

Conceptual Breakthroughs in Evolutionary Ecology. Laurence Mueller. Academic Press, an imprint of Elsevier, 125 London Wall, London EC2Y 5AS, United Kingdom. 2020. xx + 183 pages. Price (in India): US\$ 44.96.

The book under review is the third in a recently initiated Academic Press series on ‘Conceptual Breakthroughs’ in diverse fields of biology, under the overall editorship of John Avise, a distinguished researcher in the field of molecular evolution. The first two books focused on the areas of Evolutionary Genetics (2014) and Ethology and Animal Behaviour (2017) respectively. A fourth book, focused on Aging, is expected in mid-2021. The series is envisaged as a source for relatively accessible and concise overviews of major developments in thinking in various fields, and is aimed simultaneously at a general and curious reader as well as students who might use it as an adjunct to regular courses in the field. It aims to provide a brief historical tour of major milestones that shaped our understanding in these diverse fields, written by well-known researchers in that field.

This third book of the series, written by Laurence D. Mueller from the Department of Ecology and Evolutionary Biology at the University of California, Irvine, focuses on conceptual breakthroughs at the interface of ecology and evolutionary biology, starting from Charles Darwin’s enunciation of the principle of adaptive evolution through natural selection in 1858–59. Incidentally, the title involves a slightly broader interpretation of ‘evolutionary ecology’ than is often the case in textbooks and even some of the primary literature. In its

more common, narrower usage, the phrase ‘evolutionary ecology’ typically refers to studies aimed at assessing the fitness consequences of different variant phenotypes at a trait. As the author explains, he is using the term to refer to work that had both ecological and evolutionary aspects and implications. Despite this, a few chapters focus on really seminal pieces of work that were either primarily ecological or evolutionary respectively. The author is singularly well-placed to have written such a book, having spent decades doing path-breaking research on the boundaries of ecology and evolution, most notably in the areas of density-dependent selection, adaptations to crowding, evolution of population stability, and the evolutionary shaping of rates of mortality and aging. The fact that the author has excelled at both experimental and theoretical work also makes for a well-rounded selection, balancing field studies, laboratory studies and theory.

As any book on such a theme must, this book begins with Charles Darwin’s linking of an organism’s ecological success in the ‘struggle for existence’ to the longer term evolutionary success of its descendants, thereby showing how ecological challenges resulting in differential survival and reproduction of individuals bearing specific trait variants would, through heredity, lead to changes in the composition of populations with regard to those variants. The book then takes up, chronologically, brief descriptions of 64 other pieces of work, from 1894 to 2004, that the author believes to have constituted major breakthroughs in our understanding of issues at the interface between ecology and evolution. Of course, any such selection must necessarily be subjective. Nevertheless, I would imagine that most researchers in the field would largely agree with Mueller’s choices, although there might, inevitably, be some argument about a few of them. Some of the choices were educational for me. For example, I was not familiar with the remarkably prescient work of H. T. J. Norton in 1928 on the analysis of the population genetics of a locus under selection in an age-structured population with overlapping generations. This foundation was later built upon by Brian Charlesworth in the 1970s and the population genetic theory of age-structured populations was finally integrated with life-history evolution theory by the mid-

1990s. Another surprise for me was to learn about a relatively less known experimental study by G. F. Gause, widely known for his experiments leading to the competitive exclusion principle, which was one of the earliest to suggest that selection in fluctuating environments may favour the evolution of phenotypic plasticity, an issue of considerable contemporary interest.

Many of the names whose work appears in this book are well known to practically every student of evolution and ecology: people like Charles Darwin, R. A. Fisher, R. Pearl, E. B. Ford, G. F. Gause, T. Dobzhansky, L. Cole, D. Lack, R. H. MacArthur, E. O. Wilson, V. C. Wynne-Edwards, W. D. Hamilton, E. L. Charnov, D. H. Janzen, R. Levins, G. Orians, J. Roughgarden, J. Anonovics, L. Van Valen, G. C. Williams, S. C. Stearns, R. C. Lewontin, S. J. Gould, F. J. Ayala, D. Reznick, R. M. May, R. E. Lenski, R. Lande, Peter and Rosemary Grant, and J. N. Thompson. Yet, one of the strengths of the chronological arrangement of ‘breakthroughs’ in this book is that even those somewhat familiar with their contributions will gain a better understanding of how the work of these scientists intermeshed and cross-pollinated between the fields of ecology and evolution, leading to an enrichment of both. Indeed, one of the greatest appeals of this book is its treatment of ecology and evolution together. Historically, ecology and evolution matured somewhat independently with relatively few, but significant, meeting points, most notably the area of density-dependent selection, one of the author’s specific domains of expertise. Thus, during courses in basic ecology or evolution, students often do not develop a clear appreciation for how interlinked the two fields are. Nowadays, with an increasing realization that evolutionary and ecological dynamics often occur on commensurate timescales, we are beginning to see joint treatments of eco-evolutionary dynamics in the primary literature, but this development is yet to percolate into textbooks. This book, therefore, could be particularly useful as adjunct reading to basic courses in both ecology and evolution, or even in population genetics.

