Book reviews

Molecular Anthropology. Genes and Proteins in the Evolutionary Ascent of the Primates

Edited by M. Goodman and R. E. Tashian. (Pp. xiii + 466; Figures + Tables.) New York and London: Plenum Press. 1976.

It was at an earlier symposium held at Burgwartenstein in 1962 that the term 'molecular anthropology' was first introduced by Emile Zuckerkandl. The present volume is based on the papers presented at a 1975 symposium there, designed to explore the evidence that analysis of protein structure provides on the evolutionary ascent of man and the other primates. The time was right for this appraisal, for though the importance of protein structure for the elucidation of affinity has been long recognised, it is only in the past 15 years that its usefulness in relation to primate phylogeny has been more fully exploited.

The first 4 papers are introductory. Lasker, who questions the usefulness of further mere description of protein sequences interpreted on the basis of constant rates of change, sees the main aim instead as exploration of the processes, causes, and timing of diversification of populations. He urges that the search for functional differences between molecular forms of different species will be more rewarding. Vogel thinks it unlikely that an evolutionary clock exists, and stresses the need to include cytogenetic, as well as sequence, analyses at critical points in phylogeny. The review of the fossil evidence by Simons and Walker clearly indicates that the dates of primate phylogenetic branching by molecular analysis are too young — 'either the clock is incorrectly calibrated or it doesn't keep proper time'. Fighting words indeed, to which Sarich responds by suggesting that a serious re-evaluation of the inferential value of certain kinds of palaeontological evidence is in order.

After some discussion of the mathematical strategy of solving problems in primate molecular evolution comes the main body of the book. Sarich and Cronin examine the 4 techniques available for macro-molecular comparison (direct amino-acid sequencing, electrophoresis, nucleic acid hybridisation, and immunology), and, using albumin, transferrin, and DNA structures, argue that man, gorilla, and chimpanzee diverged about 4 million years ago (with a singularly confusing misprint on page 162 of inter-generic for intrageneric). Fitch and Langley conclude that the rates of amino-acid change in nucleotide substitutions are significantly non-uniform in the same protein in different lines of descent, and among proteins in the same lines of descent, and this removes a major source of support for the neutral mutation theory as originally presented. Several papers show how useful is the detailed knowledge of the haemoglobins for inferences about different sections of

primate phylogeny. There is one paper on the evolution of myoglobin amino-acid sequences and one on carbonic anhydrase. Goodman's excellent summary of primate evolution in the light of the evidence from different protein types shows that, after a period of apparent acceleration of molecular evolution in the late Cretaceous and early Tertiary, there came a slowing of rates of protein evolution, attributable both to a slowing of mutation rate and to an intensification of stabilising selection. Hilschmann's paper on the evolutionary origin of antibody specificity appears, at first, to be unrelated to the remainder of the volume, yet the lessons that it carries, regarding interaction of genes, are directly relevant to the interpretation of sequence variation that appears in the other papers. The thoughtful concluding contribution by Zuckerkandl carries the same message; that phylogenetic evolution may not be quite as simple as structural gene sequence analysis suggests, and that it is important to consider gene regulation, and particularly alteration of gene programmes.

Most of the 20 articles contain both original and review matter, well written and comprehensive, and there is a useful glossary. In all, this is a most interesting volume which illuminates the findings and the major controversies over their interpretation which are rife in this field.

D. F. ROBERTS

Introduction to Biometrical Genetics

By Kenneth Mather and John L. Jinks. (Pp. viii + 231; 22 Figures + 59 Tables. £8.50.) London: Chapman and Hall. 1977.

In this new book, Mather and Jinks present a shortened and simplified account of biometrical genetics, aimed primarily at university students and graduates. It thus serves as an introduction to their more detailed and general presentation in *Biometrical Genetics*, 2nd ed., 1971. The basic principles and methodology are clearly presented, with many examples of application and interpretation in experimental data. Perhaps necessarily, the derivations are detailed and the symbols are numerous (there is a useful glossary of these), so the reader may get involved in the detail rather than in assimilating the objectives and the uses of the different methods.

