

COMPTES RENDUS

THE EARTH AND ITS MOUNTAINS by R. A. LYTTLETON.
Ed. John WILEY & Sons, Chichester, 1982, 206 p.,
13 fig., 22 tab.

In this intriguing book the author, a former professor of theoretical astronomy, presents an alternative theory to the currently held views on the origin of the earth and its mountains. He shows that analysis of the recorded ancient-eclipse data, in terms of the lunar and solar tidal couples, indicates that the whole interior of the earth is undergoing steady contraction accompanied by intermittent contraction at the surface, producing eras of mountain-building.

The views here put forward lead in the first place to the conclusion that the earth (and other terrestrial planets) began their individual existences in solid form throughout (well documented for instance in the National Geographic Magazine of January 1985), and that the basic cause of their evolution is the still-continuing release of radioactive energy.

The central novel feature of this book is based on a reworking of the almost classic theory of tidal friction of the earth-moon-sun system, which disclosed that hitherto and invalid dynamical assumption had tacitly been made in setting up the fundamental initial equations of the theory, showing that the moment-of-inertia of the earth is steadily decreasing (diminished by 25 %) and with it also the surface-radius (diminished by 370 km). The amended theory also shows that the long-standing assumption that the earth's core consists of iron and nickel cannot be sustained. But perhaps the conclusion of most general interest that emerges from the revised theory is that contraction of the earth resulting from a steady increase of the liquid core mass and sufficient to account for more than twenty major eras of mountain-building must have taken place.

The book is subdivided in nine chapters, dealing with the origin and the interior of the earth, the nature and theory of tidal friction, the phase-change hypotheses, earth models based on seismic data, the origin of mountains, applications to other terrestrial planets and the constant of gravitation. In order to facilitate the task of the reader brief non-technical summaries of each chapter are given before the full mathematical exposition which comprises the main body of the work. Nevertheless, the book remains perfectly readable requiring only a basic scientific background as a condition for understanding the overall message of the author's views.

The book is not intended as a comprehensive textbook on geophysics nor does it attempt

to deal with the description of mountain-building processes which have already been widely disseminated in a vast literature.

Although this book primarily deals with the author's own research on basic geophysical models, it is useful for all students including geologists not mathematically-minded, as a rehearsal in compact and coherent form of the theories on the origin of the earth and its evolution, which are too often taken for granted.

M. DUSAR,
May 1986.

ENVIRONMENTAL ISOTOPES IN THE HYDROSPHERE by V. I. FERRONSKY and V. A. POLYAKOV, translated by S. V. FERRONSKY. 466 p. A Wiley-Interscience Publication. John WILEY & Sons, Chichester, New York, Brisbane, Toronto, Singapore, 1982.

There is no doubt that isotope chemistry has become increasingly important during the last two decades and that it is now being used in very many fields of research in the earth- and environmental sciences. In this respect, the study of the hydrosphere holds a very specific position.

Water is not only the most important raw material that mankind is in need of; in a less pragmatic approach it also plays a keyrole in a wide variety of reactions and processes that occur on our planet. In addition, with the existence of the stable isotopes ^{16}O , ^{17}O , ^{18}O , ^1H and ^2H (D) and the naturally occurring radioactive tritium (^3H), the watermolecule certainly is a special treat to isotope chemists. As a consequence numerous ways have been - and are being - worked out to apply isotope techniques to the study of the hydrosphere and the processes in which water plays a role.

"Environmental isotopes in the Hydrosphere" gives an excellent in-depth and quite complete description of these many applications. Different large fields of interest are dealt with in separate chapters.

In a first chapter ("Isotopic geochemistry of natural waters") the basic information is given about the behaviour of stable isotopes in aqueous systems.

A second chapter "Hydrogen and oxygen stable isotopes in the study of the formation and dynamics of natural waters") deals with the interaction between different waterbodies.

Obviously in this part of the book scientists mainly interested in other fields than hydrology will find appropriate information to their scientific domain, whether it is palaeoclimatology, ore mineralogy, geothermics or sedimentary petrology.

