

endopolyploid mitoses. Brodsky and Uryvaeva make a convincing case that the interpretation of endopolyploid nuclei originating via endomitotic cycles has been overused. One of their useful achievements is to stress the variety of mechanisms that can give rise to polyploid nuclei. What I object to is the conclusion that the suppression of mitosis necessarily gives rise to polytene nuclei *by definition*.

In Part II Brodsky and Uryvaeva are concerned with "modes and reasons for genome multiplication". In general I was rather disappointed with this, the conclusion of a long discussion on the biological significance of polyteny (by their definition) being rather weak: it is "advantageous". True, but not very helpful. They try and argue that there are some fundamental differences between polytene and diploid nuclei in their "protein spectra, [their] RNA fractions and [in] the activity of isozymes". I doubt it. Moreover they claim that the "redundancy" of their genetic information gives polyploid cells an advantage over diploid cells. This overlooks the fact that what (little) polyploid cells may win on this roundabout they lose on the swings, polyploid cells cannot usually be replaced by regenerative mitoses. In fact I consider any attempt at a general hypothesis to "account" for such a diverse phenomenon as the occurrence of polyploid nuclei as being naive. There can be no question but that polyploidy, endopolyploidy and polyteny (in Nagl's sense) have all originated many times, and independently, during the last 500 million years (or so).

One rather disturbing feature of this book is that the authors are so obviously unsure of themselves, and unauthoritative, when discussing material of which they lack first-hand experience. This is especially true when they review work of a more molecular nature. My hackles rise when, for example, I read such statements as "After fertilisation, this RNA [and here, "this RNA" is the ribosomal RNA of the oocytes], which has accumulated in an inactive form, *determines* the early events of embryogenesis" (my emphasis). I puzzled some time over the statement that "the number of genes should correspond to the degree of perfection of form and function" and can only conclude that this is one of the instances where we suffer from reading a translation. Brodsky and Uryvaeva clearly fail to grasp the generality and significance of somatic chromosome pairing in the Diptera and have not grasped the issues involved in recent controversies concerning the underreplication of chromosome regions in polytene chromosomes. Similar instances of a failure to comprehend the literature in areas peripheral to their own research could be cited. Unfortunately these undermine one's confidence in their discussion of fields of which oneself has no first-hand knowledge.

My criticisms should not overshadow the fact that this *is* a useful book for those interested in nuclear structure and function. I can only repeat that the two main reasons for reading it are (a) that it will open your eyes to a literature which you may have overlooked and (b) that the discussion of the origin and significance of

polyploidy, even if somewhat misdirected, at least will make you think.

MICHAEL ASHBURNER  
*Department of Genetics*  
*Cambridge*

**Experiments in plant tissue culture (2nd edition).** John H. Dodds and Lorin W. Roberts. Cambridge University Press, Cambridge. 1985. Pp. xvii + 232. Price £25 (HB), £8.95 (PB).

This text book offers a comprehensive practical introduction to research in plant tissue culture, at a reasonable price. All aspects of the work are covered, from planning a tissue culture laboratory through to protoplast production, somatic hybridisation, and the production of economically important compounds from cell cultures.

The chapter on aseptic technique should be read by all students before attempting tissue culture experiments, and there is a detailed consideration of basic tissue culture media. Many practical hints are included, such as the choice of the correct solvents for dissolving different plant growth regulators, and how to prepare stock solutions.

The main techniques commonly used in plant tissue culture research are covered by individual chapters, which are easy to follow. A brief introduction and explanation of the procedures and their potential uses precedes a detailed experimental procedure, ideal for teaching and/or training purposes. A number of relevant questions for further consideration by the student are also included, and each chapter concludes with a considerable number of useful references for further reading.

There are however some notable omissions, such as the consideration of protoplast electro-fusion techniques which are now becoming more widely used, and the brief page on plant tumors and genetic engineering, which seems rather inadequate considering the possible potential of such techniques, although they may have been considered to be outside the scope of this text. Overall, therefore, a useful laboratory manual for students of plant tissue culture.

M. V. MacDONALD  
*Department of Botany*  
*University of Cambridge*

**Evolution of fish species flocks.** Anthony A. Echelle and Irv Kornfield (eds.). University of Maine at Orono Press, Maine. 1984. Pp. vi + 257. Price \$20.95US (PB), \$28.95US (HB).

