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Book reviews

Cremer, T.: Von der Zellenlehre zur Chromosomentheorie. Naturwissenschaftliche Erkenntnis und Theorienwechsel in der frühen Zell- und Vererbungsforschung. Berlin, Heidelberg, New York, Tokyo: Springer 1985. xvi + 384 pp., 87 figs. Hard bound DM 135,–.

The theme of this revised "Habilitationsschrift" by a cytogeneticist from Heidelberg is the origin and development of scientific knowledge. Cremer's starting point is the well-known conception of the theorist of science, Thomas S. Kuhn, who defined growth in scientific thought as a quasi-determined progress (paradigm, normal knowledge, anomaly, crisis of thought, revolution and a change in paradigm). The validity of this model can by verified by the history of early cell and heredity research. In the second chapter (200 p) the author discusses, using detailed typical examples taken from the time of Meyen (1830) to Morgan (1910), how the main paradigms concerning cells and chromosomes developed and, as a result, how scientifically immanent as well as ideological reasons (vitalism vs. mechanism) brought a change in the paradigm.

The history of cytogenetics is no simple accumulation of discoveries and theories. Numerous wrong paths and mistakes can be counted retrospectively, which were partly inavoidable and which have occasionally even positively affected the course of research. The growth of knowledge and the formulation of paradigms occurred at times les regularly than would have been expected according to Kuhn's model.

In the following chapter, the conceptions of various scientists (M. Planck, W. Heisenberg, P. Feyerabend, K. Popper, L. Fleck et al.) as regards the growth of knowledge, as well as rules for the design of scientific paradigms, are discussed. This is followed by a short introduction to the evolutionary theory of cognition and it's significance for the intellect, with it's limits.

In the final chapter the author shows the consequences which the chromosome theory of heredity has for him as a cytogeneticist. He touches on the question of "definition of man", evaluates the often controversially discussed relationship between hereditiy and the environment, predetermination and freedom. He exercises throughout a sensitive understanding of the implications concerning religious and intellectual history. The text is supplemented by a 15 page bibliography, a list of persons, and a subject index.

This work, which is intended for an interdisciplinary interest group, is written in a lucid style and is didactically well prepared. Cremers concept of the analytical historiography corresponds to that of Ernst Mayr in "The growth of biological thought" (1982). Carefully chosen illustrations from 19th to 20th century publications present the gradual change in scientific opinion. This work, written with remarkable empathy for the subject, deserves wide recognition. It requires and promotes the view that particularly today it is necessary to concern one-self with scientific history because "it heightens one's critical awareness of one-sidedness and blind-spots in current scientific discussions" (p. 82). Forgotten bibliographical data from some citations as well as missing dates in the list of persons are merely insignificant.

H. Finke, Essen

Bassett, M.J.: Breeding Vegetable Crops. Westport (Conn.): AVI Publ. 1986. 584 pp., many figs. Hard bound $ 75.00.

"Breeding Vegetable Crops" presents an excellent overview of past and recent developments in vegetable plant breeding. Fourteen vegetable crops are described by experienced authors, all of whom have greatly contributed to plant breeding practice and knowledge. This provides a solid base for the historical achievements and recent developments but limits the attention paid to future perspectives. In each chapter some fundamental aspects as origin, botany and floral biology are dealt with, followed by breeding history and current breeding goals. Emphasis has been placed on the practical aspects of applying breeding techniques and current genetic knowledge to vegetable improvement. Detailed descriptions are presented concerning the design of a breeding program, choice of parents, selection in segregating generations, recording the data, disease resistance tests, quality evaluations and trials of advanced lines. "Breeding Vegetable Crops" is intended for advanced students who have had training in genetics and plant breeding. The content is focused on the US situation. All data is specific for the USA, neglecting most other efforts and achievements of vegetable plant breeding elsewhere in the world. For instance, breeding for adaptation to low energy conditions or quality constraints in greenhouse crops is not mentioned. Nevertheless, for plant breeders outside the USA it provides a lot of valuable and practical information. The more fundamental research worker will not satisfy his needs for profound analyses. The list of references at the back of each chapter should guide him into the direction of his interests, though he will not find references dated after 1983. As a consequence, the contribution of biotechnology to plant breeding is only very briefly mentioned, despite the recent developments with somaclonal variation, haploidization, cybridization and genetic manipulation in crops as cabbage, lettuce, carrot and tomato.

