THE INSTITUTE OF BIOINFORMATICS AND APPLIED BIOTECHNOLOGY

At a Glance

www.ibab.ac.in
IBAB is an autonomous institution set up by the Department of IT, BT and S&T of the Government of Karnataka in 2001. It is a non-profit registered Society. IBAB is supported through a grant-in-aid from the Government of Karnataka, and is located in the Bengaluru Helix biotech park in Electronic City.

IBAB is deeply indebted to the Government of Karnataka, particularly the Department of IT, BT and S&T, for continuous financial support and for choosing the institute for implementing several key initiatives. It also sincerely acknowledges the role of the Governing Body in guiding, mentoring and steering the institute to achieve its current stature.
Vision
To be an important catalyst for the growth of the biotech, bioinformatics and related industries in Karnataka and India

Mission
To grow into a world class Bioinformatics and Biotechnology institute through its education, research and entrepreneurship programmes

An endeavour at the interface of biology and informatics
“It has been a treasured and unique opportunity to be at IBAB which is bestowed with the distinctive benefit of goodwill from high calibre academics, industry professionals, bureaucrats, and most importantly interacting with bright and enthusiastic students from across India, all of which create an unparalleled ambience at this green and growing institute.”

PROF. N. YATHINDRA, DIRECTOR, IBAB 2004-2018

DIRECTOR’S MESSAGE

IBAB was established following a recommendation by the Vision Group on Biotechnology, an advisory body to the Chief Minister headed by Ms. Kiran Mazumdar-Shaw. It is a unique initiative to support the biotech ecosystem in Karnataka and India and has been a tremendous success. Other states are now trying to emulate IBAB’s successful model.

The institute has achieved several milestones since its inception. Some of its accomplishments include the implementation of well-recognized and novel postgraduate and doctoral research programmes. IBAB’s activities are driven by highly motivated faculty with excellent academic backgrounds, pursuing high quality research leading to publications in reputed international journals. In a first for biological institutions in India, IBAB initiated the incubation of start-ups as early as 2002, and has supported 25 entrepreneurs to date. The institute was recognized as a Centre of Excellence for Research and Training in Bioinformatics in 2008 by MeitY. Subsequently a Bio-IT centre was set up at IBAB in 2010 in partnership with GoK and MeitY. More recently, IBAB has launched a synthetic biology programme with support from GoK. The institute has also initiated prestigious collaborative programmes such as B-Life and B-4 to promote education and research.

The institute has a long term Vision and Mission to guide its activities. Its Governing Body and Scientific Advisory Board play a crucial role in enabling the institute to achieve its goals.
GOVERNANCE

GOVERNING BODY (GB)

IBAB is governed by a GB. The GB appoints the Director who is the executive head of the institute.

- H. Sharat Chandra, Chairman
  Honorary Director, Centre for Human Genetics and formerly Professor, Indian Institute of Science

- Kiran Mazumdar-Shaw
  Chairperson and MD, Biocon Group

- M Vijayan
  INSA Albert Einstein Research Professor and formerly, Associate Director, Indian Institute of Science

- Director
  Indian Institute of Management, Bengaluru

- Director
  International Institute of Information Technology, Bengaluru

- President
  Jawaharlal Nehru Centre for Advanced Scientific Research

- Director
  National Centre for Biological Sciences, TIFR

- Secretary
  Department of IT, BT and S&T, Government of Karnataka

- Director
  Department of IT, BT and S&T, Government of Karnataka

SCIENTIFIC ADVISORY BOARD (SAB)

The SAB is a non-statutory body comprising eminent scientists from academia and industry.

Members of the SAB review and provide suggestions on long-term strategies and short-term scientific goals of the institute.

- T. S. Balganesh
  Former Head of Research, AstraZeneca India & Head, Open Source Drug Discovery Unit, CSIR, IISc campus

- Alok Bhattacharya
  Jawaharlal Nehru University

- Amit Dutt
  Tata Memorial Centre, ACTREC

- Shekhar Mande
  Director, National Centre for Cell Sciences

- Manoj Nerurkar
  COO, Syngene International Limited

- N R Rao
  Former Divisional Chairman, Biological Sciences, IISc

- N Srinivasan
  Indian Institute of Science

- Mukund Thattai
  National Centre for Biological Sciences, TIFR

“The Vision Group on Biotechnology constituted by the Government of Karnataka in 2000 established IBAB with the foresight of recognising the power of information technology in advancing biotechnology. The aim was to achieve excellence in developing talent in computational biology that could enable the Indian Biotech sector to compete globally in key emerging areas. Over the years, it has not only delivered on its stated objectives but is renowned for its research and educational programmes. It is now poised to grow exponentially, and I am confident that it will continue to excel in its educational programmes, its cutting edge research and its support for start up entrepreneurs. We are proud of what IBAB has achieved, and we are with it on its journey ahead.”

