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Second Edition

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Methods and Protocols

Second Edition

Edited by

Paul T. Sharpe

*Department of Craniofacial Development,
King's College London, London, UK*

and

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 **Humana Press**

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Preface

Most people have some interest in embryos; this probably results, in part, from their interest in understanding the biological origins of themselves and their offspring and, increasingly, concerns about how environmental changes such as pollution might affect human development. Obviously, ethical considerations preclude experimental studies of human embryos and, consequently, the developmental biologist has turned to other species to examine this process. Fortunately, the most significant conclusion to be drawn from the experimental embryology of the last two decades is the manner in which orthologous or closely related molecules are deployed to mediate similar developmental processes in both vertebrates and invertebrates. The molecular mechanisms regulating processes fundamental to most animals, such as axial patterning or axon guidance, are frequently conserved during evolution. (It is now widely believed that the differences between phyla and classes are the result of new genes, arising mostly by duplication and divergence of extant sequences, regulating the appearance of derived characters.)

Other vertebrates are obviously most likely to use the same developmental mechanisms as humans and, within the vertebrate subphylum, the apparent degree of conservation of developmental mechanism is considerable. It has long been recognized that particular vertebrate species offer either distinct advantages in investigating particular stages of development or are especially amenable to particular manipulations. No single animal can provide all the answers because not all types of experiments can be carried out on a single species. Traditionally, developmental biologists have worked on their particular experimental favorite, working, for example, solely on *Drosophila*, or *Xenopus*, or the mouse. In the last few years, this has started to change, and there are now increasing numbers of laboratories that have acquired the expertise to work on several different animals and are thus able to harness the experimental advantages of different developmental systems to address specific developmental questions. Alternatively, Developmental Biology departments are becoming organized so that they have expertise in several model organisms. It is the increasing necessity to be able to move between embryos of different vertebrate classes as a project progresses that prompted us to assemble *Molecular Embryology: Methods and Protocols, Second Edition*. We hope that it will allow researchers to familiarize

themselves with the various commonly studied vertebrate embryos, to make informed choices about which might be best suited to their investigations, and to understand the techniques by which they might be manipulated.

Sadly, while this book was going to press, Nigel Holder, one of its contributors, passed away. Nigel was an excellent developmental biologist, a founder of the Developmental Biology Research Group at King's College, and had recently been appointed to the Chair of Anatomy and Human Biology at University College London. He was both a colleague and friend to us and to many of the other contributors to this volume. He is greatly missed.

*Paul T. Sharpe
Ivor Mason*

Preface to Second Edition

The five years or so between the current and first editions of this volume have seen perhaps the greatest period in growth and productivity in the field of Developmental Biology. This is reflected in the addition of new Chapters detailing techniques that have arisen during the intervening period including RNA interference, electroporation, “EC culture” of chick embryos, electroporation, new approaches for efficient production of transgenic zebrafish and microarrays.

We also thank the authors of other Chapters for updating their contributions since the last Edition. Some Chapters remain entirely unchanged, reflecting one of the great delights of this field, namely that “classical” techniques, unchanged for decades, are routinely employed alongside and to complement “state-of-the-art” approaches.

Finally, we would like to express our gratitude to The MRC, The Wellcome Trust and The BBSRC for supporting the research in our own laboratories. In addition, IM would like to thank the Leverhulme Trust for providing him with a Research Fellowship, which greatly facilitated the completion of this volume.

*Paul Sharpe and Ivor Mason
London, June 2006*

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