**Tertiary Chronostratigraphic Units and Sea Level Changes (Kutch and East Coast Basins, India).** Ed. D. S. N. Raju and K. S. Soodan. Nav Jyoti Scientific Publications, 4/212 Gomtinagar, Vivek Khand-4, Lucknow 226 010. 1993. 140 pp. Price: Rs 300; (US $52.00)

This book is a sequel to the enormous surface and subsurface micropaleontologic and stratigraphic data on Indian Petroliferous basins, accumulated over the years by the geologists and paleontologists of the Oil and Natural Gas Commission (ONGC), Dehradun. Edited by two senior paleontologists of ONGC – D. S. N. Raju and K. S. Soodan – the book is a compilation of fifteen articles, all of which have one author in common, D. S. N. Raju, who seems to be the moving spirit behind the publication of these articles in a book form.

Since all the hydrocarbon occurrences in the country are so far confined to the Tertiary sediments, a detailed and comprehensive chronostratigraphic framework including sea level changes, cyclical events, foraminiferal controls and hiatuses is considered essential for any oil exploration activity. Similarly, the need to standardize and correlate the Indian Tertiary chronostratigraphic units with the standard European stages has long been felt by geologists in India. This objective, however, has posed several problems, particularly of correlating the shallow marine sequences with their rich benthic foraminiferal, and other assemblages with deep-sea sequences with plankontic foraminifera and nannoplanktons. It is in these contexts that the book will be greatly welcomed by oil geologists and other earth scientists in India.

The only available chronostratigraphic scheme (applicable so far to the shallow marine Tertiary sequences of the Kutch basin) is by Biswas (1965, 1971), with subsequent refinement and addition of foraminiferal controls by Raju (1974). The additional inputs for Neogene chronostratigraphic units of Western Indian shelf, Himalayas and Upper Assam were provided by Pandey (1982), and for the Paleocene of Assam by Pandey and Ravindran (1988).

The main objective in bringing out this volume has been to give a comprehensive chronostratigraphic classification of the Tertiary basins in Kutch and the East Coast of India, and to designate holostratotypes and, wherever necessary or desirable, hypostratotypes in other areas. The present book, while recognizing and accepting 12 stages as being meaningful and useful for the Indian chronostratigraphy covering the time interval from the base of Paleocene to the top of Miocene, deals comprehensively with only 9 stages covering the interval of Eocene to Miocene. Two stages – Adiyakkamangalamian (corresponding to the Lower-Eocene Ypresian Stage of Europe) and Thirupundian (corresponding to the interval from Langhian to the middle part of Seravallian stage) – are new.

The first article by Raju deals excellently with Oligo-Miocene sequences of Kutch, and for the first time, correlates the sixteen numerically defined miogypsinid biostratigraphic zones with the corresponding stages/zones of Andaman and Nicobar Islands proposed by Srinivasan (1988). The calibration, which covers the interval from Late Oligocene (Zone N2) to Middle Miocene (Zone N12), was made possible by the association of *Miogypsina* and planktonic foraminifera in certain deep-well sections in the Cauvery and Andaman basins.

Sea level changes and cyclical events during Oligocene in the Cauvery basin, based on foraminiferal data, are dealt with in the next two articles. These sea level changes and cyclical events are correlatable with global third-order cycles of Vail *et al.* (1977) and Haq *et al.* (1987). The Miocene cyclical sea level changes in a deep well on Ravva structure, Krishna–Godavari (K–G) basin, are dealt with in the subsequent article. Nine third-order sea level fluctuations are recognized in the Early to Middle Miocene sequences.

The succeeding nine articles deal comprehensively with the stratotypes of 9 stages covering the interval of Eocene to Miocene. Limits of several of these stages are redefined and their foraminiferal controls listed. In order to provide a wider framework for correlation purposes, hypostratotypes are designated in other areas.

The last two articles by Raju summarize the diagnostic characteristics of the 12 chronostratigraphic stages recognized in the book, and also deal at length with stratigraphic events and boundary problems in the Cretaceous–Cenozoic sedimentary sequences in the East Coast basins. A very useful summary chart showing a correlation of the Indian stages with the standard stages/zones and their approximate duration, and an author index form the rear of the book.

Although the book deals admirably with the lithostratigraphy and biostratigraphy of several surface and subsurface sections of Kutch and East Coast basins, it will have a limited scope, as the proposed holostratotypes of the two new stages are based on bore hole section and samples which are not available to most geologists, who have to rely on outcropping stratotypes. It is desirable that holostratotypes be based, as far as possible, on outcrop sections. Thus, it is difficult to comprehend the rationale in selecting a deep-well section in the Cauvery basin as the holostratotype for the Lower Eocene (Ypresian) stage, Adiyakkamangalamian, when extremely good and continuous sections are exposed in Rajasthan and the sub-Himalayas. The Subathu Formation, for example, ranges in age from Middle Ilerdian to Early Lutetian and is well defined in terms of larger foraminifera (Nummulitidae) (covering Zone P5–P10) (Bagi, 1992), and in the upper part in terms of nannoplanktons (covering NP12–NP13) (Jafar and Singh, 1992).