DR. KIRAN MAZUMDAR-SHAW, CHAIRPERSON AND MD, BIOCON GROUP
Faculty of the institute are at the core of everything it does. They bring in their extensive research and teaching experience, repertoire of ideas, collaborations and funding. The faculty are very actively involved in mentoring the PhD scholars and MSc students. Despite heavy teaching responsibilities, IBAB's faculty are also engaged in high quality research in emerging areas.

**RESEARCH HIGHLIGHTS**

We are interested in understanding the structure-function relationship of proteins using structural biology tools such as X-ray crystallography, Cryo-EM and structural bioinformatics. Currently we are working on the DNA damage repair pathway proteins focusing on DNA polymerase theta, a crucial alternative non-homologous end-joining protein in mammalian cells. Structural studies on actin and actin-interacting proteins from Leishmania donovani is another area being pursued in collaboration with Dr. C M Gupta. Using the structural knowledge of proteins, we intend to design and develop novel drug molecules against some of these specific target proteins.

**H. S. SUBRAMANYA**  
Director & Biocon Chair  
Structural Biology and Drug Discovery

**KSHTISH ACHARYA**  
Faculty Scientist,  
Transcriptomics And Reproductive Biology

**R SRIVATSA**  
Faculty Scientist,  
Data Analytics and Systems Biology

**S THIYAGARAJAN**  
Faculty Scientist,  
Structural Biology and Informatics

**SHIVAKUMARA SWAMY**  
Faculty Scientist,  
Microbial Genomics

Experimental and computational approaches are being used to shortlist candidate biomarkers and to understand the molecular basis of non-obstructiveazoospermia. We have developed tissue-specific gene expression databases and novel meta-analysis methods for better use of transcriptomic data. Distribution characteristics of transcription factor binding sites are being used to differentiate mammalian promoters that function differently. We are also characterizing human meiotic chromosomal recombination regions (hotspots) across global populations.

**My research focusses on the genetics and genomics of bacteria. I am particularly interested in elucidating the mechanisms of gene gain and loss in bacteria of pathogenic and biotechnological importance. I use several genomic tools and databases along with laboratory experimentation to understand the consequences of gene gain and loss on the evolution of bacteria. Recently we have investigated pigmented members of the bacterial order Sphingomonadales at the genomic level, and discovered two key features: (a) members of this order contain an ancient prophage element, which possibly represents a specialized transduction event; and (b) members of this order appear to have synergized the biosynthesis of carotenoids and cytokinin, and the latter could have a role in enhancing the production of the former.**

**Our group is involved in developing mathematical models of autoimmune diseases, with a special focus on Rheumatoid Arthritis (RA), using a systems biology approach. Our work is focussed on capturing the essential core interaction networks and pathways involved in RA and constructing a predictive model that will provide clinically relevant parameters under disease conditions. Most recently, we have created (i) the cytokine signalling network for the regulation of inducible Nitric Oxide Synthase (iNOS) in RA, (ii) a kinetic model of nitric oxide and its stable metabolites across body compartments and (iii) an integrated framework for analyzing pathway interactions in RA.**
My group focuses on cancer genomics, pharmacogenomics, rare disease genomics and drug discovery. A large number of congenital disorders are very rare and localized to rural areas in India, a country that practices both endogamy and consanguinity. We have identified a novel loss-of-function mutation in the HACE1 gene that is associated with a rare congenital neuro developmental disorder in a boy from a remote village in southern India. We have initiated genome sequencing of Indian patient samples with other rare diseases to evolve a diagnostic panel for assaying Indian patients. Additionally, we work on understanding the role of noncoding RNA in disease pathology and its use as drug targets.

We use computational and systems biological approaches to understand disease mechanisms. Currently the focus is on the pathogenicity of Mycobacterium tuberculosis, which causes tuberculosis. Employing large-scale genomics, transcriptomics and other high-throughput datasets, we research i) long term persistence of mycobacteria, ii) host-pathogen protein interactions during infection and iii) gene regulation and expression.

My team is using gene editing technologies for (a) rational engineering of metabolic pathways in yeast for production of high value biomolecules and therapeutic proteins, (b) generating a library of synthetic genetic elements that allows tuneable gene expression over a broad dynamic range, and (c) modifying human cells for drug resistance and functional genomics studies. We have generated yeast and mammalian vectors co-expressing CRISPR/Cas9 components using PCR-based seamless assembly of DNA fragments. In addition, we are developing a bipartite system of controlling gene expression in yeast using synthetic promoters and CRISPR/Cas9-based methods.

