

Preface

The present volume of the *Handbook* is devoted to biological evolution, i.e., the evolution of living systems, including hominids. This is an enormous topic. The evolution of organisms has been studied by means of various concepts and methods applied in different fields of scientific research, virtually comprising all biological disciplines, from comparative anatomy to genetics, from biogeography to molecular biology. In addition, evolutionists make use of results in disciplines like biophysics, biochemistry, geology, climatology, etc. Thus, evolutionary biology relies on a vast amount of data and can be regarded as an extensive interdisciplinary approach. However, it should not be misunderstood as a mere accumulation of "facts". First and foremost, it is a comprehensive theory of life's history on the Earth and the overwhelming diversity of organisms, both extant and extinct.

The editors and authors of this volume aim to give a synopsis of the most important data, concepts and theoretical reflections in evolutionary biology. The intention is not to give a full account of our present knowledge of biological evolution in all its details. This would not be possible, anyway, in one volume. What is probably more interesting to the reader is a presentation of some basic ideas and "facts", and, even more, of the implications of evolutionary thinking for a comprehensive modern world view. In this sense, the eight chapters of the volume are to be understood as parts of a mosaic. Their authors present and discuss different aspects of the biological theory of evolution, tackle problems and controversial issues, and point to "open questions". As the reader will notice, the theory of biological evolution consists of many "subtheories" and is not yet a finished case (as science never is). While nobody can seriously doubt that evolution occurs, the questions "Why?" and "How?" still require some deeper analyses and leave room for speculation. The conceptual framework for evolutionary biology is Charles Darwin's theory of natural selection. However, as the *altmeister* himself was well aware, the theory needed some improvement. In the meantime, much work has indeed been done and the results of evolutionary research are astounding. However, we cannot yet rest our case.

Chapter 1 presents a synopsis of biological evolution. It summarizes the empirical evidence for evolution, the genetic basis of evolutionary change, the meaning of selection (in its different expressions), ideas of mode and tempo in evolution, and molecular evolution. In Chapter 2, Michael Ruse critically reviews some evolution controversies (including the sociobiology debate and the controversy surrounding

evolutionism versus creationism). Edward O. Wilson's contribution (Chapter 3) is a discussion of the evolutionary meaning of complex social systems. Although not an original paper (it was first published in 1991), it is still fresh and lucid, and helps our understanding of some important aspects of biological evolution. Chapter 4 is a brief presentation of the history and philosophy of evolutionary thinking in biology. It reconstructs the very idea of evolution, the main (philosophical) obstacles to evolutionism, and Darwin's theory and its ramifications in the 20th century. In Chapter 5, Gerd B. Müller gives an account of the comparatively new discipline of evolutionary developmental biology, its empirical background, agenda and concepts, research programs, and its meaning for a deeper understanding of evolutionary change. Chapter 6, by Winfried Henke, provides a comprehensive compilation and discussion of current ideas of human evolution. This chapter can also serve as an introduction to biological systematics and taxonomy, and its relevance in the context of evolutionary theory. In Chapter 7, Peter J. Richerson and his co-authors pose the question whether environmental variability and environmental change were major motors of human evolution, and reach some interesting conclusions. The human impact on evolutionary change is the topic of Chapter 8. Bernhard Verbeek discusses the question to what extent the emergence and evolutionary development of humans has changed the face of our planet.

Clearly, evolutionary biology includes many other aspects that are of some interest. However, we hope that the selection of topics presented and discussed in these chapters will serve as a guide to one of the most fascinating adventures of our intellectual history, and will invite readers to further reflection and discussion. Moreover, we hope that this volume will give the impression of evolutionary biology as a discipline "in flux". It is not by chance that human evolution is given so much space in the present volume. The future of our own and many other species will depend, to a considerable extent, on our understanding of – and attitude towards – evolutionary history and the meaning of biodiversity. We want to encourage readers to think about the importance of evolution and evolutionary biology in our institutions of higher education.

Our thanks go to the contributors of this volume who, despite their many other obligations, found time and energy to write and – in some cases – even to rewrite "their chapters". Also, we want to express our thanks to the staff of Wiley-VCH (Weinheim), particularly to Dr. Waltraut Wüst for her characteristic patience and constant encouragement.

May 2005

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