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Natasha Mhatre, Ph.D.

Ecology

University of Bristol

Born in 1979 in Mumbai, India

Studied Life Sciences and Biochemistry at Mumbai University and Biological Sciences and Animal Behaviour at the Indian Institute of Science, Bangalore

FELLOWSHIP
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PROJECT

Finding the Reciprocity Between being a Sensor and Being a Motor

The cells that transduce sound into neuronal signals are unique; they are both sensory and motor. In auditory systems across taxa, sound is captured as vibration and the cells that sense this motion can also move on their own. By combining motility with sensory capabilities, they behave like a unique class of oscillators, called critical oscillators, which can actively amplify and respond to vibration just above thermal noise. My research will be concerned with the evolution, maintenance and elaboration of mechanosensory active sensing. One finds that the structural similarity between cells used for swimming, i.e. moving, and those for mechanical sensing are remarkably similar. Hence, my working hypothesis is that sensing motion and moving were reciprocal and fundamentally inseparable processes in these ciliated swimming cells, which are ancestral in this cell lineage. Simply put, the first cell that moved using a beating cilium inevitably sensed motion. My second hypothesis is that this sense was maintained and elaborated so the presence of other nearby swimming microorganisms could be detected and used to organise cooperative swimming behaviour that was adaptive. In my time in Berlin, I will explore these hypotheses by developing and designing both the theoretical underpinnings and the appropriate experiments to test these hypotheses.

Histories: Science Communication Through Fiction

At the same time, I will be exploring short stories as a mode for communicating science. I intend to complete a series of short stories, each based on a different aspect of snake biology. Each will be told in a different narrative genre, the one most appropriate to the biology being explored. The success of fiction is often judged on the clarity and detail of its imagining. Much science, certainly biology, also depends on appreciating the full complexity of the factors affecting an organism's biology and evolution. Through this series I will be asking whether short stories can truly communicate this part of the scientific process; the process of asking and answering the right questions about a complex subject, while avoiding a simple report of the resolutions of the process.

Recommended Reading

Mhatre, Natasha, F. Montealegre-Z, R. Balakrishnan, and D. Robert (2012). "Changing resonator geometry to boost sound power decouples size and song frequency in a small insect." Proceedings of the National Academy of Sciences, USA 22, May 29. doi:10.1073/pnas.1200192109

Mhatre, Natasha, M. Bhattacharya, R. Balakrishnan, and D. Robert (2011). "Matching sender and receiver: poikilothermy and frequency tuning in a tree cricket." Journal of Experimental Biology 214: 2569-2578.

Mhatre, Natasha and R. Balakrishnan (2008). "Predicting acoustic orientation in complex real-world environments." Journal of Experimental Biology 211: 2779-2785.

PUBLICATIONS FROM THE FELLOW LIBRARY

Mhatre, Natasha (S.l.,2019)

Posture controls mechanical tuning in the black widow spider mechanosensory system

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Mhatre, Natasha (2018)

The drivers of heuristic optimization in insect object manufacture and use

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Tree crickets optimize the acoustics of baffles to exaggerate their mate-attraction signal

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Mhatre, Natasha (2015)

Active amplification in insect ears : mechanics, models and molecules

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Mhatre, Natasha (Cambridge,2013)

Low-pass filters and differential tympanal tuning in a paleotropical bushcricket with an unusually low frequency call

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Mhatre, Natasha (2012)

Sound reception and radiation in a small insect

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Mhatre, Natasha (2012)

Changing resonator geometry to boost sound power decouples size and song frequency in a small insect

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Mhatre, Natasha (2012)

Changing resonator geometry to boost sound power decouples size and song frequency in a small insect : author summary

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