

of it seems to me too condensed for a reader without training in biochemistry and redundant for one who has such training. This knowledge could have been assumed, or textbook references given, leaving much more space for industrial aspects. An article on secondary metabolites concentrates on pathways leading to a variety of antibiotics, often through unusual non-protein amino acids, of which some 200 are known. This article certainly ought to stimulate more studies on the specific pathways that channel essential precursors into non-essential secondary metabolites.

The chapters on genetic aspects include a valuable one on hybridization, which gives well-referenced lists of industrially important fungi, and of organisms in which genetic recombination has been achieved via protoplast fusion or attempted by transformation with external DNA. But the article on genetic engineering, though well written, is much too brief (23 pages) in view of its technological importance (the book reviewed below would fill this gap). Two chapters on the sources and the pure culture of industrial microorganisms maintain a firm practical approach. They tell us where to look for new microbes (in as many different soils as possible); how to isolate, enrich and screen them for a variety of different purposes (very few of the 50 000 known species of soil microbe have yet been exploited); and tabulate the main culture collections. No doubt these collections cannot supply the advanced strains developed by commercial laboratories, and one wonders how much money and scientific effort would be needed to identify or develop a new useful microbe, and how many new enterprises are in fact prospecting in this way. Two chapters finally discuss patent protection for biological inventions, and methods of batch and continuous culture of microbial, plant and animal cells.

In summary, this volume has a number of defects, reflecting perhaps uncertainty of editorial policy and a failure to decide what readership it should be aimed at. It cannot be recommended at the listed price, but it does contain much useful information not readily available elsewhere, and it would find a much wider readership and have much more impact if the price were substantially reduced. Future volumes in the series are entitled *Fundamentals of Biochemical Engineering*; *Microbial Products, Biomass and Primary Products*; *Microbial Products, Complex and Secondary Products*; *Food and Feed Production with Microorganisms*; *Microbial Transformation and Special Processes*; *Enzymes in Biotechnology*; and *Microbial Degradations*. We shall await sight of them with great interest.

ERIC REEVE

*Institute of Animal Genetics
University of Edinburgh*

Man Made Life, A Genetic Engineering Primer, By JEREMY CHERFAS. Oxford: Basil Blackwell (1982). 270 pages, price £5.50.

This is a well-written and extremely readable book on the origins, present state and future prospects of genetic engineering, which can be recommended to biology students, professional biologists, prospective biotechnologists (in particular), and even the enquiring laymen. It is no cook-book, due to the fact that the author takes a historical approach which leads us easily from early work on DNA to the present state of the art, clearly explaining key experiments and the main problems encountered on the way. Chapters on 'Restriction', 'Tools', 'Manipulation', and 'Unravelling' leave us with a clear insight into what is involved in this art, including the two new techniques of sequencing DNA. Two chapters entitled 'Applications' and 'Vaccines' describe in considerable detail the progress towards commercial manufacture of medically important products such as human insulin, human growth and anti-growth hormones and interferon, achieved by

these techniques. The ingenious alternative strategies used by competing teams and the difficulties encountered with apparently simple problems make compelling reading of stories which are not yet complete; and we shall want to keep a close eye on the columns of *Nature*, *New Scientist* and *Science*, so as to follow them through to commercial success. The commercial exploitation of the new techniques is also raising important social and legal problems which are usefully aired in a chapter entitled 'Exploitation', and each chapter contains adequate references.

ERIC REEVE
Institute of Animal Genetics
University of Edinburgh