

- (iii) Structural influences on the occurrence of ground water in SE Zimbabwe.
- (iv) An exploration strategy for higher yield boreholes in the West African crystalline basement.
- (v) Groundwater movement and water chemistry associated with weathering profiles of the African surface in parts of Malawi.
- (vi) Geomorphological controls on borehole yields; a statistical study in an area of basement rocks in central Malawi.
- (vii) The hydrogeology of crystalline aquifers in northern Nigeria and geophysical techniques used in their exploration.
- (viii) Boreholes siting in an African accelerated drought relief project.
- (ix) The use of ground electrical survey methods for siting water supply boreholes in shallow crystalline basement terrains.
- (x) New approaches to pumping test interpretation for dugwells constructed on hard rock aquifers.
- (xi) Rural water supplies: Comparative case histories from Nigeria and Zimbabwe.

The paper dealing with Hydrogeology of crystalline basement aquifers gives an exhaustive overview of crystalline basement aquifer occurrence, geological and climatic controls, evolution, geometry, hydraulic parameters, resources and recharge, combined with a discussion on exploration and management. The important constraints to current development are identified and elaborated. An important conclusion drawn is that "Although results (statistical evaluations) to date provide useful guidelines for development planning, including economic considerations, the low regression coefficients of the existing correlations limit their value for individual borehole/well siting or design. Neither statistical analysis nor on site surveys appear able to identify to a high degree of probability these local controls such as through flow channels, high permeability basal saprolite, productive fracture systems, etc., which appear to exercise overriding influence on response characteristics and result in marked heterogeneity within small areas".

The results of hydrological studies which analyse the climatic and geomorphological controls upon hydrological response from 26 catchments in Malawi and Zimbabwe provide interesting reading. A series of papers on geophysical techniques utilised and the correlation of the results with the performance of the boreholes give clear insight on their usefulness and the limitations.

The book is of immense reference value. The claim on the back cover 'Although this book concentrates on sub Saharan Africa, these principles apply equally to Southern Asia, South America and Australia', is absolutely correct. A 'must read' for every hydrogeologist dealing with ground water in crystalline rocks.

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PETROGENESIS OF METAMORPHIC ROCKS. By Kurt Bucher and Martin Frey. 6th Completely revised edition, Springer-Verlag, Berlin, 1994, XIV, 318 pages, 93 Figs., 28 Tabs., DM 58. Soft Cover.

The sixth revision of the famous Winkler's textbook, "Petrogenesis of Metamorphic Rocks" is certainly a welcome addition. Recent years have seen tremendous progress in the rapidly expanding field of metamorphic petrology. To keep pace with the subject, in the past few years, quite a number of books have been published. However, the book under review provides a well-balanced coverage and is up-to-date source on the wide ranging

topics related to the fundamentals of metamorphism and metamorphic processes. The new edition differs from the old, both in matters of content and in organisation. The authors have succeeded in striking a good balance between writing a lucid text and providing a supplementary material where development of new ideas and emerging concepts are highlighted.

The book is designed for the undergraduate and graduate students. This contribution is very useful at both the learning and teaching levels. It provides teachers with experience in presenting the involved metamorphic petrology concepts in simplified and understandable form.

The book is divided into two main sections. I. Basic Principles, and II. Metamorphism of different rock compositions. In all, there are ten chapters. The majority of the chapters are quite readable and are very well illustrated with line drawings, which help to illuminate the text. The format of each chapter is as follows:

There is an introduction, followed by illustrations and tables with a bibliography covering a large number of references from the nineties, including some of 1992 and 1993. The worked examples throughout the text are excellent.

Section I of the book has 4 chapters and begins with a comprehensive coverage of the important definitions and usage terminology. In chapter 2, composition phase diagrams and projections through graphical representation has been given a better treatment besides the classical approach. Chapter 3 summarises the significance of various chemical reactions in metamorphic rocks and their utility in construction of the phase diagrams and P-T-t paths. Chapter 4 on geothermobarometry and P-T conditions of metamorphic facies is particularly informative. This chapter contains a wealth of data that serves to illustrate what is currently achievable through the application of geothermobarometry. The authors have rightly cautioned on the various prerequisite assumptions, possible sources of errors and uncertainties involved before concluding a meaningful interpretation of the P-T data.

Thermodynamics and recent advancements in experimental petrology get little mention. The absence of these aspects therefore feature as oversights in this or any such book of modern book on petrology. It would have been good to see short exercises at the end of each chapter, which is always rewarding for tutorials.

Part II comprises six chapters which present a more synoptic but wider reaching approach to the genesis of the common metamorphic rock types. Chapters on ultramafic, calcareous, marl, pelitic and mafic rocks contain excellent phase diagrams and well-illustrated description of prograde metamorphism in the pertinent systems (CMASH, CMS-HC, KCMASH-HC, KFMASH, NCMASH etc.). Examples from regional geology integrated with frequent P-T, T-X and P-X sections on various aspects of petrogenesis are amongst its greatest attractions.

Overall, there is no doubt that the book is a major success and highly recommended to all geologists interested in metamorphic petrology. It will soon prove to be an indispensable addition to all geological and University libraries.

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NEED FOR CLEAR WRITING

Bringing specialists definitions into consistently readable English has been challenging but enjoyable. As an Editor, my sympathies always lie with the reader though absent from the scene. The reader is the most important factor in any writing or editing process.

— R.L. BATES