

Book Reviews

Beermann, W. (ed.): Biochemical Differentiation in Insect Glands. Results and Problems in Cell Differentiation, Vol. 8.

Berlin-Heidelberg-New York: Springer 1977. 215 pp., 110 figs., 24 tabs. Hard bound DM 78,-

For a variety of reasons, including their accessibility to analysis by both classical and molecular genetic approaches, interest in insects as an experimental system has increased in the last few years. The latest volume in the series *Results and Problems in Cell Differentiation* offers a timely review of three developmental systems in insects.

The first article, by Y. Suzuki, describes the differentiation and gene action in the silk gland of the silk moth. The main emphasis, after a short introduction describing the developmental morphology of the gland, is on the isolation and characterization of silk fibroin mRNA. Its accumulation during ecdysis and the adaptation of the tRNA population to the requirement of silk fibroin synthesis are discussed.

The second article, by F.C. Kafatos and coworkers, deals with the chorions and choriogenesis in the silk moth and in *Drosophila* and forms the main, and easily the outstanding, part of this volume. They extensively review the morphology and biochemical structure of the chorion, choriogenesis *in vivo* and *in vitro* and present studies of the mRNA's coding for the chorion proteins. Their study is an outstanding example of an coordinated analysis of all aspects of a developmental system. The salivary glands of diptera, or rather their polytene chromosomes, have been a favored study object for years, but the two articles by U. Grossbach and W. Baudisch in this volume dealing with the salivary gland as a system for studying differentiation at a biochemical level come as a disappointment. Although the work on the BR2 RNA has been reviewed a number of times, the treatment of both authors of the biochemical nature of the salivary glue and their possible gene loci in *Camptochironomus* and *Acrictopus* respectively seems unnecessarily restricted. Indeed, the purpose of this volume, namely to analyse a particular system under study as comprehensively as possible, would have been better served by one review of the work on salivary glands of diptera, including the work on the secretion products and their gene loci in *Drosophila melanogaster*.

In summary, this volume offers a number of useful reviews. The article by F.C. Kafatos and coworkers, in particular, is highly recommended to all who are interested in developmental systems.

N.H. Lubsen, Nijmegen

Christiansen, F.B., Fenchel, T.M.: Theories of Populations in Biological Communities. Vol. 20: Ecological Studies, Analysis and Synthesis.

Berlin-Heidelberg-New York: Springer 1977. 144 pp., 68 figs. 5 tabs. Hard bound \$ 27.30

This book is the 20th of the series 'Ecological Studies, Analysis and Synthesis' edited by W.D. Billings, F. Golley, J.S. Olson (USA) and O.L. Lange (FRG). The larger number of these volumes report on special ecosystems, now, at last, theoretical concepts on the nature of populations and biocoenosis are described and presented as well as is possible, as mathematical models. The cooperation of an ecologist and a population geneticist, based on discussions during seminars on the problem concerned, has proved very productive. Both are working at the Institute of Ecology and Genetics at the university at Aarhus, Denmark. They wrote this book

primarily because of their own interest in the subject, the authors declare in the preface, but also because of their sincere hope that it might be interesting for specialists from very different disciplines. In 5 chapters of only 135 pages, they have tried to present this new discipline that has developed very rapidly during the last years. They restrict themselves to mathematically formulated theories, stating, that these give less occasion to misunderstanding. From this, of course, results an accentuation of those aspects mostly developed in mathematical treatments, which does not always correspond with what is important in biological systems.

Simple models are presented concerning population growth and fitness within a single species. In this first chapter the problem of the simplification of conditions to obtain useful models is discussed. The theories presented here are especially fit to analyze the different components of lifecycles. These components include such physiological and ecological conditions as lifetime, birth- and death-ratio, overlapping of generations or intensity of individual interaction, completed by the change of genotype frequency and allele frequency, too with simplification. The models given in mathematical equations are illustrated by graphs with special biological examples. The second chapter treats the different types of interaction between 2 or more species; for example, prey-predator-relations, symbiotic relations or food web relations. On account of the shortness of text only simple models can be given. A relatively large space is reserved in the third chapter for the treatment of the 'niche'. First is given a definition of the term. The models presented are constructed under the same conditions as the biological communities handled before. In chapter 4 geographically-structured populations are discussed as well as equilibria of migration and extinction. Hence these models reach a relatively high level of complexity. In summary the concept of biotic communities is given.

The necessarily small number of examples from nature forms a many sided assortment. In the text a large number of original papers – ca. 150 titles up to 1975 – are referred to. A short subject index completes the book.

