represent gap areas in Indian plant biology research. The tools and techniques of new biology have opened several new and exciting avenues in plant biochemistry, as brought out in the book. These have not been sufficiently tapped by Indian plant scientists, in their rush for cloning, sequencing, tissue culture and transformation. However, this is not to undermine the importance of plant biotechnology for India. Indeed, the review volume contains an impressive range of articles in this area, including chloroplast transformation, microarray-based gene profiling in plants, herbicide tolerance, role of glycerol and quaternary ammonium osmoprotectants in plant stress tolerance, male reproductive failure in water-stressed cereals, apomixis, etc.

Apart from being a ready source of reference on contemporary topics for researchers in the area, this volume also has a tremendous potential as advanced reading material for postgraduate teaching programmes such as M Sc, M Phil, M Tech, and Ph D course work, etc. I have used some of these articles in my own teaching for a course on agricultural biotechnology for the students of M Tech (biotechnology) in our university. Given the explosive growth of knowledge and the paucity of good (and affordable) textbooks in these areas, the editors may seriously keep the postgraduate teachers and students in mind for future issues of the series, and emphasize on simpler language and more visuals such as tables, figures, flow charts, drawings, art work, etc. This would also enhance the market for the publication, which in turn makes the entire exercise useful and cost-effective for everyone involved.

On the flip side, the preface lacks depth and perspective, considering that this is the inaugural issue of an intended series from a national Society. The editors should have clearly stated the overall purpose and objectives in the short and long terms, defined the target readership and intended frequency of this publication. The paper and print quality is good, but the page layout is not as international as its authorship. If the Society intends to reach out to teachers and students, it may consider a hybrid format – between a textbook and a review journal. The editors may also consider introducing two separate sections for biochemistry and biotechnology for the convenience of the readers (though there will always be articles overlapping the two), or thematic volumes, with each issue focusing on specialized or closely-related topics, rather than a random assortment of reviews. A little thought on these aspects would further enhance the impact of this important, useful and affordable publication.

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Milestones in Petrology and Future Perspectives. Anand Mohan (ed.) Memoir 52, Geological Society of India. PB 1922, Gavipuram, Bangalore 560 019. 2003. 471 pp. Price not mentioned.

The memoir contains 21 invited papers, most of them presented at a workshop held on the theme in 2000 at Banaras Hindu University, Varanasi. In the preface, B. P. Radhakrishna emphasized the need for such a volume in giving modern information about petrology with Indian examples that are scarcely cited in foreign publications. Followed by this is the introduction by the editor, who reckons the recent developments in metamorphic petrology but forgets them in igneous petrology. Since the succession of papers in the memoir is not on some principle of order, this reviewer has grouped them with similarity of theme, disregarding their serial number in the review.

The first two papers are by the US-based petrologists who give a brief historical development. Peter Wyllie (paper 1) defines the science of petrology and emphasizes that the spectrum of petrology must include sediments. Michael Brown (paper 2) emphasizes about the need to integrate metamorphism and deformation to have a deeper understanding of tectonics and metamorphic processes during orogenesis. The absence of granulite facies rocks in collision orogens is attributed to the inability of generating ultra-high temperatures during thermal relaxation that follows collision. The Himalaya seems a good case, but both papers do not give any Indian examples. Brown pleads for pressure–temperature–time–deformation (P–T–t–d) information or what he calls 4D evolution of orogens. The trend of future research in petrology lies in examining 3D spatial relationships among features in rocks by high resolution X-ray computed tomography. Dasgupta (paper 3) briefly mentions the contributions by Indian geoscientists and emphasizes on the field and petrographic studies of rocks. In this context, the articles by Lal (paper 4) and Sharma *et al.* (paper 10) are relevant, as they give metamorphic evolution of granulites from southern Indian shield through coronae and symplectitic reaction textures in conjunction with the available petrogenetic grids. However, the deduced P–T–t paths for different terranes are only retrograde for want of data for pre-peak metamorphism. The crucial problem of the Karimnagar granulite belt (paper 10) is its location in relation to isograds and its oblique trend *vis-à-vis* the trend of the Eastern Ghats Mobile Belt (EGMB). The authors consider these granulites simply an exhumed part of the Eastern Dharwar Craton. Jayananda and his team (paper 12) give a thermal history of the Eastern Dharwar Craton along a crustal section that corresponds to the amphibolite–granulite transition zone, with increase of grade from N to S. Their report of higher temperature in the NW compared to that in the south for the deformed plutons does not accord with the direction of increasing grade and with the proposition that granulite event followed plutonic accretion. If the mineral ages give a cooling rate of 1.47°C/Ma for this crust from about 2.6 to 2.2 Ga and represent cooling and uplift, they should also reflect the time of erosion and sedimentation in the vicinity. Senthil *et al.* (paper 11) show that the dominant porphyritic monzogranite in the central part of the Closepet granite is an I-type calc-alkaline granite, while the homogenous granite on the margin and in contact with the peninsular gneiss is S-type. Santosh (paper 13) considers the exclusive role of CO_2-rich fluids in the genesis of granulites/charnockites and provides evidence from field, fluid inclusions and stable isotopes. Against this model, the dehydration melting process is supported by Bhattacharya (paper 6), for the origin of charnockite/granulite from the EGMB. Bhadra *et al.* (paper 5), report inverse metamorphism in rocks of Bastar craton fringing EGMB, based on grade and strain and calculated thermal profile across the contact. They explain this inversion by thrusting of hot granu-

