Genet. Res., Camb (1995), **66**, *pp.* 277–281

Book Reviews

Patenting of Human Genes and Living Organisms. Edited by F. VOGEL and R. GRUNWALD. Springer-Verlag. 1994. 244 pages. Price DM80.00, öS 624.00, sFr 80.00. ISBN 3 540 58148 0.

As geneticists none of us was trained as accountants, actors, salesmen or lawyers, nor did we enter science in the belief that these skills were necessary or important to us. The days have, however, long gone when we could build a successful career by locking ourselves away in a lab for 40 years with one technician and producing two papers a year. Although some fight rearguard actions, for most of us the real world has come flooding into our laboratories in the last 30 years and we have quickly had to learn new skills in which we were not trained nor perhaps had the aptitude for. No area epitomizes this more than the exploitation of intellectual property. The area is a complex one for scientists unfamiliar with the philosophy of patent law but it is not only of increasing importance as Government policy pushes towards technology transfer (there were 23 articles/reports on 'patenting' in *Nature* alone in 1994) but also runs into a wide range of public concerns about the ethics and dangers of biotechnology.

A book covering the wide range of issues involved must therefore be a welcome contribution to our understanding as scientists. It is a report of a meeting in Heidelberg in July 1993 with contributions from scientists, breeders, industrialists, lawyers as well as those concerned with ethical and social issues. Besides the papers from the meeting there are the full reports of the round-table discussions where the differing views on the more complex and contentious issues can be seen. There are, however, some reservations: it takes a rather European (and in some cases German) view of the area and, in the intervening two years some of the issues have moved on considerably – the NIH/Ventner patent application for 30000 anonymous partial cDNA sequences has fallen by the wayside and the draft EU directive on patents in biotechnology has been rejected by the European Parliament leaving the situation in Europe confused.

Nevertheless major topics of interest and concern are covered by experts in the field. Several chapters cover legal aspects and clear up much of the misunderstanding of what patenting really means. A patent needs an inventive step (not obvious to the average practitioner in the field) and not just a discovery; it has to be 'reduced-to-practice', i.e. capable of being used, although it does not give a right to use only to prevent others from exploiting it; complete disclosure of the inventive step is required (in the case of one of our patents a journal only allowed about 500 words to describe the technique; the patent runs to nearly 40 pages); a patent does not prevent use in pure research. As one author says: patent law can be seen as 'neutral' – a patent does not exclude an invention from other legal restraints on its use; although most countries will not allow patents contrary to *ordre public*, there are extremes (such as patenting terrorist devices).

Several chapters cover in detail some of the more controversial recent patents and the perceived or potential effects in such areas as pharmaceuticals, somatic gene therapy, plant/animal breeders' and farmers' rights, socio-economic problems in the developing world, and biodiversity and ethics/morality. Many of these issues are not new and do not apply to biotechnology alone and many of the misunderstandings are cleared up. The generic nature of molecular biology causes many of the problems: the concept of a gene unique to a single species is completely broken as genetic modification *in vitro* changes gene sequence at will and our understanding of what is, for example, a human gene versus a mouse gene or an animal versus a plant one. Patenting also works at many levels: the gene and its use, the hybrid gene constructs with novel functions, the technology for gene transfer as well as the transgenic organism itself; 'transgenic' microorganisms were patented as early as 1980. Plant and animal breeders already protect their products by producing hybrids which are not easy for farmers to propagate themselves. All modifications of organisms and their use or release are covered by a raft of regulations, animals by additional ones covering animal experimentation and welfare to the extent of forbidding modifications common for hundreds of years using classical animal breeding techniques (for example 'the doubling muscling' in the Belgium Blue breed). Modern farming techniques and the internationalization of industry have already had a major socio-economic impact on small companies and farmers in Europe and on the biodiversity

of animals and plants; biotechnology is just the latest of these forces and may conversely provide a range of new techniques to deal with some of the problems. And finally, many of the pharmaceutical inventions of the past, that have so positively contributed to healthcare today, would not have been possible without companies being able to protect their investment in R&D; as biotechnology becomes more complex requiring more investment the same conditions will apply.