The format of the book, as well as the quality of the graphs, facilitates the reading, though several errors of print could not be avoided. On the whole, this volume on the theory of biotic communities is an important part of the whole series and it will be of good use for all who are interested in the problem.

U. Nürnberg, Berlin

Sussman M.: Molekularbiologie und Entwicklung. Aus dem Amerikanischen übersetzt von U. Ponta. Pareys Studentexte Nr. 16.

Berlin-Hamburg: P. Parey 1978. 264 pp., 143 figs. Balacron DM 29,-

'Molekularbiologie und Entwicklung' is a translation from Sussman's well-known textbook 'Developmental Biology' which appeared in 1973. It is a treatise on developmental biology in a broad sense. Only in Chapter 2, and to a lesser extent in Chapter 5, is emphasis placed on molecular aspects of development. The German title is, therefore, somewhat misleading. Sussman's text needs no further recommendation in this review. The drawings in the book are much more instructive than the photographs, as the latter lack brightness and detail. From the errors in the translation one gets the impression that the translator does not have a background in general biology.

A.F. Croes, Nijmegen

Ellenberg, H., Esser, K., Merxmüller, H., Schnepf, E., Ziegler, H. (eds.): *Progress in Botany. Morphology Physiology Genetics Taxonomy Geobotany*, Vol. 39

Berlin-Heidelberg-New York: Springer 1977. 304 pp., 33 figs. Hard bound \$ 49.00

This series of progress reports seems to have found its definitive programme. Eighteen independent reviews (two of which are in German) refer to highlights of recent botanical research. This year, the section on Genetics exclusively concentrates on higher plants.

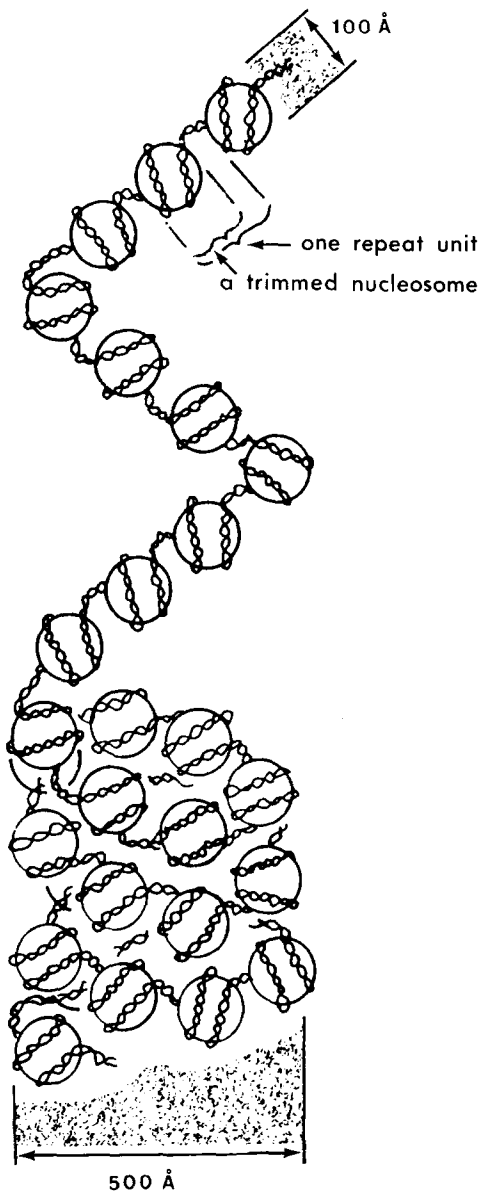


Fig. 1. The new chromatin model (according to W. Nagl, slightly changed): a 'kinky' DNA helix is wound around histone oligomers, thus forming nucleosomes, which are spaced by various stretches DNA bound to histone H1 (not drawn). In the lower part, condensed chromatin is shown: The basic subunit arrangement is the same as in extended chromatin but the quaternary structure is different (in this sample, a 500-Å fiber results instead of a 100-Å fiber). The role of highly repetitive DNA in the condensing constitutive heterochromatin and the degree of phosphorylation of H1 in condensing euchromatin and facultative heterochromatin is only poorly understood.

