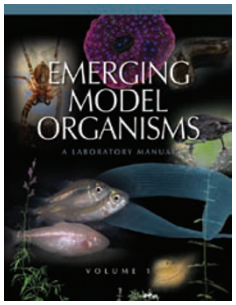
New fashion models



Emerging Model Organisms:
A Laboratory Manual, volume 1

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Barnacles, pigeons and slave-making ants served as model organisms to shape the mind of the man who laid the foundations for modern evolutionary biology. Many other 19th century biologists were also highly promiscuous in their use of study organisms. The pioneering cellular studies of E. B. Wilson, for example, involved an impressive juggle between polychaete worms, amphioxus, grasshoppers, snails and sea urchins. However, during the last 100 years there has been a dramatic bottleneck, restricting much of laboratory research to a handful of model organisms that have come to dominate cellular, molecular and developmental biology. Whereas some serendipity accompanied the choice and success of these models, their numerous advantages are obvious: ease of culturing, feasible genetics, relatively short generation times and — after decades of intensive research efforts — extremely effective resources and techniques at hand.

Although nobody will dispute the power of such models, their study is insufficient to understand all of biology. First, organismal diversity itself cannot be captured by studying a minuscule fraction of it. Second, extrapolating biological information from one organism to another may simply be wrong. Luckily, yet driven solely by professional necessity, naturalists, taxonomists and ecologists have always been studying numerous non-model organisms. Now, many of their favourite organisms are finally ready to be dissected using molecular and genetic tools. The recent interest in establishing new laboratory organisms stems in part from the surge in studies on changes in organism development during evolution (evo-devo) as well as the availability of universally applicable techniques, such as DNA sequencing. Nevertheless, even with a whole genome sequence at hand, an organism of choice may be still very far from being a tractable model system.

The first volume of the laboratory manual *Emerging Model Organisms* symbolizes the ongoing rediscovery of many neglected study organisms. The book covers 23 eukaryotic organisms in various stages and forms of laboratory domestication, ranging from choanoflagellates and mosses to wandering spiders and fruit bats. Many of these species turn out to be re-invading laboratories rather than merely emerging for the first time. Chapters on each organism detail biological background information and established experimental protocols and are written by aficionados. Surprisingly, the book omits the presentation of the over-arching evolutionary context and relationships between organisms, ultimately reading like a collection of short stories, allowing us a glimpse at the wonders of an 18th century cabinet of curiosities. The presentation of organisms differs among chapters, with some being quite short on biological content or too technical on anatomy. Most chapters are, however, nicely balanced to educate and intrigue the curious neophyte, outlining singular properties and experimental advantages of the organism. Two sources of amazement spring from the book: how much of biological diversity we ignore and how many unique techniques were developed to allow the manipulation of an organism of choice.

Not parting with the tradition of practical laboratory manuals, the available experimental techniques and protocols are described in detail for each organism. We envy the laboratory that could fully exploit the protocols provided within this volume. Imagine starting your day with a snorkle to collect some fresh *Amphimedon* samples (sponge), following by beef liver paste preparation for your hungry planarians and rounding up the day by doing an *in situ* hybridization of your latest collection of *Monodelphis* embryos (opossum). In brief, the book represents the diversity of a Woods Hole Embryology Course brought to you in Cold Spring Harbor Laboratory manual style. Although fun to browse through, the protocol section of each chapter could have been exclusively presented in the accompanying website, www.cshprotocols.org/emo, to leave more space for biological background in the printed volume. Nevertheless, the protocols may provide a rich resource for biologists aiming to develop new techniques and, in any case, may be an inspirational source for embracing emerging model organisms.

Overall, the book is attractive to anyone interested in biological research, and in particular to those looking for a new muse or seeking to convert to a new organism. What is in this book for cell biologists? Certainly a important reminder that cells exist in many different shapes and forms, including some that evade the specific paradigm of idiosyncratic yeasts and a couple of fast-growing animals or plants. The emergence of new model organisms will thus create novel perspectives on key questions as well as open new avenues in addressing specific problems, such as the mechanisms and evolution of cell-type diversity. Importantly, addressing evolutionary problems in cell biology, as in developmental biology, will need to go beyond studying apparent conservation or differences among phylogenetically distant species, and rather needs to characterize intra-species variation and variation among closely related species. Studying this biological diversity is essential to understand how mechanisms function in different contexts and how the same mechanism can generate diversity.

The first volume of *Emergent Model Organisms* illustrates the bewildering variety of natural histories and rapidly advancing techniques that have been developed to work with a wide spectrum of organisms. If Darwin were around now, he would have been the first to happily make use of this manual — and would be impatiently awaiting the forthcoming tome, describing the emergence of honeybees, squids, ascidians, rabbits, ants… and many more.

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