

# Abhilash Lakshman

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## PERSONAL STATEMENT

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I am a quantitative biologist whose research integrates **mathematical modeling, open-source computational tools, and behavioral neurogenetics** to study how organisms **generate, maintain, and re-entrain biological rhythms** following circadian disruption. My foundational contributions include a two-process dynamical framework that decomposes behavior into interacting circadian and homeostatic components, a behavioral classification algorithm that identifies discrete sleep states from continuous activity records, and the development of experimental paradigms to study the timing and amount of deep sleep. These tools are empirically validated, portable across biological systems and data types, and have been published in **Current Biology, SLEEP, eLife, and Proceedings of the Royal Society B**. My doctoral work was recognized by the **Young Scientist Medal** from the Indian National Science Academy, and hands-on experience with NIH grant applications underscores my readiness to lead an independent research program.

My future research program will investigate **how distributed timekeeping networks spanning brain clocks and peripheral clocks through the gut-brain axis** coordinate to regulate the timing and amount of **deep sleep**. I will pursue this through a combination of neurogenetic dissection, dynamical modeling, and computational behavioral analysis, asking when such distributed systems confer **robustness versus when they are vulnerable to disruption**. I aim to build an interdisciplinary group that trains scientists in integrative methods spanning behavior, genetics, and computation, contributing to research communities that value theory-driven approaches to fundamental biological questions. I am currently seeking a faculty position where I can build this program and contribute to a collaborative scientific community.

## PROFESSIONAL EXPERIENCE

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Postdoctoral Fellow <i>Gill Institute for Neuroscience and Department of Biology Indiana University Bloomington Advisor: Prof. Orié Shafer</i>	2024 – Present
Postdoctoral Research Associate <i>Neuroscience Initiative Advanced Science Research Center, CUNY Advisor: Prof. Orié Shafer</i>	2021 – 2024

## EDUCATION

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Ph.D. in Biological Sciences <i>Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) Advisors: Profs. Vijay Kumar Sharma and Sheeba Vasu</i>	2015 – 2021
M.S. in Biological Sciences <i>Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)</i>	2012 – 2015
B.Sc. (Hons) in Zoology <i>Calcutta University</i>	2009 – 2012

## HONORS and AWARDS

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CUNY Postdoctoral travel award, CUNY, USA.	2023
<b><i>Young Scientist Medal, Indian National Science Academy, India.</i></b> <i>(Highest recognition for young scientists in India)</i>	2023
<b><i>Prof. CNR Rao Medal for the best Ph.D. thesis in Biological Sciences, JNCASR.</i></b>	2021
International Travel Support (SERB, Govt. of India) to attend SRBR meeting 2018.	2018
Runner-up for Chronovideo competition at SRBR meeting 2018.	2018
Best participant at the Insect Biology School (SERB, Govt. of India).	2015
Best poster at the Chronobiology School (SERB, Govt. of India).	2013
Best participant at the Chronobiology School (SERB, Govt. of India).	2013
First prize for chronobiology quiz at the Chronobiology School (SERB, Govt. of India).	2013
Summer Research Fellowship from the Indian Academy of Science.	2011

## GRANT WRITING &amp; DEVELOPMENT

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Department of Biotechnology, Government of India ( <i>Application in preparation</i> ) Title: A Longitudinal Study of Environmental Influences on Sleep Patterns and Circadian Rhythms among Adolescents at Residential Schools (Jawahar Navodaya Vidyalayas) across India. Role: <b>Co-Principal Investigator</b>	2026
NIH – 1K99NS140562-01 ( <i>Not Funded</i> ) Title: Effects of Circadian Misalignment on Central and Peripheral Clocks, Sleep, and Metabolism Role: <b>Principal Investigator</b>	2025
NIH – 1R21NS145199-01 ( <i>Not funded</i> ) Title: Forward Genetic Screen for Genes Governing Sleep Homeostasis Contributions: Theoretical foundation, hypothesis generation, experimental design, preliminary data collection and analyses, figure making, and editing proposal draft.	2024
NIH – 1R21NS131939-01 ( <b><i>Funded</i></b> ) Title: Identification of Sleep Substances in the Brain Using Matrix Assisted Laser Desorption Ionization-Time of Flight Mass Spectrometry Contributions: Theoretical foundation, hypothesis generation, experimental design, preliminary data collection and analyses, figure making, and editing proposal draft.	2022
NIH – 1R01NS133518-01 ( <i>Not Funded</i> ) Title: Circadian and Homeostatic Sleep Control in the <i>Drosophila</i> Brain Contributions: Theoretical foundation, hypothesis generation, experimental design, preliminary data collection and analyses, figure making, and editing proposal draft.	2022
NIH – 2R01NS077933-12A1 ( <b><i>Funded</i></b> ) Title: Network Properties of Circadian Clock Modulation and Entrainment Contributions: Hypothesis generation, experimental design and light condition development, preliminary data collection and analyses, figure making, and editing proposal draft.	2022