We are interested in developing a quantitative model of Natural Killer (NK) cell effector function. NK cells integrate signals from a diverse set of activating and inhibitory receptors expressed on their cell surface. A sophisticated balance between activating and inhibitory signaling determines their effector function. We use mathematical methods seeded in ordinary differential equations (ODEs), partial differential equations (PDEs), and statistical inference and computer simulation to construct mechanistic models of NK cell effector functions. Our models seek to integrate experimental data and make verifiable predictions.

We undertake empirical policy research related to the health industries, primarily biotech and pharma, in India and abroad. We have undertaken studies in entrepreneurship, on US patents and on clinical trials. Our work has appeared in *Nature Biotechnology* several times. We also publish general articles and editorials on these themes.
We use genomics and bioinformatics tools to probe a diverse range of areas including disease vs. normal biology, agriculture, metagenomics and nutrition. We have characterized the uniquely expressed non-coding RNA in prostate cancer by analyzing patients’ samples. One such non-coding RNA is PCAT92 and its role in regulating expression of the androgen transporter has been experimentally validated. Grain amaranth, a C4 dicot, is highly nutritious, rich in its lysine content and displays majority of the desirable traits, and we have determined draft genome and transcriptome sequences. We are using comparative genomics/transcriptomics to extract genotypes unique to grain amaranth and also trying to understand and characterize microbial species that are uniquely enriched by Amaranthus.

We have a broad interest in the area of computational approaches to better understand biomolecular structure and function with a focus on nucleic acids and protein–nucleic acid interactions. Molecular modeling and molecular dynamics simulations approaches are utilized to specifically examine how non-isostericity in base pairs and base triplets influence stability and sequence dependent structures of nucleic acids duplexes with non Watson and Crick base pairs and nucleic acids tripleces. We are exploring how disparate substrate recognition and catalytic action by the RNase H class of enzymes are manifested as a dynamic consequence of their static structures.

The focus of our research is on Leishmania, a family of protozoan parasites which cause a number of human diseases including the dreaded visceral leishmaniasis, which contains an unconventional homolog of actin that displays very unusual biochemical properties, as compared to canonical actins. In addition, some of the proteins that bind actin, such as myosin XXI and profilin, contain some unusual stretches of amino acid sequences, which are completely absent in canonical proteins. Our studies have shown that UBA domains in myosin XXI are essentially required for its role in the cell division cycle, especially during karyokinesis and cytokinesis processes, whereas profilin is involved in the DNA synthesis phase, perhaps in the chromatin remodeling process, in the Leishmania promastigote cell division.
“IBAB provides freedom to the faculty scientists to work on their respective areas of interests. The institute boasts sophisticated biotech labs with advanced instruments. IBAB has excellent computational resources which include HPC clusters, GPU clusters and high memory machines. We have a molecular modelling studio equipped with open source as well as commercial softwares. Thus IBAB stands to be one of the premier institutes to pursue cutting edge scientific research.”

IBAB FACULTY MEMBER
**2002**
INAUGURATED BY HONORABLE CHIEF MINISTER OF KARNATAKA
FIRST POSTGRADUATE PROGRAMME INITIATED

**2003**
SELECTED AS A FOUNDING MEMBER OF THE NATIONAL ENTREPRENEURSHIP NETWORK

**2005**
FIRST FIRST GRANT FROM DST, GOI

**2006**
ASTRAZENECA RESEARCH FOUNDATION ENDS A FACULTY CHAIR IN CHEMINFORMATICS

**2008**
RECOGNIZED AS A CENTRE OF EXCELLENCE FOR RESEARCH AND TRAINING IN BIOINFORMATICS BY MEITY
DOCTORAL PROGRAMME INITIATED

