
REVIEWS

Annual Review of Earth and Planetary Sciences, Vol. 8. Edited by F. A. Donath, F. G. Stehli and G. W. Wetherill. (Annual Reviews Inc., Palo Alto, California 94306, U.S.A.), 1980. Pp. 626. Price: Hard cover: \$ 17.50 (outside U.S.A.).

This series has already become a 'must' for every earth science library. Seven volumes containing a wealth of data have already appeared and are very popular with research scientists and students. The present volume (No. 8) is an excellent compendium of trend-setting articles.

D. R. Lowe highlights the recent spurt in sedimentological studies on Archaean rocks and the light they throw on Archaean tectonics. N. H. Sleep and others analyse the evolutionary history of passive marginal basins and interior platform basins. H. P. Eugster draws attention to the neglected field of continental evaporites.

G. N. Hanson provides an in-depth review of the use of rare earth elements for petrogenetic modelling, which has an important bearing on processes of magma generation. The use of fluid inclusions as an excellent geobarometric tool is reviewed objectively by E. Roedder and R. J. Bodnar, who point out the pitfalls in earlier concepts and guide us to the future. Y. Gueguen and A. Nicolas provide an interesting insight into upper mantle geodynamics based on studies of synthetic and natural mantle materials.

R. P. Sharp deals with the surface features of Moon, Mars and Mercury for comparison with the earth's surface processes during its early evolution. J. B. Pollock and Y. L. Yung explore the origin and evolution of planetary atmospheres. J. Veverka and J. A. Burns describe the satellites of Mars and their bearing on interplanetary processes. H. J. Melosh summarises the mechanics of impact cratering and its relevance for earth's early evolution. The revolutionary changes in concepts of planetary evolution brought out by studies on Allende Meteorite are presented by L. Grossman.

J. A. Brewer and J. E. Oliver stress the importance of deep seismic profiling for understanding the crustal architecture. J. W. Rudnicki reviews the interrelation between fracture mechanics and earth's seismicity. The importance of heat flow studies and their bearing on the precious metal producing marine hydrothermal systems are reviewed by C. R. B. Lister.

Other important papers in the volume are on

graphy (W. H. Munk), remote sensing of ocean surface processes (J. R. Apel), Equatorial Undercurrent (S. G. H. Philander), Stratosphere Warmings (J. R. Holton), deep water forms and palaeoceanography (D. Schintker) and Early Cenozoic faunal evolutionary patterns (P. D. Gingerich).

This volume is strongly recommended for use in all earth science libraries of India.

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Groundwater in Varahamihira's 'Brihat Samhita'. By Dr. E. A. V. Prasad in the Monographs in Ancient Scientific Sanskrit Literature (Masslit). (Originally published by Sri Venkateswara University, Tirupati, India). Pp. 351. Price not mentioned. Reprinted in 1980.

The book is first in the series, written in simple, lucid English by a scientist who is on the teaching staff of the Geology Department of Sri Venkateswara University. The author, a practising geohydrologist, has considerable knowledge of Sanskrit texts dealing with earth science disciplines.

The book commences introducing Varahamihira the celebrated author of the monumental Sanskrit text titled *Brihat Samhita*, followed by a historical development of the discipline of geohydrology. The author has rendered into English, the 125 verses in Sanskrit making up the chapter called 'Dakargala' of the text of *Brihat Samhita*. Biotic environs of plants and animals, physical environ and exploitation of ground water and its ecosystem have been presented in a crisp and effective manner. Varahamihira's works are discussed in a chapter (No. 10) in the modern context.

"Westerners ignorant of Varahamihira's contributions trace the origin of geohydrology to recent past"—states the author and describes Varahamihira as founder of the discipline in the east. Perhaps Varahamihira, as himself admits, was a master compiler and promoter of the discipline, than a founder, for, he mentions that he has compiled most of the information of earlier workers like Saraswata, Manu, Baladeva and others.

