

The theory of modular and semimodular lattices also has contributed to the general development of lattice theory. Birkhoff, Ore, von Neumann and others continued the study of modular lattices initiated by Dedekind. Several definitions of semimodular lattices can be found in the literature and these generalize modular lattices. Important among them are due to Birkhoff, Maclane, Wilcox and Maeda. The author considers semimodularity and M -symmetry and proves their equivalence in lattices of finite length. Geometric lattices arise from geometry and their structure theorem due to Maeda, improved by Sasaki and Fujiwara, asserts that every geometric lattice is isomorphic to a direct product of directly indecomposable geometric lattices. Also, the connection between geometric lattices and geometry, and geometric lattices arising from graphs are studied. Ore proved that the lattice of partitions of a set is a simple geometric lattice. Whitman's classical result (improved by Jonsson) shows that any lattice can be embedded in a partition lattice (has a type-3 representation), the significance of which can be compared with the corresponding theorem for groups, representing a group as a subgroup of a permutation group. In particular, it yields Whitman's result that every lattice can be embedded in the lattice of all subgroups of some group. Jonsson proved that a lattice L has a representation of type-2 if and only if L is modular and also that any lattice having type-1 representation in Arguesian. Complemented modular lattices and modular geometric lattices are closely related. One-to-one correspondence between projective spaces and projective geometries is discussed. The classical coordination theorem of projective geometry due to von Neumann is stated and a sketch of the proof is given. The theorem is regarded as one of the deep lattice theoretical results. Another important embedding theorem due to Frink, embeds a complemented modular lattice in a modular geometric lattice. The book also discusses related results of Jonsson, Dilworth and Hall.

The chapter on varieties of lattices summarizes relevant parts of universal algebra to lattice theory. It especially discusses the problem of finding equational bases and also amalgamation properties for varieties. In the chapter on free products, the notion of free products and rela-

ted results are employed to describe free lattices and also to simplify the proof of a celebrated result of Dilworth that any lattice can be embedded in a uniquely complemented lattice. The chapter proves many powerful structure theorems concerning free products. For many of these theorems, the author's contribution is also significant.

The eight appendices appended to the first edition of the book, cover some of the important developments in general lattice theory that took place after the release of the first edition. They are written by a group of experts (including the author) in those areas. These contain either new, major advances in lattice theory (especially reviews of solved problems of the first edition), new branches of lattice theory that have grown on their own, new developments on a longstanding problem or new applications of lattice theory to theoretical computer science, etc. The appendices give statements of many recent results, without proofs, after briefly motivating them, and conclude with valuable remarks and, in some cases, with open problems related to those results. These will be useful references for researchers in those areas due to the availability of an extensive, new bibliography in the book.

Overall the book is unique, authoritative and informative in the subject and useful not only for teachers and researchers in the field, but also to those whose areas interact with lattice theory. The author's significant contributions to several chapters of the book are both astonishing and praiseworthy. A book of this kind demands vast research experience, collaboration and cooperation of a team of experts that the author was fortunately enjoying. The book gives a strong foundation in general lattice theory. It can motivate research workers in the subject and also raise curiosity among general mathematical community to know more about lattice theory, because lattices occur almost everywhere.

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Reviews in Plant Biochemistry and Biotechnology. Arun Goyal *et al.* (eds) Society for Plant Biochemistry and Biotechnology, Indian Agricultural Research Institute, New Delhi 110 012. 2002. Vol. I. 259 pp. Price: Rs 400.

This volume is a collection of 16 timely reviews by scientists of repute from India and abroad, spanning various aspects of plant biochemistry, molecular biology and biotechnology. It marks the beginning of what seems to be an annual series (at least) to be published by the Society for Plant Biochemistry and Biotechnology, Indian Agricultural Research Institute, New Delhi. Though the Society publishes a journal by the same name, this volume is not a compilation of reviews already published in that journal, nor is it based on the proceedings of any conference. The authors have been drawn from India, USA, Canada, the Netherlands, Mexico and France. Almost all the reviews are up-to-date with the latest references (up to 2001), some have even included 'notes added in proof'. To that extent, this inaugural volume scores well on its fundamentals and seems to set the right tone for future issues of the series. This is no small achievement for an Indian Society, despite the fact that there are dozens of world-class journals and review series in plant sciences ranging from monthly to yearly frequency, publishing excellent reviews from all over the world. However, almost all of them are from abroad and are either inaccessible or unaffordable to the vast majority of Indian researchers, and especially college and university libraries. By publishing this review series incorporating up-to-date information in an affordable form, the Society is doing a great service to the Indian community in this field.

The volume covers a whole range of topics of relevance to contemporary plant biochemistry, including the oxidative photosynthetic (C_2) cycle; DHAP reductases, cyanases, phosphoenol carboxylases, β -carbonic anhydrases, haemoglobins, cell plate and callose synthase, phosphate acquisition, lipid bodies in plastids, role of methanol and other single-carbon metabolites in plant signalling and growth, plant haemoglobins, etc. Some of these topics relating to plant metabolism and its regulation are of particular importance to the Indian readership, as they

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 MSc, MPhil, MTech, and PhD course work, etc. I have used some of these articles in my own teaching for a course on agricultural biotechnology for the students of MTech (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 CO₂-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-