

Zealand. In short, this chapter contains a wealth of stimulating ideas and hypotheses, which deserves a wider readership than the title of the book might attract.

Although of secondary significance, the hierarchical structure of this book deserves comment, especially in terms of attribution and referencing. The chapters are divided into sections, subsections and sub-subsections, any of which levels may have separate authors listed (but only in the Table of Contents, not in the main text). In addition the chapters have named 'co-ordinators', who are usually major authors as well. Then there are 'associate editors', one of whom is also a major contributor (as co-ordinator and author), and, at the top of the pyramid, the senior editor/compiler whose is the only name to appear on the cover. Somewhat confusing instructions about citation are given on p. xviii, but it is the variation in the number of authors and separately citable sections in different chapters which is most disconcerting. At one extreme are chapters (e.g. Chapters 2 and 5) which are largely the work of one author (who is also the co-ordinator, not surprisingly). At the other extreme is Chapter 3 which involves 29 different authors (out of a total of 59 contributors to the whole volume) and 44 individually referenced sections (or subsections or sub-subsections!). The shortest of these (3.6.1) contains approximately 150 words, but many others are only half a page in length. On the other hand, the longest continuous effort by one author (occasionally aided by co-authors) is 60 pages, and contains 32 sections or subsections. One author makes nine appearances (either alone or as a joint author) within 11 pages. On the whole, the degree of subdivision means that most sections have only one or two authors, but 4.7 has six co-authors (for 5 pages of text).

Despite these organizational anomalies, the book is a valuable compilation, effectively edited into a coherent and readable whole. It is also very well illustrated with abundant maps, diagrams, field photographs and photomicrographs (including a section of colour plates). It is obviously a useful source book for igneous petrologists and geochemists, but has plenty to offer all geologists prepared to take a global perspective.

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### Fractured rock

Rossmannith, H. P. (editor) 1990. *Mechanics of Jointed and Faulted Rock: Proceedings of the International Conference on Mechanics of Jointed and Faulted Rock, Technical University of Vienna, 18–20 April, 1990*. A. A. Balkema, Rotterdam. 994 pp. Price \$105.

A number of human endeavors must deal with faulted and jointed rock. Often the mere presence of faulted and jointed rock leads to great frustration because the rock does not behave as predicted by

engineers and scientists. Examples are numerous. Petroleum engineers developed horizontal drilling to drain fractured reservoirs only to find that the reservoir draw-down was so fast that recovery of oil was not cost efficient. Civil engineers constructed dams for hydroelectric power and then discovered that fractured bedrock drained the reservoir so fast that a significant hydroelectric generating capacity was lost through leakage. The long-term containment of nuclear waste on military reservations has been compromised by the presence of faulted and jointed rock. Leakage from ordinary landfills is often through faulted and jointed rock. The magnitude of such problems forms the impetus for a 1990 conference in Vienna, Austria in April, on faulted and jointed rock, and a similar conference in Leon, Norway during June of the same year.

The goals of the Vienna conference were to provide a forum for presentation of new research results, to promote interaction among theoreticians, engineers and consultants, and to search for a common language in terms of testing and standardization of faulted and jointed rocks. The volume coming from the Vienna conference, *Mechanics of Faulted and Jointed Rocks*, is divided into conference themes including geology, faulting, testing, numerical modeling, hydraulics, mining and applications.

The volume consists of nine plenary papers and more than 120 technical papers: a massive volume. Structural geologists will note papers dealing with the healing of microcracks, anastomosing patterns of fractures, jointing during cylindrical folding, impact-induced fracturing, rock friction and joint roughness. Geophysicists might read about such subjects as borehole breakouts, stress measurements in jointed rock, the elastic wave propagation of cracked rocks and acoustic emissions from faulted rocks. Hydrologists will look at papers on fluid flow through channels on the fracture plane and probabilistic flow models. A large number of papers for the civil and mining engineer include such topics as block modeling of jointed cliffs, the design of a large cavern in a jointed rock mass, dam foundations and the stability of embankments.

*Mechanics of Faulted and Jointed Rocks* has all the characteristics of a generic volume arising from a conference in rock mechanics. Papers cover a range of interests so that the volume is not easily classified as a collection of papers in structural geology, or any other single subject such as mining engineering. Such volumes are rarely, if ever, peer reviewed which means that the quality of the papers varies greatly. I enjoyed papers by Archambault *et al.*, Kowallis *et al.*, Moore *et al.*, Müller and Ernstson, Rives and Petit, Reches, and many others. However, it is fair to say that one or more papers should have been rejected by the editor as pure nonsense.

Finally, I was impressed with the number of countries (31) represented by authors within the Vienna volume. The distribution of authorship among countries of the world was refreshingly even, compared with many volumes overwhelmed by authors from a very few countries.

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