



International

**Human Frontier  
Science Program**

Organization

भारत सरकार  
GOVERNMENT OF INDIA

विज्ञान और प्रौद्योगिकी मंत्रालय  
MINISTRY OF SCIENCE AND TECHNOLOGY



जैवप्रौद्योगिकी विभाग  
DEPARTMENT OF  
**BIOTECHNOLOGY**

**Symposia on  
Opportunities for frontier research collaborations by the  
Human Frontier Science Program (HFSP)**

**10 Feb, NII New Delhi | 11 Feb, CDFD Hyderabad | 15 Feb, IISER Pune**

**Program @ CDFD 11th February 2023**



**Guntram Bauer**  
Director of Science Policy  
and Communications, HFSP

**Pavel Kabat**  
Secretary General  
HFSP



**Suvendra Nath Bhattacharyya**  
Indian Institute of Chemical Biology  
*My journey to explore the  
world of "microRNA"*



**Tamal Das**  
Tata Institute of Fundamental Research  
*Mechanobiology of Collective Cellular Systems:  
Cell Migration, Cancer and Development*



**Rashna Bhandari**  
Centre for DNA Fingerprinting and Diagnostics  
*Polyphosphate in mammals –  
detection, metabolism and physiology*



**Shashi Thutupalli**  
National Centre for Biological Sciences  
*Towards a synthetic biology from a  
physical perspective*



**Please apply by emailing your brief CV to an institute nearest you by  
31st January 2023**

**NII, New Delhi**  
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**CDFD, Hyderabad**  
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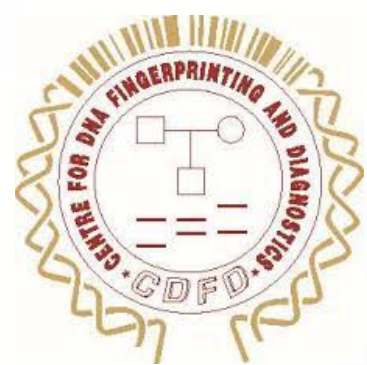
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**Symposia on  
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Human Frontier Science Program (HFSP)**

**Centre for DNA Fingerprinting and Diagnostics, Hyderabad**

**11th February 2023**

**Programme**

**10.00 AM - 10.20 AM : Introductory Remarks**

**10.20 AM - 10.40 AM : Pavel Kabat, Secretary General, HFSP**

**10.40 AM - 11.10 AM : Guntram Bauer, Director of Science Policy and Communications, HFSP**

**11.10 AM - 11.30 AM : Tea Break**

**11.30 AM - 12.00 PM : My journey to explore the world of "microRNA"  
Suvendra Nath Bhattacharyya**

**12.00 PM - 12.30 PM : Mechanobiology of Collective Cellular Systems: Cell Migration, Cancer, and Development  
Tamal Das**

**12.30 PM - 2.00 PM : Lunch Break**

**2.00 PM - 2.30 PM : Polyphosphate in mammals – detection, metabolism and physiology  
Rashna Bhandari**

**2.30 PM - 3.00 PM : Towards a synthetic biology from a physical perspective  
Shashi Thutupalli**

**3.00 PM - 4.30 PM : Panel Discussion on international collaborations supported by HFSP and Q & A session**

**4.30 PM - 5.00 PM : Tea Break**



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## Symposia on **Opportunities for frontier research collaborations by the Human Frontier Science Program (HFSP)**

**10th Feb, NII New Delhi | 11th Feb, CDFD Hyderabad | 15th Feb, IISER Pune**

The mission of The Human Frontier Science Program (HFSP) is to promote "international collaboration in basic research focused on the elucidation of the sophisticated and complex mechanisms of living organisms".

HFSP Research Grants support innovative basic research on fundamental biological problems with emphasis on novel and interdisciplinary approaches that involve scientific exchanges across national and disciplinary boundaries (<https://www.hfsp.org/funding/hfsp-funding/research-grants>). Scientists from disciplines outside the traditional life sciences such as biophysics, chemistry, computational biology, computer science, engineering, mathematics, nanoscience or physics are especially encouraged to apply for these grants as it opens up newer avenues to dissect complex structures and regulatory networks that characterize living organisms, their evolution and interactions. Specific grant and fellowship opportunities are available for early career as well as established investigators.

India has been part of the HFSP for the past several years and is poised to expand its footprint in this program. In order to increase the number of successful applications from India, efforts are being made to provide detailed information on HFSP programs to the Indian research community. To this end, a symposium series at the following locations in the country is planned, which will include talks by HFSP officials and grantees followed by Q&A session to address queries related to programs, applications etc. Indian Principal Investigators at any stage of their independent research careers as well as early career researchers like post-doctoral fellows or Ph.D students close to graduation working in any stream of science are encouraged to register and attend these symposiums at a venue closest to their workplace.



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## Symposia on **Opportunities for frontier research collaborations by the Human Frontier Science Program (HFSP)**

### **My journey to explore the world of "microRNA"**

#### **Suvendra Nath Bhattacharyya**

*Molecular Genetics Division, CSIR-Indian Institute of Chemical  
Biology, Kolkata*



Dr Bhattacharyya was an HFSP Long-term Fellow during 2005-2008 in FMI, Basel, Switzerland and also the recipient of a Career Development Award of HFSP in 2007 to get his research funded in CSIR-IIICB, Kolkata, India for 2008-2011 period.

### **Summary of research interests**

Having a successful PhD and Post-doctoral career in RNA biology research field, Dr Bhattacharyya has established himself as one of the most successful miRNA biologists of this country after starting his independent research career in 2008. miRNAs are gene regulatory small RNAs expressed in metazoan cells that regulate a majority of biological processes in our body. His research is concentrated on understanding the mechanism of miRNA activity and turnover in different types of human cells and to study consequences of miRNA deregulation in human physiology.

