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The recent volumes of *Annual Review of Earth and Planetary Sciences* carry in-depth reviews written by experts in their respective areas of specialization, and present a wide spectrum of research topics, ranging from evolutionary history of whales and dolphins to tectonic and magmatic evolution of Venus. Some of them are currently active topics, while others deal with emerging fields. As Frank Press rightly points out in his introductory article (vol. 23), the golden age which had witnessed extraordinary creativity and discovery may have been over, but the science and its methods will be appropriately remoulded to suit the new age. The articles under review in fact testify to the reshaping of science to suit the demands of a new era.

The volumes reviewed here contain eighteen and fifteen articles respectively on varied topics, with some overlap. The articles, viz. 'The fate of descending slabs' by Thorne Lay (vol. 22) and 'The mechanics of deep earthquakes' by Harry W. Green II and Heidi Houston (vol. 22) deal with similar problems. But the reader is benefitted because of their differences in perspective. The discovery of deep focus earthquakes should be considered as momentous, as they had made some lasting contributions to the earth sciences. Major questions still remain as to the mechanics of the deep earthquakes in the subduction zones, and also what happens to the descending slabs of oceanic crust. Answers to these questions which have implications for mantle convection, are now sought not only from seismology, but also from high pressure mineral and rock physics.

The articles, 'Quantum geophysics' by M. S. T. Bukowski (vol. 22) and 'Effects of phase transitions on mantle convection' by Ulrich Christensen (vol. 23), also address questions related to inner earth environments. The article on

quantum geophysics focuses on the advances made in the theoretical mineral physics, and presents a case as to why the diverse internal properties like structure compressibility, phase transformations, vibrating and optical spectra and rheology that are interrelated at the atomic level, have to be conceptualized and unified from a theoretical point of view of quantum mechanics, especially when the conditions that exist in the inner Earth may be difficult to simulate by the available laboratory techniques. The second paper reviews the role of phase transitions in influencing mantle convection. A larger question, however, is the relative role of mass flux between upper and lower mantle. This is an important problem in earth sciences from another angle. Although the plate tectonics is the accepted paradigm to account for stress accumulation and crustal deformation, it is increasingly realized that the creeping flow of mantle rocks by buoyancy forces due to thermal expansion has a role in generating stresses in the continental crust. The article by Ulrich Christensen presents the results of numerical modelling to resolve the question of nature of mantle convection, and concludes that a compromise of two end member models of whole-mantle convection and layered convection may be plausible.

Palaeoclimatic changes form the theme of many papers in these volumes. 'Late Eocene-Oligocene extinction' by Donald R. Prothero (vol. 22); 'Palaeoclimatic estimates from Tertiary leaf assemblages' by Jack A. Wolfe (vol. 23); 'The initiation of northern hemisphere glaciation' by M. E. Raymo (vol. 22) and 'Sequence stratigraphy' by Nicholas Christie-Blick and Neal W. Driscoll (vol. 23) are the articles under this theme. The first article focuses on the transition from the Eocene to Oligocene Epochs. Improved dating and correlative techniques which increased the resolution of data suggest a protracted pattern of Eocene-Oligocene extinction, precluding any sudden impact events. The review of Tertiary leaf assemblages covers the application of the 'Climate-Leaf Analysis Multivariate Program' (CLAMP) to assess the Tertiary nonmarine climate and its results from some selected areas. This statisti-

cal approach aids in analysing the Tertiary leaf varieties induced by climatic factors. Results show a 'terminal Eocene temperature deterioration' in the continents as well. The fourth article covers the science of sequence stratigraphy. The sequence stratigraphy is relatively a new discipline systematized in the 1970s when Exxon, the oil giant, released its seismic reflection data from the edges of the continents, much to the excitement of scientists world over. From these data, the scientists could decipher the pattern of the rise and fall of sea level over the past 250 million years. These studies have churned out voluminous output in the interpretation of global sea level falls. However, questions remain as to the relative role of tectonic processes and climatic factors (fluctuations in the size of ice sheets) in forcing the coastal onlaps. It is expected that recent Ocean Drilling Program (ODP) in the coastal waters may come up with complementary data. The role of tectonism is emphasized in the article on northern hemisphere glaciation by M. E. Raymo. He examines the climatic transition from warm mid-Pliocene (~3.2 Ma) to the onset of northern hemisphere glaciation around 2.4 Ma. Resolving climatic patterns of the recent geologic past is important, particularly because an increase of 3°C is predicted for the next century.

