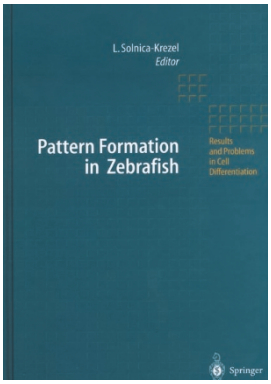
Zebragenetics



Pattern Formation in Zebrafish
Edited by Lilianna Solnica-Krezel
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The zebrafish, *Danio rerio,* was first used as a model organism on the developmental biology scene in the 1980's, with pioneering work undertaken by the Oregon scientists G. Streisinger, D. Grunwald, C. Kimmel and M. Westerfield. The prolific breeding nature of this fish, its robust nature, the transparency of its eggs, the synchrony in egg laying and its generation time have made it an attractive model organism for genetic studies. Owing to these unique characteristics, there has been an exponential increase in research on zebrafish patterning and morphogenesis over the past decade.

Pattern Formation in Zebrafish collates the work from two large-scale mutagenesis screens conducted in the 1990's, the so-called 'Boston' and 'Tübingen' screens. These screens were specifically designed to isolate zygotic, embryonic-lethal mutations and to dissect different aspects of zebrafish embryogenesis and organogenesis.

The book covers the work since these screens through analysis of different aspects of embryonic zebrafish development. It includes, for example, yolk layer formation, induction and patterning of the germ layers and specification of left–right asymmetry. In addition, large sections are also devoted to neural development and organogenesis. Useful techniques from these studies, such as fate mapping and time-lapse microscopy, are also discussed throughout the book, providing the reader with interesting information about the successful application of these studies in this particular organism.

In general, the content of the book is of high value: the text is well structured and the detailed figures are helpful. As skilled scientists have written the various chapters, the book accomplishes its mission 'to provide a valuable resource for advanced students and their teachers'. Therefore, *Pattern Formation in Zebrafish* is suitable for any researcher interested in knowing what the zebrafish model has brought to our understanding of the mechanisms underlying patterning and morphogenesis. However, the book would have benefited from a general introduction ,with didactic figures illustrating the major pathways used during inductive processes to avoid overlaps or inconsistencies between the present chapters. Furthermore, it would also have been beneficial to move the gastrulation chapter to the beginning of the book to help students unacquainted with zebrafish anatomy. This would allow the uninitiated to become more familiar with the staging series and complex morphogenetic movements that occur during the early phases of embryogenesis. To help such newcomers to zebrafish research, a short glossary to define a few words would also have been useful; for example, the authors could provide definitions of specific terms, such as ventralised and dorsalised, to enable readers to connect the visible phenotypes with the mutations affecting axis formation.

Although this book focuses on the work generated since the genetic screens in the 1990's, the authors do not highlight the limitations of such screens. As only a few of the thousands of mutations identified in any genetic screens result in an early embryonic phenotype, some important players that function during early zebrafish embryogenesis will not be found using such strategies. This is why other alternatives to genetic screens have been developed. Some important results ensuing from these additional studies, such as new insights into the function of some genes and the discovery of novel genes, are, unfortunately, underrepresented in this book. This does lead the unaware reader to think that genetics may be the only suitable technology that is really efficient in zebrafish. For example, during the course of the original genetic analysis of the dorso-ventral patterning of the embryo, the screens did not isolate a mutation in *Wnt8*, a highly conserved secreted glycoprotein that has been shown to be crucial role in early patterning in a variety of species and therefore which was expected to be present and active also in zebrafish. Additional genomic analysis showed that the zebrafish *Wnt8* encodes 2 functional Wnt8 proteins on a bicistronic transcript. Loss-of-function experiments revealed that these proteins have redundant roles in patterning the mesoderm and neurectoderm during early development, explaining why such a mutant could not be found by chemical mutagenesis and was not identified in the original screens. Another example concerns *twisted gastrulation* (*tsg*), which is essential for antagonizing the Bone Morphogenetic Protein (BMP) signalling pathway. This pathway has been described previously in *Drosophila melanogaster*, where Tsg antagonizes Decapentaplegic, the fly homologue of BMP. Similarly to Wnt8, Tsg was not identified in the original screens, but was identified through targeted knockdown technology using antisense, morpholino-modified oligonucleotides.

Hopefully, subsequent editions of this book will expand on the knowledge generated by novel technologies used in the zebrafish, such as gene inhibition, reverse genetics or genomic resources, and mention the development of advanced imaging and labelling techniques currently being developed. These are areas of zebrafish research that are sure to grow.

In summary, the production of this book has certainly required a great deal of effort and courage, for no one has previously undertaken the ambitious and tedious task of describing the mechanisms underlying patterning and morphogenetic process during zebrafish embryogenesis. Therefore, I believe this book will be a beneficial volume to any developmental biology libraries and a useful companion for those interested in the actual dissection of biological phenomena using zebrafish as a model organism. □

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