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THEORETICAL AND APPLIED GENETICS

Book reviews

MacLean, N.: Macmillan Dictionary of Genetics and Cell Biology. London: Macmillan Press 1987. 422 pp.

Those who could foresee where the rapid developments in cytogenetics were heading have been reminding us about the equally rapid emergence and deluge of novel terms that are used faithfully, in modified or renovated forms, in current genetical and biotechnological literature. As a result, more than a few authors of textbooks of genetics now describe the terms they use at the end of their books. Most of the terms, however, are widely scattered throughout the literature.

A compilation and description of the terms having ubiquitous – current and potential – future uses under one cover was, therefore, quite needed. This need is fulfilled by the dictionary under review. It begins with five tabular appendices covering (1) common and latin names of the main animals and plants utilized to uncover the underlying principles and procedures followed currently in cell biology and genetics in theory and practise; (2) the somatic chromosome numbers in some species; (3) the amount of DNA known in the haploid genomes of some biological organisms. In alphabetical order, the book precisely describes the qualitative aspects of genetics and cell biology.

The coverage of the terms embodied in the book is diverse. This reflects the versatility of the author, who has a long-standing experience in writing books. However, some descriptions are diffuse, hazy and non-crisp. The information contained in appendix tables 1–3 could be compiled into one table. Tables 4 and 5 have no direct bearing to the book. Despite these limitations, the dictionary does provide well-written meanings for many specific terms used commonly in cell biology and genetics. As such, this reviewer would recommend its purchase by students and teachers of cell biology and genetics. However, it by no means replaces the monumental work Glossary of Genetics and Cytogenetics by Rieger, Michaelis and Green; it supplements it by the addition of currently used terms.

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Constabel, F.; Vasil, I. K. (eds.). Cell Culture and Somatic Cell Genetics of Plants, Vol. 5: *Phytochemicals in Plant Cell Cultures.* San Diego: Academic Press 1988. 618 + XXYII pp., 120 figs., 69 tabs. Hard bound $ 110.00.

This book logically continues along the lines of previous volumes of the series *Cell Culture and Somatic Cell Genetics of Plants* by presenting reviews and original articles written by well-known scientists in the fields of phytochemistry and plant cell and tissue culture. The material has been separated into five general parts. The main tendency of the folio is an attempt to connect the results of experimental studies based on in vitro techniques with commercial higher plant biotechnology.

Each of the 34 chapters contains essential information on the structure, biogenesis and classification of a great number of plant metabolites, and their distribution among different taxonomic groups. Primary attention is paid to the biosynthesis, storage and disengagement of valuable substances in plant callus and suspension cultures, their qualitative and quantitative appreciation, regulatory mechanisms of their biosynthesis at the molecular level, and a comparison of the metabolite spectra and contents in plants and in vitro. Nature's unkind joke is that the more valuable the secondary metabolic product is, the less chance it has of being synthesized by unorganized and rapidly growing cell cultures. Almost classic examples of this are two dimeric indole alkaloids from *Catharanthus roseus*, vinblastine and vincristine (chapter 22 by V. DeLuca and W. G. W. Kurz).

The majority of chapters deal with possible ways of increasing biosynthetic productivity: special reviews are devoted to coumarins (chapters 1 by U. Matern et al.), flavonoids (chapter 2 by W. Hinderer and H. U. Seitz), catechins and proanthocyanidins (chapter 4 by M. N. Zaprometov), mevalonates (chapters 8–12), almost all types of alkaloids (chapters 13–26) as well as other secondary metabolites (chapters 27, 29, 30). The authors stress the importance of environmental conditions. As pointed out by J. P. Kutney (chapter 9), of particular importance are the effects of sucrose and/or other carbohydrates, $CaCl_2$, NH_4NO_3, and growth regulators, and the influence of inoculate size, fermenter construction, and volume (chapter 12 by T. Furuya). The effectiveness of fungal elicitors for the intensive production of coumarins (chapter 1), anthraquinones (chapter 7), isoquinoline alkaloids (chapter 18), and some other substances is pointed out by U. Matern et al., W. Hinderer and H. U. Seitz, H. Koblitz, and M. F. Roberts.

Among the questions discussed, the most interesting relate to single-versus two-phase culture systems, cell immobilization, two-phase aqueous and lipophilic systems (chapter 33 by H. A. Collin), stress factors, high-production medium in comparison to a high-growth one, hormone-habituated cultures, polyploidy induction by colchicine (this procedure alone caused a 70-fold increase in valepotriate accumulation in suspensions of *Valeriana wallichii*) (chapter 8 by D. V. Banthorpe).

The genetics of secondary metabolism in plants remains a poorly understood field. That is why the data presented in chapter 18 (M. F. Roberts) concerning the inheritance of the five isoquinolines – morphine, codeine, thebaine, noscapine, and papaverine – in the crosses between *Papaver somniferum* and *P. setigerum* are of great interest. In many cases, secondary metabolite biosynthesis correlates with morphogenic processes and, unfortunately, with slow growth. As M. Misawa and T. Endo (chapter 32) emphasize, to break these and other genetic correlations. "chemical and physical mutagens or random insertion of Ti plasmid into the plant genome to destroy the regulatory gene of the key enzyme could be empolyed" (p. 566). They also stress 'hairy roots" cultures of medicinal plants as a novel and promising in vitro production system. Genetic heterogenity that arises in vitro may be explored to obtain cell lines that produce larger amounts of secondary metabolites than do the intact plants, though stability of the variants is questionable (chapter 32).

Finally, this book includes such chapters as "Insecticidal phytochemicals" (G. J. Kudakasseril and E. J. Staba), "Anti-tumor compounds" (M. Misawa and T. Endo), "Flavors" (H. A. Collin) and "Phytohormones in cell and tissue cultures (K.-H. Neumann), all of which are of great value for those interested in applied problems. In conclusion, if even some in vitro cultures seem to be a good example of the "inability of plant cells to produce secondary substances" (p. 351), the majority of the data presented in this volume allow one to predict the progress in plant cell biotechnology that will be made in the near future.

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