

Preface to the second edition

The first edition of *From Egg to Embryo* was written in 1981–82 which was before the techniques of molecular biology had made a serious impact on the problem of regional specification. Over recent years there has been an absolute explosion of new molecular data, led by the work on *Drosophila*, but with *Xenopus*, the sea urchin and the mouse also participating. I felt that the right time for a second edition would be when the *Drosophila* work showed some signs of stabilizing, which it now seems to be doing.

The aims of the first edition were two-fold: to explain the theoretical basis of the regional specification problem and to summarize, in a compact form, the essential experimental data relating to early embryos. The molecular biology explosion has imposed a third goal on the second edition, which is to give the reader a map for navigating through a world of molecular detail. There are now so many potentially interesting genes being studied in so many experimental systems that it is essential to keep the logical and the dynamical categories of explanation to the forefront in order to decide what to remember and what to put in the database.

From Egg to Embryo is written for anyone who is interested in embryos and so does not conform to any particular course of study. However, the first edition enjoyed some success as an aid to undergraduate and post-graduate teaching and I hope the second edition will be found even more useful. I make no apology for not using the fashionable 'concept subheadings' or 'theme boxes'. Such a dogmatic approach to education may have its appropriate applications, but this is not one of them. *From Egg to Embryo* is a critical work, in which assumptions are questioned and problems are faced.

Readers familiar with the first edition will find very substantial changes in the second. The entire text has been rewritten with some simplification and clarification where necessary, and the arrangement of the book has been changed somewhat. There is still an initial discussion of the concepts of experimental embryology, so vital for a clear exposition of the subject but so frequently confused and misunderstood. After this comes a theoretical chapter. It now comes before, and not after, the data because morphogen gradients, bistable circuits and thresholds have become facts rather than

hypotheses. The central role which these models have in our field is symptomatic of the difference there must be between an explanation of regional specification and an explanation of how a particular gene is turned on, even though similar techniques may now be used in the two types of study. Then comes the main part of the book which consists of a brief account of the principal experiments which have built up our ideas about early development. Unlike most other books about embryology the treatment is organism by organism rather than stage by stage. Instead of jumping from cleavage in sea urchins, to gastrulation in amphibia, to segmentation in *Drosophila*, I have tried to enable the reader to see clearly the strengths and weaknesses of each experimental system. This should emphasize the truth that there is no ideal organism for this type of work, and that something can be learned from all of them, although it must be admitted that *Drosophila* has contributed more than its fair share in recent years. Organisms are not introduced in a taxonomic sequence, as might seem natural to a zoologist. They are presented in an order which introduces each layer of the conceptual framework in a manageable way. So we start with creatures whose suitability for micromanipulation has enabled the construction of reasonable fate and specification maps and proceed through the exemplars of cytoplasmic localization and cell lineage to the models for Man. *Drosophila* now comes at the end because the progress has been so fantastic that to put it earlier would inevitably lead to an anticlimax. In recognition of the fact that we now really do understand what we are dealing with, there is an Appendix which tries to explore what a real developmental program would look like and what it could be used for.

An information explosion all too easily means an explosion in the number of pages and references. Because so many people told me how much they liked the *shortness* of the first edition I have fiercely resisted this inflationary tendency. Inevitably this has meant that some old topics have had to be omitted to make room for the new ones and one casualty of this has been the section on the ctenophores, together with some of the theoretical material which has not turned out to be so useful. I have also had to be very ruthless about references. In this edition the references are intended purely as a guide to further reading. Where possible I have cited a review instead of an original paper and I have not been able to cite references to indicate priority or antiquity. This means that many excellent, innovative and influential papers have been omitted and I do apologize to their authors for this. Finally, I have also resisted the temptation to include material which does not deal strictly with *early animal development*. Although topics such as the development of the vertebrate limb, *Drosophila* imaginal discs, or the slime mould, all involve *bona fide* questions of regional specification, I felt the focus must be kept concentrated on the original subject area otherwise the length would become unmanageable.

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