

REVIEW

GONDWANA FIVE. Proceedings of the Fifth International Gondwana Symposium, Wellington, New Zealand, 11-16, February 1980. M. M. Cresswell and P. Vella (Editors), A. A. Balkema, Rotterdam, Netherlands, 1981, 349 pages. Price \$ 48.00, £ 20.50.

Gondwana Five, contains a collection of selected papers and abstracts of papers presented at the Fifth International Gondwana Symposium held at Wellington, New Zealand, during 11-16 February 1980. The volume represents the outcome of three years exercise on various aspects of Gondwana geology. There are 47 full papers and 13 abstracts of papers of which Indian contribution is only 6 full papers and 9 abstracts. For New Zealand it was an assertion that it is a part of the Gondwanaland, a fact that had escaped attention of workers on Gondwana geology.

The contributions presented under three major heads, cover a broad spectrum of subjects like palaeontology, stratigraphy, sedimentation, paleogeography, structure, regional metamorphism, orogeny, metallogeny, volcanism, global tectonics and regional tectonics. The emphasis is uneven with largest contribution of papers in the fields of palaeontology and stratigraphy. The volume covers almost all the units of the Gondwanaland and it even spills over to China. The problem of space precludes a review of all papers included in the volume.

The papers by Anderson and Tasch are more regional in approach and particularly of the former which attempts a worldwide Permo-Triassic correlation by means of biostratigraphic charts whose indispensability is increasingly realised in Palaeogeographic reconstructions. Tasch has recognised non-marine dispersal tracks linking Gondwana, USSR and China. Truswell has attempted study of progress of Permo-Carboniferous Palynology of Gondwana during the decade of 1980. He has identified the existence of a phytogeographic subprovince within the *Glossopteris* dominated Permian flora of Gondwana. Pierart's paper is also in the realm of Gondwana megaspores. The recent discovery of plant fossils from the Carboniferous of Kashmir (Pal and Chaloner, 1979) seems to have escaped notice. Rigby and Shah have attempted a comparison of flora from the Permian non-marine sequences of India and Australia. They visualise a barrier of transgressive sea in Gondwanaland which prevented floral migration into or from eastern Australia. Belton and Tintori, based on worldwide distribution of the genus *Saurichthys* suggest a connection between Tethys and Arctic ocean. Keyser has reviewed the stratigraphic distribution of Dicynodontia from Africa. He observes that the Triassic genus *Lystrosaurus* has a wide distribution in Gondwanaland and also in China and Russia. This may prove somewhat inconvenient to palaeontologists who have relied on this genus in reconstructing extensions of Gondwanaland.

The inclusion of papers on China which does not figure on maps of Gondwana, it is felt, may dilute the concept of Gondwanaland and reduce it to a palaeontological fantasy. Cheng Zhengwu presents a detailed account of Permo-Triassic fauna of China and Yung Zunyi and others on the Permo-Triassic boundary. Dickens and Shah on fossil flora and fauna extend the limit of Gondwanaland north of the Tethys Himalaya close to parts of southern and central Asia.

Most of the papers on Gondwana stratigraphy of India are unfortunately in abstract form and their significance therefore cannot be gauged. In the realm of sedimentation, however, Casshyap covers new ground and has attempted lithofacies analysis of the Late Permian Raniganj coal measures and its paleogeographic

implication. Bhattacharya has worked on the sedimentary aspect of the Kota Formation to which he gives a special status as a marine unit in the Upper Gondwana sequence of Peninsular India. There are papers on sedimentological aspect of other Gondwana basins of Africa (Visser and Van den Berg, Brunn), Antarctica (Collinson and others; Vavra and others) and South America (Rosenfeld and Volkheimer). The recognition of Silurian glaciation by Crowell and others in Central South America has particular significance.

Structure has received only moderate attention. Verma and Singh suggest a concept of large-scale fold tectonics in coal belts of India during three phases of deformation with present coal-fields preserved in downwarps and faulted down-thrown blocks. Basu and Shrivastava consider the Gondwana basins to have a rift configuration. Wopfner brings in plate convergence to explain the Permian basins of Australia. Adams has recognised three orogenic cycles common to New Zealand, Tasmania and Antarctica. Jago has brought out a late Precambrian-Early Palaeozoic relationship between Tasmania and northern Victoria Land of Antarctica. Stump's work in the Transantarctic mountains highlights an orogenic sequence of sedimentary, volcanic, metamorphic and plutonic rocks truncated by a major middle to upper Palaeozoic erosion surface.

The paper by Kamenev and Semenov contains significant results on regional metamorphism in Antarctica with two distinct periods, an earlier one involving charnockitization and a later characterized by amphibolite facies involving granitisation.

The tectonics of Antarctica has received particular attention by Sporli and Craddock and Weaver and others. Miller, based on his recognition of the elements of Pre-Andean orogenies, calls for revision of the relative position of South America and West Antarctica within Gondwanaland.

There is only one paper on metallogeny pertaining to New Zealand by Pirajno. Metallogenic Provinces of Gondwanaland need more detailed attention on the part of Gondwana geologists.

There are 10 full papers on break-up of Gondwana. Tarling lays stress on the position of Malagasy as key to Gondwana reconstruction. Although his postulated Gondwana reconstruction is more or less conventional, it leaves several Central Asian blocks, China and Manchuria as micro-continent. He brings N. America and Africa too close to each other for much of late Palaeozoic. According to Thompson, the break-up of Gondwana was initiated in middle to late Palaeozoic with the first significant lateral movement during early Cretaceous. He visualises migration of fauna even after break-up of Gondwana. Colbert, basing his evidence on reptiles, conceives connections between different units of Gondwana until Eocene time which seems far-fetched.

Kyle and others, Morley and others and Gleadow and Duddy have utilised fission-track ages for analysing thermal activity and related tectonics in Antarctica and Australia.

Raja Rao and Mitra relate the rift zones in India to break-up. Masolov and others have recognised many rift zones in Antarctica. Acharyya visualises an island arc zone between the Himalaya-Tibet-Burma-Malaya-eastern Australia and Indian Peninsula. Laird and Gindley and others deal with the break-up of New Zealand. Wellman attempts a 100 m.y. reconstruction of eastern Gondwana. There is one paper on petroleum accumulation by Johnstone as related to rift and break-up of Australia.

The concept of Gondwanaland, despite many sided progress in global tectonics, still has a strong palaeontological bias. In the delineation of Gondwana boundary, factors like geotectonic elements, geodynamic evolution, regional metamorphism, metallogeny, suture zones, geochronology, volcanic episodes, palaeomagnetism and plate tectonics should play equally important roles. Fossil records should be re-evaluated in the light of evidences of parallel evolution, mode, and agents of migration. The sixth Gondwana symposium should come to grips with these problems and present an authenticated Gondwana map with boundaries clearly demarcated. The delineation of this boundary in the Himalayan sector poses difficult geotectonic and Palaeontological problems because of the presence of faunal and floral remains of both Gondwanian and Angaran domains.

It appears the organisers have led themselves into rigorous constraints as far as the publication of this volume is concerned, as reflected in the size of letters used and extensive clipping of papers. These international symposia are held at great cost and the only useful record is the publication of papers which should receive greater financial outlay. Project oriented papers and data based conceptual papers need to be encouraged.

The book contains valuable information on various aspects of Gondwana geology and should serve as a useful reference work to Gondwana geologists. The volume is sleek and the presentation of text and illustrations is pleasant and uniform. The contents are multidisciplinary and cater to a wide variety of interests.

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