In recent years, his research on EV-mediated export of miRNAs has been appreciated worldwide and his lab presently is the leading lab worldwide in identification of mechanism of miRNA export via extracellular vesicles. His group has also pioneered in introducing the concept of organellar control of miRNA activity in mammalian cells and that concept may be one of the game changing ideas of modern cell biology in the near future.



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## Symposia on **Opportunities for frontier research collaborations by the Human Frontier Science Program (HFSP)**

### **Mechanobiology of Collective Cellular Systems: Cell Migration, Cancer, and Development**

#### **Tamal Das**

*Reader-F, DBT/Wellcome Trust India Alliance Intermediate Fellow  
Tata Institute of Fundamental Research Hyderabad (TIFR-H)*



Along with Dapeng (Max) Bi (Northeastern University) and Friedhelm Serwane (LMU Munich), Dr Das won an HFSP Research Grant in 2022 to understand how a single layer epithelium transforms into a multilayer tissue during the development of mammalian epidermis, using an organoid system, in vivo force-measurement techniques, and theoretical modelling.

### **Summary of research interests**

Since its inception at TIFR Hyderabad, Dr Das' group has been trying to tackle some of the most important problems in epithelial biology and collective dynamics using an interdisciplinary approach that combines mechanobiology, cell biology, and molecular biology. Specifically, they are studying how cell and tissue mechanics influence the dynamics of cell competition and collective cell migration in the epithelium.

Related to cell competition, they discovered that pathological stiffening of the extracellular matrix abrogates the epithelial defense against activated HRAS oncogene (HRasV12)-transformed cells. In their group, they are also looking for mechanobiological signatures of cell competition. There they have discovered that the extrusion of HRasV12-transformed cells requires a compression from the surrounding normal cells, and this compression originates from the difference in compressibility between two competing populations.

Related to collective migration, their work provided the first direct experimental evidence of a shared decision-making process that determines the emergence of a few selected leader cells at the migrating front. Relevantly, they are also trying to understand how cellular forces affect the large-scale coherent alignment of cytoskeletal elements and cellular organelles during collective cell migration. To this end, they discovered a unique process of actin cytoskeleton-driven Golgi dispersion at the onset of epithelial cell migration. In another work, they have elucidated how force-responsive alteration of lysosome positioning determines the emergence of leader cells.

Going forward, they aim to explore the collective dynamics of cells in 3D tissue environments under more physiologically relevant contexts. To this end, they are using mouse models and organoid systems towards addressing how geometric and mechanical factors interact with molecular signaling to drive the collective dynamics of cells during tissue development and oncogenesis.



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## Symposia on **Opportunities for frontier research collaborations by the Human Frontier Science Program (HFSP)**

### **Polyphosphate in mammals – detection, metabolism and physiology**

**Rashna Bhandari**

*Centre for DNA Fingerprinting and Diagnostics, Hyderabad*



A Research Grant from HFSP was awarded to Dr Bhandari in 2016 for a proposal titled “A comprehensive approach towards the chemistry & biology of polyphosphate: the forgotten biopolymer” (jointly with Prof. Henning Jessen from University of Freiburg, Germany, and Prof. Paul Wender from Stanford University, USA). Polyphosphate (PolyP) are composed of repeating units of orthophosphate of varying chain length, and are found in all living organisms from bacteria to humans. The goal of this project was to develop methods for the chemical synthesis of monodisperse and modified polyP, identify molecular transporters for the delivery of this polyanion into cells, and use these technologies to study the biological functions of polyP in mammals.

### **Summary of research interests**

Dr Bhandari's research interests span the study of signal transduction in biological systems. Specifically, her lab studies the biochemical, cellular and physiological functions of two phosphate-rich signalling molecules - inositol pyrophosphates, and inorganic polyphosphate (polyP). They use budding yeast, mammalian cell lines and mice as model systems to understand the cellular processes by which the levels of these small molecules are regulated, and investigate the cellular and physiological processes that these phosphate-rich molecules influence.



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## Symposia on **Opportunities for frontier research collaborations by the Human Frontier Science Program (HFSP)**

### **Towards a synthetic biology from a physical perspective**

**Shashi Thutupalli**

*National Centre for Biological Sciences, Bengaluru*



A Young Investigator Research Grant from HFSP was awarded to Dr Thutupalli in 2018 for a proposal titled, "Active morphological colloids for probing and tailoring intracellular antigen processing," (jointly with Prof. Geert van den Bogaart from Nijmegen, Netherlands, and Prof. Stefano Sacanna from New York, USA). He has previously been an HFSP Cross-Disciplinary Fellow at Princeton University, USA.

The idea for work funded by the HFSP originated with an accidental observation in the Bogaart lab where it was seen that host cells can ingest large glass splinters, leading the scientists to suspect pathogen morphology as a cue to host responses. The proposal to HFSP was an amalgamation of colloid chemistry, immune cell biology and biophysics. One of the aims of the proposed research was to identify the extent to which shape and motility of pathogens influence host immune defences in a process known as antigen presentation. Their research team has utilised advanced microscopy tools and various biophysics techniques to address these issues.

### **Summary of research interests**

Dr Thutupalli's research program aims for a broad understanding of the origins and organization of living systems. His lab is an interdisciplinary group combining experimental and theoretical techniques drawn from physics, engineering and biology. Their research is focused on the physics of active matter, cellular biophysics, and non-equilibrium transport processes. Broadly, they pursue two approaches - de novo construction of synthetic mimics of living matter, and probing the physical basis of organization in living systems.

Their group is a part of the Simons Centre for the Study of Living Machines and also the International Centre for Theoretical Sciences.