Arijit Ghosh Ph.D.

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Research Summary

Sleep biologist and chronobiologist with expertise in sleep and circadian behavior, statistical genetics, behavioral time-series analysis, and reproducible computational tool development. Developed open-source analytical tools, hidden Markov model frameworks, deep-learning approaches for behavioral-state classification, and genome-wide analysis pipelines in *Drosophila*.

Education

Jawaharlal Nehru Centre for Advanced Scientific Research — Bangalore, India
PhD in Chronobiology — *August 2016 – June 2022*

National Institute of Science Education and Research — Bhubaneswar, India
BSc-MSc dual degree in Life Sciences with focus on bioinformatics and cell biology — *August 2011 – June 2016*

Experience

Visiting postdoctoral fellow — September 2022 – Present
Laboratory of Systems Genetics, National Heart, Lung, and Blood Institute — *Bethesda, MD*

- Developed statistical and machine-learning frameworks for classification of *Drosophila* sleep into distinct behavioral states, including `FlyDreamR`
- Built reproducible algorithms and analytical workflows to extract circadian and sleep phenotypes from large-scale behavioral time-series datasets
- Conducted multiple genome-wide association studies of circadian clock and sleep-related traits in the *Drosophila* Genetic Reference Panel
- Contributed to a book chapter on the genetics of sleep in *Drosophila*, published original research articles, and received the L'Enfant fellowship for postdoctoral training

Graduate research fellow — August 2016 – June 2022
Chronobiology and Behavioral Neurogenetics Laboratory, Neuroscience Unit, JNCASR — *Bangalore, India*

- Conducted original research in chronobiology, sleep, and population genomics of circadian phase, resulting in multiple peer-reviewed publications
- Developed and published open-source tools for high-throughput automated analysis of circadian rhythms and sleep, including `VANESSA-DAM`
- Contributed to organizing academic conferences, training programs, and science outreach activities on and off campus

Masters dissertation research fellow — May 2014 – June 2016
Goswami Lab, School of Biological Sciences, NISER — *Bhubaneswar, India*

- Established primary bone, immune, and stem cell culture workflows in the laboratory
- Developed molecular dynamics simulation routines for ion-channel focused projects
- Established histological and imaging-focused assays for bone tissue engineering studies
- Worked collaboratively on multiple bioinformatics and quantitative biology projects

Short training

Summer trainee — May 2014 – July 2014
with Professor Naibedya Chattopadhya — *CSIR-CDRI, Lucknow, India*

- Studied osteogenic induction using pharmacological modulators of TRP channels

Summer trainee — May 2013 – July 2013
with Professor Richa Rikhy — *IISER Pune, India*

- Investigated mitochondrial distribution and morphology in developing *Drosophila melanogaster* embryos

Summer trainee May 2012 – July 2012
with Professor Chandan Goswami *NISER, Bhubaneswar, India*

- Performed bioinformatic analysis of the evolution of TRP channels in vertebrates

Publications

***(asterisk): First or co-first author**

Preprint

- ***Arijit Ghosh**, Susan T. Harbison. **"Inferring the genetic basis of sleep states in *Drosophila melanogaster* using hidden Markov models"**. *bioRxiv*, (2026): 2026.2001.2014.699526.

