Gehring, W.J. (ed.): Genetic Mosaics and Cell Differentiation. Vol. 9: Results and Problems in Cell Differentiation.
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The rapid development of somatic cell genetics within the last decennium is one of the exciting events in modern biology. An old concept, that of using genetic mosaics for studying developmental processes is now being applied with great success. An alternative approach is the construction of 'hybrid' organisms from genetically marked cells of different origin, so-called chimaeras.

Both techniques allow the reseacher to follow the fate of one or more cells throughout development. This provides information on the developmental capacities of single cells, on the time and sequence of differentiation events, on the question of whether cells are irreversibly determined at certain stages of development, and on the extent of cell interactions during differentiation.

The book 'Genetics Mosaics and Cell Differentiation', edited by Walter Gehring, contains the present state of knowledge in this field. In my opinion he has done his job exceedingly well: the sequence of contributions and their content reflect considerable editorial care and he has had great success in integrating the topics.

The cover of the book is very appealing, with good illustrations. It doubtlessly represents an essential contribution to any library although the high price does not encourage a wide distribution. The scientific level is of top quality but the presentation of data and the discussions definitely allow the reader less familiar with this field to follow what is being discussed. Some articles slightly suffer from language problems which are made particularly evident by the elegant presentations of others. More careful proof reading for some articles would have been useful.

A series of 8 contributions is dedicated to experimentation with *Drosophila*. Two additional articles cover aspects of development in mice. The arrangement and content of the articles follow a logical line corresponding to the natural sequence in development: questions concerning determination and differentiation in earliest development are raised first and then pursued into later developmental stages. The first two papers introduce the methodology of generating mosaics in *Drosophila* and the possibilities of applying this technique to developmental studies. W. Janning demonstrates the principles of constructing fate maps in early development (blastoderm stage) by the use of gynadromorphs. The implications and problems of interpreting such fate maps are discussed and their application to embryology are considered. The same subject is later on taken up and extended by Marriam.

H.J. Becker provides a comprehensive review on aspects of mitotic recombination and position effect variegation. Both have widely different underlying mechanisms but the results of both events can be useful in analyzing distinct parameters of differentiation time of certain differentiation events or cell numbers, such as 'clonal initiation'. Mitotic recombination also proves as a suitable tool for obtaining more insight in gene inactivation mechanisms due to position effect variegation.

The chapter of K. Illmensee takes up the question on the developmental capacities of cells and cell nuclei at different developmental stages. Answers can be found using a third fundamental technique: nuclear transplantation or transplantation of entire cells or certain cellular constituents.

J.R. Marriam extends the analysis and interpretation of estimates of primoridial cell numbers and the question of cell lineage during early development. Cell lineage problems are also raised in the subsequent article by E. Wieschaus. Here the discussion is extended to cell lineage in more advanced stages of development up to adults. In a logical completion of this series of papers the various aspects are discussed in a comprehensive way by A. Garcia-Bellido and P. Ripoll and related to their concept of compartimentalization.

A further step in the analysis of developmental events is the question of how differential gene expression in single cells can be integrated to allow the formation of distinct morphological structures. Two hypotheses try to explain how the spatial pattern is created during the course of cellular differentiation. They either assume the formation of 'prepatterns' or the existence of 'positional information'. Both concepts are evaluated in view of results obtained from studies with genetic mosaics by C. Tokunaga.

The close relationship of these first six articles in content leads to some overlapping. This is, however, of considerable interest to the reader since it exposes the degree of agreement between the various authors.

The following two chapters deal with equivalent problems of early development in mice. Mitotic recombination as a tool for developmental studies in vertebrates is very limited in its application; the majority of information has been obtained from chimaeras.

The experimental production of chimaeras has been used for almost 20 years. The conclusions derived from such studies on early development (cell lineage) are critically reviewed by R.L. Gardner. His statement on our ignorance regarding early developmental processes in mouse embryos despite all available information confirms one of the immediate impressions of the reader of this article, but it must also be pointed out that the situation in more extensively studied systems like *Drosophila* is not so fundamentally different.

The second chapter on mosaics in higher vertebrates, contributed by A. McLaren, discusses what is probably at present the best understood developmental system in mammals, sexual differentiation. This article very carefully evaluates the various aspects with particular attention to the genetic data available.

The final chapter of this volume provides insight into the most advanced level of interaction between differentiated cells, the behavioural level. The conceptual framework for the application of mosaic techniques to behavioural studies is critically discussed. This article exposes more clearly than any other not only the facilities but also the limitations in interpreting studies of genetic mosaics.

The volume, in conclusion, exposes a fascinating variety of fundamental biological problems which can be approached by genetic means. Most intriguingly, most of the experimentation carried out within the last 10 years could have been done just as well some 30 years ago. Evidently the interest and concepts of biologists were not devoted to such aspects for many years. The progress of molecular biology has only recently stimulated other approaches, probably not least by the consideration that the experimental possibilities of pure biochemistry might not suffice for exploring the complications of developmental mechanisms. The contributions of this volume extend at no time to discussions of potential molecular mechanisms. The rapid progress in our knowledge on eukaryotic genes will probably very soon stimulate integrating discussions of molecular and genetic knowledge.

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