

cations, and it is a source of reference from which the analyst can readily sample.

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Kerrick, D. M. (ed.) *Contact Metamorphism*. Washington D.C. (Mineralogical Society of America: Review in Mineralogy, Vol. 26), 192, xvi + 847 pp. Price \$26.00.

My first thought while leafing through the contents of this sturdy volume was that the authors had left us with nothing else to do with thermal aureoles except apply the collected knowledge gathered together here. I began to fear that, by its very comprehensiveness, the volume might inadvertently secure the demise of its own subject through a public perception of a line ruled across the page and marked 'knowledge of this field is now complete'. Well, of course, by fourth thoughts I was beginning to see some glimmerings of things still left to think about, but Derrill Kerrick and his authors are really to be congratulated on a work that is awesome in its scope and completeness, and more than maintains the standards of its stable-mates.

Kerrick, in a succinct opening chapter, introduces many of the themes of the volume, and draws comparisons with regional metamorphism. I fail to see why he need be so tentative in suggesting that some areas of low-*P* regional metamorphism are intermediate in character, representing regional-scale contact metamorphism. The bulk of the chapters are in any case of broader scope than just contact metamorphism. A highlight is Labotka's summary of the properties and compositions of metamorphic fluids; not only do you get an instant reference for all the equilibrium constants and equations of state you need for C-O-H fluid calculations (no, I haven't checked for typographical errors), but for once, the often more abundant salt components are also taken into account.

P-T conditions for low-pressure rocks are dealt with in two chapters. Pattison and Tracy take on the metapelites, dividing them up into facies series with distinctive assemblages and developing a petrogenetic grid to illustrate phase relations between them. Use of geothermometers and geobarometers is also reviewed briefly and there is an exhaustive list of those aureoles which have been described in English, classified according to facies series. This may be galling for Welsh language enthusiasts and other anglophobes, but a godsend to anyone looking for a particular natural example to prove his latest inspired idea, or just wanting good teaching ideas. Tracy and Frost carry out a similar exercise on low-*P*-high-*T*

phase equilibria in all the other rock types that do anything interesting during contact metamorphism. My edition his copious errata to the figure captions for this chapter.

The theme of metamorphic fluids returns with a review of Brennan of metamorphic permeability and its implications for how fluids move through crystalline rocks. This chapter considers both cracking and fracture permeability, and equilibrium fluid distributions along grain boundaries. Unfortunately, metamorphic secondary porosity, long predicted from stable isotope studies, and increasingly imaged by cathodoluminescence or back-scattered electron microscopy, does not get comparable billing.

Metasomatism in aureoles is described and summarised by Barton, Ilchik and Marikos, in a chapter which comes dangerously close to letting metamorphic petrologists know that some aureoles contain ore deposits. Their pragmatic recognition of a wide range of fluid types and sources in aureoles is sharply juxtaposed against a chapter by Ferry which takes a highly theoretical approach to a very simplified system.

Further chapters deal with several practical approaches to aureole studies: Nabelek on stable isotopes, and Furlong, Hanson and Bowers on modelling thermal regimes. This chapter is a particularly important introduction to modern modelling methods that incorporate evaluating fluid flow. Kinetics of specific reactions in aureoles (although not necessarily the underlying processes) are discussed in chapters by Joesten and by Kerrick, Lasaga and Racubrn. The book concludes with chapters on aureole tectonics by Paterson, Vernon and Fowler, and on 'aureole systematics' (the most extensive lists yet, of aureoles described in English) by Barton, Staude, Snow and Johnson.

With all this in 850 pages, what else can be said? The main omission that I felt was the emphasis in most chapters on contact metamorphism as a low pressure equivalent of regional metamorphism, where most of the same rules still apply (e.g. lithostatic pressure = fluid pressure), rather than as a deeper equivalent of geothermal field alteration, closely related in space and time but not always operating under the same constraints (e.g. fluid pressure = lithostatic pressure). There have been studies, notably the work of Fournier in Yellowstone, which attempt to link contact metamorphism to contemporary active processes rather than to our inferences of deeper, and still more obscure, events and this must surely be an important direction in the future. That said, such criticism is offered primarily because it is obligatory to demonstrate that the reviewer has read the

book and thought about it. The reality is that this is an outstanding volume that should be on the bookshelf of every researcher or graduate student concerned with metamorphism in any of its guises.