Perhaps this is the 3rd English version of the Sanskrit verses of the Dakargala chapter, since such

versions by earlier students like Kern and Chidambara Iyer do exist. It would have been more useful and appealing to a modern student had the translation been supplemented by modern observations culled out from pedology, petrology and geohydrology from the existing literature on parts of India. In verse 107 it is stated that rock of colour of beryl, etc., may need clear petrological observations. Rocks, with specific colour, ensure supply of perennial water is observed. With the rich experience of the author, it would have been nice to have explanation from a petrologist's point of view. Similarly, methods to break rocks to deepen the wells are given, which may help such operations in the absence of explosives.

Varieties of plants, trees with and without termite association, have been given by Varahamihira as indicators of groundwater at certain depths and directions. The author has done well in presenting them with details.

Errors are few and the get-up of the book is nice. On p. 11, it is mentioned that *Brihat Samhita* consists of 100 chapters in 300 slokas, but it may be more than 3000 slokas. In the Bibliography reference to the work of Kern is missing.

The author deserves our admiration for presenting the scientists a book enriched by eastern observations of long past, but true even to this day. Perhaps this will mark the commencement of an era which will witness the oncoming of more and more books of similar kind.

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Nitrogen and Rice. (International Rice Research Institute, Los Banos, Laguna, Philippines, P.O. Box 933, Manila, Philippines), 1979. Pp. v + 499. Price: Highly developed nations \$ 11.25; Developed Nations \$ 4.50.

The book *Nitrogen and Rice* is the outcome of the Symposium on Nitrogen and Rice sponsored by International Rice Research Institute, Philippines. The book embodies 28 scientific papers on (i) Role of nitrogen in rice production; (ii) Nitrogen transformation in rice soils; (iii) Heterotrophic nitrogen fixation in rice soils; (iv) Nitrogen fixation by algae; (v) Azolla and its utilization for rice production and (vi) Agronomic practices to increase nitrogen in rice soils.

Rice is grown under a wide variety of soils and climatic conditions where nitrogen along with water management is the key to the realization of the high yield potential of modern rice varieties. Low cost nitrogen is one of the requisites for the well-being of small rice farmers of the tropics. The nitrogen requirement of doubling (321 mt rice) rice production in 20 major rice growing countries by 1994 is estimated to be 9.7 mt and is considered an attainable goal when 79% of the rice area could be irrigated.

To increase yield, it is necessary to raise the productive efficiency of nitrogen by increasing the amount of nitrogen supplied naturally and by the proper use of the fertilizer nitrogen. Under the low input supply in the tropics for increasing the spikelet number per unit area (sink capacity) thereby yield, good quality of young seedlings, shallow planting, closer spacing, deep placement of basal nitrogen, top dressing at the early panicle formation stage, etc., are proven technology for rice production. Ammonium nitrogen (NH_4) is the dominant mineral form in flooded soils and urea is and will continue to be the dominant form of chemical nitrogen source. Recycling of organic wastes does help maintaining soil nitrogen at fairly high level. Urea based controlled release fertilizers such as urea briquets and coated urea have been found to be more efficient in low land rice.

Considerable saving in use of chemical fertilizer may be made by using effectively animal manure (compost) and/or inoculating rice field with N^2 -fixing cyno-bacteria (blue-green algae); green manuring of rice field with legumes (*Sesbania sp.*), growing Azolla and incorporating Azolla prior to transplanting of rice.

While giving the recommendations for future research, it is stressed at the end in the book that the importance of N for rice production justifies the intensive research effort on biological N-fixation including Azolla, blue-green algae, heterotrophic nitrogen fixation, legume rhizobium N-fixation and N-transformation. N-transformation study would reveal the relative role, of denitrification and ammonia volatilization in the loss of N from rice fields. These studies will involve the balance experiments with ^{15}N -labelled N-fertilizer. It is further suggested that new technique involving placement, timing and source of N be included in research programme.

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