. He explained to me the whole idea and its objectives. I was a bit reluctant considering the fact that I was from a pure humanities background. I have an MA in English and another MA in Mass Communication and Journalism. Later as I went deep into it, I started taking interest in the whole idea. After a few months, I informed Mustafa that I would like to go ahead with it. Thus, FAED was born on November 20, 2018 as the Certificate of Incorporation was issued that day.

We took up a space in Guwahati Biotech Park, IIT Guwahati for our office cum laboratory. We work in coordination with Dr. Mustafa Barbhuiyan, Founder of FAED, Dr. Amaj Ahmed Laskar another Director of the company and Dr. Rinki Kumar, a Microbiologist working in USA.

In the rural areas of Assam, the clinical diagnostic facilities in the laboratories of primary health centre (PHC) dispensaries etc. are inadequate. In some PHCs even laboratories are unavailable. A patient is generally referred for undergoing laboratory tests to the private laboratories or district civil hospital which is not feasible most of the time due to various factors like distance, nature of emergency of the disease, time factor etc. FAED aims to fill in the gaps of the healthcare system and fix it at the grassroots level. It aims to work in sync with the Essential Diagnostics List (EDL) of World Health Organisation thereby introducing the best practice of clinical laboratory tests and medicine in Government run hospitals and health care centres in low resource settings. FAED envisions to provide a private-public model for Advanced Essential Diagnostics services in Assam.

FAED as a non profit Section 8 company aims to provide health care benefits to society to prevent unwanted deaths due to lack of accurate and timely diagnosis, to develop research and continuous medical education (CME) programs that cater to the local community needs and develop comprehensive evidence based 'Essential Diagnostics List' for specific regions in southeast Asia. Engage with the government, stakeholders and physicians practicing in the area to critically look at the role of mis-diagnosis and unwanted healthcare burden in the society.

We look forward to providing high quality laboratory medicine services for accurate and timely disease diagnosis to the vast majority of the population where healthcare is a neglected part of their lives. The primary aim is to make accessibility of the latest technology and best practices in the field of diagnostics for the vast majority of the undeserved population of Assam and North East India.

FAED will provide continuous medical training to physicians, nurses and other health workers so that they remain updated on the latest biomedical and diagnostic innovations and train a new generation of Medical laboratory Scientists. I would like to urge today's youngsters through this write up to take up challenging tasks or missions, unconventional careers or professions, to serve the society, to dream big and make it happen.

International Day of Forest

International Day of Forests was celebrated at IASST on 21st March 2021. Speakers from Aaranyak, an NGO working on Forestry and Conservation, were invited to deliver talks on importance of conservation of forests, wildlife and grasslands and share the contribution of Aaranyak in that regard.

Opening remarks were provided by Dr. Devasish Chowdhury, Associate Professor, IASST where he welcomed and introduced the speakers. He welcomed all present for the talk, including teachers from BTAD Region who had joined via online mode for the session.

Prof. Ashis K. Mukherjee, Director IASST, delivered the Welcome Address. He talked about the need for balancing development with sustainable use of forest resources. He explored the various ways through which IASST may contribute towards the cause of natural resources conservation. He advocated generating awareness among masses regarding bio-conservation and particularly sensitizing school and college students towards the need of sustainable use of forest resources. As a Scientific Institution, IASST may contribute by conducting research on biodiversity and climate change, including taxonomic identification of traditional herbs and plants and establishing their pharmacological credentials. Such identified plants that have proven medicinal values may also be encouraged for scientific plantation. Prof Mukerjee stressed on the need for working in collaboration with agencies working on similar lines as Aaranyak & not working in silos.

Mr. Udayan Borthakur, Head of Wildlife Genetics Division in Aaranyak, delivered his talk on the importance of conservation of forests. He pointed out that forest area roughly the size of England is being lost every year due to deforestation. Every day, 45-250 species of flora and fauna are being lost. He talked about the major threats to forests, viz. Deforestation and habitat destruction, over-exploitation of forest resources, Global climate change, Invasive species and underlying social conditions like increased per capita consumption, poverty, rapid population growth and formulation of unsound policies and their flawed execution. He stressed on the importance of the balance of social, economic and environmental sustainability for inclusive development. He pointed out the success of protection of ecoregions in mitigating species extinction. Mr. Borthakur highlighted the work of the Conservation Genetics division of Aaranyak in application of DNA-based tools in wildlife research and supporting Government agencies through wildlife forensic DNA Investigations.