This book fills an important gap in the interpretation of the evolution of fish species flocks, it being 25 years

since the last general treatment of the subject. It is based on contributions made at a symposium held in June 1983 by the American Society of Ichthyologists and Herpetologists. The subject is introduced in the first chapter by Ernst Mayr, an original contributor to the field more than 40 years ago, who reviews the research into the origin of fish species flocks carried out up to and including presentations at the 1983 symposium. This chapter provides excellent background information for those readers not completely familiar with the subject by discussing the possible mechanisms, and their relation to accepted evolutionary theories, which may have led to the formation of the large species flocks found in many fresh water lakes. A major problem in explaining the development of large numbers of sympatric species are the relatively short evolutionary time spans involved.

The next two chapters continue with the general introductory theme. Greenwood defines more concisely exactly what is a species flock and Ribbink discusses the tenability of the species flock concept.

The following 13 chapters present evidence of the existence of species flocks in the lakes of North and Central America, the Philippines and Africa. The data presented include paleontological discoveries, behavioural observations, isozyme frequencies and morphological differences and provide a great deal of information from many intensive research programmes.

McCune, Thomson and Olsen discuss fossil evidence of speciation in semionotid fish of the Mesozoic Great Lakes of North America and relate this to the influence of periodic climatic change. Smith and Todd use meristic and ecological characteristics in their study of the evolution of species flocks in fishes of the North Temperate lakes. They provide useful definitions of the terminology used in the description of fish species flocks and illustrate the hypotheses put forward for the evolution of such flocks with examples from North Temperate lakes. They suggest that notwithstanding the fluctuation model for intralacustrine speciation, which proposes that the isolation and reunification of different areas of lakes due to varying water levels contributes to the origin of fish species flocks, the evidence they present indicates that most speciation has concurred within lakes due to divergent reproductive strategies. In the following chapter Kornfield and Carpenter include waterspouts as a possible contributing factor in the dispersal of cyprinids in the Philippines and cite their occurrence on other lakes containing species flocks. Parenti compares the evolution of the Andean killifish genus *Orestias* with that of African cichlids and indicates the different geographic factors in their respective evolutionary histories.

The following three chapters all cover Mexican fish species flocks. Echelle and Echelle present a great deal of data linking climatic changes with the geographical distribution of Atherinid fish on the Mexican plateau but I felt that an unfortunate excess of jargon affected this contribution. Barbour and Chernoff continue the study of Atherinid fish with a discussion of morphological and morphometrical variation in the genus *Chirostoma* and suggest a re-evaluation of the concept of

species flocks and a restriction of the use of the term to include only those monophyletic groups for which an origin in a physically unimpeded environment cannot be ruled out. Humphries distinguishes between genetic differentiation as measured by electrophoresis and morphology in pup-fishes from Laguna Chichancanab; the traditional view associating speciation with major genomic changes may not be a general model as the amount of genetic variation accompanying speciation may vary and morphological differences due to simple genetic changes may play a significant role in sympatric divergence.

The next six chapters all describe research carried out on the cichlids of the African Great Lakes. Greenwood uses the large species flock or flocks of haplochromine fishes in Lake Victoria as examples in a discussion of the possible mechanisms of species flock evolution. Witte, again working with Lake Victoria haplochromines, discusses the role ecological differentiation may play in speciation. McKaye and Gray continue the theme of habitat colonisation with a field study on cichlids in Lake Malawi, supported by experimental evidence collected from artificial reefs. Sage, Loiselle, Basasibwaki and Wilson return to the cichlids of Lake Victoria with a comparison of protein and morphological divergence. They suggest that the rapid rate of morphological change between species showing little protein differentiation may be partly due to 'behavioral drive'. Detailed differences between two morphs of *Cichlasoma minckleyi* are used by Liem and Kaufman to suggest that such change may be a stage towards speciation. Strauss follows with the use of cephalic variation in haplochromine cichlids in relation to trophic specialisation. The final two chapters return to general discussion when Dominey discusses the effect changes in mating systems may have in producing rapid reproductive isolation between divergent populations and compares species flocks in fish and *Drosophila* and finally, the editors, Kornfield and Echelle pose the question "Who's tending the flock?" when they consider the extinction of fish species flocks either by natural events or human activities.

The overall impression from the book is of a great deal of data being presented in effort to understand the rapid evolution of fish species flocks. The arguments over the exact definition of a fish species flock and the possible mechanisms of their evolution will, no doubt, continue. Further research must determine the genetical control of the physical differences which are found between species and the roles these differences play in behavioral isolation. However the book does make a significant contribution to an extremely interesting area of evolutionary genetics and it is to be hoped that 25 years do not have to pass before another such volume is produced.

DAVID THOMPSON  
Fisheries Laboratory  
Lowestoft