**2009**
MOVED TO NEW CAMPUS IN BIOTECH PARK

**2010**
BIO-IT CENTRE ESTABLISHED WITH SUPPORT FROM MEITY AND GOK

**2011**
MSC IN BIOINFORMATICS AND BIOTECHNOLOGY LAUNCHED

**2012**

**2013**
IBAB’S NEW ‘MSC IN BIOINFORMATICS AND APPLIED BIOTECHNOLOGY’, RECOGNIZED BY THE UNIVERSITY OF MYSORE, TAKES OFF

**2014**
INFOSYS FOUNDATION ENDS INFOSYS CHAIR. DR. C. M. GUPTA IS THE FIRST OCCUPANT

**2015**
B-LIFE PROGRAMME IN BIG DATA INITIATED TOGETHER WITH THE B-LIFE CLUSTER (NCBS, INSTEM AND C-CAMP)

**2016**
B-LIFE PROGRAMME IN BIG DATA - PHASE 2, INITIATED

**2017**
SYNTHETIC BIOLOGY PROGRAMME LAUNCHED

**2018**
BIG DATA BIOLOGY PROGRAMME WITH IIIT-B LAUNCHED, SUPPORTED BY DBT
B-S PROGRAM - PHASE 2, LAUNCHED WITH THE MITTAL INSTITUTE, HARVARD UNIVERSITY, SUPPORTED BY DBT
MSC IN BIOTECHNOLOGY AND BIOINFORMATICS, RECOGNIZED BY BANGALORE UNIVERSITY, TAKES OFF

DR. KIRAN MAZUMDAR-SHAW ENDS A FACULTY CHAIR IN COMPUTATIONAL BIOLOGY. PROF. YATHINDRA IS THE FIRST OCCUPANT

**2019**

**2020**

**2021**

**2022**

**2023**

The IBAB curricula are based on continuous feedback from industry and academia. This enables the institute to offer the best education, based on contemporary research. The programmes are designed to instill in its students a sense of independence and confidence in applying scientific methods.

The courses have an optimal mix of lectures and laboratory work and the education is rooted in ongoing research relevant to both industry and academia. The students have described the IBAB courses as a ‘risk free period to explore new areas’. Each student has a dedicated faculty mentor counselling him or her on a regular basis. IBAB graduates are in high demand by industry. The course motivates and enables them to pursue PhD opportunities, whether in India or abroad.

**COURSES**

For students interested in becoming good, well-grounded academics, IBAB is a perfect launch pad. The institute takes pride in its ability to impart to its students the necessary skills needed to build a successful career in this field. At present, it offers a two-year MSc programme in Biotechnology and Bioinformatics, a PhD programme, post-doctoral training and several short term internships. A Postgraduate Diploma programme in Big Data Biology is about to be launched.

The MSc programme in Biotechnology and Bioinformatics is a unique dual specialization degree programme that builds competence in both biotechnology and computational biology/bioinformatics. Students of this programme are provided extensive training in cell and molecular biology, computer science, mathematics, statistics, bioinformatics and so on. Right from the beginning, the faculty ensures that the students get an immersive high quality research experience. They also get several opportunities to meet and interact with high-profile scientists from across the globe. Events such as the annual Kiran Mazumdar-Shaw Lecture series have enabled the visit of a Nobel laureate.

The success of the MSc programme is reflected in the competition for entry by students from across the country, as well as the placement of the graduating students. Many students have moved on to pursue a PhD at some of the world’s top research institutes. Others have joined companies and have succeeded in leaving their mark.

The institute will soon launch a new Post Graduate Diploma in Big Data Biology. This programme will be run in collaboration with the International...
Institute of Information Technology, Bengaluru. Through this programme, the two institutes hope to harness their respective core strength in genomics and other areas of the biological sciences, and the computational sciences respectively. The course will be taught by faculty from both the institutes and experts drawn from academia and industry. It will involve extensive laboratory sessions, industry-oriented projects and interactions with industry.

The PhD programme involves intensive training under the guidance of faculty members working in diverse areas such as genomics, systems biology, synthetic biology, cancer biology, structural biology and drug discovery, epigenetics, infectious diseases and microbiology. The research fellows have full access to state-of-the-art research facilities, which include fluorescence microscopes, HPLC/FPLC and 2D electrophoresis systems, NGS DNA sequencing comprising a HiSeq 2500 Sequencer, HiScan Beadchip Scanner and other accessories and equipment needed for high throughput sequencing. The institute has dedicated research laboratories, cell-culture facilities, and an animal house needed for translational research. The institute is equipped with high-end servers and high performance computing clusters essential for research in big data and computational biology. This is in addition to the vast resources of high-end instruments such as a confocal microscope, a mass spectrometer, an LCMS and robotic liquid handling equipment and other specialized facilities available at BBC (Bangalore Bioinnovation Centre) next door, which is part of the Biotech Park.

**ADMISSIONS**

Admission to the MSc programme is through a national-level, two-step merit-based process – an online entrance test followed by a rigorous interview. Students from any branch of science, technology or medicine are eligible to apply.

The institute’s consistent demonstration of strengths in education and research in bioinformatics has led to its recognition as a ‘Centre of Excellence for Research and Training in Bioinformatics’ by MeitY.
The degree is awarded by Bangalore University, which has recognized IBAB as a special institute under Section 66 of K.S.U. Act, 2000. This provides the institute functional autonomy in terms of administering the course. Scholarships are offered to those in need, based on merit. The institute also awards the prestigious Phi-Psi scholarships for MSc students who design their own fourth-semester projects and bring them close to the level of publication.