lites of EGMB over the cold rocks of Bastar craton. The problem of inverted metamorphism, first recognized in the Himalayan Metamorphic Belt (HMB) is lucidly narrated by Joshi and Rai (paper 16). They determined fractal dimensionality from the published P–T data and suggest that fractal displacements along pervasive shear planes caused inverted metamorphism in the HMB. Adopting an integrated approach, Sharma (paper 7) gives ensialic orogenesis model for the Proterozoic Aravalli Mountain belt. From an anticlockwise path, he considers the Rajasthan granulites to have formed by magmatic underplating and later exhumed by thrusting. According to him, the Aravalli fold belt represents a classic example of crustal thickening followed by underplating.

All four papers on igneous petrology deal with mafic rocks. Srivastava and Singh (paper 8) state that out of two dolerite dyke swarms from southern Bastar craton, the younger ones of 1776 Ma age have a space–time correlation with the dykes of North America and Antarctica, and as indicators of rifting, support the existence of the Palaeoproterozoic Columbia Supercontinent. REE data of igneous complexes in the rifts traversing Deccan Volcanic Province (DVP) have been used for batch-melting calculations by Kumar (paper 9), to show that the degree of melting increased from N to S and resulted due to changing lithospheric thickness under the DVP. Islam and coworkers (paper 15) show geochemically that the basaltic volcanics from Phe area of the Zanskar Himalaya are comparable with the volcanics from Central Kashmir and NE Pakistan. They link this volcanism to birth and evolution of Neo-Tethys. The basaltic rocks of 20th century and Pleistocene age from Barren Island Volcano show no major change in composition, according to Haldar and Luhr (paper 14). The eastward subduction of Indo-Australian plate under the Indo-Myanmar–Andaman–Sumatra block is considered to be the cause of volcanism in this region.

In structural geology, Srivastava and Gairola (paper 18) offer a new scheme of fold classification in a multilayered sequence, while Srivastava *et al.* (paper 20) provide a methodology about how deformed feldspars are used in the estimation of strain in a folded region, with a case history from Garhwal Lesser Himalaya. From the asymmetric orientation pattern of *c*-axis of quartz inclusions in a garnet porphyroblast from Aravalli schist, Mamtani (paper 17) suggests that the porphyroblast grew syntectonically during non-coaxial flow. The remaining two papers (19 and 21) are on high-pressure rocks from Western and Eastern Himalaya. In Ladhak Himalaya, the Indus Suture Zone (ITS) has a fault contact with the Tso-Morari Gneiss (TMG) which, in turn, has thrust contact with the third unit of the Tethyan sequence. Ravikant (paper 19) proposes that the normal fault contact between ITS and TMG (though isogradic, according to this reviewer) is a consequence of exhumation by uplift and extensional unroofing. The last paper is on the ophiolitic rocks of Arunachal Pradesh, NE Himalaya by Ghosh and Ray, who provide mineral analyses and calculated P and T values of these high-pressure rocks.

This reviewer feels that 15 papers on metamorphic petrology and only four on igneous petrology have caused an academic imbalance in the memoir, not only numerically but also for scientific information. Soft-rock petrologists may wonder why this branch of petrology was completely excluded, while limited papers were presented in the workshop. In this memoir, inscribed Petrology in the title, papers on pure structural geology appear out of place. The editor has tried to summarize all the papers in the introduction, but failed to do so uniformly. The editing of papers is rather poor as some have basic mistakes, besides minor typological errors. Figure 5 in paper 4 has two missing phases on the low-pressure side of two reaction curves with negative slope. The univariant curve [Spr-Spl]–[Bt] should have Kfs and Qtz; Qtz should be on the other side of the curve: Opx Sil L = Grt Crd Kfs Qtz. Also, the reaction curve $[I_2] - [Bt]$ should include Grt and Qtz on the lower temperature side, because these two phases also exist along with other phases of interest at $[I_2]$ (p. 74). In paper 10, an explanation of symbols in figure 1 *b* (p. 198) is missing, while figure 4 (p. 213) in the same paper has the reverse label of P and T for the coordinate axes. 'Manickavasagam' is wrongly spelt (p. 225) and on pages 143 and 354, the verb 'is' remains unrecalled by 'are'. Notwithstanding this, the memoir would be useful to geoscientists, especially metamorphic petrologists for obtaining important information and references on the subject of hard-rock petrology. In brief, the memoir with its 'hard stuff' has enough meat to chew.

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