## JOURNAL PUBLICATIONS

1. **Lakshman Abhilash**, Reed Evans and Shafer OT (2025) Recognition of distinct sleep states in *Drosophila* uncovers previously obscured homeostatic and circadian control of sleep. **Current Biology** 36: 968-978. DOI: 10.1016/j.cub.2026.01.015. *bioRxiv*: <https://doi.org/10.1101/2025.06.23.661143>.
2. Tomaiolo JN, Fleury S, Bilder A, Nacimba J, **Lakshman Abhilash**, Kim YS, Fenno LE, Ramakrishnan C, Deisseroth K and Mingote S (2025) Evidence for age-related vulnerability in dopamine-glutamate projections to the lateral entorhinal complex. *bioRxiv*: <https://doi.org/10.1101/2025.10.06.680552>.
3. **Lakshman Abhilash** and Shafer OT (2024) A two-process model of *Drosophila* sleep reveals an inter-dependence between circadian clock speed and the rate of sleep pressure decay. **SLEEP** 47: 1-21. <https://doi.org/10.1093/sleep/zsad277>. *bioRxiv*: <https://doi.org/10.1101/2022.08.12.503775>.
4. Chowdhury B, **Lakshman Abhilash**, Ortega A, Liu S and Shafer OT (2023) Homeostatic control of deep sleep and molecular correlates of sleep pressure in *Drosophila*. **eLife** 12:e91355. <https://doi.org/10.7554/eLife.91355>. *bioRxiv*: <https://doi.org/10.1101/2022.09.30.510368>.
5. **Lakshman Abhilash** and Shafer OT (2023) Parametric effects of light acting via multiple photoreceptor types contribute significantly to circadian entrainment in *Drosophila melanogaster*. **Proceedings of the Royal Society B** 290: 20230149. <https://doi.org/10.1098/rspb.2023.0149>. *bioRxiv*: <https://doi.org/10.1101/2022.03.02.482722>.
6. Persons JL, **Lakshman Abhilash**, Lopatkin AJ, Roelofs A, Bell EV, Fernandez MP and Shafer OT (2022) PHASE: An open-source program for the analysis of *Drosophila* phase, activity, and sleep under entrainment. **Journal of Biological Rhythms** 37: 455-467. [doi.org/10.1177/07487304221093114](https://doi.org/10.1177/07487304221093114).
7. **Lakshman Abhilash**, Arshad Kalliyil and Vasu Sheeba (2020) Activity/rest rhythms of *Drosophila* populations selected for divergent eclosion timing under temperature cues. **Journal of Experimental Biology** [doi.org/10.1242/jeb.222414](https://doi.org/10.1242/jeb.222414). *bioRxiv*: 10.1101/831347.
8. **Lakshman Abhilash** and Vijay Kumar Sharma (2020) Mechanisms of photic entrainment of activity/rest rhythms in populations of *Drosophila* selected for divergent timing of eclosion. **Chronobiology International** 37: 469-484 [doi.org/10.1080/07420528.2020.1727917](https://doi.org/10.1080/07420528.2020.1727917).
9. **Lakshman Abhilash**, Aishwarya Ramakrishnan, Srishti Priya and Vasu Sheeba (2020) Waveform plasticity under entrainment to 12-hour T-cycles in *Drosophila melanogaster*: behaviour, neuronal network and evolution. **Journal of Biological Rhythms** 35: 145-157. [doi.org/10.1177/0748730419899549](https://doi.org/10.1177/0748730419899549).
10. **Lakshman Abhilash**, Arijit Ghosh, Vasu Sheeba (2019) Selection for timing of eclosion results in co-evolution of temperature responsiveness in *Drosophila melanogaster*. **Journal of Biological Rhythms** 34: 596-609.
11. **Lakshman Abhilash** and Vasu Sheeba (2019) RhythmicAlly: Your R and Shiny based open-source ally for the analysis of biological rhythms. **Journal of Biological Rhythms** 34: 551-561.
12. Saloni Sinha, Arindam Ray, **Lakshman Abhilash**, Manish Kumar, Sreelakshmi K Sreenivasamurthy, TS Keshava Prasad and Maneesha S Inamdar (2019) Proteomics of Asrij perturbation in *Drosophila* lymph glands for identification of novel regulators of hematopoiesis. **Molecular and Cellular Proteomics** 18: 1171-1182.
13. Manishi Srivastava, Vishwanath Varma, **Lakshman Abhilash**, Vijay Kumar Sharma and Vasu Sheeba (2019) Circadian clock properties and their relationships as a function of free-running period in *Drosophila melanogaster*. **Journal of Biological Rhythms** 34: 231-248.
14. **Lakshman Abhilash**, Radhika Shindey and Vijay Kumar Sharma (2017) To be or not to be rhythmic? A review of studies on organisms inhabiting constant environments. **Biological Rhythm Research** 48:677-691.
15. **Lakshman Abhilash** and Vijay Kumar Sharma (2016) On the relevance of using laboratory selection to study the adaptive value of circadian clocks. **Physiological Entomology** 41:293-306.
16. KL Nikhil, **Lakshman Abhilash** and Vijay Kumar Sharma (2016) Molecular correlates of circadian clocks in fruit fly *Drosophila melanogaster* populations exhibiting early and late emergence chronotypes. **Journal of Biological Rhythms** 31:125-141.
17. Manaswini Sarangi, Payel Ganguly, Zenia, C Arvind, **Lakshman Abhilash** and TNC Vidya (2014) Common myna roosts are not recruitment centres. **PLoS ONE** 9.
18. Koustubh M Vaze, Nisha N Kannan, **Lakshman Abhilash** and Vijay Kumar Sharma (2012) Chronotype differences in *Drosophila* are enhanced by semi-natural conditions. **Naturwissenschaften** 99:967-971.
19. Koustubh M Vaze, KL Nikhil, **Lakshman Abhilash** and Vijay Kumar Sharma (2012) Early and Late emerging *Drosophila melanogaster* fruit flies differ in their sensitivity to light during morning and evening. **Chronobiology International** 29:674-682.

