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Book reviews

Drosophila: A Laboratory Handbook. By MICHAEL ASHBURNER. New York: Cold Spring Harbor Laboratory. 1989. 1331 pages. Price $180.00. ISBN 0 87969 321 5.

Drosophila: A Laboratory Manual. By MICHAEL ASHBURNER. New York: Cold Spring Harbor Laboratory. 1989. 434 pages. Price $50.00. ISBN 0 97969 322 3.

Price for the set: $230.00.

This book is essential for every fly lab. It is a remarkable piece of work in its depth and coverage. Michael has produced alone the type of coverage that is usually associated with multi-author volumes and has done it exceptionally well. He covers the genetics and developmental biology of *Drosophila* in sufficient detail not to send you back to the old literature after the first page on any topic, which happens with so many handbooks. If you do decide you want to know more it is very thoroughly referenced to enable you to find the original papers.

Michael has always been a 'walking *Drosophila* manual' for me and many others, always available at the other end of a phone. Whatever obscure fact I've been searching for or material I've been trying to obtain he has always known the answer or where to find it and who to phone who may just still have a particular stock or library. These phone calls have saved me incredible amounts of time and the book is the same: everything you decide you want to know about *Drosophila* is there. In fact when you look something up all sorts of fascinating things you didn't think you wanted to know catch your attention and you end up reading about something else. The friendly style of presentation is very accessible. The sheer volume of information hasn't caused a degeneration to lists of facts. It is readable even in some of the areas of chromosome mechanics where one might think this could not be achieved. Michael should have more time to do other things not only because he has finished his book, but because fewer of us in the field should have to keep pestering him because he remembers things we've forgotten!

There really is little to criticize in the book, so what we will do is describe what is covered and point out a few picky details that could be improved/included next time.

Chapters 1–4 are introductory in nature explaining how the handbook came about and the basics of *Drosophila* terminology. The more detailed chapters begin with an analysis of *Drosophila* chromosomes, describing the chromosomes themselves (mitotic, meiotic and polytene) and the techniques used to visualize them. The next block of chapters concern Molecular Biology, Tissue Culture and Developmental Biology. The Molecular Biology chapter covers the genome size, satellite DNA, ribosomal RNA and ribosomal proteins genes, mitochondrial, DNA, transposable elements and viral genomes. It contains some very useful information, for example the codon usage tables for *Drosophila* will be much used for designing oligonucleotides. It is a pity that the restriction maps of transposable elements do not carry a scale, though their size is given in another table, so the information is there. This chapter obviously could not cover the exponentially growing field of *Drosophila* molecular biology so information on gene organization and gene expression of individual genes, clusters of genes and small gene families has been omitted. Tissue Culture describes primary culture and the many cell lines that have been made. Details of how to make cell lines and deal with them, including transfection with DNA, are given.

Developmental Biology, whilst a large chapter, like that on molecular biology, concentrates on the essentials and not on the vast collections of data on experiments interfering genetically and experimentally with the developmental process. There are brief details of the staging systems used for oogenesis, spermatogenesis, embryogenesis, larval and pupal development, some details on how environmental factors can influence development and details, such as they are, of hormone titres, throughout development. There is then a lengthy presentation of techniques used to study development, including details of working with specific tissues, and the basics of anaesthetization and sexing of animals.

There follows an excellent block of chapters about *Drosophila* genetics. This really is not covered well anywhere else and it is very valuable to see all the ways the genome can be manipulated so clearly laid out.

Mutagens and the types of mutation they produce are analysed, and some breeding schemes for detecting specific types of mutations are included. With this chapter you could design and run a mutagenesis experiment with no previous knowledge of *Drosophila*

genetics. The mutant alleles which can be obtained from such schemes are described and classified into lethals, steriles and suppressor/enhancer mutations.

Mapping and genetic exchange is one of the chapters in this group on genetics which will be valuable well beyond a specialist *Drosophila* lab, as it covers all the principles of genetic mapping and the establishment of linkage groups, and the calculation of genetic map distances. Factors influencing recombination frequencies such as maternal and genetic background are important for analysing data. Fine structure mapping is included and details of detecting very rare recombination events are covered. Gene conversion, male recombination and mutations affecting meiotic exchange are all included in a very readable way. The all-important step of virgin collection for all of these experiments is covered and must be read by all newcomers to *Drosophila* genetics.

