MAHIMA BOSE

Phone: +91 9899673590 | mahima.bose@tifr.res.in | LinkedIn | Mumbai, India

EDUCATION

PhD in Developmental Neuroscience August 2017-December 2023 (*Expected*)
Tata Institute of Fundamental Research, Mumbai, India

Dissertation: "Role of transcription factors FOXG1 and LHX2 in neurodevelopment and gliogenesis."

BSc (with Honours) Biomedical Science July 2014-June 2017
Acharya Narendra Dev College, University of Delhi, India

RESEARCH EXPERIENCE

Tata Institute of Fundamental Research, Mumbai, India August 2017-Present
Research Scholar; Advisor: Prof. Shubha Tole

Projects:

- Thesis Project I: Understanding the role of transcription factor FOXG1 in regulating neuron-glia cell fate decisions in the developing mouse neocortex and hippocampus.
- Thesis Project II: Elucidating the role of transcription factor LHX2 in regulating morphometry and synaptogenesis of the neocortical superficial layer neurons.
- Side Project: Generating a single-cell multiomics atlas of the developing mouse hippocampus

Achievements:

- Integrated multimodal information from ChIP-Seq, epigenomic, and RNA-seq datasets with *in vivo* genetic perturbations to elucidate the role of *Foxg1* in gliogenesis.
- Established and optimized single-cell genomics/multiomics analysis pipelines to study differential molecular mechanisms of gliogenesis in the neocortex and the hippocampus.
- Optimized the *in vivo* genetic strategy to label the entire dendritic arbor of neurons, sparsely and evenly, to study their development. Integrated omics approaches to find multi-stage roles of Lhx2 in circuit development.
- Mentored a team of two Master's students and one graduate student. Collaborated with fellow graduate students and postdocs in all three projects to integrate multiple areas of expertise in my research.

Ludwig-Maximillian University/ Helmholtz Pioneer Campus, Munich, Germany May-August 2022
Visiting Research Fellow; Advisor: Dr Boyan Bonev

Project:

- Elucidating 3D genome dynamics by LHX2:LDB1 transcriptional regulator complex in the developing mouse neocortex and hippocampus using Hi-C and multiomics.

Achievements:

- Generated samples and optimized protocols for Hi-C and SHARE-Seq sample preparation from mouse cortical cells.
- Analyzed Hi-C data to develop insights into chromatin architecture changes upon cell differentiation.
- Contributed to developing a Hi-C analysis package, "AnalyzeHiC" by writing and optimizing scripts.

FELLOWSHIPS AND AWARDS

EMBO Short-Term Scientific Exchange Fellowship May 2022
Received Fellowship for a collaborative project with Dr Boyan Bonev at the Helmholtz Pioneer Campus, Germany, to "Elucidate 3D genome dynamics mediated by LHX2:LDB1 in the developing mouse hippocampus and neocortex".

Short-Term Travelling Fellowship by the Company of Biologists April 2021
Received Fellowship for a collaborative project with Dr Boyan Bonev at the Helmholtz Pioneer Campus, Germany, to "Elucidate 3D genome dynamics mediated by LHX2:LDB1 in the developing mouse hippocampus and neocortex".

Travel award by Elsevier Publishing Group May 2018
Received a travel award by Elsevier Publishing Group dedicated to meritorious graduate students for travelling to Japan to attend the International Society for Developmental Neuroscience 2018 (ISDN 2018) conference.

SKILLS

Molecular Biology: Quantitative PCR, Gel Electrophoresis, Molecular Cloning, CRISPR-Cas9, Immunohistochemistry
Genomics: ATAC-Seq, ChIP-Seq, CUT&RUN, RNA-Seq
Single-cell genomics: Seurat, Signac, Monocle3, Velocyto
Programming: Bash scripting, R, Python
Microscopy: Confocal microscopy, Fluorescence microscopy
Cell culture: Cell culture, Tissue culture, Explant culture
Animal handling: *in utero* electroporation, Mouse behavioral analysis

INVITED TALKS

Deep Bioinformatics Bootcamp, CSIR-IHBT, Palampur, Himachal Pradesh August 2023
Invited speaker and trainer on 3D Genome, ChIP-Seq, RNA-Seq analysis

No Garland Neuroscience Conference, Pune, India Feb 2023
Selected speaker

CONFERENCES AND SCIENTIFIC TRAINING

Cortical Development, Milazzo, Sicily, Italy May 2022
Poster presentation

International Society for Developmental Neuroscience, Nara, Japan May 2018
Poster presentation

CERTIFICATE COURSES AND PROFESSIONAL TRAINING

Hands-on training workshop on CRISPR-Cas9 technology. April 2019
CSIR-IGIB, New Delhi, India
Gained knowledge and hands-on experience in CRISPR-Cas9 technology for applications in my dissertation project.

Scientific Writing and Communication Course Aug 2018
Cactus Communications Pvt. Ltd, Mumbai, India
Acquired scientific and technical writing skills for grant and manuscript writing.

Bioinformatics and *in silico* drug discovery course Jan-Dec 2016
The University of Delhi, New Delhi, India
Gained hands-on experience in Genomics, Proteomics, and Big-Data analysis using bioinformatics tools and programming languages R and Python.

TEACHING EXPERIENCE

Advanced Neuroscience, Tata Institute of Fundamental Research, Mumbai Dec 2019-Feb 2020
Taught first-year graduate students about the latest advances and research in Developmental Neuroscience.

PUBLICATIONS

Chromatin accessibility and gene expression are differentially regulated in the developing neocortical and hippocampal primordium by LIM-HD transcription factor Lhx2
*Varun Suresh, *Bhavana Muralidharan, * Saurabh Pradhan, **Mahima Bose**, Leora D'Souza, Arpan Parichha, PC Reddy, #Sanjeev Galande, and #Shubha Tole. (*PLOS Genetics*)

Preprints

PRDM16 cooperates with LHX2 to shape the human brain.
Varun Suresh, Bidisha Bhattacharya, Rami Tshuva, Miri Danan Gotthold, Tsivya Olender, **Mahima Bose,** Saurabh Pradhan, Bruria Ben Zeev, Richard Scott Smith, Shubha Tole, Sanjeev Galande, Corey Harwell, Manuel Baizabal, Orly Reiner (*BiorXiv*)

Publications in press

Dual role of FOXG1 in regulating gliogenesis in the developing neocortex via the FGF signalling pathway.
Mahima Bose, Varun Suresh, Urvi Mishra, Ishita Talwar, Anuradha Yadav, Shiona Biswas, Simon Hippenmeyer, and #Shubha Tole

Manuscripts in preparation

An LHX2-NEUROG2-WNT network regulates dendritic morphogenesis in the layer II/III neurons of the developing neocortex.
***Mahima Bose**, *Sreenath Ravindran, Archana Iyer, Binita Vedak, Achintya Srivastava, and #Shubha Tole.

Corpus callosum crossing is regulated by β-catenin function in the *Lmx1a* lineage-derived midline glial population.
Arpan Parichha, Ishita Talwar, Debarpita Datta, Varun Suresh, **Mahima Bose**, and Shubha Tole

REFERENCES

Professor Shubha Tole – PhD Advisor - shubhatole@gmail.com
Professor Sandhya Koushika – Thesis Committee Member - spkoushika@tifr.res.in