"Cosmogenic radioactive isotopes in natural waters" is a third chapter. After giving information about the origin and distribution of these isotopes, the major part of this chapter describes the behaviour of tritium in the atmosphere and in different waters. The next subject of this chapter is another important cosmogenic radioactive isotope: ^{14}C . This chapter concludes with a relatively short discussion of other cosmogenic radio-isotopes.

Two shorter chapters follow :

One (IV : "Radioactive isotopes of heavy elements in natural waters") gives a survey of the use of non cosmogenic radioactive isotopes in studying water and related topics. The enumeration of dating techniques is not complete and the chapter is less elaborated than the previous ones, but the subject is of course less related to the study of waters.

The last chapter (V) deals with the "Origin of the Earth's hydrosphere in the light of the isotopic composition of water" : a more academic problem. Summarizing the concepts about the origin and evolution of our oceans in a planetary and cosmogenic scope, this chapter must be considered as an introduction to a complex and rapidly evolving field.

Although the last two (shorter) chapters contain very interesting information, the first three chapters make out the major part and the backbone of this book. The authors start each of these three chapters by giving a very basic introduction at a physical chemical level, then clearly explain the fundamentals of each method or subject and consequently illustrate the use and applications by reviewing in detail each specific field.

With its 87 tables, 135 figures and about 800 references to the literature, the result gives a very complete and well documented picture of the actual "state of the art".

"Environmental Isotopes in the Hydrosphere" can be used as a text-book by students or scientists who are less familiar with isotope methods. But it is also a very useful reference-work for lecturers and specialized researchers. In this respect it is worth mentioning that since both authors are Soviet-scientists, many references are made to the recent Soviet- and Eastern European research, a source of valuable information with which many "western" scientists are less familiar.

E. KEPPENS.
January 1986.

METALLIZATION ASSOCIATED WITH ACID MAGMATISM.
Ed. by A. M. EVANS.
International Geological Correlation Programme.

Suite au Symposium international sur les problèmes de minéralisation associée au magmatisme acide qui eut lieu à l'Université d'Exeter en décembre 1979, ce livre fut édité réunissant les différentes communications qui y furent faites. Le Symposium fut essentiellement axé sur la mise en évidence de critères révélant le potentiel

minier des granites par des méthodes géochimiques et minéralogiques. La majorité des articles concerne les minéralisations en étain et tungstène mais Nb, Ta, Be, Mo, porphyry copper ne furent pas négligés.

Myriam MARDAGA.

VOLCANOES AND THE EARTH'S INTERIOR .
With introduction by Robert and Barbara DECKER.
Dartmouth College. Readings from Scientific American. Ed. W. A. Freeman & C°, San Francisco.

This collection of 10 articles from Scientific American provides an excellent sampling of recent studies in volcanology. Part I explores the regional settings of volcanoes with regard to plate tectonics. Part II deals with the differing products of explosive and non explosive volcanoes; and Part III shows volcanoes as dim windows on the products, processes, conditions and evolution of the earth's interior.

Part I contains three articles presenting three basic types of volcanoes : subduction-zone volcanoes which occur along convergent plate margins, rift volcanoes along separating plate boundaries (with description of the unique ecosystem developing around hydrothermal vents) and hot-spot volcanoes within the plates.

These articles describe the nature of these tectonic regions and provide important insights into the differing root systems of three volcanic groups.

Part II contains three case histories of different types of volcanic eruptions : the lava lakes of Kilanea (Hawai) as an example of oceanic rift volcanoes and Hawaiian volcanoes, tephra from Mt. Mazama (Oregon) and the eruptions of Mt. St-Hélène in 1980 (Washington) as examples of subduction zone volcanoes.

Part III contains four articles about the earth's mantle which can only be studied indirectly.

From celestial mechanics, geophysics, the study of meteorites and volcanoes provide indirect evidence on the composition and physical phases of the mantle or origin of the basalt. Volcanic rocks, especially kimberlites rich in deep-seated inclusions provide the only direct tests for models of the earth's mantle. Two types of mantle rocks may be explained leading to basalt derived from two sources : one that appears to have been partially melted several times and undifferentiated mantle.