Biometrical genetics was developed by the Birmingham school, and much of the methodology deals with pure breeding or inbred lines, and their crosses (F_1 , F_2) and back crosses, and so is only readily applicable to plants and laboratory animals. The objective is to study and quantify the kind of gene action involved, contrasting with the operational (or

statistical) approach of quantitative genetics (for example, Falconer, 1960). The concept of heritability is not introduced until page 195. Unfortunately, the opportunity is missed to match the notation of the 2 approaches and show where they overlap.

Because so much of the material and methodology deals with pure breeding or inbred lines of plants and their crosses, the book will probably be of little interest to medical geneticists dealing with family pedigree data or data from different kinds of relatives. Its main asset will be that it can give a quick and simple insight into these alternative methods of genetic analysis of continuous traits.

C. SMITH

Guidelines for Research Involving Recombinant DNA Molecules

(Pp. vi + 181; Figures + Tables.) US Department of Health, Education, and Welfare. 1976.

The research covered by these guidelines has provoked unprecedented public interest, and has already produced fascinating results in genetics. There is no doubt that the results are so exciting that work in this field will expand greatly and continue to be important for many years.

The guidelines cover experiments in which different segments of DNA (for example, a mammalian structural gene and a bacterial plasmid) are joined together by chemical methods and then have the ability to infect and replicate in some host cell (for example, *Esch. coli*). In this way large amounts of 'cloned' DNA can be prepared quickly and cheaply. There is also the possibility that in some cases the bacteria could produce the protein product of a mammalian gene (for example, a peptide hormone). Fears have been raised that either all or some of the experiments which could be carried out present a potential biohazard. This feeling has been increased by the indiscriminate use of the evocative term 'genetic engineering' to cover all such experiments. The National Institute of Health has tried to assess the potential hazard of a variety of manipulations, and the guidelines present detailed experimental procedures to deal with most situations, at least in laboratories dependent on NIH funding. The position is unusual in that, despite much guessing and speculating on the hazards, very few experimental data are available.

The guidelines categorise experiments according to the source and purity of DNA and the disablement, or inability to live outside an experimental environment, of the bacteria used for growth. They then specify a level of containment to match the estimated potential hazard. They recognise both physical (P numbers) and

biological (EK numbers) containment and express their hope that better forms of biological containment will be developed.

Physical containment varies from minimal, where the main protection is use of good microbiological practices, to high, a specially constructed laboratory designed to contain micro-organisms that may cause serious epidemic disease.

However, in addition to defining all levels of containment, the NIH guidelines state that certain experiments may not be initiated at the present time. These include cloning of DNA from oncogenic viruses or the deliberate formation of recombinant DNAs containing genes for the biosynthesis of potent toxins (for example, diphtheria toxins or snake venoms).

An interesting section of the guidelines deals with 'Roles and responsibilities'. Much responsibility devolves onto the principal investigator and the institutional biohazard committee. As well as having technical expertise, the biohazard committee must be able to assess the acceptability of its decisions to the local community and its Minutes must be available for public inspection.

Extensive appendices provide supplementary information on physical containment and discussion of alternative vectors.

The details of the guidelines are constantly being brought up to date and the researcher involved in this field needs to be ever alert. Evidence of this may be seen in the criticism of the Californian workers who cloned the rat insulin gene (see *Science*, September 30). British research workers use a different set of guidelines (set out in the Williams report, HMSO), which are roughly comparable and which are administered by a Genetic Manipulation Advisory Group. Most other countries are using one or other of these sets of guidelines.

S. MALCOLM

Gene-Environment Interaction in Common Diseases. Proceedings of the Symposium on Gene-Environment Interaction in Common Diseases held February 11-12, 1976, Tokyo.

Edited by Eiji Inouye and Hideo Nishimura. (Pp. 234; Figures + Tables. £21.25.) Baltimore, London, and Tokyo: University Park Press. 1977.

The publication of a volume from Japan on this important topic raised hopes in the reviewer that this book might prove to be a valuable source of original experimental data and ideas from Japan in the field of genetics and epidemiology. Not only has one had the suspicion that much important Japanese work is neglected or entirely ignored in the Western literature,