



Name: **Sheeba Vasu**

Designation: Professor

Department: Neuroscience Unit

Institute/University: Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)

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Specialization/Research Areas: Circadian rhythms, Sleep and Drosophila Neurogenetics

Education Details (Post-graduation onwards & Professional Career)

SR. NO	DEGREE AWARDED	INSTITUTION/PLACE	YEAR	FIELD OF STUDY
1	MSc	Mangalore University, Mangalore, India	1996	Applied Zoology,
2	PhD	Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India	2002	Circadian Rhythms

Employment Details: Position and Employment (Starting with the most recent employment)

INSTITUTION/PLACE	DESIGNATION	FROM DATE	TO DATE
Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru, India	Professor	June 2023	to date
Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru, India	Associate Professor	June 2018	May 2023
Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru, India	Assistant Professor	May 2014	May 2018
Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru, India	Faculty Fellow	January 2014	May 2014
Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru, India	Ramanujan Fellow	Jan 2009	Dec 2013
University of California, Irvine, USA	Associate Specialist	March 2007	Sept 2008
New York University, New York, USA	Post-doctoral fellow	July 2003	Feb 2007

University of Massachusetts, Worcester, USA	Post-doctoral fellow	Jan 2002	July 2003
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Research Interest

Sheeba Vasu's research is focused on understanding connections between behaviours and their underlying neurogenetic basis. Behaviours governed by circadian clocks are the primary focus, in addition to examining impact of conspecific interactions or 'social impact' on life history using the fruitfly as a model. Using the genetic toolkit of *Drosophila melanogaster*, her studies suggested that a circadian neuropeptide signals to sleep centers via its cognate receptors ([PMID: 30131970](#)). Her studies were the first to suggest a role for gap-junction proteins -Innexins, in modulating the circadian rhythm of locomotion in flies ([PMC8426565](#)). Studies from her laboratory demonstrated that temperature-sensitive ion channel dTRPA1 shapes the waveform of activity rhythms and revealed that a circadian neuropeptide pigment-dispersing factor suppresses nighttime activity under continuously warm days ([PMC9744560](#)). The fly circadian circuitry is employed to examine the bidirectional relationship between neurodegenerative conditions and circadian rhythms and her research has provided evidence for heat-shock proteins ([PMC9254228](#)) and autophagy pathways being able to rescue behavioural rhythmicity including sleep-wake patterns ([PMC10312063](#)). Having established a unique set of populations subjected to long-term selection under naturalistic environments she demonstrated evolution of both circadian clock properties and life-history traits ([PMID 35910567](#)). She showed that evolution of extremely 'early' and 'late' chronotypes is accompanied by altered circadian clock organization including heightened temperature sensitivity in the 'late' chronotypes ([PMID 32291322](#)). She demonstrated that cyclic food-availability was not a time-cue to the central brain clock ([PMID 35983646](#)) and provided the first high-resolution day-night profile of the fly metabolome ([PMID 26422411](#)).

Awards/Honours:

- Fellowship of the Indian National Science Academy (INSA) January 2024.
- Recognised among the "75 under 50" scientists selected by DST, published in February 2022
- Awarded the DST Ramanujan Fellowship 2009-2013.
- Chosen for Hot Topic Presentation and Travel Award 2007, Gordon Research Conference (GRC) in Chronobiology.
- Research Excellence Trainee Travel Award 2006, Society for Research on Biological Rhythms (SRBR).
- Best Ph.D. Thesis Award of 2002 from Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India.
- Awarded postdoctoral fellowship from Japanese Society for the Promotion of Science (JSPS), Japan in 2000 (declined).

Other relevant information

Administrative and Academic responsibilities

Based on scientific contributions and academic interactions with the community in India and internationally, the following responsibilities have been conferred:

- Society for Research in Biological Rhythms (SRBR) Education **Committee Member** – since 2020. *Role – discuss with an international committee of Chronobiologists regarding developing ways to enhance education of chronobiology concepts among students and research scholars.*

- Society for Research in Biological Rhythms Program **Committee Member** 2021-22. *Role – discuss with an international committee of Chronobiologists to select Symposia, Chairs, speakers and awards for Bi-annual meeting of the Society (SRBR).*
- **Vice-President** Indian Society of Chronobiology since March 2022. *Role – Along with members of the Executive committee of Indian Society of Chronobiologists regarding capacity building measures to enhance interactions amongst chronobiologists within the country and to conduct Schools and workshops to teach Chronobiology concepts to students and research scholars.*
- **Chairperson, Governing Body** of MES College of Arts, Science & Commerce since January 2023.
- Member of Editorial Board Journal of Biological Rhythms 2023 – 2026.
- Member of Editorial Board (**review editor**) Frontiers in Physiology – Chronobiology since 2018.
- **Served as Ad-hoc reviewer for the following journals:**
Current Biology; Frontiers in Neurology; Journal of Neurogenetics; BMC Genomics; PloS One; Journal of Biological Rhythms; Journal of Genetics; Science Reports; Nature Communications, Journal of Experimental Biology
- **Review Editor** Editorial Board of the 'Insect Neurobiology' Section of Frontiers in Insect Science.
- Served as **Thesis Examiner** for PhD theses at IISc, NCBS, NIMHANS, BHU, TDU
- Served as **Thesis Committee Member** at NCBS, NIMHANS, MAHE
- Served as **Ad-hoc reviewer for the following funding agencies:**
 - National Science Foundation (NSF) USA
 - Department of Biotechnology (DBT), India
 - Czech Science Foundation, Czech Republic
 - Israel Research Foundation (ISF)
- **Reviewer** - project evaluation for Vision group – Science and Technology Government of Karnataka.

