addition to the book, and a version of the program in FORTRAN even more useful. Charging the would-be user $7.00 for the program booklet would seem to unduly inhibit acceptance of the Rittmann norm as a viable petrological tool.

In addition to the key for the Calculation of the Rittmann norm, the book contains some introductory sections describing the principles on which the method is based, some comments on the composition of the major igneous rock-forming minerals, and a guide to the use of the key tables. Finally, there are two sections, one comparing the CIPW norm with the Rittmann norm and the other describing the various petrological applications of the Rittmann norm.

It is perhaps not surprising that the author and his associates are noted for their work on alkaline and sub-silicic igneous rocks. The Rittmann norms calculated for rocks of this general type appear to be particularly informative and the method may become quite widely adopted. Whether the Rittmann norm will be used by petrologists working on more 'normal' rocks seems less certain. The empirical and complex nature of the calculation will deter many, some of whom will continue to classify and subdivide their rocks on the more straightforward basis of the chemical analysis.

I. L. GIBSON

SUGIMURA (A.) and UYEDA (S.). *Island arcs: Japan and its environs.* Amsterdam–London–New York (Elsevier), 1973. viii+247 pp., 134 figs. Price £11·40.

This is the third volume in the series 'Developments in Geotectonics'. With a dominantly geophysical approach it is concerned mainly with the structural and dynamic aspects of island arcs as exemplified by the Japanese islands. The book is divided into three large chapters conveniently subdivided into more than fifty topics and supported by a list of some 600 references.

The first chapter deals mainly with the presentation of data on seismicity, gravity, heat flow, electrical conductivity, palaeomagnetism, etc., but there are also sections on geological structure, topography, volcanoes, basaltic magmas, and hot springs. It concludes with a unifying section on the zonal arrangement of geological and geophysical features in island arcs. The second chapter describes the post-Miocene geological history of Japan, underlining the relationship between igneous activity, sedimentation, and tectonics. The episodic nature of movements is stressed and in particular the contrast between Neogene and Quaternary events. The innovation of the east Japan arc system is considered in relation to the geometry of interacting plates.

In the final chapter, concerned with processes, the authors examine the island-arc model based on a descending mantle flow and lithospheric slab. Seismic properties and magma generation are discussed with respect to the pressure/temperature characteristics derived from the model. The Pacific or island-arc type of orogenic belt is said to be characterized by an asymmetric profile, paired metamorphic belts, and a spatial separation of geosynclinal and igneous activity. An integral part of the process is the development of marginal seas such as the Sea of Japan, which appear to result from expansion and spreading as magma rises above the deeper parts of the Benioff zone.

The book is generously, and in part well, illustrated but some of the figures are

difficult to read (e.g. 33, 36, 81, 82) or lacking in substance (e.g. 89). The main problem is with diagrams based on map outlines with a scale too small for the type of information being shown. Both the title and the publisher's synopsis suggest a more comprehensive treatment of island arcs than actually materializes. It is unfortunate, for example, that so little attention is given to petrological and geochemical variations in orogenic volcanic rocks especially since these are likely to have a very direct connection with many of the structural and geophysical properties that are discussed in the book. It is also surprising that although consideration is given to the generation of basaltic magma there are only two passing references to andesite, which is not even listed in the subject index.

The book will undoubtedly be of interest to geophysicists investigating island arcs and to geologists working in Japan. Apart from this, it must be destined mainly for libraries rather than personal bookshelves. This is a pity because by distilling the existing text once more and widening the scope a little it could have had a much wider appeal amongst earth scientists. P. E. BAKER

KIRKLAND (D. W.) and EVANS (R.), Editors. *Marine evaporites: origin, diagenesis, and geochemistry* (Benchmark Papers in Geology). Stroudsburg, Pennsylvania (Dowden, Hutchison, and Ross, Inc.) and London (John Wiley & Sons), 1973. xvi+426 pp., 210 figs. Price £11·15.

The idea of the Benchmark Papers in Geology series is, in general, a good one, collecting together major papers on a particular topic in a single volume. The books are of particular value to individuals and institutions with restricted budgets.

Any collection of papers, like an anthology of poems, can be criticized for the inclusion of some and the omission of others, and it is some measure of the skill of the editors that this book offers such a balanced view of marine evaporites.

This volume is divided into three major sections, the first consisting of eighteen papers on the origin of evaporites, the second section with nine papers on evaporite petrology, and the final section with four papers on evaporite geochemistry.

The value of this book to students is greatly enhanced by the comments the editors have made on groups of papers that form coherent subsections within the major groupings. These comments underline the history of the research, and in some cases supply up-to-date information on areas of study.

The section dealing with the origin of evaporites is subdivided into three subsections, the first two dealing with present-day evaporite deposits (Holocene or Flandrian) in lagoons and supratidal areas, and the last dealing with ancient evaporite deposits and theoretical models. It is appropriate that the book should open with five papers on sub-marine evaporite deposits, as prior to the last two decades it was generally considered that most evaporites formed in this way. The briefness of the papers on the Caspian Sea is regrettable as this is the most extensive and complex area available for present-day study. The studies reported from Peru, Baja California, and Australia give a well-balanced view of the variations that can occur in basically similar environments.