

ficient clarity, the basic foundations such as coupling reactions and purification procedures that enable to obtain almost home-made preparations of antibodies for immunofluorescence. These chapters are followed by detailed descriptions of immunofluorescence applications. The primer contains outstanding, high-quality color photographs. *Immunofluorescence in Clinical Immunology* is worth recom-

mendation for all those readers who are using or are going to use immunofluorescence as a tool for research or for diagnostic purposes.

Jakub Gołab
Department of Immunology
Center of Biostructure Research
Medical University of Warsaw,
Warszawa

Early evolution. From the appearance of the first cell to the first modern organisms, by Martino Rizzotti, Birkhauser Verlag, 2000. 175 pp.

What is early evolution? The answer one receives to this question depends on whom one asks. For some scholars it is the emergence of life from a prebiotic environment, for others it describes the molecular transition from an RNA to a DNA-protein world. For the author of the reviewed book, it is the appearance of the first cell, the subsequent formation of the prokaryotic cell and finally, the emergence of eukaryotes and multicellularity. In this era of genomics, most scholars discuss early evolution from a gene-centric position. Genes are considered both the major players and subjects of natural selection. Rizzotti seems to hold a more traditional view on evolution. For him, the organism and, particularly, the cell defines a major unit of evolutionary change. This focus on cells as opposed to molecules as entities of evolutionary change is reflected in his definition of cell division. He states "...reproduction consists of the formation of a replica by means of binary fission of a cell which has accumulated enough material to give rise to two cells..." In this context, overproduction and modularity rather than genetic content are seen as the basic properties of an evolving system. Although this view is not able to explain the causes of early evolution or the transition from a non-living to a living world, it is refreshing to be reminded that genes are not the only entities which are propagated by replication. Cellular membranes, organelles (mitochondria, plastids and peroxisomes), as well as centrioles are all too complicated to be formed *de novo*, and are all propagated by the replication of preexisting structures. In these times of "Jurassic Park" it is important to understand that DNA is not enough to create an organism.

The author also holds a traditional view of the role of natural selection in the creation of evolutionary novelties. He stresses that the complexity of the cell is achieved by a succession of small steps and always prefers evolutionary scenarios based on gradual evolution by natural selection and adaptation. He

strongly opposes hypotheses which assume that highly complex biological systems suddenly appeared at the very beginning of evolutionary history. For him such ideas are reminiscent of the revisionist idea of a "golden age" in human history. In most cases, he holds a common sense assumption that formation of a new cellular structure requires a complicated, stepwise chain of events which only happen extremely rarely in evolution. Thus, he opposes the hypothesis assuming that multiple endosymbiotic events were required for the formation of almost all cellular structures. Instead, he considers endosymbiosis as being only one of many ways of gaining complexity.

Given the authors viewpoint, it is not surprising that there is very little molecular detail in the book. There is not a single DNA sequence presented, and the so called "molecular comparisons" – the author prefers to call them – "gene sequence comparisons", are mentioned only briefly. On the other hand, the book contains many well done schematics of complicated cellular structures and phylogenetic trees representing their evolution, which help to guide readers through the dense forest of alternative hypotheses.

Rizzotti is very particular about terminology. In many cases he disagrees with the traditional nomenclature and either proposes his own terminology or strongly recommends the use of single terms whenever several alternative terms exist in the literature. My favorite example of this is the extended discussion on terminology related to the distinction between bacterial flagellum and eukaryotic cilium (p. 136–137). This kind of redefinition of commonly used terms would be very helpful in communicating results of scientific investigations, as well as in teaching. At some points however, Rizzotti seems to go too far. For example, he defines enzymes involved in nucleic acid replication, transcription and translation as "...proteins required for polynucleotide pro-

cessing machinery...". This definition is far too simplistic for such complicated molecular processes. The author does not shy away from presenting new evolutionary scenarios or commenting on existing hypotheses. He also tries to introduce new research programs to test the proposed models of evolution. For example (p. 133) he suggests searching for the heterotrophic sister groups of Eukaryotes which bear the so called complex plastids – organelles with more than two membranes, for use in dating the related dichotomies.

The strength of this relatively short book (175 pp.) is in the use of a variety of examples from different taxonomic groups to confirm or reject evolutionary scenarios. Rizzotti seems to be very familiar with the

variation of life and extends his analyses well beyond the standard model organisms. In conclusion, *Early Evolution* is not a popular science book written to support a single-minded view of early stages of biological evolution. Instead, it is aimed at scholars who either work in a related field, teach evolutionary theory or are simply interested in reading a review of recent ideas on this subject. For students, it would be a good complement to the standard textbooks on evolution.

Jarosław Marszałek
Department of Molecular and Cellular Biology
Interdisciplinary Institut of Biotechnology
Medical University of Gdańsk, Gdańsk