For the PhD programme, students who have qualified to receive UGC/CSIR, NET, BINC, DBT, ICMR and other scholarships are encouraged to apply. Candidates are selected based on a rigorous interview process. In addition to the students qualified to receive the above-mentioned national fellowships, IBAB also offers a few in-house fellowships for outstanding students.

STUDENT ACHIEVEMENTS AND PLACEMENTS

Many students from each batch of MSc have qualified, some with very high ranks, in national level competitive examinations such as CSIR-NET, DBT, BINC, GATE and JMM. Many of them opt for an academic career, and pursue a doctoral programme at a well-recognized university or research institute in India or abroad. The institute has a dedicated placement cell, which supports industry placements. IBAB’s placement record has been consistently above 95% for each batch. The PhD students receive rigorous training in the area of their research. In addition to regular in-house seminars, they routinely present posters to showcase their work at national as well as international conferences. They publish their work in peer-reviewed high quality journals which is mandatory before thesis submission. IBAB graduates are in high demand and find positions in India or abroad in excellent academic labs, or take up appropriate positions in industry.

ALUMNI

Since its inception in 2002, almost 1000 students have passed out of the institute. IBAB alumni have gone on to study at some of the most prestigious institutions in the country and abroad, including the Indian Institute of Science, the National Centre for Biological Sciences, the IITs, the University of Cambridge and Cornell University. Some of them are faculty members at prestigious institutions, many of them are in leading roles at multinational companies, some hold top positions in startups that have grown with their help and yet others have started their own companies. The institute is proud of its alumni and assured of the fact that they will bring to themselves and to the institute many honors in the years to come.

A sample of companies and academic institutes where IBAB students have been placed:

<table>
<thead>
<tr>
<th>COMPANIES</th>
<th>ACADEMICS WITHIN INDIA</th>
<th>ACADEMICS OUTSIDE INDIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biocon</td>
<td>ACTREC, Mumbai</td>
<td>Cornell University</td>
</tr>
<tr>
<td>Cellworks Research</td>
<td>Indian Institute of Science</td>
<td>European Bioinformatics Institute</td>
</tr>
<tr>
<td>Eli Lilly</td>
<td>Indian Institute of Science Education and Research</td>
<td>Heidelberg University</td>
</tr>
<tr>
<td>GlaxoSmithKline</td>
<td>Indian Institutes of Technology</td>
<td>Imperial College</td>
</tr>
<tr>
<td>Molecular Connections</td>
<td>J N Centre for Advanced Scientific Research</td>
<td>Institute of Population Genetics</td>
</tr>
<tr>
<td>Novartis</td>
<td>National Centre for Biological Sciences</td>
<td>Max Planck Institutes</td>
</tr>
<tr>
<td>Philips Research Centre</td>
<td>TIFR, Mumbai</td>
<td>University Le Reunion</td>
</tr>
<tr>
<td>Quintiles</td>
<td>TIFR, Hyderabad</td>
<td>University of Cambridge</td>
</tr>
<tr>
<td>Strand Life Sciences</td>
<td>The Institute of Mathematical Sciences</td>
<td>University of Zurich</td>
</tr>
</tbody>
</table>

“...The exposure and expanse of topics we learn is great. The kind of experiments we get to do give us a lot of confidence. This place cares about knowledge and not exams and marks. IBAB brings you out of your comfort zone yet makes you feel comfortable with new things. Most importantly, even though we are the junior most in the institute we have access to brilliant facility and any idea is always heard in labs and classes...”

IBAB STUDENT
IBAB faculty are engaged in high quality research in frontier areas of biology and publish in the best international journals such as Cell and Nature Biotechnology. The institute and the faculty have built a rich network of collaborators from well known hospitals, industry and academic institutes of excellence.

The faculty have published 60 papers in the last five years despite substantial teaching responsibilities. Focus areas of research include genomics, systems biology, synthetic biology, cancer biology, structural biology and drug discovery, epigenetics, infectious diseases and microbiology.
“When it comes to a life science start-up, the puzzle is complex. The institute has supported us in several ways and not just limited to laboratory space and infrastructure, but mentoring us on our entrepreneurship path. We have had unique opportunities open up due to our association with IBAB. We are proud to be IBABians.”

**DENovo BIOLABS, INCUBATEE**

**ENTREPRENEURSHIP**

IBAB has been incubating and promoting entrepreneurs in biotechnology and related areas since its establishment in 2002. Further, the institute was selected as a founder member of the National Entrepreneurship Network (NEN) set up by the Wadhwani foundation in 2004, along with IIM, Ahmedabad; IIT, Mumbai; BITS, Pilani and SPJIMR, Mumbai.

