The editor, in a Preface, states the purpose of the book: "... to serve as a guide to some of the main facts and concepts relating to the ductile deformation of rocks". The book continues with an Introduction which takes the form of a succinct historic review of the development of current ideas on ductile deformation. It is then divided into three parts, each beginning with editorial comment and continuing with the selected reprinted articles and extracts.

Part I, *Slaty cleavage and its relationship to strain*, is the shortest of the three sections. Only two full articles (Wood and Means) are included with extracts from Sharpe and Sorby sandwiched between. I was uneasy with this mix and felt that the selection did not do justice to this important topic. Siddans' 1972 review would have been an appropriate opening, being an invaluable summary of 19th century ideas for students, and an ideal accompaniment to the historical extracts. On the whole, I found Part I too short to be of real value, but to do the subject justice would be a volume in itself.

Part II, *Deformation textures and flow mechanisms*, is more expansive than Part I. It contains three times the references in its editorial introduction, and reprints seven articles, only one of which is an extract. Many key contributions on metamorphic textures and porphyroblasts are reproduced (one by the editor) but, unlike Part I, no truly classic papers have been selected. The seven contributions span the years 1963–1978 and despite the earliest, Spry, having built on the work of Zwart (who in turn built on Sander) no contributions from either were selected. I find this surprising. It seems particularly a pity that Zwart's work, which so influenced current interpretation of metamorphic textures and to which there is constant reference in these articles, should not be included in its original form.

Part III, *The geometry of strain*, is the last, largest, section (half the book) made up of nine articles/extracts. The topics covered range from Cloos's classic paper on Maryland and Flinn's pioneering work on three-dimensional progressive deformation, to recent techniques of strain measurement and deformation paths. The last three articles are 'odd-balls' which distort the balance. Mitra, on deformation mechanisms, seems more suited to Part II. Ramsay's shear-zone review is reproduced in its entirety despite covering rather a specific form of strain; although undoubtedly an important contribution of great teaching value, it is easily available in its original *Journal of Structural Geology* (1980) form and, arguably, is too recent for benchmark status. There must be more suitable earlier contributions by Ramsay on the geometry of strain especially from the 1967 book, which are truly benchmark, having captured a new generation of structural geologists. The final article is a one-page extract which seems an unsuitable conclusion to the book.

This volume undoubtedly reproduces important contributions to structural geology. However I am not convinced that the title "*Fabric of Ductile Strain*" is appropriate. Although slaty cleavage and metamorphic textures answer to fabric of ductile strain, many of the articles on "geometry of strain" are concerned with techniques of strain measurement from deformed objects. The volume would have been a more successful thematic book had the content been less diverse. With "fabric" in the title the reader might expect to see some of the classic fabric work extracted from, for example, Sander, Fairbairn and Voll. Clearly, with a volume which is a personal selection of articles this choice is open to debate.

However, the other personal aspect of the book, Stauffer's editorial commentary, is its most positive element in my view. Between the three sections is a well-written linking commentary, a refreshing and enlightening discussion of the articles and other contributions which were not included, plus a comprehensive reference list. Such reviews are educational for students and teachers alike.

On the whole, my views on this volume are coloured by its very nature, one in a series "Benchmark Papers in Geology". There seems a real danger that what starts as a personal selection of important contributions becomes the established view, on publication. By making this selection of articles more accessible to North American students than the original diverse articles, is the editor unwittingly discouraging the student from reading other relevant contributions which are not included and require a little more effort? Might the end result be a narrowing, rather than broadening, of the student's repertoire?

If the term "benchmark" must be used (jargon, like "keynote address" which implies superior status) I would prefer it to be applied to classic and historic work which, on consensus opinion, has endured at least a generation (20 years) and preferably more. There must be sufficient contributions which answer this description to fill a volume, *Fabric of Ductile Strain*. Many would certainly be inaccessible in modern libraries, so well worth reproduction. This is not true of most of Stauffer's collection. In my view, it is poor value at $48 since more than half the contents appeared in 1970s leading journals which are surely available in original form. Students should be encouraged to read these articles in the journals, along with many other equally important papers, rather than be spoon fed from a prepacked selection.