Details of ongoing/completed projects.

- Ramanujan Fellowship Research Projects **Completed 2013**
- SERB No: SB/SO/AS-19 / 2013; A study of the interactions between the circadian clock and homeostatic mechanisms regulating sleep and arousal in *Drosophila melanogaster*. **Completed 2013.**
- CRG/2019/006802 Investigating the role of gap junctions in the Drosophila circadian pacemaker network. **Completed 2023**

Technological innovations and new products:

- Open-Source Application for time-series analysis developed in the laboratory - RhythmicAlly and VANESSA – CRA and SA, both available on GitHub.

Publications of the last 5 years in relevant areas. Sheeba Vasu (Publication Name – Vasu Sheeba)

(a) Original Research Papers

1. Sharma A, Narasimha K, Manjithaya R*, and **Sheeba V***. Restoration of sleep and circadian behavior by autophagy modulation in Huntington's disease. **Journal of Neuroscience** (*accepted for publication*). * co – corresponding authors

2. Iyengar, A, Rao S, **Sheeba V**. A subset of circadian neurons expressing dTRPA1 enables appropriate phasing of activity rhythms in *Drosophila melanogaster*, under warm temperatures. **Journal of Biological Rhythms** 38 (4), 341-357, <https://doi.org/10.1177/07487304231159713>
3. Dani C and **Sheeba V**. *Drosophila* populations reared under tropical semi-natural conditions evolve season-dependent differences in timing of eclosion. **Frontiers in Physiology - Chronobiology** 2022 Jul 15;13:954731. doi: 10.3389/fphys.2022.954731.
4. Singh V, Potdar S, **Sheeba V**. Effects of food availability cycles on phase and period of activity/rest rhythm in *Drosophila melanogaster*. **Journal of Biological Rhythms** 2022 Oct;37(5):528-544. doi: 10.1177/07487304221111287.
5. Prakash P, Pradhan A, **Sheeba V**. HSP40 overexpression in pacemaker neurons protects against circadian dysfunction in a *Drosophila* model of Huntingtons Disease. **Disease Models Mechanisms** 2022 Jun 1;15(6):dmm049447. doi: 10.1242/dmm.049447.
6. Chakravorty A, Sharma A, **Sheeba V**, Manjithaya R. Glutamatergic synapse dysfunction in *Drosophila* neuromuscular junctions can be rescued by proteostasis modulation **Frontiers in Molecular Neuroscience - Molecular Signaling and Pathways**. DOI:10.3389/fnmol.2022.842772
7. Iyengar, A, Kulkarni R, **Sheeba V**. Under warm ambient conditions, *Drosophila melanogaster* suppresses nighttime activity via the neuropeptide PDF. **Genes Brain Behavior**, 21 (4), e12802
8. Ghosh A, **Sheeba V**. VANESSA—Shiny Apps for Accelerated Time-series Analysis and Visualization of *Drosophila* Circadian Rhythm and Sleep Data. **Journal of Biological Rhythms**, <https://doi.org/10.1177/07487304221077662>
9. Lone SR, Potdar S, Venkataraman A, Sharma N, Kulkarni R, Rao S, Mishra S, **Sheeba V**, Sharma VK. Mechanosensory Stimulation via Nanchung Expressing Neurons Can Induce Daytime Sleep in *Drosophila*. **Journal of Neuroscience**. 2021 Nov 10;41(45):9403-9418. doi: 10.1523/JNEUROSCI.0400-21.2021.
10. Ramakrishnan A, **Sheeba V**. Gap junction protein Innexin2 modulates the period of free-running rhythms in *Drosophila melanogaster*. **iScience**. 2021. PMID: 34522854
11. Ghosh A, Dansana S, Sharma P, **Sheeba V**. Evidence for co-evolution of masking and circadian phase in *Drosophila melanogaster*. **Journal of Biological Rhythms**. 2021, 36 (3)254-270.
12. Abhilash L, Kalliyil A, **Sheeba V**. Responses of activity rhythms to temperature cues evolve in *Drosophila* populations selected for divergent timing of eclosion. **Journal of Experimental Biology**. 2020, 223 (11).
13. Abhilash L, Ramakrishnan A, Priya S, **Sheeba V**. Waveform Plasticity under Entrainment to 12-h T-cycles in *Drosophila melanogaster*: Behavior, Neuronal Network, and Evolution. **Journal of Biological Rhythms**. 2020, 35 (2), 145-157
14. Abhilash L, **Sheeba V**. RhythmicAlly: your R and Shiny-based open-source ally for the analysis of biological rhythms **Journal of Biological Rhythms**. 2020, 34 (5), 551-561
15. Sasml R, Das Saha N, Schueder F, Joshi D, **Sheeba V**, Jungmann R, Agasti SS. Dynamic host-guest interaction enables autonomous single molecule blinking and super-resolution imaging. **Chem Commun (Camb)**. 2019, 55(96):14430-14433.doi: 10.1039/c9cc07153a.
16. Abhilash L, Ghosh A, **Sheeba V**. Selection for Timing of Eclosion Results in Co-evolution of Temperature Responsiveness in *Drosophila melanogaster*. **Journal of Biological Rhythms**. 2019, 13. doi: 10.1177/0748730419877315.
17. Varma V, Krishna S, Srivastava M, Sharma VK, **Sheeba V**. Accuracy of fruit-fly eclosion rhythms evolves by strengthening circadian gating rather than developmental fine-tuning. **Biology Open**. 2019 Aug 27;8(8). pii: bio042176. doi:10.1242/bio.042176
18. Srivastava M, Varma V, Abhilash L, Sharma VK, **Sheeba V**. Circadian clock properties and their relationships as a function of free-running period in *Drosophila melanogaster*. **Journal of Biological Rhythms**. 2019 doi:10.1177/0748730419837767.
19. Srivastava M, James A, Varma V, Sharma VK, **Sheeba V**. Environmental cycles regulate development time via circadian clock mediated gating of adult emergence. **BMC Developmental Biology**. 2018 doi:10.1186/s12861-018-0180-6.