Dr. Bibhuti P Lahkar, Programme Secretary and Division Head of Aaranyak, delivered his talk about the significance of Grasslands and their Conservation and Management. Grasslands are basically land where grasses are the dominant plants but some legumes, shrubs and herbs are also present with few woody plants. These grasslands serve as large storehouses of carbon.

They also host a delicate ecosystem of species known as grassland obligate species, whose survival is closely linked with existence of grasslands. Grasslands help to preserve soil and soil fertility and protect soil erosion from streams and river channels. Grasslands are also important to humans as they provide sources of livelihood for nearly 1000 million people worldwide along with forage for livestock, renewable energy, recreation and tourism. However, the extent of grassland in India has reduced dramatically with the increase in agricultural production. Grasslands which once were extensively present in the floodplains of the Ganga, the Brahmaputra rivers and their tributaries have now remained confined only to Protected Areas. Grasslands are in fact the most threatened of all habitats in India. As a result, many grassland obligate species like pygmy hog, hispid hare, swamp deer, Asiatic water buffalo, one-horned rhinoceros and hog deer have become threatened. The major threats to grassland are conversion of grasslands to agricultural fields to support human population, plantations in grassland, unsystematic burning, livestock grazing and invasion of alien species. Aaranyak is actively working to help preserve grasslands especially focusing on innovative use of the invasive species and using them as potential sources of livelihood for the people in the area.

The day long programme concluded with an address by Dr. Bibhab Kumar Talukdar, CEO Aaranyak. IASST and Aaranyak discussed potential areas of collaboration and pledged to work swiftly towards achieving common objectives together. The Vote of Thanks was delivered by Dr. Dhruba Sharma, Deputy Registrar, IASST.

Grassland Ecosystem-its significance, conservation and management



Bibhuti P Lahkar, Ph.D.

Programme Secretary and Division Head
Member, Commission for Ecosystem Management, IUCN
Member, World Commission on Protected Area, IUCN
Member, Special Survival Commission, IUCN



Commercial Potential of Drugs from Venom

- Upasana Puzari¹ & Prof. Ashis Kr. Mukherjee^{1,2}

¹Dept of Molecular Biology and Biotechnology, School of Sciences, Tezpur University, Tezpur- 784028, Assam.
²IASST, Vigyan Path Garchuk, Paschim Boragaon, Guwahati 781035, Assam, India

Venoms are a valuable resource of lead molecules for the development of novel therapeutics against several life threatening diseases. Venomous organisms produce a range of toxic proteins and polypeptides that aid in immobilizing, killing, and digesting of prey[1, 2]. However, with meticulous characterization, the relatively less-toxic zootoxins can be molded into candidate life-saving drug proto-types[2-6]. Recently, an approach called 'Venomics' has been coined which integrates proteomics, genomics and transcriptomics approaches, thereby allowing comprehensive analyses of venoms in order to identify potential leads for new drugs from a limited quantities of venom [7, 8]. The venom components can target coagulation and membrane proteins, and surface receptors of cells with affinity and selectivity which have been applied in clinical studies[9, 10].

Venoms from snakes, toads, spiders and scorpions have been used for millennia in many traditional remedies and medicines for treating a variety of ailments[9]. Snake venom has found use in Ayurvedic medicine since the seventh century B.C. to prolong life and treat arthritis and gastrointestinal ailments, and also to treat asthma, polio, multiple sclerosis, rheumatism, severe pain and trigeminal neuralgia[10]. Tarantulas are used in the traditional medicine in Mexico and Central and South America to treat a variety of ailments ranging from asthma to cancer[11]. However, the modern era of venoms-based drug discovery did not begin until the 1970s with the development of the blockbuster antihypertensive drug captopril [12, 13]. In 1975, Captopril®, the first successful and most reputed example of a commercial drug that was developed from snake venom. It is a biomimetic of a bradykinin-potentiating peptide from the Brazilian arrowhead viper *Bothrops jararaca* venom, and is used to treat hypertension and cardiovascular disease by inhibiting angiotensin converting enzyme which is responsible for the conversion of angiotensin I to angiotensin II[14]. Two more drugs, Aggrastat® (Tirofiban) and Integrilin® (Eptifibatid), based on snake venom disintegrins are currently available on the market as anti-platelet agents[14, 15]. Another such example is Prialt® (ziconotide), derived from marine snail *Conus magus* venom peptide which possesses strong analgesic activity[16]. In addition to these, much more research has been directed to explore the anti-cancer potential of snake venom proteins and peptides[2, 17]. Many of the major pharmaceutical companies (and most major agrochemical companies) have venom-based drug discovery programs and/or they use venom-derived molecules for target validation (e.g., AstraZeneca, Eli Lilly, Johnson & Johnson and Merck)[1].

