partial view, of the totality of scientific activity.

What strikes an American reader is how Daniels, in spite of his virtues, runs into trouble because programme and practice fail to match. Daniels strongly insists—too strongly in my opinion—that a democratic culture concept in the pre-Civil War years hindered professional growth by an anti-elitist, egalitarian view of science. By the Progressive Era, the expert is in the saddle for reasons left unclear by the author. Since his method inclines to neat intellectual dichotomies, Daniels equates uniformitarians with partisans of natural selection and catastrophists with opponents of natural selection, a gross oversimplification of the situation in the United States and Britain. Being conscious of intellectual positions, Daniels cites chemists in post-Civil War America as leaders in the pure science ideal drive. A social history would have noted that many, perhaps most, chemists of that day were in applied endeavours. Since intellectuals wrote about the survival of the fittest, Daniels assumes businessmen literally believed in this competitive ideal, even though he himself cites the contrary views of Andrew Carnegie. Most American historians today note that many American businessmen tried their best to minimize competition by forming trusts or engaging in tacit price fixing. Daniels is unaware of recent work casting doubt on the view that the Social Darwinists believed in the jungle bloody survival of the fittest.

A sprinkling of errors indicates a rather careless handling of mere facts, even for intellectual history. Cartier did not explore western Canada. Benjamin Rush studied chemistry at Edinburgh to get a medical degree, not merely to aid industry. The Smithsonian was not a "museum of public entertainment" in its early years. Two different dates are given for the start of the important Darwin–Gray correspondence. Darwin was by no means one of the first scientists to appeal to nature rather than to logic. There never was a Federal Bureau of Agriculture, the term "Department" being used even before cabinet status was attained. Simon Newcomb never "headed a government observatory". John Wesley Powell fell in the early 1890s, not the late 80s. The Science Advisory Board of 1933 was not advisory to the Tennessee Valley Authority. Frank B. Jewett was president of the National Academy of Sciences, not the AAAS. While these are perhaps pedantic quibbles in terms of that splendid abstraction, a national ideological framework, yet they are the stuff from which a true social history of the sciences in America will some day emerge.

NATHAN REINGOLD

Substitution Reactions

Free Radical Substitution Reactions. By K. U. Ingold and B. P. Roberts. Pp. viii+245. (Wiley: New York and London, August 1971.) £5.75.

THE authors of this volume seem to have found considerable difficulty in finding a suitable title. Having chosen *Free Radical Substitution Reactions,* they take justifiable pains to make clear what is not to be found in the book. The subtitle brings the prospective reader much nearer to the real content, which is concerned with S_H2 reactions. If the reader is still mystified the preface makes the position quite clear in the statement that bimolecular homolytic substitution reactions involve the attack on an atom in a molecule by an incoming radical to bring about replacement of a second radical originally bound to the atom. Further, since the majority of the chemical elements are multivalent, the atom under attack is not a terminal one. Ten chapters deal in turn with elements of group IA, groups IIA and B, group IIIA, group IVA, group VA, group VIA, group VIIA, transition elements, rare earth elements, and finally group O elements, for which, incidentally and not surprisingly, no example of an S_H2 reaction is as yet known. The chapters vary considerably in length and, as is to be expected, reactions at the oxygen atom receive the most attention. Reactions at carbon, sulphur, phosphorus and the metals tin, mercury, cadmium, zinc, magnesium, and aluminium are also reported at some length. The presentation of the subject matter is logical and precise to the extent that the reader should be able quickly to locate the information he wants and for this reason a subject index is not included.

The subject matter concerns bimolecular homolytic processes at multivalent atoms involving attack on interior or non-terminal atoms. Such reactions may be synchronous or stepwise, depending in each case on the properties and behaviour of the initially formed adduct radical. Where appropriate, stereochemical considerations are fully discussed. Reactions involving metals, for example, magnesium, mercury and tin, frequently have important implications for preparative processes. In some of the reactions discussed the existence of an S_H2 reaction is by no means firmly established, as is in fact made quite clear by the authors themselves, and there is frequently quite a divergence between the behaviour of reactions at atoms within the same group, for example, nitrogen and phosphorus. The wide occurrence of S_H2 reactions at oxygen is not unexpected. Such processes have attracted much attention largely as a result of the use of peroxides as initiators in polymerization studies and other free radical processes. Reactions at the sulphur atom have also received wide study in particular with compounds containing the relatively weak sulphur–sulphur bond. The subject matter is treated with a measure of critical insight into mechanisms and perhaps one of the most interesting features of this volume is to be found in the revelation of the diversity of behaviour which is to be found in the reactions which can be classified as S_H2 processes.

This volume makes a useful addition to the rapidly growing literature of free radical chemistry and it is particularly acceptable because it brings together for the first time a wide range of information, which will become of increasing interest to both academic and industrial chemists.

D. H. HEY

Mathematical Genetics

Probability Models and Statistical Methods in Genetics. By Regina C. Elandt-Johnson. Pp. xviii+592. (Wiley: New York and London, August 1971.) £11.75.

THIS book covers the standard topics of mathematical genetics, such as segregation ratios, gene frequencies in populations, genetic correlations, the effects of selection, inbreeding, linkage, mutation, assortative mating and so on. It also includes a chapter on the theory of incompatibility of transplants, a field in which Professor Elandt-Johnson has herself done some useful work. The author states that the book is intended for biologists with only a minimum knowledge of mathematics and statistics; about six of the nineteen chapters are taken up with an explanation of standard statistical theory and practice, chiefly from the Neyman-Pearson point of view. The references listed in the book provide a very helpful guide to further reading and to original papers.

As might be expected from this author, the book is (with a few exceptions) written most carefully and lucidly, and with an emphasis on exact definition, though difficult proofs are omitted. The book also usefully explains some of the practical methods of analysing genetic data (especially in human genetics).

Professor Elandt-Johnson points out from time to time some of the snags and qualifications, and notes that the conclusions only follow when the original assumptions are valid. However, these necessary disclaimers are not always very prominent. One wonders what a reader new to the subject will make of the (perfectly correct) qualification that the theory of confidence intervals does not enable one to draw any conclusions from any particular sample. In his investigation he will collect many samples, and will want to draw conclusions from