20. Potdar S, **Sheeba V**. Wakefulness is promoted during day time by PDFR signalling to dopaminergic neurons in *Drosophila melanogaster*. **eNeuro** **2018** doi: <https://doi.org/10.1523/ENEURO.0348-18.2018>.
21. Potdar S, Daniel DK, Thomas FA, Lall S, **Sheeba V**. Sleep deprivation negatively impacts reproductive output in *Drosophila melanogaster*. **Journal of Experimental Biology**. 2018 Mar 26;221(Pt 6). pii: jeb174771. doi: 10.1242/jeb.174771. PubMed PMID: 29361608.
22. Prakash P, Nambiar A, **Sheeba V**. Oscillating PDF in termini of circadian pacemaker neurons and synchronous molecular clocks in downstream neurons are not sufficient for sustenance of activity rhythms in constant darkness. **PLoS One**. **2017** 12(5): e0175073. doi:10.1371/journal.pone.0175073.

(b) Scientific Reviews

1. Iyer AR and **Sheeba V**. A new player in circadian networks: Role of electrical synapses in regulating functions of the circadian clock. **Frontiers Physiology**. **2022** 13:968574. doi: 10.3389/fphys.2022.968574

(d) Chapters contributed to books

1. Dani C, Kannan NK, **Sheeba V**. Environmental adaptation and evolution of circadian clocks. Chapter 9, in **Insect Chronobiology**, Eds. Numata H and Tomika K, Springer *Invited Book Chapter*. https://link.springer.com/chapter/10.1007/978-981-99-0726-7_9#chapter-info
2. Contributed 6 chapters in **Experiments with Drosophila for Biology Courses**, Eds, SC Lakhotia and H A Ranganath, Indian Academy of Science. ISBN: 978-81-950664-2-1.
 - Menon A, **Sheeba V**. Do female *Drosophila melanogaster* flies show a preference to lay eggs at a particular time of the day? pp. 453-457.
 - Dani C, **Sheeba V**. Assaying the effect of ambient temperature on lifespan of *Drosophila*. pp. 453-457.
 - Dani C, **Sheeba V**. Heat stress tolerance in *Drosophila*. pp. 453-457.
 - Dani C, **Sheeba V**. Effect of environmental temperature on development times in *Drosophila*. pp. 453-457.
 - Dani C, **Sheeba V**. Testing the ability of *Drosophila* to tolerate desiccation stress. pp. 453-457.
3. Das A, **Sheeba V**. Temperature Input for Rhythmic Behaviours in Flies: The Role of Temperature-Sensitive Ion Channels. In, **Biological Timekeeping: Clocks, Rhythms and Behaviour**. (Ed) Kumar V, 2017. DOI 10.1007/978-81-322-3688-7_19

(f) Other publications – Science communication

- **V Sheeba** The many mysteries of sleep. Shastragathi. 2022 Jan Vol 56, Issue 6. Translated – Malayalam