## OTHER PUBLICATIONS

20. **Lakshman Abhilash** (2018) The 2017 Nobel Prize in Physiology or Medicine: From flies to clocks. In *KAAS News (Karnataka Association for the Advancement of Science)* 4:1-4.
21. **Lakshman Abhilash** and Vijay Kumar Sharma (2017) Time measurement in living systems: Human understanding and health implications. In *Space, Time and the Limits of Human Understanding* (Eds. Wuppuluri S and Ghirardi G) pp. 337-352 Springer.
22. **Lakshman Abhilash** (2017) On the reality of time: Lessons from chronobiology. In *Samay (Indian Society for Chronobiology)* 3:3-7.

## TALKS

The Society for Research on Biological Rhythms (SRBR) Biennial Meeting <i>SRBR, Amelia Island, FL, USA</i>	2026
The 67 <sup>th</sup> Annual Drosophila Research Conference <i>Genetics Society of America, Chicago, IL, USA</i>	2026
Circadian photoentrainment in <i>Drosophila melanogaster</i> <i>Indian Institute of Science, Bangalore, India</i>	2025
The 8 <sup>th</sup> Rhythms in the South-Eastern Region Meeting (RISER) <i>Vanderbilt University, Nashville, TN, USA</i>	2025
Gill Mini-Symposium <i>Gill Institute for Neuroscience, Indiana University, USA</i>	2024
10-year Anniversary Celebration <i>Advanced Science Research Center, CUNY, USA</i>	2024
<i>Drosophila</i> Neurobiology Colloquium <i>NIH/NHLBI</i>	2023
Neuroscience Tutorial: A two-process model of fly sleep <i>Initiative for the Theoretical Science, CUNY, USA.</i>	2023
Neuroscience Seminar <i>Jawaharlal Nehru Centre for Advanced Scientific Research, India.</i>	2022
Hargobind Khorana Lecture <i>Indian Academy Degree College, Karnataka Association for the Advancement of Science.</i>	2018

## TEACHING and MENTORSHIP EXPERIENCE

I have a sustained record of teaching at graduate and undergraduate levels across India, the USA, and several workshops and schools organized by the Science and Engineering Research Board (SERB) and the European Molecular Biology Organization (EMBO). My particular areas of expertise are in chronobiology, statistical hypothesis testing, responsible conduct of research, time-series analyses, sleep, and computational methods in Biology.