Peer-reviewed publications and book chapters

- Tushar Kanta Acharya, Parnasree Mahapatra, Shamit Kumar, Nishant Dubey, Srujanika Rajalaxmi, **Arijit Ghosh**, Ashutosh Kumar, Chandan Goswami. **"Conserved and unique mitochondrial target sequence of TRPV4 can independently regulate mitochondrial functions"**. *PROTEINS: Structure, Function, and Bioinformatics*, 0 (2024).
- Sara Milojevic, **Arijit Ghosh**, Vedrana Makevic, Maja Stojkovic, Maria Capovilla, Tomislav Tosti, Dejan B. Budimirovic, Dragana Protic. **"Circadian Rhythm and Sleep Analyses in a Fruit Fly Model of Fragile X Syndrome Using a Video-Based Automated Behavioral Research System"**. *International Journal of Molecular Sciences*, 25(14):7949 (2024).
- Narendra Pratap Singh, **Arijit Ghosh**, Susan T. Harbison. **"The Genetics of sleep in *Drosophila*"**. In Philip Gehrman, Alex C. Keene, Struan F. Grant (eds) *Genetics of Sleep and Sleep Disorders*, Springer, Cham (2024).
- Tushar Kanta Acharya, Subhashis Pal, ***Arijit Ghosh**, Shamit Kumar, Naibedya Chattopadhyay, Chandan Goswami. **"TRPV4 regulates osteoblast differentiation and mitochondrial function that are relevant for channelopathy"**. *Frontiers in Cell and Developmental Biology*, 11 (2023).
- ***Arijit Ghosh**, Vasu Sheeba. **"VANESSA - Shiny apps for accelerated time-series analysis and visualization of *Drosophila* circadian and sleep data"**. *Journal of Biological Rhythms*, 37, no. 2 (2022): 222-231.
- ***Arijit Ghosh**, Pragya Sharma, Shephali Dansana, Vasu Sheeba. **"Evidence for co-evolution of masking and circadian phase in *Drosophila melanogaster*"**. *Journal of Biological Rhythms* 36, no. 3 (2021): 254-270.
- Tushar Kanta Acharya, Satish Kumar, Nikhil Tiwari, ***Arijit Ghosh**, Ankit Tiwari, Subhashis Pal, Rakesh Kumar Majhi, Ashutosh Kumar, Rashmita Das, Abhishek Singh, Pradip K. Majhi, Naibedya Chattopadhyay, Luna Goswami, Chandan Goswami. **"TRPM8 channel inhibitor-encapsulated hydrogel as a tunable surface for bone tissue engineering"**. *Scientific Reports* 11, 3730 (2021).
- Nabanita Roy Chattopadhyay, Koustav Chatterjee, Nikhil Tiwari, Sudipta Chakrabarti, Sushil Kumar Sahu, Sankar Deb Roy, **Arijit Ghosh**, R Rajendra Reddy, Piyanki Das, Sudipa Mal, Basab Bijay Karnar, Ashok Kumar Das, Sam Tsering, Komri Riba, Zoreng puii, Eric Zomawia, Y Indibar Singh, Amol Ratnakar Suryawanshi, Abhishek Kumar, Dipyaman Ganguly, Chandan Goswami, Tathagata Choudhuri. **"TLR9 polymorphisms might contribute to the ethnicity bias for EBV-infected Nasopharyngeal Carcinoma"**. *iScience* 23, no. 3 (2020): 100937.
- Lakshman Abhilash, **Arijit Ghosh**, and Vasu Sheeba. **"Selection for timing of eclosion results in co-evolution of temperature responsiveness in *Drosophila melanogaster*"**. *Journal of Biological Rhythms* 34, no. 6 (2019): 596-609.
- Somdatta Saha, Samikshya Sucharita, Rakesh Kumar Majhi, Ankit Tiwari, **Arijit Ghosh**, Sunil Kumar Pradhan, Bijay Kumar Patra et al. **"TRPA1 is selected as a semi-conserved channel during vertebrate evolution due to its involvement in spermatogenesis"**. *Biochemical and Biophysical Research Communications* 512, no. 2 (2019): 295-302.
- Sridhar Sanyasi, Satish Kumar, **Arijit Ghosh**, Rakesh Kumar Majhi, Navneet Kaur, Priyanka Choudhury, Udai P. Singh, Chandan Goswami, and Luna Goswami. **"A modified polysaccharide-based hydrogel for enhanced osteogenic maturation and mineralization independent of differentiation factors"**. *Macromolecular Bioscience* 17, no. 3 (2017): 1600268.
- Somdatta Saha, ***Arijit Ghosh**, Nikhil Tiwari, Ashutosh Kumar, Abhishek Kumar, and Chandan Goswami. **"Preferential selection of Arginine at the lipid-water-interface of TRPV1 during vertebrate evolution correlates with its snorkeling behaviour and cholesterol interaction"**. *Scientific Reports* 7, no. 1 (2017): 1-21.
- ***Arijit Ghosh**, Navneet Kaur, Abhishek Kumar, and Chandan Goswami. **"Why individual thermo sensation and pain perception varies? Clue of disruptive mutations in TRPVs from 2504 human genome data"**. *Channels* 10, no. 5 (2016): 339-345.
- Rakesh Kumar Majhi, Somdatta Saha, Ashutosh Kumar, **Arijit Ghosh**, Nirlipta Swain, Luna Goswami, Pratyush Mohapatra et al. **"Expression of temperature-sensitive ion channel TRPM8 in sperm cells correlates with**

vertebrate evolution". *PeerJ* 3 (2015): e1310.

