
PREFACE

This book is about an old fundamental problem of embryogenesis and the contemporary methods and ideas used to approach this subject. In the long history of science the invention of a new instrument or an innovative technique have played an unpredictable role with far reaching consequences for scientific progress and society in general. Such an outstanding case is the construction of the pendulum by Galileo who used it as a 'clock' in order to measure time with unprecedented accuracy for the standards of his era. With this new instrument he could precisely determine the kinematic features of moving bodies and lay down the foundations of the classical mechanics that was later developed by Newton. During the last decade or so we have experienced another case of the unexpected consequences stemming from the exploitation of a novel invention: the need of some collaborating laboratories of CERN to exchange their collected results led to the use of telecommunication cables and the data, in the form of electronic documents, which were transmitted and shared by all via a computer network and suitable browsing software. This facility initiated the spectacular development of the WWW which revolutionized not only scientific advancement but most social activities of our times. The present book with its online edition is an example of the profound changes introduced recently in the area of communications in general and in publishing in particular.

In biology an analogous revolution occurred during the last three decades when some ingenious biochemical methods and techniques were developed, in particular gene cloning and sequencing. Developmental and evolutionary biology have particularly benefitted from these innovations and the questions that can now be addressed and answered go to an unprecedented depth. The case of *Hox* genes is a typical example of how a long-standing morphological enigma can now be tackled at its molecular and genetic roots. In 1894 Bateson systematically analyzed for the first time in fruitflies mutations that he termed *homeotic mutations*, in which one body region develops at the location of another body region. For many decades classical genetics and embryological observations were the only means employed in the study of these peculiar mutations. Nevertheless, hard work, experimental skills and ingenuity resulted in the accumulation of important observations which are indispensable for the formulation of some illuminating empirical rules. This effort was rewarded in 1978 when E.B. Lewis established a physical correlation between the extent of the functional domains of the *Bithorax* genes of the fruitfly and the location of these genes in the third chromosome. This unexpected property, coined collinearity, was later found to be not only a feature of the *Bithorax* complex in insects but a developmental strategy that controls axial patterning of most animal species.

With the discovery of the homeobox in the early 80s, the era of molecular embryonic development came dynamically into play imposing a complete metamorphosis of the field. Most efforts are now focused on clarifying

the structure, regulation and interactions of genes involved in different stages of development. In this pursuit the study of *Hox* genes plays a central role.

This book is a synopsis of the activity of homeotic genes without aiming to cover all features and related topics of this wide area of research. For instance the role of homeobox genes in plant development is not included and only selected aspects of *Hox* gene expression in specific examples of vertebrate organogenesis are presented in detail. Since the book is not intended to be all-encompassing, the choice of chapter subjects is selective. Nevertheless I hope the choice is coherent and representative of most research directions where *Hox* genes are involved. It is only just the beginning of the molecular era of biology, but it is an exciting time because one feels that the discoveries will enrich our knowledge will converge from different scientific disciplines.

I would like to take this opportunity to thank the authors of this volume who accepted promptly to contribute and succeeded in giving a balanced and authoritative overview of this rapidly progressing field. As mentioned above, it is a great advantage of electronic publishing that the chapters appear online and they are stored in the Eureka updatable database so that a continuous flow of new results may be incorporated in the book. The idea for creating this book is due to Dr. Ronald Landes, the publisher of Landes Bioscience. I hope his initiative will prove helpful to many graduate students and researchers working in different branches of biology and medicine. Thanks are also due to Ms. Cynthia Conomos, the Book Publications Director, who undertook with enthusiasm the administrative responsibilities of the edition.

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