There are a series of chapters on chromosome biology, the tricks of the *Drosophila* trade. Mostly they refer to *Drosophila melanogaster* but what is available for other species is always covered. How to detect and recover inversions and how they affect recombination is accompanied by lots of practical hints on how to deal with particular problems. The specific balancer chromosomes used in the lab, what you can do with them and the advantages and disadvantages of each are explained. This gets a little more complex and probably beyond the scope of the beginner as he moves on to translocations, their nomenclature, recovery and maintenance. Deletions are another important part of studying *Drosophila* genetics, the sizes and severity of their effect are described along with how to recover and create deletions and their effects on genetic exchange. Duplications are rather more variable in their effect than deletions, again the types of duplication available, how to recover them and their uses are described in depth. A brief description of transposons and transposition within the *Drosophila* genome is presented making it clear there are many more elements than the retroviral families and P elements we are most familiar with.

There is a lengthy analysis of compound X-chromosomes used widely to study meiotic processes and in stock maintenance. Again, this is beyond the scope of the beginner but clearly explains how a compound X is constructed and its properties. The organization of the Y chromosome, which is needed for male fertility but not male development is included. The ways in which Y chromosome rearrangements can be used and how to use markers translocated from other chromosomes to compensate for the lack of conventional markers on the Y are interesting, but should probably be tackled after reading the chapter on compound X chromosomes. Some topics are also introduced like position-effect variegation which the non-*Drosophilist* may not be familiar with. Things then get even more sophisticated and move on to compound XY chromosomes, the complexities of XY genetic exchange, and ring chromosomes and their uses. Fortunately the diagrams are very good in all of these chapters.

Having dealt with the sex chromosomes, the book moves on to the same thing with the autosomes. There are then very specialized sections on unusual recombination events, for example between a normal and mutated chromosome, and failures in normal sex chromosome segregation. Haploid cells, tetraploid flies and methods for producing triploid stocks and how these chromosomes then segregate and recombine at meiosis are followed by a description of spontaneous and induced genetic recombination in mitotic cells and how these can be used to screen for mutations.

Transvection is an unusual phenomenon which has fascinated Michael Ashburner for some time, so it is not surprising to see a whole chapter devoted to it. What happens is that two alleles which normally complement or partially complement each other show a more severe phenotype when one allele is associated with a chromosome rearrangement, presumably resulting because somatic pairing between homologues is disrupted. Although only observed in a few well-studied genes it may well be more widespread throughout the genome and is certainly an interesting area to be unravelled.

Genetic mosaics are valuable for studying gene expression during development and methods for making them by chromosome loss, mitotic recombination and nuclear and cellular transplantation are included along with the essentials for making the cells and analysing the results. There is good coverage of the PM, IR and Hobo systems of hybrid dysgenesis and the elements responsible for them. Of practical importance is the use of the PM system for the production of transposon-tagged mutations for subsequent cloning. Using the PM system to integrate DNA into the genome of *Drosophila* is also described. Some of the P-element vectors for transformation are presented in detail as are other transformation systems.

Artificially induced copies of genetic mutations, namely phenocopies, are covered though at present this is not a frequently used approach.

Though most of the work and techniques are directed to *Drosophila melanogaster*, some 3000 species belong to the Family Drosophilidae. The species and subgroups are introduced as well as the general taxonomic characteristics of the families. Brief descriptions of the families and some analysis of the divergence and geographical distribution is included in this guide. There is a good bibliography of relevant literature. The *melanogaster* species group and the subgroup, their geography, identification and general characteristics are described.

The concluding chapter is on the all-important pests and parasites that can affect *Drosophila* stocks –

unfortunately it does not include a magic foolproof way of getting rid of them all.

With the main textbook comes a comb-bound book of protocols. This is a collection of techniques commonly used in *Drosophila* labs. It is probably more useful to a new lab than an established one as most people have a set of techniques with their own modifications to optimize procedures for the precise system they are studying.

The techniques cover chromosomes, molecular biology, tissue culture, developmental biology and transformation. The molecular biology section is very short, which is reasonable with so many manuals available on common molecular techniques which are rarely unique to *Drosophila*. But it is a point which potential purchasers should be aware of. It will not be sufficient to have just this collection of protocols as your laboratory manual for all areas of *Drosophila* research.