W. H. Lindhout, Wageningen

Esser, K.; Kück, U.; Lang-Hinrichs, C.; Lemke, P.; Osiewacz, H.D.; Stahl, U.; Tudzynski, P.: Plasmids of Eukaryotes, Fundamentals and Applications. Berlin, Heidelberg, New York, Tokyo: Springer 1986. xi + 124 pp., several tabs. and figs. Soft bound DM 39,–.

What is a plasmid? The seven authors of this little book give a very general definition of a plasmid as being any genetic element which is supplemental to the normal genome of the cell. It is questionable whether single-stranded RNA molecules such as viroids of higher plants have to be included. However, the majority of known plasmids are either covalently closed and circular double stranded DNA or linear double stranded DNA molecules; the self-replicating forms of single- and double-stranded RNA molecules are not discussed in the book.

In the preface, the authors try to introduce the terminology "biotechnical genetics" to cover all genetic manipulations at the molecular, cellular, and plant (or organ) level. Although the term is correct, it probably will never replace its current equivalent "genetic engineering".

A condensed introductory chapter gives, as well as the definition, further information on the history of bacterial and eukaryotic plasmids, and indicates the use of bacterial plasmids for gene cloning.

The second chapter shows in detail how in the 1970s the plasmid monopoly of bacteria was broken when plasmids were also discovered, first in yeast and maize, and later in an increasing number (three Tables are presented) of other eukaryotes – plants and animals, including man. Whereas the bacterial plasmids are circular and can vary considerably in size, ranging from 2 to 500 kb, eukaryotic plasmids only rarely exceed 10 kb and can be circular or linear. Most of the known eukaryotic plasmids appear to originate from mitochondria (which supports the endosymbiotic theory for the descent of mitochondria from bacteria). Some other plasmids reside in the nucleus, like the well-known 2 μm plasmid in *Saccharomyces cerevisiae*. A third group of plasmids has not yet been assigned to specific compartments of the eukaryotic cell. Also in this chapter detailed information is given on fundamental aspects, such as localization, morphological and biochemical characterization, and function of the nuclear plasmids in *Saccharomyces*, *Dictyostelium* and in *Drosophila*, and the mitochondrial plasmids in *Podospora*, *Neurospora*, *Claviceps*. In higher plants, plasmids seem to be involved in cytoplasmic male sterility (cms). However, so far there are no experimental data to demonstrate the causal relationship between the presence of certain plasmids and the occurrence of cms.

Since plasmids are so widely distributed and their molecular structure is so diverse, knowledge about the replication cycle, insertional capacity, and genetic function could be exploited in biotechnology. This aspect is treated in the last chapter where practical implications of eukaryotic gene cloning are indicated using plasmid derived vector systems. These are constructed as circular DNA molecules with prokaryotic and eukaryotic domains for cloning and expression in prokaryotic and eukaryotic cells. Further, important aspects such as vector composition (being either replicative or integrative), the maintenance of the vector in the host cell, and the expression of the cloned genes, are explained. Here, a reference to the construction and application of artificial, plasmid derived, *linear* yeast chromosomes (see: Murray and Szostak (1983) Nature 305: 189–193) would not have been out of place. The book ends by giving some biotechnological perspectives indicating that heterologous cloning through recombinant DNA technology broadens the base of variation among strains and, as such, is additive to traditional strain improvement.