Apart from providing necessary infrastructure, IBAB also facilitates its incubatees through mentorship, networks and opportunities to collaborate with its faculty. So far, 25 startups have been incubated. This includes companies set up by alumni, such as DeNovo Biolabs. Cellworks Group, which acquired venture capital and expanded to the US is a good example of a successful incubatee. Several of the start-ups have been doing exceedingly well, including winning national-level competitions and receiving prestigious funding.

The institute was actively engaged in setting up the Bangalore Bioinnovation Centre (BBC), which is a state-of-the-art incubation facility, set up by GoK, with generous funding from DBT. The IBAB Director also serves on the Board of Directors of BBC. IBAB’s proximity to BBC and its facilities, is helpful to the institute’s incubatees.

**CURRENT INCUBATEES**

**PAST INCUBATEES**
IBAB is expanding its activities to achieve its Mission of growing into a world class institute. Several novel educational programmes have been envisaged in emerging areas such as genomics, big data biology and synthetic biology. The institute aspires to become a hub of bioinformatics and big data in the country, in line with the European Bioinformatics Institute (EBI).

It intends to (a) develop tools and technologies, (b) host and mirror databases, especially India-specific databases, and (c) carry out basic and applied bioinformatics research. The institute also aims to play a pivotal role in enriching the biotech ecosystem in the country. It plans to (a) enhance its basic and translational research capabilities, (b) develop products and technologies in the areas of socio-economic importance, and (c) support entrepreneurs through novel strategies.

The following are the most recent initiatives:

**BIO-IT CENTRE**

The global demand for well-trained professionals in the area of genomics and big data analysis necessitates intensive training and educational programmes in this area to create adequate manpower.

IBAB, with support from GoK, has launched a research and training programme in genomics with the following objectives:

1. To generate human resources competent in genomic sciences and big data analytics.
2. To impart short-term training specifically to students, teachers, faculty, researchers, clinicians and agriculture scientists on genomic data generation and analysis.
3. To blend training with research in a way that would also accomplish some research goals in the area of genomics specific to (a) population genetics of Karnataka; (b) the nutritional and medicinal value of indigenous plants; (c) precision medicine and healthcare.

4. Create awareness among students, clinicians, and medical, agricultural and academic researchers about the utility and power of genomic sciences in diagnosis, therapy and crop improvement, through training programmes.

Regular training programmes in sequencing and data analysis are conducted and over 130 students have been trained in the last few months. Simultaneously, research programmes in collaboration with hospitals, industry and academic groups of excellence are in progress.

**SYNTHETIC BIOLOGY PROGRAMME**

Synthetic Biology is a rapidly growing field of science having the potential to transform several areas of high socio-economic relevance such as healthcare, agriculture, environment, novel materials, energy, clean water and manufacturing.

The Synthetic Biology programme has been established at IBAB with generous support from GoK. The broad objectives of this programme are:

1. To create tools, technologies and services to support academic and industrial research.
2. To undertake translational research to develop products and technologies in the areas of high socio-economic impact such as food, fuel, health and environment.
3. To create skilled manpower through educational and training programmes.

Research facilities, including a yeast biology lab, cell and tissue culture facility as well as a genome engineering laboratory have been established and are fully functional. Research and training programmes are also part of this initiative.

**BUILDING BHARAT-BOSTON BIOSCIENCES (B4) PROGRAM**

A Boston-Bangalore Biosciences Beginnings (B4) Program was initiated in 2016, in collaboration with The Mittal Institute, Harvard University, with support from DBT and GoK. The objectives of this program have been to create a scientific corridor between Boston and Bengaluru, to enable the exchange of scientific manpower and ideas between the two cities, and to promote high quality entrepreneurial activities.

Four Indian post-doctoral scientists have carried out research in Harvard University laboratories, and 50 students have been trained in the areas of neuroscience and genomics, through two workshops conducted in Bengaluru and taught by Harvard and local faculty.
With the successful completion of this programme, IBAB has received funding from DBT to initiate a renamed and more ambitious Building Bharat-Boston Biosciences (B4) Program, with a much larger scope and vision.

**B–LIFE BIOCLUSTER PROGRAMME**

IBAB has collaborated with the DBT-funded B–Life Biocluster comprising InStem, NCBS and C–CAMP to enhance educational and research competence in the area of big data. This programme supports faculty, research and training in the area of big data at IBAB and the partnering institutes.

