

BOOK REVIEWS

Statistics for geologists

Cheaney, R. F. 1983. *Statistical Methods in Geology*. George Allen & Unwin, London. 169 pp. Price: paperback £5.95.

It is generally agreed that most geologists require some grounding in statistics, as many of the branches of the subject are now highly numerical and can produce vast quantities of data. However, the teaching of elementary statistics to undergraduate geology students is a task viewed with some trepidation by many lecturers, unless they are themselves specialist statisticians. The main problem encountered is that a proportion of the students is always somewhat wary of mathematics and, indeed, may have had little formal training in the subject beyond an elementary level at school. Similar problems might be encountered by more mature geologists who are attempting to come to grips with the subject for the first time. It is for this reason that elementary texts on statistics written for geologists by geologists are so welcome. The authors can recognize the limitations and forebodings of their audience, can cater for them, and can stimulate their interest by the inclusion of relevant geological examples. *Statistical Methods in Geology* by R. F. Cheaney is the latest text to join the small band of books of this type.

Chapter 1 deals with basic definitions, types of measurement and the graphical and mathematical methods of describing frequency distributions. Chapter 2 is a full description of the theory of hypothesis testing using calculations based on the binomial distribution. Chapter 3 covers the Kolmogorov-Smirnov test applied to comparing a sample with a theoretical distribution and with another sample. Chapter 4 deals with nominal scale statistics as represented on contingency tables and introduces the concept of degrees of freedom. Chapter 5 covers the Normal distribution, Student's *t*-test and confidence limits. Chapter 6 describes a number of tests applicable to ordinal scale data. Chapter 7 covers correlation and regression. Chapters 8 and 9 describe the statistical tests relevant to directional data. Chapter 10 outlines the method of constructing and testing hypotheses, and sampling procedures. Appendices provide additional exercises and brief résumés of matrix algebra and error theory.

The book is quite well written and assumes very little mathematical background. However, the style is rather too terse at times for easy comprehension, and more use could have been made of diagrams to illustrate difficult points. Little coverage is given to the theory of the techniques described, and the text concentrates on the procedures employed. It would have been advantageous if more guidance could have been given on which tests are the most applicable in given circumstances. A shortcoming of the book is that it appears to have been written for the field geologist dealing with a relatively small number of samples. Indeed, the author envisages that many statistical analyses will be performed in the field, a practice that may not be universally adopted. Consequently, perhaps undue emphasis has been placed on non-parametric tests at the expense of parametric tests. For example, Chapter 7 on correlation and regression is far too short and does not deal adequately with the topics. This is unfortunate for the reader who wishes to obtain some insight into the means of dealing with the vast quantities of ratio scale data produced, for example, by modern analytical equipment. A very welcome inclusion, not to be found in other books of this type, is a treatment of the statistical analysis of directional data in two and three dimensions. Although, of necessity, the most mathematically taxing section of the book, this will be of great use to structural geologists, sedimentologists and even prospective palaeomagnetists.

Although this new book will not displace other elementary texts on geological statistics, it is a valuable contribution and will provide useful background reading for those wishing to gain insight into the methods on which the book concentrates.

P. Kearey

Earthquakes and man

Gere, J. M. & Shah, H. C. 1984. *Terra Non Firma: Understanding and Preparing for Earthquakes*. Freeman, New York. 203 pp. Price: hardback £19.95; paperback £11.95.

As the title implies and the authors make clear, their considerable authority is applied to the writing of a simple popular account of earthquakes and associated phenomena, concentrating largely on the social and economic effects and avoiding theoretical treatment as far as possible. The causes and distribution of earthquakes are described against a background of elementary plate tectonics. Methods of recording and assessing magnitudes and intensities are briefly outlined. Related topics such as liquefaction hazards, the behaviour of tsunamis, attempts at earthquake prediction, engineering design, and self-protection in an emergency, are reviewed in separate chapters, but the treatment throughout is essentially qualitative. Naturally enough, the book concentrates on examples from plate boundaries and is slanted towards American experience. The more obscure rationale of the comparatively rare intraplate earthquakes, although mentioned, receives scant attention. Although the seismologist or earthquake engineer is unlikely to learn much of theoretical value from this unassuming and modestly priced book, he may well find it an attractive source of case histories, which are described in a lively and readable manner, and profusely illustrated.

I. E. Higginbottom

Unstrained grains through the looking glass

Adams, A. E., MacKenzie, W. S. & Guilford, C. 1984. *Atlas of Sedimentary Rocks under the Microscope*. Longman, Harlow, Essex. 104 pp., 217 colour plates. Price: softcover £9.95.

This atlas is the third in a series of books of photomicrographs intended as laboratory manuals for use mainly by undergraduates, teachers and amateur geologists. The book is divided into three principal divisions, namely terrigenous clastic rocks, carbonate rocks and other sedimentary rock groups, for example, cherts and evaporites.

Like all pictorial geology texts, those that contain a plethora of colour photomicrographs are aesthetically pleasing and simple to follow. In this respect the *Atlas of Sedimentary Rocks under the Microscope* does not fail to delight. It is set out in an acceptable and logical format, is easy to use and, at £9.95, should be well within the budget of most undergraduate students.

The terrigenous clastic and carbonate sections, which comprise nearly three-quarters of the Atlas, have introductory figures and tables on grain size, texture and classification which assist the reader in compartmentalizing the rock types illustrated. A two-column format is used throughout, the photomicrographs being arranged two or three to a page in the outer column. The photomicrographs are generally of high quality, although some of the plane-polarized light shots are too dark, particularly in the clastic rock section.

The carbonate section of the book is particularly strong and beautifully illustrated. Allochemical components of limestones (ooids, peloids, lithoclasts, intraclasts and pisoids) are well documented, as are a great number of bioclasts including molluscs, brachiopods, echinoderms, corals, bryozoans, arthropods and foraminifera. This latter component is particularly valuable for the recognition of fossils in thin section. Until now, bioclasts have been adequately described only in the expensive text of Horowitz & Potter (1971).

The above comments highlight the high-quality aspects of the *Atlas of Sedimentary Rocks*. As a clastic sedimentologist I was dismayed to