An excellent review by W. Nagl reports on recent advances in the organization and replication of the eucaryotic chromosome. Interesting things can be reported: a real breakthrough in the elucidation of the chromatin structure necessitates the rejection of most of the former chromosome models. With the introduction of spherical particles in a linear arrangement of bead-like histones, the so-called nucleosomes, one is presented with a new chromatin model (Fig. 1). Some progress has also been made in the understanding of the biosynthesis of chromatin, the distribution of nucleosomes and differential DNA replication. The mutation chapter, very well written by W. Gottschalk, also concentrates on findings in higher plants. The mechanisms by which nuclear genes express themselves in higher plants seems to reveal a high degree of homology with the pathways of gene expression in procaryotic cells (H. Binding). This year, in a report on extranuclear heredity, C.G. Arnold emphasizes the phylogenetic origin of the genetic apparatus in plastids and mitochondria. It is exciting that there is evidence for the existence of episomes in eucaryotes! More genetical aspects such as cytogenetics, incompatibility and hybridization can be found in the chapters on evolution of seed-plants (K. Kubitzki). A detailed subject index has been compiled. All with all a valuable aid with which to remain up-to-date in plant genetics.

H.F. Linskens, Nijmegen

Gunther, F.A. (ed.): *Residue Reviews. Residues of Pesticides and Other Contaminants in the Total Environment*. Vol. 68

Berlin-Heidelberg-New York: Springer 1977. 154 pp., 13 figs., 30 tabs. Hard bound DM 43,10

The organophosphate insecticide fenitrothion has been used in Canada and the USA since 1968 in attempts to control the spruce budworm, a lepidopterous forest pest. The results of these investigations are summarized by P.E.K. Symons in the paper 'Dispersal and toxicology of the insecticide fenitrothion; predicting hazards of forest spraying'. The distribution and fate of fenitrothion after spraying (concentrations in the physical environment, as well as in plants and animals, and degradation), toxicity and the consequences of forest spraying to animal populations (terrestrial and aquatic insects and fish) and conclusions to be drawn are reviewed. N. Sethunathan et al. present a review on 'Parathion, residues in soil and water.' Residues and degradation products are reported in soil and water, including lake sediments. The stability of the breakdown products paraoxon, nitrophenol, aminoparathion and para-aminophenol, relative to the biological substrate, is discussed. The interactions between different pesticides and the impact of such combinations on microflora and biochemical transformations of major importance have to be considered more carefully in future. By R. Engst et al. a survey is given of the 'Recent state of lindane metabolism'. Metabolism of lindane in warm- and cold-blooded organisms, in plants and by microbes in soil as well as the metabolism of the potential lindane metabolites polychlorobenzenes and polychlorophenols is reviewed. The last two papers are dealing with inorganic compounds and their residues. 'Fluorine in foods' by J. Kumpulainen and P. Koivistoinen is a review covering the following topics: 1) F in rock bed, soil and air; 2) F in foods of vegetable origin (transfer of F from soil into plants and distribution, effect of fertilizers and F-containing pesticides on the F content of plants, effect of airborne F pollution on the F content of plants and F concentration in foods of vegetable origin); 3) F in foods of animal origin (F in meat, eggs, etc.; effect of airborne F pollution on the F content of poultry, eggs and cows milk, fish, fish products and crustaceans); 4) Effect of fluoridated water and of processing and preparation of foods on the F content; 5) Composition of the F intake from different types of foods and average daily F intake in some countries.

'Determination of arsenic and arsenicals in foods and other biological materials', presented by R.C. Lewis, is a survey of appropriate analytical methods for total As and organoarsenical pesticides, including methylarsenic and dimethylarsenic (cacodylic) acids and 4-hydroxy-3-nitrobenzene-arsenic acid (Roxarsone).

W. Dedek, Leipzig

Solomon, D.L.; Walter, C. (eds.): Mathematical Models in Biological Discovery. Lecture Notes in Biomathematics. 13

Berlin-Heidelberg-New York: Springer 1977. 240 pp., 43 figs. 4 tabs. Soft bound \$ 11.40

This volume of nine lectures, the outcome of a symposium held in January 1975, is intended to show how mathematical models have contributed to biology. Following a preface by Ch. Walter in the first paper 'Role of mathematical population geneticists in the evolutionary synthesis of the 1930's and 40's', William B. Provine gives an illuminating historic account of the influence of mathematical models on the development of population genetics. Apparently the author's thorough research was initiated by a claim (C.H. Waddington, E. Mayr) that 'very few qualitatively new ideas have emerged (from mathematical treatments)' and an opinion that the models of Fisher, Haldane, Wright provided a rigorous mathematical formulation of already present ideas. Provine has worked through most, if not all, the basic papers and monographs and has gathered additional information from the correspondence of Wright and Dobzhansky and from personal conversations with Wright, E. Mayr, Lewontin and others. He is able to show how deeply mathematical thinking has influenced the convergence of the views of evolutionists, geneticists, Lamarckians, Neo-Darwinians a.s.o. into modern evolution biology. Even for the initiated it is surprising to see how recently our common beliefs on evolution were vigorously disputed. Provine's article is a pleasure to read, particularly for anyone interested in how Science advances (Cf. W.B. Provine, *The Origins of Theoretical Population Genetics*, University of Chicago Press 1971).