Susan H. Treagus

Mesozoic geology of the World viewed stratigraphically

Moullade, M. & Nairn, A. E. M. (editors) 1983. *The Phanerozoic Geology of the World II, The Mesozoic, B.* Elsevier, Amsterdam. 450 pp. Price: hardcover US $111.75 (in U.S.A. and Canada), Dfl. 265.00 (rest of the world). In the U.S.A. and Canada the book is available from Elsevier Science Publishing Co. Inc., P.O. Box 1663, Grand Central Station, New York, NY 10163, U.S.A.

Earth scientists construct their edifice mainly on the foundation of regional data. Since its birth, geology has been mainly a regional science and its greatest achievements frequently have come from critical evaluations of some aspect of global geology. In addition to its academic appeal, an accurate and detailed knowledge of world regional geology has become also an economic and social necessity, especially in the course of the last two decades. As a consequence, both academic and industrial interest in the regional geology of the Earth has experienced a recent boom, particularly when compared with the stagnant decades from about 1930 to 1960, when, in the absence of a unifying theoretical framework, regional geological studies had come to be viewed as being little more intellectual than postage-stamp collecting, compared with the challenges offered by experimental and theoretical studies. Needless to say, in this re-awakening of interest in global geology the advent of the theory of plate tectonics, itself a child of regional considerations, has played a major role. For the first time, since the glorious days of the Viennese school's world-wide syntheses under the leadership of Suess, regional geology has begun to make sense: it has become predictable. This was rarely the case only two decades ago and earlier, when geologists were always ready to describe, but were seldom prepared to predict.

One of the discouraging aspects of pursuing regional geologic research, especially on a large scale, is the immensity of the available information and, ironically, the grave difficulties in obtaining it. Not only are the data scattered throughout countless local journals, government or company reports, and books of limited circulation, but also difficult to use owing to language barriers, even if one could gather all the local sources of information. Thus, readily available, authoritative reviews and syntheses of regional geology written in a major international language (now mainly English) have become indispensable to students of global geology.

The Phanerozoic Geology of the World series was conceived as an answer to this demand and was intended to "provide a comprehensive description of the regional geology of the world for the Palaeozoic, Mesozoic and Cainozoic eras respectively." The first volume of the series, *The Mesozoic, A*, was published seven years ago in 1978 and covered Africa, Australasia, and northern, central and southeastern Asia together with the European provinces of the U.S.S.R. The present volume deals with the Americas in part, Antarctica, and with the two south Asian countries of Pakistan and India. The third volume of the Mesozoic is planned to cover the rest of Europe, northwest African maritime countries, the Mesozoic ocean floor, and some of the broader issues of the Mesozoic geology of our planet.

As they had done for its predecessor, the editors invited contributions for this volume stressing the desire for a more palaeogeographically orientated approach and for a clear distinction between data and interpretations. This basic outline probably accounts for the initial choice of authors (mainly stratigraphers and biostratigraphers), the dominantly stratigraphic treatment, the emphasis of palaeontology, the sparsity of structural information, and the gross inadequacy of the tectonic histories of the areas dealt with in the individual chapters.

The first two chapters of the book are devoted to North America and Greenland. An international team of geologists from the U.S.A., Canada and Denmark describe the Mesozoic sedimentary history of northern and central Alaska, the Canadian Arctic islands and northern Greenland, emphasizing the subdivision of the Phanerozoic rocks in these regions into three tectono-stratigraphic assemblages of approxi-

mately Cambrian to Missisippian, Missisippian to mid-Early Cretaceous, and mid-Early Cretaceous to Tertiary ages. They relate the complex Mesozoic history of this region with the help of very informative non-palinspastic palaeogeographic maps showing the major lithofacies distribution and sediment transport directions, schematic stratigraphic cross-sections, and a simplified correlation chart. At the end of the chapter they discuss the regressive–transgressive cycles that affected the region during the Mesozoic Era and their correlation with the global sea-level changes of Vail and his associates from Exxon. They also include a discussion of the palaeolatitudes across which the region drifted during the Mesozoic time, as revealed by faunas and other palaeoclimatic indicators. The chapter ends with a rich reference list.

