statistical method but with no claim to theoretical expertise. When he entitled Section 1.1 "How to avoid making a fool of yourself", he set the tone for the whole book. He neither regards statistics as a set of rules for blind application nor contemplates with awe a mathematical edifice; for him, biostatistics is a pattern of thought and analysis to aid the biologist in understanding his data, not a substitute for reason.

Dr Colquhoun serves a generation of biologists not completely averse to mathematical argument, and he gives them a modicum of algebraic explanation. Occasionally he may seem to be whistling in the dark to preserve his own courage in the face of mathematics, but in places—notably in his discussion of variances of functions—he presents admirably concise algebraic support for his methodology at a level suited to his readers.

The book covers much of the standard material on distributions, tests, and estimations, with greater emphasis on the practice of regression, calibration curves, bioassay, and non-linear estimation than is usual. The early chapters betray excessive addiction to nonparametric methods, in spite of their unsuitability for the later, more interesting, problems of estimation; the strange notion that "there is usually no reason to prefer the mean to the median" appears once more. Nevertheless, the presentation of nonparametric techniques is essentially practical and consistent, until more complex problems compel a switch to the usual Gaussian models. The chapter on curve-fitting and regression is an admirable account of a difficult topic; simple examples illustrate well the meaning of least squares, the process of minimization, the consequences of reparameterizing, and the difficulties introduced by non-linearity. Throughout the book, the author shows an understanding of the use of computers and a welcome awareness of the dangers inherent in uncritical use of standard packages. A little oddly, he seems to attribute the emphasis that statisticians place on linear models to their aesthetic delight in matrix algebra.

A biologist who studies this book may not find all he needs, but he will certainly be led away from folly.

D. J. FINNEY

Petroleum

Geology of Giant Petroleum Fields. Edited by Michel T. Halbouty. (A Symposium of Papers on Giant Fields of the World, including those presented at the 53rd Annual Meeting of the Association in Oklahoma City, Oklahoma, April 23–25, 1968.) Pp. viii+575. (The American Association of Petroleum Geologists: Tulsa, Oklahoma, 1970.)

WHEN this volume was published, a large number of petroleum geologists must have been, with the reviewer, surprised (agreeably) to read in Table 1 that the nineteenth largest oilfield in the world was the Ekofisk Field in Norwegian North Sea waters, with estimated recoverable reserves of 7,000 million barrels. After developments in 1971, not only has this estimate been confirmed, but new important oil discoveries have been made in the British sector of the northern North Sea. It seems probable that the British Petroleum Forties Field may be considerably larger than Ekofisk. BP Ltd have very recently announced that oil production from this field is likely to rise to 400,000 barrels per day—about one-fifth of Britain's present consumption. Such a dramatic change in the petroleum reserves of a country can only come from the discovery of giant oil or gas fields, and this latest example amplifies the theme of this book—namely, that a very large proportion of the world's reserves of hydrocarbons are contained in large individual accumulations. As the editor points out, the almost freakish natural imbalance of petroleum reserves in the present economic dominance of these fuels divides the nations into "haves" and "have nots", just as the imbalance of coal and iron ore deposits did in older times, but with a very different distribution. Oil reserves mean economic and political power—facts which economists and politicians of both "haves" and "have nots" are only now beginning to realize to the full. The romantic figure of the new generation Arab, exchanging his desert robes and camel for western-style military uniform and Cadillac, and flexing his extortionist muscles, is matched by the less familiar figure of the coal and iron age magnate searching disconsolately in his wardrobe for the tattered cloak of a petroleum "have not".

The book does not shirk the problems of definitions and assessment of economic value of reserves of petroleum. The accuracy of reserve estimates —particularly recoverable reserves— depends on drilling and production data density, which in turn reflects the stage of development of the oil or gas field. The US with about 23,000 oil and gas fields tends to rely almost exclusively on well data, whereas the USSR with only 1,118 fields is in a much more primitive stage of development and has to rely on estimates based on one discovery well only. The book states that what it offers in this respect is an indication of order of magnitude.

One significant departure of the book from previous discussions of the same problem is the escalation of scale from 100 million barrels to 500 million barrels of oil and from one trillion cubic feet to 3.5 trillion cubic feet as defining the lower limit of "giant" fields. This is necessary because there are too many fields on the older definition to handle within the scope of the book—many of which, incidentally, would not be economic to develop in Alaska or in the northern North Sea.

The editor in his introduction points out that reserves do not have the same value irrespective of location. Proximity to markets makes them more valuable. Remoteness, and extremes of environment (=cost of development) greatly increase the size of accumulation which will be economic. All that can be simply said is that very large fields will pay wherever they are, and this fact emphasizes the purpose of this book, which is to establish guidelines—both empirical and scientifically deduced—pointing to the fundamental geological factors which lead to the accumulation of oil and gas in large fields.

The approach to the problem is a well-tried one. It starts with twenty-seven papers describing and analysing the giants of productive regions (for example, US, Mexico, Venezuela, and so on) or the case histories of famous individual giants both old and new (for example, Oklahoma City, Gröningen and Sarir). These case histories are well balanced in terms of the wide variety of sedimentary, stratigraphic and structural conditions, but understandably not so well balanced from a regional or total reserves point of view. The treatment of the Middle East is totally inadequate, no doubt because either developers or governments will not allow open disclosure or discussion.

The book concludes with a chapter of analysis, first, of the geological factors which control the occurrence of giants and, second, proposes a classification of the world's sedimentary basins. The former is admirable and would not find many dissenters among the ranks of thinking explorationists. This more or less tells us what to look for. The basin classification—with the maps of productive regions—attempts to guide us where to go to explore for giants. This is less successful, perhaps unnecessarily complicated, with palpable errors which cannot be discussed here, and in any case is highly controversial.

The science of petroleum exploration is, like many others, at a stage where it is bemused by the plethora of description detail and highly individual speculative theory. It badly needs works of synthesis like this book which is wholly admirable and useful not only to industrial explorationists and management, but is invaluable to teachers and students of the subject. W. D. GILL