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

admitted, however, that even before the collapse melting may have occurred in a layer within a few hundred kilometres of the Earth's surface. To what extent the Earth had mountains before the phase-change event is not indicated. It is the phase-change event, a cataclysmic collapse of the Earth's interior, leading to a reduction of the planet's radius by an average of 70 km which is proposed as the primary driving mechanism of mountain building. This collapse is envisaged as occurring over a period of perhaps a few minutes, at most a few hours. Not surprisingly the author suggests that: 'the most violent epoch of mountain-building would of course have been the few minutes of the initial collapse itself'. Thereafter, although the planet is 'thoroughly stable', it evolves with rising internal temperature, yet at the same time contracting steadily, with pressure in the deep interior far exceeding the strength of the material involved. This post-cataclysm contraction amounts to a further decrease of radius of about 300 km, so far. Mountain building subsequent to the cataclysmic collapse is thus a consequence of contraction and the theory quite elegantly explains why periods of orogeny should be separated by periods of relative quiescence lasting of the order 1.5×10^8 years.

The book is clearly and concisely written. It opens with a set of summaries which describe, without recourse to mathematical proofs, which feature in later chapters, the principal elements and consequences of the theory. Nine chapters cover the origin of the Earth, its interior, the nature and theory of tidal friction, the phase-change hypothesis, Earth models based on seismic data, the origin of mountains, applications to other planets, and finally a chapter which poses the question: 'Is the Constant of Gravitation Constant?' Illustrations are minimal, 13 figures and one photograph.

What makes this book so difficult to assess is that no attempt is made to discuss the author's model of the mechanism of mountain building in relation to any other view or theory of global tectonics, not even plate tectonic theory. For this reason, I suspect that the author's theoretical arguments, no matter how well formed they may be, will not convince the majority of earth scientists until such time as they are more thoroughly evaluated against the well established body of knowledge of geological processes and Earth history to which little credence is given in this book.

R. McQuillan

Active crust

Vyskocil, P., Wassef, A. M. & Green, R. (editors) 1983. *Recent Crustal Movements*, 1982. Elsevier, Amsterdam. 351 pp. Price: hardcover US $89.25 (in U.S.A and Canada), Dfl. 210.00 (rest of the world). In the USA and Canada the book is available from Elsevier Publishing Co. Inc., P.O. Box 1663, Grand Central Station, New York, NY 10163, U.S.A.

The papers in this volume were presented at the 3rd Symposium on: "Recent Crustal Movements and Phenomena Associated with Earthquakes and Volcanism" in May 1982 in Tokyo at the General Meeting of the International Association of Geodesy. The volume is split into four sections:

(i) new results in crustal movement studies at local or regional scale;
(ii) crustal deformations associated with volcanism;
(iii) crustal deformations associated with seismic activity;
(iv) error analysis; computations, methods of measurements.

There are 25 papers and 20 abstracts. The abstracts are, for the most part, useful only because they contain the mailing addresses of the authors concerned who might, through correspondence, reveal the data on which their conclusions are based. The meat of this book is in the papers: of the 19 in the first three sections 9 are on Japan, 6 on the U.S.A. and one on each of Venezuela, Australia, Fennoscandia and the U.S.S.R. There is, thus, a strong bias towards the U.S.A. and Japan.

As in any collection of such papers, some are good and present new data in sufficient detail to be useful, while others are not. The main criticism of this book is its price: $85 for 25 papers is not good value. Moreover, the entire collection of papers and abstracts had already been published as a single issue of *Tectonophysics* (volume 97, pp. 1–351). This book simply adds hard covers. Its price is prohibitive for any student or private library. Institutional libraries who do not already subscribe to *Tectonophysics* should consider whether to do so rather than pay so much for a single issue.

J. A. Jackson