I recommend this book to all scientists concerned about the issues of IPR; although it suffers as being a report from a conference and not a well-balanced overview, it gives valuable information in an important and fast-moving field that cannot be gained elsewhere. We can be sure that the pressures on scientists to 'transfer technology' and to demonstrate that basic research 'creates wealth' are going to increase and, whether we like it or not, patenting is here to stay and we had better understand it and control it to our advantage.

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The Encyclopedia of Molecular Biology. Editor in Chief Sir John Kendrew. Blackwell Science. 1994. xxiv + 1165 pages, Hardback. Price £99.50. ISBN 0 632 02182 9.

If you want to become a molecular biologist, have time to spare and live near a suitable university, you should take an advanced course in this complex and ill-defined subject which should include experimental techniques as well as theory. If you don't have these facilities, you could study a textbook of molecular biology such as *Molecular Cell Biology*, 3rd edition, by Harvey Lodish *et al.*, Scientific American Books, which will take you through the elements of biological chemistry, control of cellular activity by the nucleus, recombinant DNA technology, gene control in development, building and fuelling the cell, and integrative and specialized cellular events, helped by a wonderful array of coloured diagrams and descriptions of experiments you wish you could do.

If, however, you are a biologist with incomplete knowledge of its molecular aspects and want to find out more about topics you meet in recent literature, such as glycans, EXAFS, molecular chaperones, or bacterial chemotaxis, then you will find the encyclopedia under review particularly helpful. It contains some 5500 entries, ranging from very short definitions to substantial articles of 5000 words or more. There are 218 articles described as 'Long', which are signed and listed alphabetically and under the subject groups 'General' (one article by Sir John Kendrew), 'Structural Biology' (22 articles), 'Molecular Genetics' (49 articles), 'Bacteria and Bacteriophages' (11 articles), 'Cell Biology' (48 articles), and smaller groups under 'Evolution', 'Developmental Biology', 'Immunology', 'Neurobiology', 'Molecular Medicine' and 'Plant Molecular Biology'. The 240 contributors responsible for these articles are also listed, with names and addresses but not page numbers or titles of articles; so if you want to know what articles Z. I. Bashir, B. Blyth or A. Tramontino wrote you have to do some scanning.

All the entries are in alphabetical order, forming their own index, and there are both cross-references from one entry to another, and references to journal papers or reviews at the end of each entry. The references for some articles were not very up-to-date, which would hinder those wanting to pursue the topic further. For example, the article on molecular chaperones might just have managed to include a reference to the Cold Spring Harbor Laboratory Monograph on 'The Biology of Heat Shock Proteins and Molecular Chaperones', published in 1994; while the Cold Spring Harbor Laboratory Monograph on 'Stress Proteins in Biology and Medicine' (1990) mentioned chaperonins as a new phenomenon, the term first being used in 1988, and this book is quite relevant to the encyclopedia article on heat shock.

Sir John Kendrew's entry discusses the historical development of molecular biology since the term was first used in 1938, and offers us Erwin Chargaff's definition of molecular biology as 'the practise of biochemistry without a licence'. Two quite distinct schools developed, one primarily interested in the three-dimensional structure or conformation of biologically important macromolecules and the other in biological information and its replication. These eventually came together, and Kendrew concludes that 'today the boundaries between biochemistry, genetics, molecular biology and biophysics have become less and less well defined'. So this book has a good mixture of articles using one or more of all four disciplines. A fifth discipline which might have been included is applied mathematics; but I only found a lone short article on Fourier series, and very brief definitions of Fourier synthesis and Fourier transforms, which looked at all mathematical.

There are many fascinating cross-referenced paths one can be led into by dipping into this encyclopedia. Thus Table M2 in the article on molecular chaperones suggests that prions may be rogue molecular chaperones, but gives no reference. Prions to me spell 'scrapie', the mysterious disease of sheep that shepherds were always talking about when I first came to Edinburgh. Scrapie is actually listed in the encyclopedia and says, simply, '*See* transmissible spongiform encephalopathies', and there the whole mystery is laid out, with prions and virinos as alternative hypothetical particles, the PrPc protein with its amino acid sequence decoded, genes in mice etc. affecting the time the disease takes to manifest itself, and the infective agent purified from infected sheep passing through filters that only allow viruses to pass through.