The setup of the book is clear. It contains an informative table of contents, a useful subject index, and an extended list of references (more than 400 recent papers and books; the list includes references up to 1985). The text is relevant and compact, but very comprehensible; the subdivision into chapters, subchapters and paragraphs is consistent. Tables and figures are accurate, however, figure 23 could have been made clearer. The book is recommended as a textbook for molecular biology students and a reference source for researchers interested in "biotechnical genetics".

L. J. W. Gilissen, Wageningen

Weatherall, D.J.: The New Genetics and Clinical Practice. Oxford, New York, Tokyo: Oxford University Press 1986. vii + 206 pp., several figs. and tabs. Soft bound $ 15.95.

This monograph is a clear and excellent introduction to recent advances in human molecular genetics and in the significance of this discipline for diagnosis and prevention of genetic diseases. As the book is mainly directed at clinicians, research workers and health administrators it begins with two chapters devoted to the frequency and spectrum of genetic diseases, to the molecular biology basis of gene functioning, and to recently developed techniques of gene analysis.

Haemoglobin disorders, which are biochemically already rather well documented and which are probably the commonest single gene disorders in man, are used as the main model to illustrate how recombinant DNA technology can be applied to the study of genetic disease. The application of these new techniques has also been elaborated to other areas of medicine e.g. the immune system and cancer, and to the prenatal diagnosis of genetic disorders.

The final chapter goes into ethical aspects connected with the preventive use of recombinant techniques.

T. Hustinx, Nijmegen

Karlin, S.; Nevo, E. (eds.): Evolutionary Processes and Theory. Orlando: Academic Press. x + 786 pp., several figs. and tabs. Soft bound $ 34.50.

This book is based on a workshop held in March 1985, at five different locations in Israel. It was a sequel to a workshop on evolutionary theory which had been conducted in Israel ten years earlier. The 1985 workshop was essentially divided into two parts: the first was concerned with molecular biology; the second with population genetics. A comparison with the 1975 workshop shows that the greatest progress has been made in the field of molecular biology. On the populational level, developments seem to be slower: discussions still center mainly on sexuality, altruism and speciation, and the new findings in these areas seem to be less significant than the results of the molecular biologists. Some of the new concepts will profoundly change neo-Darwinism, e.g. the discovery of eukaryotic virus-mediated transmission and the paradox that in eukaryotes only 20% of the genome is transcribed. However, the most fundamental concept of neo-Darwinism, viz. that evolution is the conversion of variation among individuals within an interbreeding group into variation between groups in space and time, remains unchanged.

The book comprises both general and specialised chapters. It gives an excellent survey of most areas of evolutionary theory and should be present in every biological library.

G. J. de Klerk, Lisse

Bainbridge, B.B.: Genetics of Microbes. Tertiary Level Biology, 2nd Edn. Glasgow, London, New York: Blackie 1987. 244 pp., 106 figs., 37 tabs. Soft bound £ 11.95.

There are several good textbooks on microbial genetics, and a few of them are excellent. If an author wants to compete on the market, his product has to possess special merits. Certainly, a merit of Bainbridge's book is its compactness: the framework and principles of the subject are presented within a reasonable space.

The book comprises 10 chapters in which the basic concepts of microbial genetics are treated, concerning bacteria inclusive *Streptomycetes*, phages, and fungi (filamentous as well as yeast). Since the issue of the first edition (reviewed in TAG 62: 316, 1982), recombinant DNA technology has developed spectacularly, so the chapter and paragraphs concerning this subject were adapted to contemporary views, e.g. comprising the construction of yeast plasmids and artificial chromosomes. Throughout the whole book, the principles of molecular biology are emphasized, sufficiently linked, however, to non-molecular aspects of genetics. The text is well-illustrated with schematic drawings, and each chapter is paralleled by a list of references and further readings. The book can be recommended to every student in biology.

C. K. Stumm, Nijmegen