

browser. One interesting aspect is the variety of symbolism used in naming genes, and here *Caenorhabditis elegans* scores particularly well since the types of genetic defect observed fall into about 80 types which can be distinguished by three-letter symbols. Examples are *let*, *mel*, *sem*, *msh* and *aex*, respectively, for lethals, maternal effect lethals, sex muscle, major sperm protein and expulsion-defective mutations. This results in a very simple gene list, with numbers after each gene symbol indicating different loci with the same phenotype. 530 genes were listed in the last edition of *Genetic Maps*, and this has increased to 830 in the present volume. Also, our curiosity about what is new is easy to satisfy because each new gene is starred. Most of these are lethals, whose basis will doubtless be under intense study since they represent essential genes. The newcomer to this branch of genetics will find the recent book, *The Nematode Caenorhabditis elegans* (edited by Wood *et al.* Cold Spring Harbor Laboratory, 1988), makes essential and compelling reading.

Next in the list comes the fruit fly, for which Sturtevant produced the first linear genetic map of any organism in 1913, consisting of five genes on the X chromosome. The number of genes known is now probably well over a thousand, and rapidly growing with the analysis of the genes controlling very early development. A very useful list of biochemical loci gives details of their effects, where known, as well as position and references. I was pleased to find the genes 'sevenless' (symbol *sev*) and 'bride of sevenless' (symbol *boss*) but the presumably even more recently named genes 'son of sevenless', 'sisterless' and 'capuchino', in a very recent issue of TIG, were not there.

Students of *Drosophila melanogaster* enjoy such poetic names for their new genes, and they certainly stick in the mind, e.g. disco, dunce, eagle, easter, ellipse and gooseberry, even if they don't give you a clue as to what the gene does. It will be noted that many of the old morphological marker genes have now entered the biochemical list. The *Drosophila* maps in this volume must obviously be studied with Michael Ashburner's Handbook (reviewed in this issue of *Genetical Research*) on the bench beside you.

The chapter on the mouse gives an alphabetical list of genetic loci, a map of the genes located on each chromosome together with those known only to be on that chromosome shown below it, a list of the DNA clones and probes (taking up 29 pages), and a map showing the location of these clones/probes on each chromosome, except that there are too many to fit into the X chromosome map or that for the *t* region of chromosome 17. Further tables and a map give details of retroviral and cancer-related genes. This mass of information is up to date to spring or summer 1989; and again it can be more easily digested with the help of *Genetic Variants and Strains of the Laboratory Mouse* (edited by M. F. Lyon and A. G. Searle,

Oxford University Press, 1989). One can also link on to GBASE via Telenet to get the very latest information on mapping data and unmapped loci, mouse/human homologies, a map of the mouse genome with all known human homologies overlaid, maps tailored to your own individual requirements, etc.

The human genome data are if possible even more dramatic, with over 4800 genes identified at 15 September 1989; and I will simply mention the 'Oxford Grid', an ingenious diagram relating the homologous genes of man and mouse on different chromosomes, and the list and maps showing the morbid anatomy of the human genome, i.e. the disorders for which the mutation has been mapped to a specific site. About 550 of these are listed.

I have not said anything about plants, but recommend those listed to the reader's attention. The importance of continued genetic studies on these should be too obvious to need emphasis. In conclusion, one must congratulate all the contributors to these 1100 pages: many of them might easily have said: 'I have to concentrate on my own research'. The complete volume should be in every library and most active laboratories should have one or more of the paperback sections. Just to scan these pages makes one realize how thin our genetic information is when set against the magnificent variety of organisms which our species has not yet driven to extinction. If you want to know which is the smallest map in the book, it is that of the Mongolian gerbil, consisting of two pairs of linked genes.

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The Cattle of the Tropics. By JOHN P. MAULE. Edinburgh: can be ordered from The Senior Administrative Officer, Centre for Tropical Veterinary Medicine, Easter Bush, Roslin, Midlothian EH25 9RG, Scotland, U.K. 255 pages. £25.00 including postage. ISBN 0 907146 05 8.