The first chapter is one of the most successful of the book. The others follow more or less the same general outline with widely varying degrees of success.

The second chapter by J. P. Owens reviews the northwestern Atlantic ocean margin between Newfoundland and Florida in a narrow strip extending from the edge of the continental shelf and the inner limit of Triassic–Jurassic basins. This chapter is essentially a synthesis of the physical stratigraphy of this region that only peripherally touches upon the many types of geophysical and biostratigraphic investigations being carried out in this part of the world. Owens concludes his chapter with a summary of geological development of the Atlantic margin of North America, describing the diachronous Triassic rifting, the Early to Middle Jurassic break-up east of the line of Triassic rifts, and the progressive inundation of the continental margin from the Middle Jurassic to the Middle Cretaceous.

The Central American region is represented by two chapters, devoted to Mexico (by K. Young) and to the Caribbean region (by J. Butterlin). In both chapters, the narrative leans heavily on non-palinspastic palaeogeographic maps: on his maps Young only shows the marine vs non-marine areas through time, whereas Butterlin's maps also contain much lithofacies information. In areas with so much past (and present) mobility, the usefulness of these generalized non-palinspastic maps are greatly reduced, however.

W. V. Maresch's description of the northern Andes extending from the Huancabamba deflection near the Peru–Ecuador border along the western, northwestern, and northern edges of the Guayana Shield to the Venezuelan Andes south of the Caribbean introduces the part of the book devoted to South America. The rest of the continent is represented by chapters on Brazil (by S. Petri & J. C. Mendes), on the Triassic and on the Jurassic of Argentina and Chile (by P. N. Stipanicic & A. Riccardi, respectively), and finally on the Cretaceous of Argentina, Chile, Paraguay, and Uruguay (by N. Malumian, F. E. Nullo & V. A. Ramos). All these chapters are richly illustrated with outcrop maps, palaeogeographic maps, correlation charts, local detailed maps with isopachs, and even photographs showing outcrops.

Chapters 10 and 11 treat the two south Asian countries, India (by S. N. Bhalla) and Pakistan (by A. A. Kureshi), while the last two chapters treat Papua New Guinea (by S. K. Skwarko, C. M. Brown & C. J. Pigram)—one of the best chapters of the book—and Antarctica (by M. R. A. Thomson).

As a source book to world regional stratigraphy, the second volume of *The Phanerozoic Geology of the World* is an invaluable addition to any geologist's library, if he has an interest in regional geology. The book contains a wealth of data and references not readily accessible elsewhere, but unfortunately its prohibitive price would probably put it beyond the reach of many individuals. It is, however, a must for the research libraries of universities, oil companies, and geological surveys engaged in regional research. For all its advantages, however, the second volume of *The Phanerozoic Geology of the World* falls short of its declared goal of providing a comprehensive treatment of the geology of the areas treated. The book is little more than a classical stratigrapher's view of the world and as such contains extremely scanty and commonly out-of-date accounts of the geological evolution of the regions described. In some of the articles even the stratigraphic part is out-of-date and would have been considered so even if the book had appeared in 1979, when the majority of its constituent chapters were apparently written, and not with a four-year delay! To cite a few examples, Butterlin's article makes no mention of the Coniacian sill event and the consequent anomalous thickness and buoyancy of the Caribbean plate that has played such a critical role in the latest Mesozoic evolution of the Caribbean area; the chapter on India has no references to the recent Swiss and French work in Ladakh and its surroundings that has contributed substantially to the Mesozoic stratigraphy of these regions and especially has documented the Triassic rifting of Neo-Tethys and the island-arc character of the Dras volcanics. In the chapter on Pakistan, the ophiolites of the Waziristan suture are considered ultramafic and mafic intrusions into the sedimentary rocks of the Indian foreland! No reference is made to the work of American, Swiss and French scientists that not only documented the tectonic position of these ophiolites, but also the evolution of the Kohistan arc complex.

