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BOOK REVIEWS

Motoo Kimura THE NEUTRAL THEORY OF MOLECULAR EVOLUTION
Cambridge University Press, 1983, pp. 367, price: $ 69.50

In 1968 M. Kimura presented a hypothesis that the great polymorphism of proteins, revealed by electrophoretic methods, in populations of different species results only from random elimination of fixation of mutations in DNA. These mutations, according to Kimura, are selectively neutral or nearly nutral and their distribution in populations reflects only drift phenomena. Kimura's standpoint was very vigorously oriticised especially among very numerous representatives of the so-called synthetic theory of evolution or neodarwinists founded by Th. Dobzhansky and continued on a molecular level by his followers like F. J. Ayala. The discussion is still going on and the problem of the nature of evolution on the molecular level is one of the most exciting problems of molecular biology. The follows of the "synthetic" neodarwinistic school maintain that the enormous protein polymorphism in populations of nearly all organisms results from the selection of different alleles coding for proteins and that the overdominance in heterozygotes is at the base of the observed protein polymorphism. M. Kimura tries to demontrate that the variation on the molecular level is neutral and not selectable. He believes that the mutations resulting from random nucleotide substitutions in DNA are either deletorious and eliminated by selection or nearly neutral and the changes in their frequencies in populations result from stochastic processes like random drift and randow mutation frequencies. M. Kimura has a strong mathematical background and is continuing the great traditions of Fischer, Wright and Haldane, the founders of the mathematical theory of population genetics.

Many publications of M. Kimura and his followers as well as the arguments and discussions of his oponents were published in numerous different journals and are difficult to follow. For the first time M. Kimura presents his theory in an extensive way in the present book. He not only develops his biological and statistical arguments but also discusses the arguments of numerous oponents of the neutral theory of molecular evolution.

As this book is published already in the era of eukaryotic gene cloning and sequencing, Kimura includes a very interesting discussion on the molecular evolution of some eukaryotic genes like globins, histones or tubulins. He shows that in the evolution of these genes the base substitutions at the third positions of the codons are much more numerous than in the other two positions. As such mutations usually create synonymous codons and thus are not reflected in aminoacid composition of the proteins they show that the neutral mutants take part in evolution on the molecular level. Also the evolution for instance of globin pseudogenes, which are not expressed, is more rapid than that of genes producing globin molecules. These and other molecular phenomena are discussed as arguments for the predominant role of neutral mutations in molecular evolution.

The lecture of this book is quite exciting even if not all the author's arguments are easily acceptable. The truth is may be in between the two oposite theories. Some parts of this book for the reviewer and biologists without sufficient mathematical knowledge are difficult to follow, like for instance chapter 8 on stochastical analysis in population genetics. But the rest of the book is fascinating and presents problem of evolution on the level of DNA and proteins as

opposed to evolution on the organism level which indubitably is strictly Darwinistic. This book should be read not only by those working in population genetics but is an important contribution to the problem of evolution in the era of molecular biology.

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HETEROSIS: Reappraisal of Theory and Practice. Editor: T. Frankel. Series: Monographs on Theoretical and Applied Genetics, vol. 6, Springer-Verlag Berlin-Heidelberg-New York-Tokyo, 1983, pp. 290, 32 figures.

The book consists of 10 chaptes written by different authors and represents genetic bases and possibility of using the phenomenon of heterosis of some species of cultivated plants in agricultural practice.

Chapter 1 (Biometrical Genetics of Heterosis — J. L. Jinks) contains fundamental information concerning inheritance of quantitative traits. It also gives definition and estimation methods of genetic parameters associated with the additive gene action, dominance and non-allelic interaction. These parameters are also interpreted in the aspect of the analysis of heterosis.

Chapters 2-4 (Heterosis in Maize: Theory and Practice — G. F. Sprague; Heterosis and Hybrid Seed Production in Barley — R. T. Ramage; Hybrid Wheat — P. Wilson, C. J. Driscoll) discuss the problem of heterosis in maize, barley and wheat. Particularly interesting is the problem concerning genetic bases and possibilities of practical use of heterosis in self-pollinating ereals — barley and wheat, though heterosis breeding of these species at present is of no larg utilitary importance. Attention should be paid to the discussion of various genetic mechansms of male sterility and the ways of using male-sterile lines for the production of heterotic chybrids.

Chepter 5 (Heterosis and Hybrid Seed Production in Fodder Grass — G. Kobabe) presents results af studies concerning heterosis in *Dactylis glomerata*, *Lolium perenne*, *Lolium multiflorum* and intiergeneric hybrids of *Lolium* × *Festuca*. This chapter contains examples of using the mechanosms of incompatibility and male sterility in the production of F_1 hybrids and cases of apomictiic reproduction of F_1 hybrids.

The next three chapters concern heterosis in vegetable plants. Chapter 6 (Heterosis in Vegetable Crops — O. H. Pearson) discusses in a general way the use of heterosis in *Asparagus officinale*, *Brassica oleracea*, *Daucus carota*, *Cucumis sativus*, *Cucumis melo*, *Cucurbita pepo*, *Cucurbi ta maxima*, *Solanum melongena*, *Capsicum annuum* and *Spinacia oleracea*. Chapter 7 (Heterosis in Tomato — M. Yordanov) presents in detail biological bases and methods of production of tomato hybrid seeds on a large scale. In chapter 8 (Heterosis and Hybrid Cultivars in Onions — B. D. Dowker and G. H. Gordon) the authors discuss results of studied dealing with the occurrence and practical application of heterosis in onions.

Chapter 9 (Heterosis in Ornamentals — R. Reimann — Philipp) gives genetic bases of heterosis in ornamental plants and examples of heterosis breeding program based on previous plant testing with regard to the general combining ability. The author also pays attention to a probability of using various kinds of male sterility (double flowers, deformations of flowers) and heterostyly for the production of F_1 hybrids.

The last chapter (Heterosis and Intergenomic Complementation: Mitochondria, Chloroplast and Nucleus — H. K. Srivastava) presents biochemical bases of heterosis and results of studies concerning mitochondria and chloroplast complementation from the viewpoint of the interpretation of heterosis on molecular level.

As seen from the mentioned topics of individual chapters the book represents an outline of the most important achievements of studies dealing with the phenomenon of heterosis in cereals, grasses, vegetable and ornamental plants. It also discusses genetic bases of that phenomenon and the main methods applied in heterosis breeding. The book should be of large interest to both geneticists and plant breeders.

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Russell P. J. — GENETIK. EINE EINFÜHRUNG. Springer-Verlag, Berlin, 1983, 236 pp., 42,—DM.

This book originally appeared in 1980 under the title "Lecture notes on genetics" as an introductory text into genetics for students of medicine in the United States. The author discusses a number of specific molecular processes involved in storing, transimision and expression of genetic information in prokaryotes and in eukaryotes. The text is well organized and full of didactically useful ideas. Nearly half of the book deals with the genetically oriented molecular biology. Presentation of genetics at cellular level, in particular of problems related to gene expression, is comprehensive. Short, but communicative account of classical approaches to transmission of genetic traits is given.

Data from human genetics have not been used by the author as examples supporting discussion of genetic problems. The hypothesis of Mary Lyon is discussed in chapter dealing with human genetics without mentioning the clonal nature of the inactivation of chromosome *X*. Presentation of specific problems of human genetics is only sketchy, incomplete and some examples are badly chosen, e.g. galactosemia is discussed as a positive indication for aminocentesis. For medical students this text may be useful rather as a supplementary reading.

The book may be recommended for lecturers of genetics both in universities and in medical schools as a model approach for introducing into modern genetics.

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