box-binding protein (TBP), UBF/SLI, and the mediator (9–13, 20–22). A number of more specific activators/transcriptional regulators are also included: yeast GCN4, GAL4 & GAL11 (31, 35); *Drosophila* heat shock protein HSF (34); rat CCAAT/enhancer binding protein (29); serum response factor SRF which has a novel DNA binding domain (33); the leucine-zipper containing Fos/Jun components of AP-1 (30); and viral activators (26).

Eukaryotic regulatory networks. A considerable portion of book two of the monograph is devoted to this important and fascinating aspect: mating-type interconversion in yeast (36, 37); *Drosophila* development (45); retinoid and steroid receptors (42, 43); myogenesis and endodermal development (39, 40); and the multifaceted regulation of viral-induced human interferon synthesis (44).

If pressed to choose a 'favourite' amongst this impressive compendium, I would have to plump for the article by Charles Yanfosky, both for the historical perspective and the treatment of transcriptional regulatory mechanisms in prokaryotes and eukaryotes (1). Nevertheless, it is really not appropriate to single out a *pièce de résistance* given the high standard of *Transcriptional Regulation* throughout.

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Molecular Genetics of Drosophila Oogenesis. By PAUL F. LASKO. CRC Press and R. G. Landes Company, Georgetown, Texas. 1994. 120 pp. Hard cover price £74. ISBN 1 57059 032 X.

The differentiation of the oocyte is one of the most intriguing problems in Developmental Biology. The *Drosophila* oocyte is arguably the most complex cell in the organism and is the only cell with the capacity to build all the cell types of the larva and fly.

The detailed morphology of oogenesis has been well documented. A germ-line derived stem cell divides to generate a cluster of 16 cells, one of which will become the oocyte and 15 which will become nurse cells. The cluster is surrounded by somatically derived follicle cells. This egg chamber functions as a unit. The nurse cells produce many of the components needed to build the oocyte and subsequently the embryo. The follicle cells produce some components of the egg, such as yolk and the external covering. However, the commune of cells does not just provide the building blocks for an embryo, such as yolk, ribosomes and materials for permitting rapid mitosis after cell division, it also sets up a complex organizational system such that very early in oogenesis the oocyte has obvious axes. The anterior/posterior and dorso-ventral axes are apparent early in the assembly of the oocyte and these same axes are determined in the developing embryo.

The study of mutants which disrupt oogenesis and embryogenesis in *Drosophila*, along with the tremendous advances in molecular biology, has provided the basis for a leap forward in our understanding of how the axes and segmentation of the embryo is assembled. It led to the molecular evidence that morphogenetic gradients, so long assumed to be present from experimental interference with development, were real.

The anterior/posterior axis is defined by localized mRNAs being translated after fertilization into proteins which establish gradients, for example, the products of the *bicoid* gene at the anterior and of *nanos* at the posterior. Many other gene products are required for the correct localization of the transcripts which are produced in the nurse cells and transported into the oocyte. The function of *bicoid* and *nanos* proteins is to turn on the appropriate zygotic genes in the correct regions of the embryo to build the head, thorax and abdomen.

The establishment of the extreme anterior and posterior regions of the embryo involves signalling from specific follicle cells lying at the anterior and posterior of the oocyte. Activation of the responding zygotic genes requires the local activation of an oocyte surface ligand followed by a signal transduction cascade. For dorso-ventral polarity a receptor is present throughout the oocyte membrane; localized proteins made in the ventral follicle cells secreted into the space between the oocyte and vitelline membrane lead to the local activation of the receptor. This in turn leads to a cascade of events in the oocyte that causes a transcription factor to enter the nuclei on the ventral side and establish the correct gene expression for products required in dorsal and ventral cells.

These pathways that establish the axes of the embryo are well understood and now the questions become: 'What has been happening earlier in development to determine the sex of the germ-line and ensure that an oocyte develops; how is regionalized follicle cell gene expression achieved; how does one cell become the oocyte and others develop into nurse cells; how is the position in the egg chamber of the presumptive oocyte selected; what drives the complex morphogenetic movement of the follicle cells; how are materials transferred to the oocyte at specific stages in oogenesis from the nurse cells and how exactly are specific transcripts localized?' These problems are now being tackled and we are beginning to discover that the oocyte is an active participant in, for example, signalling to the overlying follicle cells the position of the nucleus, which is always anterior and dorsal, thus setting up a signal transduction cascade that affects cell behaviour and transcriptional activities of follicle cells.