Among the review articles in the two volumes, one of my favourites is the article titled 'Arc assembly and continental collision in the Neoproterozoic east African orogen: Implications for the consolidation of Gondwanaland' by Robert J. Stern (vol. 22). The impressive style of narration and the brilliant exposition of ideas make it a memorable article. The Neoproterozoic Era (1000-540 my), which encompassed a protracted orogenic cycle, is a fascinating interval characterized by the evolution of eukaryotes and appearance of metazoa, large events of continental glaciation, increased concentration of oxygen in the atmosphere and the development of banded iron formation. Pan-African Orogenic cycle was not restricted to Africa, but throughout the Gondwanaland. The evidences of the Pan-African tectonism indicate that the plate tectonic systems had been in ex-

istence even in the early phases of the Earth's history. The article chronicles the sequence of tectonic events comprising the East African Orogen (EAO). Of special interest is the mention of granulites of southernmost India and Sri Lanka, which were earlier thought to be Archean and Paleoproterozoic, but have since been proved to be Neoproterozoic (660–550 Ma). The author suggests that the younger ages indicate a second younger collision event between the west and east Gondwanic continents. He further states that collision along EAO led to the crustal overthickening and development of strike-slip shear zones and faults related to extensional basin. The modern analogue is the 'escape tectonism' observed in parts of the Himalayan orogen.

Reading this type of compendiums gives you an experience akin to a space mountain ride in Disney World. From a breathless ride in the realm of Neoproterozoic world, we are thrown into a mundane world of earthquakes and active tectonics, and again to much rarefied fields of tectonic evolution of Venus, radar investigations of Mars, Mercury and Titan and physics of zodiacal dust and the mind-shattering enigma of origin of life. I like to focus on the chapter on earthquakes and active tectonics first, being the topics that are closer to my heart. H. Kanamori gives a succinct review of the physical processes of earthquake generation in his article on 'Mechanics of earthquake generation' (vol. 22). There have been significant advances made in the study of slip distribution on a fault. Seismic imaging of major earthquake zones shows that slip models can be interpreted in terms of 'barriers' and 'asperities', ideas to which Kanamori himself has made significant contributions. He emphasizes the mechanical models of faulting involving the factors such as macroscopic and microscopic static stress and dynamic stress fields. The article on 'Active tectonics of the Aegean region' by James Jackson (vol. 22) deals not only with earthquakes, but also tectonics. What is most interesting here is the abundance of observational data, precluding any element of speculation. The whole dynamics of the deformation is built upon from the high quality seismicity data

and measurements of velocity field in the fault zones using space-based geodetic techniques.

Christopher F. Chyba and Gene D. McDonald review some current issues related to origin of life and exobiology research (vol. 23). Consensus is that *sine qua non* of life is liquid water. Thus, search for life is essentially a search for liquid water. This view is criticised as being born out of 'parochialism' by a group led by irrepressible Carl Sagan. An alternate view insists that extraterrestrial life may look quite different from what we are accustomed to. The article also brings out some salient issues concerning the origin of life on Earth. The questions on the sources of energy available to force the prebiotic organic synthesis are also addressed. A 'chicken or egg' problem haunts the researchers in this field. Which formed first: RNA or proteins? The majority favours RNA. On the whole, the authors have done a thorough job and leave out nothing on one of the most engaging areas of interdisciplinary research today.

Some reviews deal with emerging fields. What appeared most exciting to me in this category is an article titled 'Geomorphology and *in-situ* cosmogenic isotopes' by T. E. Cerling and H. Craig (vol. 22). This article presents an avantgarde method to date the geomorphologic surfaces using the production rates of different cosmogenic isotopes. This method of dating the erosional surfaces will help to resolve some of the long-standing problems in geomorphology, archaeology and active tectonics. The work of an Indian scientist, D. Lal finds repeated reference in this paper. Fortunately, a solid infrastructure and a strong tradition exist in our country that is helpful to strengthen and diversify this line of research to solve some specific problems.

The annual reviews also contain articles in the domain of planetary sciences, in particular about radar imaging of Mars and Venus. Other chapters in the volumes cover a potpourri of topics. As no book review is considered in order without a few quibbles, I would like to add that a topical arrangement of articles would have made these volumes more reader-friendly. On balance, I must say that these articles open up wide

vistas of future research, and remind us most emphatically that the earth sciences have really come of age into a world of high quality data, high resolution and increased quantification of natural processes. And, they are recommended to both professionals and students for these reasons.

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Biology of the Fungi by Dr J. G. Vaidya. Satyajeet Prakashan, I Floor, Sulochan Apartments, Pune 411 038. 1995. I Edition. 670 pp. Price not known.

Fungi have been getting increased recognition as important components of the microbial world and presently global attention is focused on aspects of biology, biochemistry and biotechnology of fungi for enhancing our knowledge base essential for achieving progress. In this context, a book dealing with Biology of Fungi to provide authentic information on the subject is most welcome.

The book on the *Biology of the Fungi* attempts to give an overview of the salient aspects of fungi under two major sections, viz. Fundamentals (Part I) and Fungi in Action (Part II). Topics dealt with under the Fundamentals section include biological characters, vegetative growth and reproduction, ultrastructure and nutritional aspects. In the second part a wide range of topics including fungal pathogenesis, nutrition and metabolism and role of fungi in biodeterioration and biodegradation are covered. Two chapters are also devoted to fungal metabolites and role of fungi in biotechnology.

The author has stated that he has chosen a 'multidisciplinary approach for making fungi comprehensible to the layman' while the references are included for the sake of 'students and research workers'. Each section comprises of six chapters and the contents of each chapter are presented under many subtitles.

While appreciating that the author has expended considerable effort in compiling information pertaining to fungi and presented them in a manner