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What are species? What are the factors involved in their evolution? Dr Max King presents an up-to-date synthesis of theoretical, experimental and descriptive perspectives on speciation in higher organisms. The book provides a fresh insight into the processes involved in speciation utilizing the multi-dimensional databases now available. The author clearly and concisely analyses the most recent research in plant and animal populations, concentrating on the evolutionary processes, the role of chromosomes and the genetic mechanisms involved in speciation.

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Evolution

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Preface

For me, the late 1970s and early 1980s provided one of the great insights into the scientific approach. After gaining my Ph.D. in the Genetics department at the University of Adelaide in 1976, I worked with Bernard John in the Department of Population Biology at the Research School of Biological Sciences (Australian National University), for some nine and a half years. Here, most of my research was on the population cytogenetics of a number of Australian grasshopper species, and a continuation of my studies on the structural and population cytogenetics of Australian amphibians and reptiles.

At that time, Australia was one of the great centres for cytogenetic research, and the Department of Population Biology boasted the presence of both Bernard John (the chair and later Director of the Research School of Biological Sciences) and Michael White (who had retired from the chair of Genetics at Melbourne University and continued his research at the Department of Population Biology). Since both of these strong-minded individuals had very different views about most things, debate and discussion on the pros and cons of any evolutionary issue or cytogenetic principle were possible at any time. The atmosphere created for research was inescapably productive. On more than one occasion, determined discussion during or after the weekly seminar resulted in the publication of a paper on some aspect or interpretation of evolutionary theory.

For me, the learning experience at ANU, and in other spheres too, included the appreciation that some scientists would simply not accept the possibility that a particular theory was either correct or incorrect, despite incontrovertible evidence to support or refute it. For example, some had established their own view on speciation and simply stood their ground. Presumably this was because they had published extensively supporting one concept and either felt that they would look silly, or – don't mention the thought – might be wrong, if they did otherwise. Virtually any evolutionary or cytogenetic issue can be debated, and if one has a pre-ordained position there seems to be little value in pursuing the matter. Unfortunately, speciation research appears to have attracted its fair share of dogmatists in the past and will undoubtedly attract them in the future. My own view is that intransigence is not what science is about. A theory is only as good as the evidence which supports it, and if the evidence is starting to go the other way,

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you look for a new theory. In this regard, the purpose of my using two quotations by Ernst Mayr, drawn from 1963 and 1982 publications, to introduce Chapter 9, was not to show that he was wrong in his earlier conclusion, but that he had the integrity to change his mind from the earlier to the latter. It would be nice to think that this was a more widespread trait.

One might simply ask, what hope do we have of producing a unified perspective on the modes of speciation when we start from a position of polarization on every single issue? It is not even possible to satisfy people with a definition of what a species is, let alone explain how it evolved from its congener. In writing this book, I have taken the approach that basic concepts must be explained in terms of their weaknesses and strengths, acknowledging the fact that the possibility for disagreement is endless.

Because of the vast body of published information, I have had to be particularly ruthless in my culling of the literature. In this regard, it is more important to provide the most comprehensive account of the action of, and evidence for, intricate mechanisms involved in speciation processes, rather than provide yet another loose overview. Although continuity and background information have also necessitated a broad coverage, such areas have been deliberately minimized. Thus, while a number of models for chromosomal speciation are undoubtedly sympatric in their origin and are considered in detail, sympatric speciation is not dealt with here in any detail. Equally, modes of speciation in microorganisms and asexual species are not considered. The literature on polyploidy and parthenogenesis is extensive and there are a number of excellent volumes which deal with these subjects satisfactorily. Chromosomal divergence is only one aspect of these processes and so, while not being irrelevant to the areas considered here, they are only briefly discussed. This book has been written about the two most common forms of speciation in bisexual plants and animals, the non-chromosomal forms of allopatric speciation and the processes of chromosomal speciation. But here again, while certain aspects of allopatric speciation are examined, emphasis is concentrated on chromosomal speciation and the processes which have enabled this to occur. I have had to be selective in the examples I have used and may no doubt be criticized on the use of too many to drive home a point; too few for clarity; or the use of those examples which fail to show the alternative view. In the case of the latter, I have tried at all times to present a balanced interpretation of the available data and to provide a series of possible conclusions where the data suggest that this was the case.

I recently read a book review in which a volume on meiosis was attacked for being written with a turgid style and for being far too sophisticated for the non-specialist reader. The book was the most comprehensive analysis of meiosis yet made. To me, there is no escape from this issue; the subject at hand is complex

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and to be dealt with fairly the complexity must be presented. This book is aimed at advanced students and evolutionary biologists. Even so, it is pretty difficult to present a theoretical perspective on the fixation of negatively heterotic rearrangements in founding populations as snappy reading. The fact of the matter is that repetitious examples are boring, but in some cases they are necessary. My only suggestion to the disillusioned reader is a detour into le Carré or Ludlum. I don't expect to be rushed for the film rights. However, I also think that the conclusions reached are compelling and are supported by an overwhelming amount of evidence.

I must acknowledge the assistance of Professor Peter Parsons who, when in the chair at La Trobe University, not only fostered my career in science, but suggested that I write this book. Many scientists have commented on various chapters of the manuscript and to them I am most grateful. Apart from Peter Parsons, Drs Graham Flannery and Neville White from La Trobe University and Dr Les Christidis from the Museum of Victoria were most helpful. My support at the Northern Territory Museum has been outstanding and in this regard I thank the Director Dr Colin Jack-Hinton.

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