discussed, which include genetic expression of endosperm traits (Mo Huidong), differential response to environmental stress (Baker), the genetic basis of environmental sensitivity (Jinks & Poona), metabolic control in quantitative genetics (Dean *et al.*), quantitative characters in Salmonids (Gjedrem *et al.*), three articles on quantitative genetics in trees (Van Buijtenen; Burden; Müller-Stark & Gregorius), and microevolution of vertebral numbers in the garter snake (Arnold).

We come finally to mathematics, theory and generalities. Kempthorns, in an overview of the field, finds the theory too simplistic and looks to help from the massive use of supercomputers; Hill & Keightley examine in depth models for predicting response to selection and the maintenance of variation, Lande discusses the development of quantitative genetics in relation to natural selection and evolution. Mathematical teeth will be needed to cope with Henderson (progress in statistical methods since 1976), Kennedy & Sorensen (mixed model methods for predicting genetic merit), Ratner (selection and stochastic trends), Karlin (non-gaussian models), Melchinger (means and variances in hybrid populations), Wu & Li (an operational genetic theory of heterosis), Zhivotovsky (analysis of correlated characters), but they can finish with Turelli's paper on population genetic models for polygenic variation and evolution.

I hope my catalogue of topics will persuade many geneticists that they will find something of interest in this book. Molecular genetic applications may make the classical plant and animal breeding experiments redundant within a few years, and may also reduce the importance of mathematical theory. But the new techniques will not be able to control the numerous genes of small effect which, we must assume, will continue to play a major role in evolutionary and artificially induced changes in quantitative characters. And finally, the book is very well edited, by the four editors and seventy-three referees, handsomely produced and cheap in its paperback form, and, of course, there is no other book like it!

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Current Communications in Molecular Biology: Viral Vectors. Edited by YAKOV GLUZMAN and STEPHEN H. HUGHES. New York: Cold Spring Harbor Laboratory. 1988. 180 pages. Paper $20.00.

This latest volume in the *Current Communications in Molecular Biology* series contains thirty articles describing a wide range of viral vectors. No article in the paperback-sized book is larger than seven pages and each is limited to no more than three figures. In general this makes the articles concise and to the point. As a result these articles contain the information that a practising molecular biologist requires.

The most striking feature of this book is the lack of any article devoted to small DNA viruses SV40, Polymer or BK. These viruses still have uses as vectors, particularly in stable transfection systems with dominant markers and transient assays; and SV40 is probably still the most suitable vector when combined with a COS cell system for the rapid analysis of gene expression. There is still room for improvement in these vectors by removing restriction sites and inserting polylinkers. One suspects that most biotechnology companies have produced their own suite of vectors for this purpose.

Two chapters on bovine papilloviruses (BPV) open the book, but it is clear from these and the introduction by Stephen Hughes that long-term application of this virus is limited by its restricted host range and its rather unpredictable habit of integrating instead of remaining extrachromosomal. Epstein–Barr virus (EBV) is an improvement on BPV, having a broader host range and greater stability. A new generation which incorporates the orilyt replication origin is described by Sugden's group. When induced, the stable copy number of approximately 50 per cell is increased by a factor of 500–1000; how this increase in copy number influences protein production is not yet known.

The major class of vectors discussed in *Viral Vectors* are the Herpes viruses and retroviruses. The large Herpes-like DNA viruses are likely to have a role in the development of vaccines. Pseudorabies viruses which do not infect humans could be useful for livestock; as an experiment, Post & Thomsen report on the expression of TPA in such a vector. An increasingly important aspect of recombinant protein production is authentic post-translational modification. In this respect Baculovirus, which grows in insect cells, can be very useful: the book describes examples of biologically active E1A, EGF receptor and protein kinase C produced in this system.

Retroviruses which have in the past promised much (and have been much hyped!) as a system for introducing genes into cells and animals have still not yet made their mark, despite the extremely elaborate constructions of double promoters and sophisticated packaging cell lines. Perhaps the most exciting development in animal viral vectors, described in *Viral Vectors* by Schelsinger *et al.*, is the use of Sindbis Virus as a vector. This single stranded RNA virus can be manipulated to produce up to 0·5 mg of chloramphenicol-acetyl-transferase (CAT) in 24 h from 10^9 cells.

Plant vectors occupy three of the thirty chapters in this book. Cauliflower Mosaic Virus (CaMV) turns out to have similarities to animal retroviruses in that replication involves reverse transcription and a double-stranded DNA intermediate. However, making viral vectors is difficult due to the small amount of disposable sequences. The CaMV 35S promoter and transcription terminator directs efficient expression of

foreign genes in many plants. Maybe the most efficient system for transformation of plants will be to use single-stranded RNA viruses (like the Sindbis Virus used in animal cells). Ahlquist *et al.* show that these viruses can be constructed and manipulated by means of biologically active cDNAs made from a broad host range virus such as Brome Mosaic Virus which can infect barley, wheat and other cereals.

As is inevitable with such a book in a fast-changing field several new innovations are not included or have been published elsewhere. For example improved Sindbis vectors were described in *Science* in early 1989 and the incorporation of DNaseI sensitive sites into vectors to allow tissue specific expression are not included in the book. However, *Viral Vectors* is well worth reading for anyone who wishes to know how to express a gene in animal or plant cells.

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