In the recent years key technical advances in combination with industrial focus have converged to provide a larger-than-ever pipeline of venom-derived therapeutics. Although a number of potent drug candidates have been isolated and characterized from venoms, however they need to undergo rigorous preclinical evaluation for successful commercialization. For these drug-prototypes to be commercially viable, it is crucial to understand their pharmacokinetics properties including absorption, distribution, metabolism, bioavailability, and excretion. Therefore, collaboration between the clinical and basic sciences, including toxicologists and researchers skilled in drug synthesis, is necessary to critically assess the feasibility of a drug-prototype, and pharmaceutical industry can offer further contribution in the commercial success of these candidate molecules.

References:

1. King, G. (2013). Venoms to drugs: translating venom peptides into therapeutics. *Australian Biochemist*, 44(3).
2. Kalita, B., A.J. Saviola, and A.K. Mukherjee. (2021). From venom to drugs: a review and critical analysis of Indian snake venom toxins envisaged as anticancer drug prototypes. *Drug Discovery Today*.
3. Mukherjee, A.K. and S.P. Mackessy. (2013). Biochemical and pharmacological properties of a new thrombin-like serine protease (Russelobin) from the venom of Russell's Viper (*Daboia russelii russelii*) and assessment of its therapeutic potential. *Biochimica et Biophysica Acta - General Subjects*, 1830(6), 3476-3488.
4. Thakur, R., Kumar, A., Bose, B., Panda, D., Saikia, D., Chattopadhyay, P., & Mukherjee, A. K. (2014). A new peptide (Ruviprase) purified from the venom of *Daboia russelii russelii* shows potent anticoagulant activity via non-enzymatic inhibition of thrombin and factor Xa. *Biochimie*, 105, 149-158.
5. Kalita, B., & Mukherjee, A. K. (2019). Recent advances in snake venom proteomics research in India: a new horizon to decipher the geographical variation in venom proteome composition and exploration of candidate drug prototypes. *Journal of Proteins and Proteomics*, 10(2), 149-164.
6. Greener, M. (2020). The next generation of venom-based drugs. *Prescriber*, 31(4), 28-32.
7. Mukherjee, A.K., Saikia D. & Thakur R. (2011). Medical and diagnostic applications of snake venom proteomes. *Journal of Proteins & Proteomics*, 2(1).
8. Waheed, H., Moin, S. F & Choudhary, M. I. (2017). Snake venom: from deadly toxins to life-saving therapeutics. *Current medicinal chemistry*, 24(17), 1874-1891.
9. Pennington, M.W., Czerwinski, A. & Norton, R.S. (2018). Peptide therapeutics from venom: Current status and potential. *Bioorganic medicinal chemistry*, 26(10), 2738-2758.
10. King, G.F. (2011). Venoms as a platform for human drugs: translating toxins into therapeutics. *Expert opinion on biological therapy*, 11(11), 1469-1484.
11. Machkour-M'Rabet, S., Hénaut, Y., Winterton, P., & Rojo, R. (2011). A case of zootherapy with the tarantula *Brachypelma vagans* Ausserer, 1875 in traditional medicine of the Chol Mayan ethnic group in Mexico. *Journal of Ethnobiology and Ethnomedicine*, 7(1), 1-7.
12. Cushman, D.W. & Ondetti, M.A. Ondetti. (1991). History of the design of captopril and related inhibitors of angiotensin converting enzyme. *Hypertension*, 17(4), 589-592.
13. Opie, L. H., & Kowolik, H. (1995). The discovery of captopril: from large animals to small molecules. *Cardiovascular research*, 30(1), 18-25.
14. Utkin, Y. N. (2015). Animal venom studies: Current benefits and future developments. *World journal of biological chemistry*, 6(2), 28.
15. Mohamed Abd El-Aziz, T., Soares, A. G., & Stockand, J. D. (2019). Snake venoms in drug discovery: valuable therapeutic tools for life saving. *Toxins*, 11(10), 564.
16. Miljanich, G. P. (2004). Ziconotide: neuronal calcium channel blocker for treating severe chronic pain. *Current medicinal chemistry*, 11(23), 3029-3040.
17. Koh, C. Y., & Kini, R. M. (2012). From snake venom toxins to therapeutics—cardiovascular examples. *Toxicol*, 59(4), 497-506.



