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## Book reviews

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*Lampbrush Chromosomes.* By HAROLD G. CALLAN. Berlin, Heidelberg, New York, Tokyo: Springer-Verlag, 1986. 254 pages. DM228, £82.00, ISBN 3 540 16430 8 (Berlin), 0387 16430 8 (New York).

Lampbrush chromosomes are found in certain organisms at the diplotene stage of meiosis. The chromosomes have intermittently-distributed regions of their nucleoprotein axis extended into lateral loops, where transcription occurs. Indeed the prime attraction of lampbrush chromosomes as an object of study is that individual transcription units can be directly observed by light microscopy after autoradiography using tritium-labelled probes complementary to the primary transcripts. The transcripts can also be observed by electron microscopy in Miller-spreads.

It seems that lampbrush chromosomes were first observed by Walther Flemming in 1878 in oocytes of the axolotl, so the present monograph is able to review observations spanning a century. However, nearly all the significant observations have been made since 1950 and the contributions of J. G. Gall in the United States and H. G. Callan and his associates in Britain have played a major part in the development of the subject. The monograph reviews the relevant literature to mid-1985 and gives a full account for example of the important paper published in 1985 by Diaz and Gall on transcription units at histone loci in lampbrush loops of the newt *Notophthalmus*. Here the transcription may be from either strand. After initiation at a promoter at the 5' end of a histone gene, transcription may proceed beyond its 3' end through spacers and other histone genes of the cluster and then on without interruption through an extensive series of satellite I sequences. This example of readthrough transcription provides a good explanation for the large size of most transcription units and may be a general feature of transcription at the lampbrush stage.

The opening chapter of the book describes work by which a basic understanding of the main structural features of the chromosomes was reached. There follows a useful section on instrumental details, saline solutions and manipulation procedures involved in

the main techniques used for experimental studies. The next chapter describes and illustrates the distinctive structural features by which individual amphibian lampbrush chromosomes may be recognised and mapped, features such as centromeres, nucleolar organizers, fusing loops, granular loops, spheres, axial granules and double axis regions. One intriguing circumstance brought to light by this kind of work concerns the heterozygosity of a long stretch of the largest bivalent of *Triturus cristatus*, where the landmark loops on one chromosome do not match the structures of its homologue. This heterozygosity turned out not to be associated with sex determination, but the heterozygosity found in all adult newts is achieved at the expense of the lethality of all homozygous zygotes. The next two chapters are concerned with various aspects of transcription in amphibian oocytes and this is followed by a chapter with discussion about the possible reasons why some species have oocytes with lampbrush chromosomes while others do not. There follows a full treatment of the prominent lampbrush structures on Y chromosomes in primary spermatocytes of *Drosophila hydei*, much studied in Germany and Holland, notably by G. F. Meyer, O. Hess and W. Hennig. In this and related species, normal transcription on the lampbrush loops is associated with the expression of several male fertility genes, which is necessary for fully functional spermatozoa to develop. Nevertheless convincing evidence for the expression of protein-coding sequences at these fertility loci still seems to be lacking. A short chapter is devoted to the primary nucleus of the unicellular alga *Acetabularia* where transcription on lateral loops has been demonstrated in Miller-spread preparations. The chromosomes are lampbrush-like but their diplotene status is non-proven. A final section of the book describes ongoing studies to characterise the various nucleoproteins in oocyte nuclei and monoclonal antibody and other techniques. The prominent lateral loops of lampbrush chromosomes are associated with considerable accumulations of protein which contribute to their distinctive morphology and we know very little of the origin of these proteins or their function. One possibility is that

some of the loop proteins are involved in the recognition and storage of particular transcripts required post-fertilization in the early development of the embryo.

