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Book reviews

Genetic Variants and Strains of the Laboratory Mouse, 2nd edition. Edited by MARY LYON and ANTHONY SEARLE. Oxford University Press. 1989. 876 pages. Hard cover £90. ISBN 0 19 854204 6.

The first edition of this book was published nine years ago, and the new, greatly expanded edition has come out at a very appropriate time, when the 'new genetics' is taking a firm grip on the mouse and is involving new laboratories, techniques and technologies. This edition is obviously a major landmark, to which ready access will be essential for everyone working in the many branches of mouse genetics. The Mouse Fancy – whose fancy strains started the whole subject – those with an interest in rodent evolution, and many other geneticists and biologists will also find the book interesting and instructive to dip into.

No branch of genetics can develop properly without a logical system of naming loci, genes, alleles, etc., designed so that it can evolve along with research progress. The mouse fraternity were fortunate to be set on the right track by Dunn, Grüneberg and Snell in 1939, and to have been bullied into conformity by an international committee, which has I think sat ever since (I expect I shall be told that no bullying was needed). The result is the three chapters (1, 10 and 14) by Mary Lyon on the rules and guidelines for naming genes, chromosome anomalies and inbred strains, and also the impression gained of order and logic which pervades the book – and this certainly eases the reader's task in getting to grips with a very complex subject. From my own experience as an editor. I know that it can be very difficult to get agreement on gene terminology among different teams and individuals, and I hope that geneticists working on certain other organisms will take a lesson from the mouse.

Mouse geneticists will know broadly what to expect to find in this book, so I will concentrate on information which should be of interest to others, noting which chapters are new to this edition. The most important chapter (2) is the catalogue of mutant genes and polymorphic loci by Margaret C. Green, which is a considerable expansion of her catalogue in the first edition. It occupies 393 pages, gives details of the mutant alleles at each locus, with their phenotypes, and includes ample references given after each locus. A helpful innovation is the page headings giving locus symbols, which enable one to find one's way easily about the catalogue. Searching out the genes you want, by character, is facilitated by Table 2.1, listing the 1450 or so loci by their phenotypic effects; among these categories we find cell-surface antigens, viral, disease and tumour resistance, immune defects, oncogenes and viral integration sites, endogenous viruses, DNA sequences and transgenes, as well as the more old-fashioned classes of phenotype. Just browsing among all these genes is an absorbing pastime.

Chapter 3 (new) gives details of 110 retroviral and cancer-related genes, with the host strains and chromosomes carrying them, and shows their map positions where known. Chapters 4 and 6 give the complete mouse linkage map (showing the locations of 965 loci in the total chromosome length of 1600 cM), and the summarized recombination data and chromosome assignments on which the map is based; we are reminded that the first linkage in any vertebrate was established in the mouse in 1915. Chapter 5 (new) gives special attention to the map of the *t*-complex, which I am glad to welcome as a still intriguing mystery. Chapter 7 (new) will be of special interest, since it gives the linkage and synteny homologies in mouse and man so far identified (201 markers mapped in both mouse and man are listed and their locations in the various mouse chromosomes shown where known). Apart from the general list of these genes in Table 7.1, Table 7.2 gives linkage conservation of autosomal genes – i.e. a listing of segments whose linkage has been conserved since divergence of lineages leading to mouse and man – Table 7.3 lists conserved autosomal syntenic segments, and Table 7.4 gives examples of changes in gene order between mouse and man. Nadeau and Reiner, the authors of this chapter, derive some interesting estimates from these data, which may lead to critical arguments; thus the mean and standard error of the lengths of all conserved automosomal segments in the genome are estimated as $10{\cdot}4 \pm 2{\cdot}4$ cM, and the number of linkage disruptions that have occurred since the divergence of the mouse and man lineages is estimated as 134 ± 35, which corresponds to about 0·96 disruptions per million years (myr) and is equivalent to 0·48 reciprocal translocations per myr. Table 8 in chapter 8 (new) gives 15 pages of detailed information on probes that reveal variant fragments in mouse DNA (i.e. RFLPs); and chapter 9 (new) discusses the highly repeated DNA families in the *Mus musculus* genome.

Chapters 11–13 give full details of normal and variant mouse chromosomes, the latter including numerical variants and structural rearrangements.