As a part of this programme, every year five students from IBAB work as interns on big data biology projects for 6-12 months with faculty in the B–Life Biocluster. In addition, IBAB faculty regularly conduct a three-day, hands-on foundation course on data analytics in the life sciences, using R statistical package for the PhD students of the B–Life Biocluster. The institute also runs several other short courses in this area each year, with a plan to launch a postgraduate diploma in big data biology soon.

**THE TRANSLATIONAL RESEARCH PROGRAMME**

In line with its mandate, IBAB is establishing a translational research group with the aim of developing intellectual property (IP), technology and products that will support entrepreneurship. The institute has initiated translational research programmes in the areas of genomics, synthetic biology and drug discovery.

A small rodent vivarium to support drug discovery, vaccine and biomarker development has been established. The institute is also establishing strong collaborations with IT and biotech companies, such as Intel and Syngene International, to enhance its translational research activities.

“As String has been a grateful beneficiary of the excellent environment that IBAB offers for startups. It is a supportive and operationally efficient launching pad for early stage startups. Being in IBAB also provides startups the unique opportunity for collaborations with the faculty and students.”

STRING BIO, INCUBATEE
The campus is home to several beautifully designed avenues, landscaped lawns, walkways and lush greenery of a variety of plants and trees. IBAB is surrounded by India's world-famous IT and BT industry, creating the perfect setting for interdisciplinary exchanges between informatics and biology, which the institute is capitalizing on.

IBAB is located in a 20-acre, well-planned and aesthetically developed campus in the biotech park, The Bangalore Helix, located in Electronics City. The institute’s 2-storied academic block houses the classrooms, auditorium, laboratories, library the administrative office and is well decorated with paintings and photographs.

IBAB has full-fledged residential facilities on campus with separate hostels for male and female students. Accommodation is assured for all IBAB students. The hostels have been carefully planned with well-furnished spacious rooms, a gymnasium and several well-outfitted pantries. Some fully furnished guest rooms, guest suites and accommodation for staff and faculty are also available. Housed in a standalone building in the middle of the campus, the dining hall is truly the melting-pot of the campus. This is where the residents of the Park meet on a daily basis. It provides freshly-cooked hygienic food to members of the campus community.

FACILITIES

IBAB has an excellent library which is well-stocked with books, CDs and periodicals on a variety of subjects. It also subscribes to a host of academic journals, both print and online. The literature section contains hundreds of books on fiction, travel, poetry, biographies and other genres. The library is tastefully designed, and large metal molecular models of nucleotides and peptides adorn its high ceilings.

The classrooms have laptop-friendly seating, with internet connections, and are AV-enabled. The research and student laboratories are air-conditioned. Each student is allotted an independent high-end computer, with access to a high-speed internet, best-in-class software and high performance clusters needed for computational biology work.

The wet-laboratories are well equipped with necessary common instruments and facilities needed for high quality training and research. Students and research scholars have access to a central instrumentation facility which houses equipment such as fluorescence microscopes, FACS, DLS, PCR and real-time PCR machines, gel imaging systems, high and low-speed refrigerated centrifuges, microfuges, HPLC/FPLC and 2D electrophoresis systems. In addition, researchers and students have access to the extensive equipment and specialized facilities such as confocal microscope, ITC, proteomics lab and histology and cytology facilities at BBC next door.

Students also have access to the Bio-IT centre facility, which has high end sequencing equipment such as HiSeq-2500, Hi-scan microarray scanner, and other accessories needed for library preparation, quality control and sequencing.

The institute has a high-quality auditorium to host seminars and lectures by eminent speakers that benefit the student and research community. The auditorium is aesthetically designed and equipped with video conferencing systems.

"IBAB's industry-aligned curriculum and the multidisciplinary student pool has provided a fabulous human resources stream to tap into for us and other life science companies in the country. We have a significant number of IBAB alumni in our team and their training at IBAB has helped in grooming them with appropriate analytical, experimental and soft skills required for the industry."

DR. SHIREEN VALI, CELLWORKS GROUP, INCUBATEE
OUTREACH & EVENTS

IBAB has always extended its services to the larger community outside the campus. The institute organizes seminars, workshops and other scientific and cultural events.

IBAB has always extended its services to the larger community outside the campus. It has provided training and support to several academic institutions and companies. Illustratively, it has conducted courses for the postgraduate students of CHG and JNCASR, has trained employees of Infosys, Wipro and Biocon, and has organised a big data workshop for Intel engineers. The faculty also deliver lectures and participate in education programmes in schools, colleges and on other campuses throughout Karnataka and beyond.

The institute has hosted and motivated students from colleges and institutes from across the country. This has been a great exercise in breaking barriers that keep youngsters away from science and also a wonderful opportunity for our scientists to talk about their work with a non-specialist audience. Some of these visiting students have subsequently joined IBAB’s MSc programme.