This lacuna apart, the book has an impressive get-up. The value of the book, however, would have gone up even further had (a) the various articles been more throughly planned and coordinated in order to avoid unnecessary repetition of illustrations and references, (b) the location maps been made more meaningful and detailed (showing locations of the deep wells and type sections mentioned in the text), (c) pertinent references to previous works been included, and (d) equivalents of the various stages in other parts of the country been suggested. For example, a small-scale map showing the location of Bodian village (holostratotype of Taptian stage) could have been given instead of the vague location map (p. 61). A litholog of the succession exposed in the type area should also have been given. Incidentally, there is no mention in this article of the equivalent Taraporian stage proposed by Pandey (1980). Figure 1 (p. 49) is repeated *ad nauseum* on pp. 55, 69, 79, 89, 97, 105 and 115 with only slight changes in the location of holostratotypes and hypostratotype, as the case may be. These so-called location maps are too generalized and small-scale

to be of any use. A reader is kept in the dark about the precise location of several well sections mentioned in the text, e.g. PY-1-D well, Pappanacheri well (PHC-A) (p. 61) and Snf PNC-A (p. 81). One fails to find the location of these wells even in the two maps of the Cauvery basin on pp. 15 and 27. In fact, more detailed maps of the Cauvery basin have been published elsewhere by ONGC (*Proc. XII Indian Colloquium Micropaleontology and Stratigraphy*). Similarly, one finds that the references cited in the various articles are very selective and important references have been omitted. For example, in article 4, there is no mention of the paper by Raju *et al.* (1989), which deals with the paleobathymetric trends from upper Eocene through Pliocene in the K–G basin. In fact, this article deals comprehensively with sea level changes during Miocene in the entire K–G basin, instead of in one particular structure as in this book.

There are several editorial lapses which will become apparent to discerning readers. The reference to the paper by Raju *et al.* (1989) on p. 65 deals with K–G basin, while the article is on Cauvery basin. Other instances are the usage of Tapti stage (p. 61), Aida stage (pp. 89, 90, 98) and Vinjhan stage (pp. 97, 98) instead of Taptian, Aidaian and Vinjhanian stages, respectively. Omission of age in Ma in Tables on pp. 73 and 84 may also be noted.

However, these lapses do not in any way detract from the merits of the book which has great reference value. The various authors and the editors are to be congratulated for making available a wealth of data which active paleontologists, stratigraphers and oil geologists cannot afford to miss.

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# MEETINGS/SYMPOSIA/SEMINARS

**ECCOMAS 96: Second ECCOMAS Conference on Numerical Methods in Engineering; Third ECCOMAS Computational Fluid Dynamics Conference**

Date: 9–13 September 1996
Place: Paris, France

Topics include: Mathematical modelling; Adaptive approximation techniques; Numerical and intelligent algorithms; Parallel computing; Software environment; Multidisciplinary optimization; Inverse problems; Active control; Nonlinear dynamics; Solid and structural mechanics; Materials science; Computational fluid mechanics; Turbulence and combustion; High speed flows; Computational electromagnetics; Environment and geosciences; Industrial applications.

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**International Conference on Disasters and Mitigation (INCODIM)**

Date: 19–22 January 1996
Place: Madras, India

Topics include: *Earthquakes*: Earthquake zoning and seismic risk analysis; Geological studies related to earthquakes; Recent developments in instrumentation for earthquake studies; Engineering practices for earthquake-resistant constructions and urban planning; Remote sensing for earthquake studies; Earthquake and its environmental impact; Prediction, crises and post-disaster management. *Landslides*: Geotechnical aspects and advancement in instruments to landslide studies; Remote sensing in the study of landslide; Slope stability, soil dynamics and rock mechanics; Landslide mitigation management. *Cyclones*: Periodicity of cyclones; Meteorological aspects of cyclone; Recent trends in cyclone warning; Engineering structures in cyclone-prone areas – construction of shelters – mitigation. *Floods*: Remote sensing studies for flood control management; Flood prediction and forecasting; Flood mitigation and damage assessment; Flood rating; Floods and engineering structures; Environmental impact assessment of floods. *Droughts and fires*: Drought forecasting and mitigation; Remote sensing techniques in drought studies; Drought hydraulics and crop damage assessment; Urban drought management; Computational modelling for drought; Environmental impact assessment of drought; Fire during drought. *Blasts*: Effects of bomb explosion; Underwater, underground and air blasts; Effect of rock launches. *Epidemics*; Medical relief measures and management.

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