Chapter 15 lists inbred mouse strains with their coat colour and mutant genes, and chapter 16 (new) gives a very interesting discussion of the wild house mouse and its relatives, covering the systematics of the genus *Mus* and the geographical distribution of its different taxa, inbred strains of wild mice derived from the different species, and chromosomal variants of feral origin. Chapter 17 gives the strain distribution of polymorphic variants for alleles of 338 loci in 246 inbred strains. This is a selected subset from the Jackson Laboratory computerized database, which (believe it or not) contains information on 426 polymorphic loci in 569 inbred strains and substrains, the selected subset being restricted to strains typed for at least 20 loci and to loci typed in at least 15 strains. The resulting table covers 98 pages and should surely satisfy most of those who can make use of this enormous mass of data.

Details of the Recombinant Inbred or RI strains are given by Benjamin Taylor in chapter 18. Some 23 sets of RI strains are listed, with substrains of each original cross ranging in number from 3 to 26, all of which have been inbred for between 17 and 97 generations (presumably by sib matings). As an example, 26 substrains have been inbred for 63–88 generations from the C57BL/6J × DBA/2J cross to form the BXD series. These 26 inbred lines have been typed, with a few gaps, for 163 loci which differ in the two progenitor strains. The mind really boggles at this extraordinary achievement, and my amazement is not reduced by seeing from Table 18.1 that 10 of these sets of RI inbreds, including the BXD set, are held by Dr Benjamin Taylor at the Jackson Laboratory. It should be said that the tables given in this chapter list the strain distribution patterns, i.e. the sublines which carry the allele from each progenitor strain, for virtually all the loci and sublines in 16 of the RI series.

Chapter 19.1 deals with immunologically important loci, and presents tables containing over 800 congenic strains, about 500 of which carry the H-2 complex as their differential locus. 'Altogether over 500 H-2 haplotypes are listed. This, undoubtedly, is the largest collection of congenic strains and haplotypes of any vertebrate, if not of any animal species altogether', to quote Jan Klein, author of this chapter. Chapter 19.2 catalogues the mutant genes and carrier strains maintained at different laboratories; and finally chapter 20 lists the subline codes for holders and producers of inbred or other genetically defined mice. An index of 20 pages in three columns ends the book, since the many lists of references have their very appropriate places after loci, tables and chapters.

I hope that my condensed description of what this book contains will encourage many of our readers to order this book for their library and laboratory or personal shelves. It stands out as an awe-inspiring monument to the labours of geneticists of several persuasions working with mice over the last half-century, and we owe much gratitude to the mouse, which has changed from a pest with the ability to make many people jump on to the nearest table with a shriek into potentially one of the greatest benefactors of mankind. I even suggest that geneticists should organize to collect money for a large physical monument to the mouse, with perhaps smaller monuments to *Escherichia coli* and *Drosophila melanogaster*.

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The House Mouse: Atlas of Embryonic Development. By K. THEILER. Second printing, 1989. New York: Springer-Verlag. 178 pages. DM 168.00. ISBN 3 540 05940 7.

In Science, as in art, understanding is often a process of mapping one area of knowledge on to another. When '*The House Mouse*' was first published in 1972 it was the definitive anatomical description of the development of this mammal. That the book soon went out of print is no reflection on its quality; there was no best-selling competing text. Rather, it indicates a restricted market in a relatively inactive field. The advent of gene cloning has created a period of new activity, one of understanding in which anatomy is coupled to molecular genetics in an adventure which aims to discover the origins of anatomical structure in terms of the activity of specific genes. In this enterprise the developmental biologist is armed with a variety of techniques, notably transgenics, *in situ* hybridization and immunohistochemistry. He most certainly also needs a chart of mouse developmental anatomy. Hence the reprinting of Professor Theiler's book.

The book describes the development of a consistent series of hybrid embryos (from inbred C57BL/6 females crossed with CBA males) carefully grouped into 28 stages, each described in a brief chapter. Development is covered from the one-cell stage (1–20 h) to the postnatal period (to 24 days post partum, with a separate chapter on postnatal growth). Each chapter is headed with an informative name for the stage described, a stage number, gestation age, and an indication of the roughly equivalent stage of human development. The description of each stage is shared equally by text and illustrations. The book contains 202 references with an addendum of 10 pages of selected bibliography, and a good index. The only significant addition to the original printing is the considerable expansion of the bibliography.

Each chapter describes the external features of the embryo and the progressive development of its organ systems with frequent, useful comparisons with human development. One of the best features of the book is that the anatomical descriptions are related to individual embryos. Each chapter lists, with their age, those specimens in the series that fall within the described stage. The reader is thereby equipped to