The frequent use by many of the authors of the obsolete geosynclinal nomenclature, and statements such as "this does not explain the tectonic evolution during the Subhercynian cycle, which is older than the supposed mid-Caribbean Ridge" sound extremely archaic and are, moreover, confusing. Although much lip-service is paid to plate tectonics throughout the book, many of the authors are obviously out-of-touch with the present state-of-the-art in regional tectonic interpretation and as a consequence most chapters do not go beyond being stratigraphic summaries of the areas covered. Scanty treatment was also given to subjects other than regional structure, such as igneous and metamorphic evolution and palaeomagnetism that are crucial for an understanding of regional geologic evolution.

All these deficiencies are probably the result of the original choice of authors by the editors. If structural geologists with a broad background and experience in regional tectonics had been combined with biostratigraphers and sedimentologists, a much more balanced and useful treatment would have resulted that would have earned the book its title. As it now stands, the title *Geology of the World* seems to include a lot more than the book actually offers.

A final word on the illustrations should be added: I am surprised to find so few correlation charts displaying lithofacies data in a book devoted to regional stratigraphy. Correlation charts containing merely formation names are of little use to people not intimately familiar with the regional geology of the area described. In some of the maps the choice of symbols is confusing (e.g. fig. 3 of chapter 12 seems to have the same symbol for Cretaceous ultramafic rocks and Triassic sedimentary rocks!). On the average, the book is well-illustrated, with the exception of columnar stratigraphic sections.

A. M. C. Şengör

Mountains: an original view

Lyttleton, R. A. 1982. *The Earth and its Mountains*. John Wiley, Chichester. 206 pp. Price: hardcover £15.50.

This book is quite revolutionary in some of its concepts. The author, formerly professor of theoretical astronomy at the University of Cambridge, a Gold Medallist of the Royal Astronomical Society and a Royal Medallist of the Royal Society has written many books and papers on astrophysics, cosmogony, cosmology, physics, dynamics and geophysics. The present text, he tells us in his preface, is developed from a lecture he gave to the Milne Society in Oxford University in 1978 entitled "Gravitation, Ancient Eclipses and Mountains". The occasion he says, gave him the opportunity to give a coherent account of ideas on the theory of the structure of the Earth which he had been investigating during the past two decades.

His ideas about planetary evolution have led him to conclude that the Earth, as well as other terrestrial planets, began their existence in solid form throughout. Evolution from this primordial state is caused by release of radioactive energy from within the planetary interior. His studies of the Earth–Moon–Sun system and a re-working of the tidal friction theory lead to a further conclusion that the Earth is contracting and that seismic (earthquake) data can be interpreted in terms of an Earth which, when in all-solid form, would have had a moment of inertia 25% greater than at present with a radius some 370 km larger. He rejects the assumption that the Earth's core consists of iron and nickel and follows W. H. Ramsey who first proposed a phase-change hypothesis to explain the development and present existence of a liquid core. Among the terrestrial planets, we are told, only in the Earth and Venus have pressures been high enough for the Ramsey phase-change to occur.

So, how does this model of the Earth' planetary evolution impinge upon conventional wisdom regarding the 'origin of mountains'? It is suggested that the Earth may have been in entirely solid form for about one billion years. During this period, the central temperature gradually rose until it reached a critical value at which time a sudden phase-change occurred and a collapse of the Earth's core resulted. It is