Sometimes there is more than one protocol for a given technique and some comment on the conditions when each might be more appropriately used would be helpful. I think it is doubtful, for some of these procedures such as preparing chromosomes, *in situ* hybridizations to embryos or dissociating imaginal disc cells, whether a 1- or 2-page protocol can really serve as more than a starting point, and nothing can substitute for a visit to an experienced lab routinely using the techniques where the 'tricks of the trade' can be learned. There are useful appendices of recipes for solutions and lists of suppliers; again some guidelines on when to use which recipe, e.g. Ringers, might be valuable.

In summary, everyone doing *Drosophila* research needs this book in their laboratory not just in the library. Many people teaching genetics and developmental biology in a more general context will also find it valuable.

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Locus Maps of Complex Genomes: Genetic Maps, 5th Edition. Edited by STEPHEN O'BRIEN. New York: Cold Spring Harbor Laboratory. 1990. Published in two forms: (1) Complete version of 1103 pages. Cloth-bound. $150. ISBN 0 87969 338 X. (2) As six paperback volumes with the following contents: *Book 1 – Viruses,* 185 pages. $27. ISBN 0 87969 342 8. *Book 2 – Bacteria, Protozoa and Algae.* 137 pages. $27. ISBN 0 87969 343 6. *Book 3 – Lower Eukaryotes.* 205 pages. $27. ISBN 0 87989 344 4. *Book 4 – Non-Human Vertebrates.* 179 pages. $27. ISBN 0 87969 345 2. *Book 5 – The Human Maps.* 261 pages. $27. ISBN 0 87969 346 0. *Book 6 – Plants.* 151 pages. ISBN 0 87969 347 9.

It is a great pleasure to welcome the new edition of *Genetic Maps*, still under the editorship of Stephen O'Brien, who has looked after the successive editions published in 1980, 1982, 1984, 1987 and (now) 1990. His preface makes it clear that the series is to continue, and I look forward to seeing the sixth edition displayed at the 1993 International Genetics Congress in Birmingham (UK). Each new edition is designed to make the previous one obsolete, and is not simply an appendix adding lists of new genes, RFLPs and references. This new edition of 1100 pages (360 more than the last) is available in two forms as described above, the complete cloth-bound volume being too bulky to be easily stolen from a library, while the paperback sections should survive a few years of rough treatment on the laboratory bench.

We now find about 150 organisms (given a little uncertainty about the number of different viruses), 200–250 maps, including in some cases nuclear genes, mitochondrial genes, cloned genes, restriction polymorphism and *in situ* hybridization data. New organisms include a Bacillus phage (ϕ29) whose complete DNA of 19285 bp has been sequenced, three fungi (*Magnaporthe grisea* – a blast fungus, *Phycomyces blakesleeanus* and *Schizophyllum commune*), two insects (*Anopheles quadrimaculatus* and *Nasonia vitrepennis*), the Mongolian gerbil, the fishes *Fundulus* and *Lepomis*, and the plants *Lactula sativa*, *Brassica oleracea*, *Pisum sativum* and *Secale cereale*.

In a few cases there has been no updating, e.g. Phage Lambda, *Proteus mirabilis*, *P. morganii*, *E. coli*. In contrast to the last of these, *Salmonella typhimurium* has 166 new genes added to the previous list of 587, indicating much recent activity; and I suspect the same may be true of *E. coli*, whose map here is dated 1984. T4 phage reports an increase from 60 to 85% of the genome sequenced, but no other T phages get a mention and readers may forget that they ever existed in the laboratory test-tube. Phage Mu should certainly have been included, but progress is shown for phages P1, P2, and P4 (whose complete DNA sequence of 11627 bp has been determined). DNA and RNA viruses are, of course, being very actively pursued, and the 100 pages on animal viruses contain a wealth of information as recent as could be included at the times of writing, too complex to be summarized here. It should be noted, however, that information on the animal RNA tumour viruses is restricted to the 24 restriction maps published in the previous edition. There is no mention of any plant viruses or other plant parasites – shouldn't this gap be filled?

Gene lists on the great majority of organisms included have been updated to mid or late 1989. So there is plenty of stimulating new information for the