Sleep and Circadian Rhythms <i>Guest Lecture Psychological and Brain Sciences, IU Bloomington, IN, USA.</i>	April 2026
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<i>Drosophila</i> Sleep States <i>NeuroCURE Class, University of New Mexico, New Mexico, USA.</i>	April 2026
Time-series Analysis and Entrainment <i>EMBO Chronobiology School, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India.</i>	March 2025
Statistical Hypothesis Testing for Biologists <i>Graduate Center, CUNY, New York, USA.</i>	October 2024
Statistical Hypothesis Testing and R Programming for Biologists <i>Advanced Science Research Center, CUNY, New York, USA.</i>	Spring 2024
Scientific Rigor and Data Management <i>Graduate Center, CUNY, New York, USA.</i>	April 16, 2024
Responsible Conduct of Research <i>Graduate Center, CUNY, New York, USA.</i>	March 25, 2024
Statistical Hypothesis Testing (Graduate level) <i>Jawaharlal Nehru Centre for Advanced Scientific Research, India.</i>	Sep 2022
Basic Chronobiology (Graduate level) <i>Jawaharlal Nehru Centre for Advanced Scientific Research, India.</i>	2016 – 2020
Advanced Chronobiology (Graduate level) <i>Jawaharlal Nehru Centre for Advanced Scientific Research, India.</i>	2017
Experimental Design and Statistical Hypothesis Testing for Biologists (Graduate level) <i>Jawaharlal Nehru Centre for Advanced Scientific Research, India.</i> JNCASR, Bangalore, India.	2016 – 2020
Analysing Biological Rhythms (Graduate level) <i>CCS University, India.</i>	2019
Undergraduate and High School Student Research <i>Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India;</i> <i>Advanced Science Research Center, CUNY, New York, USA;</i> <i>Gill Institute for Neuroscience, Indiana University, Bloomington, IN, USA.</i> Supervised multiple undergraduate and high school student research projects, providing hands-on training in <i>Drosophila</i> genetics, life-history, behavioral assays, data analyses, and scientific writing.	2015 – Present

## SERVICE

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### **Current**

Education Committee Member <i>Society for Research on Biological Rhythms</i>	2026 – Present
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The Education Committee aims to support the development of current and new chronobiologists by organizing and overseeing educational activities related to biological rhythms. This includes establishing online resources for education and ensuring there are annual Chronobiology Summer Schools.

Official Nominator <i>The VinFuture Prize</i> Serves as an official nominator for this international science and technology prize.	2026 – Present
OSF (Open Science Framework) Technology Advocate <i>Center for Open Science</i> Actively promotes open-science practices and ways to ensure reproducible research in science.	2025 – Present
Review Editor <i>Frontiers in Physiology (Chronobiology)</i>	2023 – Present
Independent peer reviewer <i>Journal of Biological Rhythms, F1000 Research, PLoS ONE, Journal of Insect Science, Scientific Reports</i>	2019 – Present
Assisted peer review <i>Journal of Biological Rhythms, Current Biology, iScience, Journal of Comparative Physiology A, PLoS Biology, Nature</i>	2018 – Present
<b>Previous</b>	
Chair <i>Gordon Research Seminar in Chronobiology</i>	2025
Member <i>Diversity Committee – Gordon Research Conference</i>	2025
Preprint Editor (Systems Biology team lead) <i>Proceedings of the Royal Society B</i> Led the systems biology team in screening and evaluating preprints for potential endorsement and fast-track consideration at <i>Proceedings of the Royal Society B</i> .	2023 – 2025

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## OUTREACH

Inferring <i>Drosophila</i> sleep states <i>Pueblo Brain Sciences, University of New Mexico, New Mexico, USA.</i> Through Pueblo Brain Science we bring hands-on neuroscience education, using tools like fruit flies, 3D-printed models, and behavioral data analysis, to Native American communities including Zia, Jemez Pueblo, Navajo Nation schools, and other New Mexico high schools, with the goal of exposing young students and educators to biological research and brain science.	2026
To sleep or not to sleep? <i>Bloomington Science Café, IN, USA.</i> The Bloomington Science Café is a free, monthly event that brings scientists and the public together in an informal setting to discuss a wide range of scientific topics through accessible talks and open Q&A discussions.	2026
Community Science Outreach Volunteer <i>Advanced Science Research Center, CUNY, New York, USA.</i>	2022-2024
Content contributor <i>“Lighten Up! On Biology and Time” – An exhibition at EPFL Pavilions, Switzerland</i> Contributed scientific content and historical context to an international science-art exhibition exploring the connections between living organisms and natural light-dark cycles.	2022

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