IBAB has actively supported many of GoK’s educational initiatives. Each year, girl students who are toppers from rural high schools around the state are sent to different institutions on study tours under the Chetana programme. IBAB hosts Chetana students for a couple of weeks each time, and organizes a dedicated and intense lecture-and-lab programme for them.

IBAB hosts a prestigious lecture series instituted by Dr. Kiran Mazumdar-Shaw (“The Kiran Mazumdar-Shaw Lecture”). The inaugural lecture was delivered by Nobel laureate Venki Ramakrishnan of MRC, Cambridge. Other illustrious speakers include Lemelson-MIT prize winner Sangeeta Bhatia, Dinshaw Patel of the Memorial Sloan-Kettering Cancer Centre, New York; Arul Chinnaiyan of the University of Michigan at Ann Arbor and Ram Sassisekharan of MIT, Boston. IBAB faculty, students and the larger scientific community benefit significantly from the talks and subsequent interactions with these eminent scientists.

IBAB periodically conducts workshops on a variety of topics. These include a Symposium on advances in non-coding genomics; High-throughput data-driven biology; Next generation sequencing data analysis; Proteomics: Advances, applications and challenges; and Cell biology. In the area of entrepreneurship, StartUpBio-2017 saw the attendance of 200-plus attendees, including 80 representatives of 60 start-ups.

Students at IBAB periodically organize cultural events to celebrate various festivals, welcome the new batch, bid farewell to the outgoing batch and so on. These events provide an opportunity for students to exhibit their talents and leadership skills.

EVENTS

The institute organizes seminars, workshops and other scientific and cultural events. IBAB organizes its Foundation Day each year to commemorate its establishment. This is a whole-day event, in which an eminent scholar gives a talk, and interacts with students and faculty, and research scholars present their work through posters. The institute also hosts a convocation for its graduating students. Some of the eminent speakers at these events have included Prof. C N R Rao, Bharat Ratna; Dr. Gurdev Khush, FRS; Prof. P Balaram, IISc; Prof. Shrinivas Kulkarni, CalTech; Prof. H. Y. Mohan Ram, University of Delhi; Prof. D. Balasubramanian, L V Prasad Eye Institute; Dr. J. Ramachandran, GangAgen; Dr. T Ramasami, DST; Prof. Dennis Brey, University of Cambridge; and Prof. G. Padmanaban, IISc.

IBAB has actively supported many of GoK’s educational initiatives. Each year, girl students who are toppers from rural high schools around the state are sent to different institutions on study tours under the Chetana programme. IBAB hosts Chetana students for a couple of weeks each time, and organizes a dedicated and intense lecture-and-lab programme for them.
IBAB has been continuously supported by the Department of IT, BT and S&T, Government of Karnataka through a grant-in-aid, as well as specific programme funding. The institute has also attracted funding from national and international funding agencies, industry and other philanthropists. The faculty have also been able to attract extramural research funding from various agencies within and outside the country.

Some of the funders have been:

<table>
<thead>
<tr>
<th>INDUSTRY</th>
<th>GRANT-MAKING ORGANISATIONS</th>
<th>PHILANTHROPIC DONORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biocon</td>
<td>CSIR</td>
<td>Dr. Indira Ghosh</td>
</tr>
<tr>
<td>ICICI Bank</td>
<td>DBT</td>
<td>Dr. Kiran Mazumdar-Shaw</td>
</tr>
<tr>
<td>Millipore India</td>
<td>MeltY</td>
<td>Ms. Sudha Murty</td>
</tr>
<tr>
<td>MSD Pharmaceuticals</td>
<td>DST</td>
<td>Dr. J. Ramachandran</td>
</tr>
<tr>
<td>Novozymes South Asia</td>
<td>Wadhwani Foundation (USA)</td>
<td>The Infosys Foundation</td>
</tr>
<tr>
<td>Sartorius India</td>
<td>University of Michigan, Ann Arbor (USA)</td>
<td>The AstraZeneca Research Foundation India (AZREFI)</td>
</tr>
<tr>
<td>Strand Life Sciences</td>
<td>Institut Merieux (France)</td>
<td>Individuals for scholarships or events at the institute</td>
</tr>
</tbody>
</table>

INSTITUTE OF BIOINFORMATICS AND APPLIED BIOTECHNOLOGY
Biotech Park, Electronics City Phase I
Bengaluru 560 100, India
Tel: 080-285 289 00, 080-285 289 01, 080-285 289 02
Fax: 080-285 289 04
Email ID: info@ibab.ac.in
Website: www.ibab.ac.in