Some of the research work covered in this book is likely to be familiar to many students in either ecology or evolution, but not to both groups. Some of the theoretical (mathematical or otherwise)

evolutionary work covered here, for example, is not typically dwelt upon in courses in ecology, although many would argue it should. The converse (ecological work not often taught in courses on evolution) is also true, especially for some of the field studies described in the book, as well as some of the theory. Thus, there is much here to benefit students of both ecology and evolution. There is also good coverage of 'breakthroughs' in coevolutionary thinking: coevolution is one of the topics that often slips through the cracks and is not properly covered in courses in either ecology or evolution. In addition, there is a helpful 18-page appendix with references that covers some basic issues like developing theory in life-history evolution, modelling genetic change in evolution, pros and cons of laboratory versus field experiments, and some genetic techniques widely used in evolutionary ecology studies. This appendix provides a good entry into the literature in the field that is not already cited when discussing the 65 'breakthroughs'.

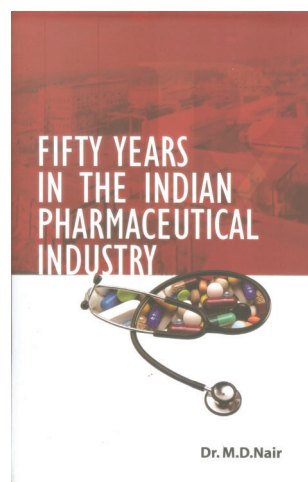
On a more personal note, it was gratifying to find that the sole study from any country in the global south to make it to this selection was a 2003 publication from our laboratory in JNCASR, Bengaluru. This was a paper co-authored with N. G. Prasad (now at IISER Mohali), Sutirth Dey (now at IISER Pune), and Mallikarjun Shakarad (now at the Zoology Dept of Delhi University), and constituted the first experimental validation of the prediction that population stability could evolve, via life-history tradeoffs, as a by-product of regular evolutionary change due to selection on components of the life-history such as developmental rate.

Overall, the book is certainly of considerable value to students and also researchers in the fields of ecology and evolution, especially life-history evolution, density-dependent selection, and population and community ecology. However, due to the constraints of the series' format, the treatment of each piece of work cited is relatively brief and sketchy. I would have enjoyed a much thicker book, with at least twice or thrice as many pages devoted to each of the 'breakthroughs'. Thus, the utility of the book is more as an adjunct to a basic textbook for students, or as a quick reference to major historical developments in the field for researchers. Another major

shortcoming of the book is the extremely shoddy copy-editing done by the publishers. There are numerous typographical errors, including in headings, that detract from an otherwise pleasant reading experience. This is particularly deplorable, because publishers like Elsevier increasingly cite the expenses borne in the value-addition they make by providing top-rate editorial, copy-writing and typesetting services in attempts to justify their exorbitant pricing of scientific literature. Clearly those services have not been of high quality in this case.

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Fifty Years in the Indian Pharmaceutical Industry. M. D. Nair. Published in 2019. Reprinted in 2020. 309 pages. Price: Rs 499.

To appreciate the real progress India has made it would suffice to note that in 1950 our average life expectancy was only 31 years and presently it is 69.27 years. This itself attests to the tremendous progress India has made in addressing health and nutritional issues through green revolution, white revolution and pharma transformation. The transformation of the Indian pharma sector from its

infancy to its present exalted position in Global Pharma Business needs to be seen through the eyes of those who have been in this sector life long as this success has been made possible due to vision, hard work, and sustained efforts of so many famous persons scattered across academia, industry, business and government sectors. The Indian pharma success is a fruition of the collective efforts of several persons driven solely by pure passion and commitment to larger national interest.

The personal memoirs of M. D. Nair who has been one such member of passionate pharma enthusiasts, beginning almost mid of previous century, attempts to provide a glimpse into those happening years and in the process remembers great personalities, and events which many a current players possibly may not be aware of.

Nair's professional journey started at CIBA Research Centre, progressed to SPIC, and then to consultancy. This has given him a deep insight into pharma sector where in his more than 50 years contribution in pharma sector he has come in contact with several great personalities and this book is primarily a memoir having 16 chapters in the book, some short and some long. The first chapter 'Story of the growth of Indian pharmaceutical industry' highlights numerous (27) factors which affected pharma growth. The second chapter, 'Some of the stalwarts who influenced healthcare services in India', is the longest chapter of the book and highlights great science influencers like A. P. J. Kalam, M. S. Swaminathan, K. M. Cherian, Devi Shetty, Ranjit Roy Chowdhary, Ramalingaswamy, Mashelkar and others. Though these giants were not directly connected with pharma sector, their vision and actions gave impetus to its growth. The next chapter 'A few of the many who shaped the destiny of the Indian pharmaceutical industry in my era' briefly introduces us to the likes of Parvinder Singh (Ranbaxy), Anji Reddy (DRL), Yosuf Hamied (CIPLA), Kiran Mazumdar (BIOCON), Nitya Anand (CDRI), A. V. Rama Rao (NCL, IICT), T. R. Govindachari (CIBA-Geigy), Mohammed Mazed (SAMI Labs), Chandru Sahni (Klenzaid), Ajit Singh (ACG) and S. Ramachandranan (DBT). Lifetime passion and contributions of each and every person mentioned in this chapter are phenomenal. These three