The author of this volume is the former Director of the Commonwealth Bureau of Animal Breeding and Genetics, and is widely respected as a much-travelled expert on tropical livestock, particularly tropical cattle. He has now condensed his experience into a volume that will be a sound reference for students, and others, who wish to make sense of the vast amount of genetic variation that occurs in this class of livestock.

There are, we are told, some 740 million cattle in the tropics, though how anyone actually knows this is not clear to me. Those of us who are familiar with the temperate *Bos taurus* are frequently baffled by the array of breeds and their crosses that we see around. But when we move to the less familiar, not to say unfamiliar, *B. indicus*, *B. brachyceros*, *B. bibos*

javanicus and *B. Bibos frontalis*, and the many crosses among them, we are well and truly lost. We can only be grateful that John Maule imposes order on seemingly endless chaos. He sets out his criteria for classification and then proceeds to do so. Within each major type, he then identifies breeds and he groups those further by geographical location. The outcome is a description of some 300 breeds, though as the author rightly points out, the concept of a breed is somewhat loose and ill-defined. Be that as it may, you can now read about the characteristics of such breeds as the Tamakadua, the Umblachery, the Djakore, the Karamajong, the Romosinuano and some breeds of which you may never even have heard. It is, by the way, fairly easy to introduce these names to divert dinner-party conversation from the tiresome topic of BSE. There is nothing like creating the air that you really know your way around the cattle world, and this is much more effective than railing against friendly foreigners who have banned the import of British beef.

It is always tempting for those of a *Bos taurus* bias to regard these tropical cattle as a vast resource for transgenic work. Interesting genes must be there in some number, though how anyone is going to find them is far from obvious. This topic, quite rightly, is not John Maule's concern. He is concerned to improve tropical cattle for the job they are supposed to do in the areas where they occur. He raises some very important issues in the process.

When western technologists apply themselves to tropical cattle improvement, they have to guard against imposing the wrong technology on the system. But much more than that, what improvements do they seek? They may well concentrate on milk and beef – the only products with which they are familiar. This pays no heed to cattle as measures of wealth and the associated social status of their owners. Nor does it properly allow for the use of cattle as draught animals, or as providers of dung for fuel, among other by-products. Those of us accustomed to regarding cattle products as victuals can learn much from John Maule's discussion of how cattle are woven into the very social fabric of many tropical societies. Although he does not make the point specifically, this brought home to me that perhaps the main contribution of western society, in the longer term, should be through the training of people from tropical areas, who will understand intuitively what could and should be done

with tropical cattle without disrupting the societies who live by them.

There still exists the need to improve these cattle now and, true to form, John Maule does not shun the challenge. He reviews the evidence and provides the references – some three quarters of which come from the 1980s. He discusses in detail sensible selection criteria, and proposes workable breeding programmes, drawing a careful distinction between maximization and optimization. To me, knowing very little about the tropics, it reads like good, sound common sense. There is still an acute lack of information about a large number of indigenous breeds which the author feels may be useful. At the very least, he says, they should be evaluated. That, he points out, demands a recording system and valid comparisons, which in turn demand a structure, organization and a degree of literacy that are not always on hand. Truth be told, one need not go to the tropics to find limitations on these scores, as anyone who has ever analysed field data will be well aware.

The author's own preference throughout this volume is that indigenous breeds should receive much more attention in improvement programmes. These cattle are well adapted to local conditions, and are resistant to (or perhaps tolerant of) various pathogens and parasites. That apart, the author claims that crosses with *Bos taurus* are often not a solution, because of their management requirements and particularly because of the ensuing high costs of production. He claims further that the use of *Bos taurus* crosses to create new breeds has been of only limited success, so far. I cannot dispute this, though exceptions like the Santa Gertrudis, the Jamaica Hope and the Australian Droughtmaster readily spring to mind. But perhaps the development of these and other successful breeds were associated with more favourable management, which the author emphasizes is essential if *Bos taurus* genes are to be exploited. He provides a very useful section on management requirements.

Given the quality of the paper, the half-tone plates have come out very well, and are uniformly instructive in depicting the various breeds. My favourite is plate 38, showing the author looking dangerously fit, a lot fitter in fact than a cow of the Kedah-Kelantan breed he had just haltered. That cow did not stand a chance.

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