Studies of the parent-daughter-ratios of long-lived radioactive elements in volcanic rocks allow subtle insights into the composition, structure- and evolution of these mantle source rocks.

The final article in this series concerns Yellowstone National Park, a "hot spot" in the earth's crust. Its strong volcanic and tectonic activity makes it a unique location for the study of processes that originate deep in the earth.

All articles have been published separately between 1975 and 1981 when they were compiled by Robert and Barbara DECKER. There is no need to express the text-book qualities of

these articles which are of general interest and easily comprehensible for earth scientists and students.

M. DUSAR.

TECHNIK-WÖRTERBUCH. GEOWISSENSCHAFTEN.
Deutsch-English (372 p.) - English-Deutsch (400 p.)
(2 tomes). Herausgeber : Prof. Dr. rer. nat.
Adolf WATZNAUER. Ed. VEB Verlag Technik Berlin.

These technical dictionaries give translations for more than 38.000 concepts related to all specialities of geology.

For geologists accustomed to reading Anglo-Saxon literature, the "Deutsch-English" tome will be very useful to help than understand occasional German publications; the reverse is true for German readers of course. The large number of catchwords guarantees a successful search. Grammatical gender for all German words is indicated in both tomes.

Walter DE VOS.

EARTH'S HISTORY. STRUCTURE AND MATERIALS.
Ed. by Brian J. SKINNER, Yale University.
Serie EARTH AND ITS INHABITANTS.
Readings from American Scientist.
William KAUFMANN, Inc., Los Altos, California.

Ce volume de haute tenue didactique rassemble plusieurs textes publiés, entre 1969 et 1980, dans "American Scientist". On y trouve 16 publications décrivant la terre et le système solaire, la dérive des continents, les activités volcaniques et la géochronologie. On y lit, entre autres, la description de l'éruption de Mt. Ste-Hélène (1980).

G. VANDENVEN.

COMPUTER SOFTWARE FOR SPATIAL DATA HANDLING.
International Geographical Union.
Ed. D. F. MARBLE.

Ce travail consiste en trois parties qui donne une analyse des programmes existants, modules et systèmes qui traitent des données spatiales ou manipulent dans les domaines des sciences, de géographie-météorologie-géologie-hydrologie, etc...

Presque tous les systèmes et programmes existants sont décrits jusqu'en 1979.

Pour obtenir rapidement une vue générale, on a ajouté, dans la partie 1, quelques listes d'index, notamment un index de sigles, un index du langage programmeur, un index de l'ordinateur-type et un index de mots-matières.

Pour chacun des systèmes, programmes ou modules, on donne une description de une ou plusieurs pages, dans lesquelles on traite les points suivants :

1. nom ou mot lettriste avec signification;
2. Destination du système, programme ou module dans laquelle on donne une description des possibilités générales ainsi que les possibilités plus spécifiques.
3. Données et descriptions de la nature et de l'entrée.

4. Traitement des données : décrit la transposition des données et les résultats.

5. Renseignements sur les programmes et mode d'emploi : décrit la langue de programmeur utilisé, le système d'opération, les types d'ordinateur sur laquelle et les bibliothèques-subroutine nécessaires.

6. Origine du système ou programme : auteur, documentation, etc...

7. Disponibilité : adresse à contacter, testée ou non, à vendre, etc...

Vol. 1 "Full Geographic Information Systems" décrit les systèmes complets existants.

Vol. 2 "Data Manipulation Programs" décrit les programmes spécifiques pour la mesure des angles, segments, distances, polygones, etc... ou des programmes existants pour modèles concernant : flux, démographie, simulations générales et programmes de dépouillements d'images. pour le traitement des photos-satellites.

Vol. 3 "Cartography and Graphics" décrit les systèmes de retranscription de cartes, programmes de dessins, présentations de diagrammes, présentation sur cartes des lignes et points, hachures de surfaces en grid ou "vectormode", contour et interpolation des surfaces, propositions en tridimensionnelles, projections de cartes, transformations et mesures des distances.

H. GOETHALS.