Technical Skills

- **Behavioral and organismal assays**: *Drosophila* sleep and circadian rhythm assays, eclosion assay, oviposition assay, developmental timing assay, lifespan assay, video tracking, and quantitative analysis of locomotor behavior
- **Fly work**: Maintenance, embryo isolation, staining and imaging, population maintenance, genetic crosses, and brain dissection
- **Cell culture and assays**: Bone, macrophage, and neuronal cell lines; primary mesenchymal stem cell isolation and culture, hematopoietic stem cell isolation and culture, calvarial osteoblast culture, peritoneal macrophage isolation and culture, MTT assay, ALP assay, and osteoblast mineralization assays
- **Immunostaining and microscopy**: Cells and tissues; immunoblotting, fixed-cell fluorescence imaging, live-cell calcium imaging, live-cell pH measurement, live-cell mitochondrial potential dynamics, and confocal microscopy
- **Animal handling**: Rat, mouse, and rabbit handling; dosing, bone marrow isolation, peritoneal macrophage isolation, and calvaria isolation

Computational Skills

- **Programming**: R, Python, Perl, MATLAB, bash, and awk
- **High performance computing**: Pipeline development and SLURM-based job scheduling
- **Statistical modeling and data analysis**: Parametric and non-parametric inference, hypothesis testing, experimental design, time-series analysis, and method development for large-scale biological datasets
- **Probabilistic modeling**: Building and implementing hidden Markov models for multiple data types and applications
- **Machine learning and deep learning**: Developed and implemented machine-learning workflows for biological and behavioral time-series data, including hidden Markov models, BiLSTM and deep sequence models, clustering, regression, random forests, and gradient boosting, with experience in feature engineering, grouped cross-validation, class imbalance handling, and model evaluation using keras3, TensorFlow, PyTorch, ranger, and h2o
- **NGS and omics analysis**: Standard genomics and epigenomics workflows for DNA-seq, RNA-seq, ATAC-seq, ChIP-seq, and pooled sequencing, including pipeline development and implementation in HPC environments
- **Sequence analysis, homology modeling, and phylogenetics**: Proficient with MEGA, MODELLER, YASARA, and PHYLIP
- **Molecular dynamics and docking**: Proficient with YASARA, VINA, AutoDock, and VMD
- **Visualization**: Proficient in R (base, ggplot2, and extensions), GraphPad Prism, OriginPro, SigmaPlot, and CIRCOS
- **App and dashboard development**: Proficient in Shiny, CSS, and HTML5
- **Design and productivity tools**: Adobe Illustrator, Adobe Photoshop, Adobe Lightroom, and Microsoft Office
- **Public code repository**: `https://github.com/orijitghosh`

Awards, Achievements, and Professional Memberships

- Awarded the SRBR Merit Award by the Society for Research on Biological Rhythms Awards Committee (2026)
- Awarded the Sleep and Circadian Science Scholar Award by the Sleep Research Society (2025)
- Awarded the L'Enfant fellowship from the National Heart, Lung, and Blood Institute, Bethesda, MD, for postdoctoral training (intramural equivalent to the F32 Ruth L. Kirschstein Postdoctoral Individual National Research Service Award) (2024 – Present)
- Awarded Best oral presentation award at the Johns Hopkins Sleep and Circadian Research Day (2024)
- Awarded the SRBR Merit Award by the Society for Research on Biological Rhythms Awards Committee (2024)
- Awarded a visiting postdoctoral fellowship from the National Heart, Lung, and Blood Institute, NIH (September 2022 – Present)
- Awarded the SRBR Merit Award by the Society for Research on Biological Rhythms Awards Committee (2020)
- Awarded the Global Diversity Fellowship from the Society for Research on Biological Rhythms Awards Committee (2020)
- Awarded Bhagwati Devi Memorial Award for best oral presentation at the International Symposium on Biological Rhythms (2019), organized by the Indian Society for Chronobiology
- Awarded CSIR Junior Research Fellowship (2016 – 2018) and CSIR Senior Research Fellowship (2018 – 2021) for graduate studies

- Awarded Best poster teaser award at the in-house symposium at JNCASR (2017)
- Awarded Best Student award at the DST-SERB School in Insect Biology (2016)
- Qualified in Graduate Aptitude Test in Engineering (GATE) (2016)
- Ranked 26th and 32nd in LS category and 59th in JRF category in the National Eligibility Test, organized by the Council of Scientific and Industrial Research, India (CSIR NET 2015 – 2016)
- Awarded 2nd prize at the 1st International Conference on Translational Research, India
- Received the prestigious DST-INSPIRE scholarship for pursuing BSc and MSc in basic sciences from the Department of Science and Technology, Government of India
- Trainee member of the Society for Research on Biological Rhythms (2020 – 2024)
- Trainee member of the Sleep Research Society (2024 – 2025)