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Highlights of National Innovation and Start-up Policy 2019 for Students and Faculty

- Chandrabhan Kakory

A fifteen membered committee was constituted by Ministry of Human Resource Development to formulate detailed guidelines for various aspects of innovation, Startup and entrepreneurship management. After multiple rounds of meetings, National Innovation and Startup Policy 2019 for students and faculties of HEIs were prepared. The Policy is a guiding framework to envision an educational system oriented towards startups and entrepreneurship opportunities for student and faculties. The guidelines provide ways to Indian HEIs to develop entrepreneurial agenda, managing Intellectual Property Rights (IPR) ownership, technology licensing and equity sharing in Startups or enterprises established by faculty and students.

Important Directive Principles of the Policy

- Student and faculty startup Policy and action plan should be formulated at university level, which is in line with the current document along with well-defined short-term and long-term goals.
- Development of entrepreneurship culture should not be limited within the boundaries of the institution.
- While defining their processes, institutions will ensure to achieve following:
 - **Incubation support:** Offer access to pre-incubation & Incubation facility to start ups by students, staff and faculty for mutually acceptable time-frame.
 - Will allow licensing of IPR from institute to start up: Ideally students and faculty members intending to initiate a startup based on the technology developed or co-developed by them or the technology owned by the institute, should be allowed to take a license on the said technology on easy term, either in terms of equity in the venture and/ or license fees and/ or royalty to obviate the early stage financial burden.
 - Will allow setting up a startup and working part-time for the startups while studying / working: HEIs may allow their students / staff to work on their innovative projects and setting up startups.

However, the student must describe how they will separate and clearly distinguish their ongoing research activities as a student from the work being conducted at the start up.

- Students who are under incubation, but are pursuing some entrepreneurial ventures while studying should be allowed to use their address in the institute to register their company with due permission from the institution.
- Allow faculty and staff to take off for a semester / year as sabbatical/ unpaid leave/ casual leave/ earned leave for working on startups and come back. Institution should consider allowing use of its resource to faculty/students/staff wishing to establish start up as a fulltime effort. The seniority and other academic benefits during such period may be preserved for such staff or faculty.
- In return of the services and facilities, institute may take 2% to 9.5% equity/ stake in the startup/ company, based on brand use, faculty contribution, support provided and use of institute's IPR
- No restriction on shares that faculty / staff can take, as long as they do not spend more than 20% of office time on the startup in advisory or consultative role and do not compromise with their existing academic and administrative work / duties. **In case the faculty/ staff holds the Executive or Managerial position for more than three months in a startup**, then they will go on sabbatical/ leave without pay/ earned leave.
- Every faculty may be encouraged to mentor at least one startup.

Product Ownership Rights for Technologies Developed at Institute

- When institute facilities / funds are used substantially or when IPR is developed as a part of curriculum/ academic activity, IPR is to be jointly owned by inventors and the institute.
- 1. Inventors and institute could together license the product / IPR to any commercial organization, with inventors having the primary say. License fee could be either/or a mix of -

- a. Upfront fees or one-time technology transfer fees.
 - b. Royalty as a percentage of sale-price
 - c. Shares in the company licensing the product
2. An institute may not be allowed to hold equity as per current statute, so SPV may be requested to hold equity on their behalf.

Suggested Norms for Faculty Start-ups

- For better coordination of the entrepreneurial activities, norms for faculty to do startups should be created by the institutes. Only those technologies should be taken for faculty startups which originate from within the same institute.
- Role of faculty may vary from being an owner/ direct promoter, mentor, consultant or as on-board member of the startup.
- Institutes should work on developing a policy on 'conflict of interests' to ensure that the regular duties of the faculty don't suffer owing to his/her involvement in the startup activities.
- Faculty startup may consist of faculty members alone or with students or with faculty of other institutes or with alumni or with other entrepreneurs.
- In case the faculty/ staff holds the Executive or Managerial position for more than three months in a startup, they will go on sabbatical/ leave without pay/ utilize existing leave.
- Faculty must clearly separate and distinguish on-going research at the institute from the work conducted at the startup/ company.
- In case of selection of a faculty start up by an outside national or international accelerator, a maximum leave (as sabbatical/ existing leave/ unpaid leave/ casual leave/ earned leave) of one semester/ year (or even more depending upon the decision of review committee constituted by the institute) may be permitted to the faculty.