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Contemporary issues in evolutionary biology

Preface

We are delighted to bring to the readers, a set of peer-reviewed papers on evolutionary biology, published as a special issue of the *Journal of Genetics*. These papers emanated from ruminations upon and discussions at the *Foundations of Evolutionary Theory: the Ongoing Synthesis* meeting at Coorg, India, in February 2014, and the *Foundations of Biology* meetings at Pune, India, in April 2015 and March 2016. One of us (LSS), along with Sutirth Dey (IISER Pune) and Amitabh Joshi (JNCASR, Bengaluru), organized these meetings in order to bring together a diverse set of interested academics to discuss and argue about fundamental issues in the subject. These discussions included, among others, the possible consequences of nonDNA-based inheritance—epigenetics and cultural evolution, niche construction, and developmental mechanisms on our understanding of the evolutionary process, speciation, complexity in biology, and constructing a formal evolutionary theory.

This special issue begins with an original article by K. P. Mohanan on the *Conceptual Foundations of Evolutionary Thought*, in which evolution is conceptualized as symmetry breaking, thereby attempting to integrate physical, biological (macroevolution), and cultural (societal) evolution. Biological evolution and cultural evolution are further examined conceptually as the emergence and persistence of traits rather than taxa. Structural and functional constraints are invoked to explain the contrast between the emergence of novelty and the resistance to novelty (persistence). The second article presents a review of various species concepts, and thoughts about species concepts versus the delimitation of species. The authors, Shanker *et al*., focus on the general lineage concept and provide a practical approach for species discovery and delimitation. The third paper is on complexity in biological systems. Reviewing the history of complexity theory, Bhat and Pally distinguish between complicatedness and complexity, and propose that multiscalarity and excitability are central to complexity in living systems. This is followed by articles on epigenetics and one by D. P. Kasbekar on phenotypic abnormality in hybrid Sordariaceae fungi. Manjrekar discusses transgenerational epigenetic inheritance (TEI), first providing a nice, broad review of the phenomenon, and then focussing on prions as mediators of TEI. In the light of environment-specific generation/loss and survival advantages conferred by some prions, he suggests that TEI through prions may be adaptive. TEI may also occur through the placenta in placental mammals, and Sailasree *et al*. review this phenomenon. Apart from the developmental role of the placenta on the foetus, epigenetic changes in the placenta may be transmitted to successive generations by the offspring.

The papers on epigenetics are followed by ones on niche-construction. The first, by Renee Borges, describes co-construction of organisms, which may significantly affect morphological and behavioural phenotypes of organisms. Inheritance is a common thread that runs across several papers in this issue. Co-construction of organisms by symbionts requires transmission of symbionts between generations. This is often achieved through vertical (usually maternal) transmission, although symbioses that involve macroorganisms may require horizontal transfer. Gupta *et al*. also deal with niche construction, but critique the claims that the role of niche construction in evolution has been neglected by standard evolutionary theory and that niche construction should occupy a place at par with natural selection in evolutionary explanations of adaptation. This position has generated a debate and the article is followed by a rebuttal by Feldman *et al*. and a response to the rebuttal.

The next set of papers deal with cultural and behavioural evolution. Raghavendra Gadagkar explores the conceptual space of the evolution of culture by offering four different conceptions of culture—as a historical account, and with different extents of the role of biology. In his original Viewpoint article, he also discusses the consequences and the necessity of studying cultural evolution through all four conceptions. Singh and Chatterjee review work on the evolution of religious belief in humans. Explanations ranging from religion being adaptive to being a by-product of adaptive cognitive mechanisms to being maladaptive are discussed. The final paper, by Milind Watve, draws parallels between phenomena from behavioural evolution and behaviours among scientists, and argues that a study of social behavioural epistemology would benefit science by understanding various biases.

We thank all the authors for their enthusiastic responses, and their submissions that allowed this special issue to be brought out on time. We also thank all the reviewers for their timely reviews (occasionally within a day!) and helpful comments. All the participants of the Foundations of Evolutionary Theory (2014) and Foundations of Biology (2015 and 2016) meetings are thanked greatly for contributing to enriching discussions, whose presence is felt in several of these papers.

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