Talks, Conferences, and Workshops

- Selected for a talk at Advances in Sleep and Circadian Science (ASCS) 2025, Clearwater Beach, FL
- Selected for a talk at the Johns Hopkins Sleep and Circadian Research Day (2024)
- Presented a poster at SRBR 2024, organized by the Society for Research on Biological Rhythms
- Selected for a talk at the *Drosophila* Neuroscience Community meeting (2024), NIH
- Presented a poster at the Gordon Research Seminar and Conference on Sleep (2024), Galveston, TX
- Presented a poster at the Gordon Research Seminar and Conference on Chronobiology (2023), Galveston, TX
- Selected for a talk at the Gordon Research Seminar on Chronobiology (2023), Lewiston, ME
- Presented a poster at the Johns Hopkins Sleep and Circadian Research Day (2023)
- Selected for a talk at the *Drosophila* Neuroscience Community meeting (2023), NIH
- Presented a poster at the Probabilistic Modelling in Genomics meeting (2023), CSHL
- Selected for a talk at the 6th meeting of the *Drosophila* Ecology Evolution Supergroup
- Selected for a talk at, and helped organize, the International Conference on Chronobiology (2021), funded by IUSSTF and the Indian Society for Chronobiology
- Attended and helped organize the 2020 International Chronobiology Summer School as a teaching assistant
- Presented a poster at SRBR 2020, organized by the Society for Research on Biological Rhythms
- Selected for an oral presentation at the International Symposium on Biological Rhythms (2019), organized by the Indian Society for Chronobiology at CCSU, Meerut, India
- Attended and helped organize InSearch – Insects in Research symposium (2018, 2019, and 2020), organized by the Clock Club, JNCASR, Bangalore, India
- Attended the International Symposium on Biological Timing and Health Issues in the 21st Century, February 2017, University of Delhi, India
- Attended the workshop on NGS data analysis and curation (2017), JNCASR, Bangalore
- Attended the DST-SERB School in Insect Biology (2016), Punjabi University, Patiala, India
- Attended and helped organize the 3rd Biennial Meeting of the Probiotic Association of India, March 2016, organized by NISER, Bhubaneswar, India
- Presented a poster at the 1st International Conference on Translational Research: From Basic Science to Clinical Application, February 2015, organized by KIIT, Bhubaneswar, India
- Attended the 2nd meeting of the Indian Sub-continental Branch of the International Neuropeptide Society, December 2015, organized by NISER, Bhubaneswar, India
- Attended the 35th All India Cell Biology Conference (AICBC), December 2011, organized by NISER, Bhubaneswar, India
- Attended the national science camp VIJYOSHI (Vigyan Jyoti Shibir), organized by the Indian Institute of Science, Bangalore, India, in November 2011

Teaching, Mentorship, and Service

- Member of the Editorial Advisory Board at *SLEEP Advances* (2025 – 2028)
- Served as a *FARE2026* committee member, which disburses approximately $250,000 in travel awards to trainees at the NIH
- Mentored a summer trainee at NIH in Summer 2024

- Served as a judge at the NIH Graduate Student Symposium (2024) and Postbac Poster Day (2025)
- Mentored a postbaccalaureate trainee at NIH (2023 – 2024)
- Regularly mentored 1–2 junior graduate students throughout 2016 – 2022
- Mentored a 1-year master's dissertation thesis project at JNCASR (2019 – 2020)
- Taught the basic chronobiology course at the Neuroscience Unit, JNCASR (3 weeks each in 2018, 2019, and 2021)
- Teaching assistant at the 2020 International Chronobiology Summer School (May – July 2020)
- Taught the chronobiology practical course time-series analysis module (3 weeks each in 2018 and 2019)
- Taught the basic statistics module of the neurobiology practical courses at the Neuroscience Unit, JNCASR (2 weeks each in 2018 and 2019)
- Served as the Secretary of the Student Advocacy Group at NISER (2017 – 2018)
- Mentored 2 summer trainees each in 2017, 2018, and 2019 at JNCASR, 1 summer trainee in 2015 at NISER, and 1 short-term trainee in 2015 at NISER