Ch. Walter's article 'Contributions of enzyme models' begins with the early modeling of enzyme kinetics (Brown, Henri, Michaelis and Menten). For a basic model he discusses various approximations and the errors introduced, describing an algorithm for deriving quasi-steady state rate equations and methods to adapt models to data. Stuart Kauffman's 'Dynamic models of the mitotic cycle: evidence for a limit cycle oscillator' describes earlier models for the mitotic cycle and proposes an oscillator in the form of two coupled differential equations. The model is compared with experimental data on heat shock experiments in *Physarum*. A. Babloyantz's 'Mathematical models for morphogenesis' is just another report on some morphogenetic clines in reaction-diffusion equations. D. and L. Garfinkel and W.T. Moore's 'Computer simulation as a means of physiological integration of biochemical systems' reviews the process of modeling with reference to liver metabolism, cardiac metabolism and cellular growth. Other papers are mainly of a methodological character: D.S. Riggs' 'How models of feedback systems can help the practical biologist'; R.A. Goldstein's 'Reality and models: difficulties associated with applying general ecological models to specific situations'; H.R. van der

Vaart's 'Biomathematical models: some triumphs and some triumphs and some defeats'.

K.P. Hader, Tübingen

Gunther, F.A.; Davies Gunther, J. (eds.): Residue Reviews. Residues of Pesticides and Other Contaminants in the Total Environment. Vol. 66

Berlin-Heidelberg-New York: Springer 1977. 212 pp., 4 figs. 13 tabs. Hard bound DM 49,60

In the paper 'Advances in tin compound analysis with special reference to organotin pesticide residues' by J. Kumpulainen and P. Koivistoinen, the following aspects of tin compounds are reviewed: Compounds used in plant protection (tricyclohexyl tin hydroxide and triphenyl tin compounds), other organotin compounds, analytical methods (determination of total tin by oxidation of organic matter, colorimetric and fluorometric methods), determination of organotin by special methods developed for tricyclohexyl tin hydroxide and triphenyl tin compounds and specific methods. The risk of contamination of samples with tin from canned foods and movement of tin stabilizers from PVC film into foods is discussed. The paper 'Algae and pesticides' by G.L. Butler includes studies from 1946 to 1975 in which algae were either direct or indirect recipients of pesticides. The papers reviewed, although dealing particularly with pesticide toxicity, also cover the topics of degradation, bioaccumulation and bioassay of herbicides, insecticides, fungicides and PCBs. By P.P. Williams a survey is presented of 'Metabolism of synthetic organic pesticides by anaerobic microorganisms'. Techniques for culturing anaerobes, anaerobic symbiosis and types of anaerobic ecosystems are reviewed (benthic systems, water-laden soils, gastrointestinal and reticulo-ruminal contents, feedlot wastes, sewage sludge and associated sites). The metabolic degradation compiled is based on the type of reaction: Nitro reduction, amide hydrolysis and deamination, dealkylation of N- and O-alkyl compounds, dehalogenation, hydrolysis of phosphate esters, alkyl and phenyl carbamates and aliphatic esters, conjugate formation and heterocyclic ring cleavage and other reactions. Pesticide and metabolite, comparative evidence for structure, microbial source, gaseous phase and reference to a specific paper are presented in comprehensive tables. Part III of the review is titled 'State of the art of the toxicological evaluation carried out by the Joint FAO/WHO Expert Committee on Pesticide Residues.' G. Vettorazzi presents toxicological reviews, ADI values and no-effect levels, reported from 1963 up to and including 1975, of 32 compounds by classes: Ammonium and bipyridylum compounds, carbamodithioates, chloronitrobenzenes and derivatives, dinitrophenols, diphenyls, isoindole derivatives, miscellaneous aliphatic and inorganic compounds, miscellaneous cyclic compounds, organomercurials, organotin compounds and pyrethroids. 'Recent advances in PCB analysis' are reviewed by I.S. Krull. The extraction of PCBs (polychlorinated biphenyls) from environmental samples, chromatographic separation, special application of electron capture detector (ECD) to PCB analysis in gas chromatography, improvements in PCB analysis via computers and future advances in PCB analysis are all discussed.

W. Dedek, Leipzig