One aspect of the account which I find interesting, concerns the grounds on which several hypotheses about lampbrush loops were proposed at particular times, enlivening the subject for a period, only to be discarded as further evidence was adduced. Since the demise of a hypothesis frequently takes place at a scientific conference or a less formal meeting, its passing may be inadequately recorded in the scientific literature, but the present account is not found wanting in this respect. Moreover the reader is given a good idea of where the wider gaps lie in our present understanding of the subject.

This book is very expensive. Nevertheless if you want an authentic account of work with lampbrush chromosomes for your library, this hardback volume is without rival. It is beautifully illustrated, with over 150 micrographs reproduced on good quality paper, together with 40 diagrams, drawings and tables. There are over 460 references listed in the bibliography and there is a subject index. So you do get something substantial for your money.

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*Embryogenesis in Angiosperms. A Developmental and Experimental Study.* By V. RAGHAVAN. Cambridge University Press. Cambridge. 1986. Developmental and cell biology series, 17. i-xiii; 303 pp. £27.50. US\$39.50.

Techniques have been developed in recent years for the regeneration of whole plants from novel sources. Meristem culture, the derivation of plants from callus or directly from leaf segments, from single cells and protoplasts and from haploid pollen grains has been achieved, albeit erratically, in many angiosperm species. This converging evidence for totipotency has kindled an interest in how such atypical embryogenesis compares with the conventional form. This book caters for this interest by reviewing what students of morphology, ontogeny, biochemistry and genetics have discovered about modes of angiosperm development. The author has in mind the needs of both the university student and the research worker who wants an up-to-date survey.

The account leads in with the basic framework of angiosperm embryogenesis, endosperm development, the role of the suspensor and the synthesis of storage proteins, and then deals in turn with specific research fields such as seed and proembryo culture, the different forms of somatic embryogenesis, pollen grain culture and the evidence for totipotency. There is a useful concluding chapter on practical applications like

embryo rescue, clonal multiplication, the use of haploids and the conservation of germplasm. There is a commendable attempt to integrate different kinds of evidence, including recent molecular and biochemical information about the synthesis of storage proteins and mRNA sequence during embryogenesis. It is not an easy story to tell since so much of the plot is missing. The functional significance is still not understood of the different pathways which establish the ground plan of the embryo. Although the course of endosperm development is known well enough it is still obscure just how the endosperm sustains the developing embryo. The recipes for successful production of whole plants from callus, single cells and protoplasts point to a bewildering array of pragmatic cookery. The author draws attention to the evidence for intraspecific genetic variation in response to particular media. This looks like a clue worth following. Another promising approach is the exploitation of mutants which impair some part of embryo development, as a means of studying aspects of regulation. The recent work with *Zea* and *Arabidopsis* points the way. Anyone looking for research problems in the field of embryogenesis should be well satisfied since the text fairly bristles with recognition of unsolved problems.

This book can be recommended as a useful addition to the C.U.P. development and cell biology monographs. There are some thousand items in the literature list, perhaps sufficient to daunt the student, but meat and drink to the investigator.

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*Genes and Development*, volume 1, no. 1, March 1987. New Journal, published monthly by Cold Spring Harbor Laboratory in association with The Genetical Society of Great Britain. First year's subscription \$65 plus postage for individuals, \$195 plus postage for Institutions from Cold Spring Harbor Fulfillment Dept. P.O. Box 100, Cold Spring Harbor, N.Y. 11724.

It is a pleasure to welcome a new journal which is a joint publishing and editorial venture between Cold Spring Harbor Laboratory and the British Genetical society. It is scheduled to appear monthly in the now fashionable large format of 11 × 8½ inches (not quite a standard size, e.g. *Nature* was ¼ inch taller and narrower, but shed ¼ inch of height two years ago). The paper is of a semi-glossy high grade which gives high quality reproduction of colour as well as black and white photographs; the print, in two columns giving some 1000 words per page, is easy on the eye, and there is no feeling of crowding to save space on the page. The figures are often larger than they need to be for clarity, but I must admit to liking them the way they are – it gives the impression that good