It is these fascinating problems and others concerned with what we know about the establishment of the germ-line (which is integrally linked to the establishment of the posterior of the embryo) and about the products needed for early mitosis in the

embryo which are the subject of this book. Paul Lasko has made a careful and thorough review of the area that is up-to-date – and rapid publication has preserved this – so the information is current. The facts are generally accurate, though I am a little concerned that the emphasis on the regulation of yolk protein gene expression by hormones is on juvenile hormone, when ecdysone is equally important. The book concentrates very much on the genetics and molecular biology of oogenesis, and the role of hormones, which are inevitably involved, is rather neglected. This is probably justified given that we do not yet understand what the hormones are doing.

That 40 pages of this 120 page book are dedicated to references is testament to the fact that much is happening in this area. It is also valuable to have a review of the whole area together. Such a book is really a long review. It has an advantage over publications from meetings covering a topic, which would often tackle an area such as this, in that it is all by one author, so there is one style, no overlaps and no gaps. However, the very fact that the area is so full of activity will mean that it dates very rapidly. If it were a cheap paperback accessible to graduate students, undergraduate teachers and even some very keen undergraduates to annotate as things develop, it would be very useful. The fact that it is the hardback with a very high price tag will put in firmly in the library – which is a shame!

The quality of the print is poor, so the photographs are not very clear, and I think the book would have benefited from a few more diagrams and illustrations. It is fine for those who already know, but to the newcomer the actual pictures of localized mRNAs and protein gradients convey the real excitement of the advances in understanding oogenesis much better than words.

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Gene Targeting: A Practical Approach. Edited by ALEXANDRA L. JOYNER. Oxford University Press/ IRL. 1993. 234 pages. Price Paperback £19.50. Also available in Hardback. ISBN 0 19 963406 8.

It is only 13 yr since embryonic stem (ES) cells were first isolated (Evans & Kaufman, 1991), 10 since the first report of germ line transmission (Bradley *et al.* 1984), and 7 yr since the first animal models following *in vitro* mutagenesis of ES cells (Kuehn *et al.* 1987; Hooper *et al.* 1987). The first targeted modification was introduced to the mouse germline as recently as 1989 (Thompson *et al.* 1989). In the intervening 5 yr the number of targeted loci have risen well above 100. Gene targeting has almost become a standard laboratory technique which most molecular biologists will need to address at some point in their careers. The need, therefore, for a practical manual such as *Gene Targeting* as a companion to the earlier and excellent *Teratocarcinomas and Embryonic Stem Cells* (IRL Press 1987, ed. E. J. Robertson) is indisputable.

Three other recent volumes deal with the general subject of gene targeting: *Gene Targeting* by John Sedivy and Alexandra Joyner, *Embryonic Stem Cells: Introducing Planned Changes into the Animal Germ Line* by Martin Hooper and *Methods in Enzymology, vol. 225* edited by Paul Wasserman and Melvin De Pamphilis. Those planning to attain expertise in every aspect of ES technology would be well advised to consult them all. *Gene Targeting*, however, contains most of the information required to design and build targeting vectors and is particularly well-suited to the reader who is new to targeting but may have made collaborative arrangements with others who have expertise in ES culture and proven success with germline transmission. The reader should bear in mind that while the molecular biology of gene targeting is actually quite straightforward, the appropriate technique for routine handling of ES cells is less easily acquired and remains most problematic.

In common with others of the same series, *Gene Targeting* contains chapters contributed by leading groups with proven experience in different aspects of gene targeting: vector construction, production of targeted clones, production of chimaeras, production of completely ES-derived fetuses, and gene and enhancer trap strategies. Placed somewhat incongruously within these, is a chapter dealing with analysis of gene transfer in bone marrow stem cells – an excellent treatment in itself, but of little direct relevance to gene targeting until haematopoetic stem cells can be purified in culture.

The fast pace of advancement in gene targeting means that any book on this subject is doomed to rapid obsolescence and clearly the authors cannot be faulted on that score. *Gene Targeting* already predates the successful use of the double replacement strategy to replace one sequence with another (Stacey *et al.* 1994), indeed, this strategy is not discussed in the otherwise comprehensive discussion of targeting vectors in chapter 1. It also predates germline transmission and expression of a yeast artificial chromosome containing human sequences (Jacobovits *et al.* 1993). In the chapter on production of targeted clones and again in that dealing with production of germline chimaeras, the authors imply that growing ES cells on inactivated feeder layers is absolutely necessary for efficient germline transmission. Readers should be aware that for certain cell lines this is clearly not the case. All of the knockouts generated in Martin Hooper's and David Melton's laboratories, for example, have used targeted ES clones isolated and cultured entirely without feeders. Notably, the ES line HM1, which was weaned from feeders at third passage, has given high levels of germline transmission following a two step targeting procedure (Stacey *et al.* 1994).