

# LAD Conferences

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L a b o r a t o i r e d e r e c h e r c h e s u r l e s a s y m é t r i e s d ' i n t e r f a c e s

**Partha Mitra, Cold Spring Harbor Laboratory & Cornell Medical School**

## Evolution of Song Culture in the Zebra Finch

**Coauthors: Olga Feher, Haibin Wang, Sigal Saar, Partha Mitra, Ofer Tchernichovski**

Would culture resembling existing ones evolve in an island colony of naïve founders? This cannot be studied experimentally in humans; we performed the analogous experiment using socially learned birdsong, an ethological model of culture. We quantified songs from zebra finch isolates unexposed to song (ISO), and a second group with exposure to wild-type song culture in laboratory colonies (WT). ISO and WT songs formed distinct clusters in feature space. We created multigenerational tutor-pupil lineages from isolate founders. Both for tutor-pupil only and multi-individual social settings, songs evolved from the ISO towards the WT cluster in 3-4 generations. Therefore, species-typical song culture can evolve de novo.

Based on a recursive parental effects model from quantitative genetics, we suggest that song culture may be modeled as a multigenerational phenotype, implicitly encoded genetically in the founders and unfolding over several generations. Parallels exist with models of cultural and linguistic evolution.

**Partha Mitra** received his PhD in theoretical physics from Harvard in 1993. He worked in quantitative neuroscience and theoretical engineering at Bell Laboratories from 1993-2003 and as an Assistant Professor in Theoretical Physics at Caltech in 1996 before moving to Cold Spring Harbor Laboratory in 2003, where he is currently Crick-Clay Professor of Biomathematics. Dr. Mitra's research interests span multiple models and scales, combining experimental, theoretical and informatic approaches toward achieving an integrative understanding of complex biological systems, and of neural systems in particular.

The Mitra lab works in close collaboration with research groups at other institutions, including NYU, Caltech, CCNY, and Cornell Medical School, where Dr. Mitra is also an Adjunct Associate Professor. Dr. Mitra is a fellow of the American Physical Society. Dr. Mitra's work has been previously featured in major media outlets including the Economist, and he authored a recent book (Observed Brain Dynamics) from the Oxford University Press.

### Selected Publications

- Womelsdorf, T., Fries, P., Mitra, P.P., and Desimone, R. 2006. Gamma-band synchronization in visual cortex predicts speed of change detection. *Nature* 439: 733-736.
- Derégnaucourt, S., Mitra, P.P., Fehér, O., Pytte, C., and Tchernichovski, O. 2005. How sleep affects the developmental learning of bird song. *Nature* 433: 710-716.
- Pesaran, B., Pezaris, J.S., Sahani, M., Mitra, P.P., and Andersen, R.A. 2002. Temporal structure in neuronal activity during working memory in macaque parietal cortex. *Nat. Neurosci.* 5: 805-811.

**Anna Maria Di Sciullo, [www.interfaceasymmetry.uqam.ca](http://www.interfaceasymmetry.uqam.ca)  
CRSH, FQRSC**