B. W. D. YARDLEY

Taylor, S. R. *Solar System Evolution. A New Perspective. An Inquiry into the chemical composition, origin, and evolution of the solar system.* Cambridge (Cambridge University Press), 1992, 306 pp. Price £35.00

The distinguished geo/cosmochemist Ross Taylor follows up *Lunar Science: A Post Apollo View* (1975) and *Planetary Science: A Lunar Perspective* (1982) with a book that attempts 'to account for the existence of the planets, satellites, asteroids, and comets'. 'The book is biased toward the geochemical point of view . . .'. 'The subject is rendered very difficult by the wide variety of contrary opinions . . .'; 'Sometimes the data are suspect.' 'Grand theories are useless if they cannot explain the minute details', but 'the mere accumulation of the staggering amount of detailed observations in the solar system is of little use unless there is some unifying concept . . .' Rather than providing 'a detailed travelogue or Cook's Tour of the solar system', 'I have attempted a commentary on the problems of its origin and evolution.'

Chapters are: Planetary Formation: A Historical Perspective; The Solar Nebula; The Meteorite Evidence; The Role of Impacts; The Planets; Rings and Satellites; The New Solar System. After turning the pages and spot-checking sections of particular interest, I became impressed with the careful presentation of the geochemical data. The mineralogical, petrological and geophysical data are more sketchy.

In the last chapter on The New Solar System, Ross Taylor describes 'The End of Clockwork Solar Systems', and the 'Collapse of Grand Unified Theories'. In 'Our Present Understanding', he summarises how a fragment of a spiral arm from a galaxy condensed towards its centre; underwent erratic evaporation, condensation and melting; spread out into a rotating disc with dust moving to the centre; evolved into a sun which became a fiery orb and bodies ranging in size up to protoplanets. Ultimately the present planets were generated and finally blasted by most of the surviving planetesimals. This general scenario is deservedly accepted by solar system scientists, but readers may wish to consider being cautious in accepting some currently popular ideas. Thus the large impactor hypothesis for the origin of the

Moon/Earth system may be too simple. My prejudice is to favour a complex sequence of events with erratic growth of the Moon. Some of the chemical properties of the lunar rock fragments and minerals are perhaps more easily explained in this way. The plagioclase/basalt/etc. crust may constitute the accumulations from several magma oceans and remelted cumulates.

In the Epilogue, Ross Taylor philosophises on the place of *Homo sapiens* in the solar system, and focuses in the sequence of lucky chances required for man to reach the current capacity to reconstruct the history of the solar system. We are probably alone in the Universe. 'The (human) species still retains its highly aggressive instincts (JVS: I remember listening to certain geochemical debates in the 1970s!), once necessary for survival, but now potentially as much of a danger as the loss of flight was to prove to the Mauritian dodo.'

Readers should enjoy remarks on the following in the Notes and References: apocryphal elephant at Leningrad; the wisdom of acquiring a wife; a Napoleonic view of the asteroids; New Zealand shepherds.

Ross concludes with the provocative: 'One is comforted on this journey, by the steady convergence of scientific ideas toward some kind of consensus, as new facts are acquired. Science is in this way distinct from most other human activities, which display the opposite tendency of divergence with time, a process most clearly revealed by the multitude of religions and philosophical systems.' Can't wait for your next book Ross!

J. V. SMITH

Freith, S. J., Ofoegbu, C. O. and Onuoha, K. M. (eds.) *Natural Hazards in Western Central Africa.* Braunschweig/Wiesbaden (Vieweg and Sohn) 1992. vi + 174 pp. Price DM88.0.

Before the Lake Nyos gas release that killed some 1700 people in 1986, western central Africa was not considered an area of high risk from major natural disasters. However, based on the oral history of western Cameroon, spectacular 'misbehaviour' of lakes recurs in legends of the local tribes, suggesting that that type of phenomenon was well known in the past. With the rise in population around these lakes, it is clear that increasing attention should be paid to the hazards presented by the rapid expulsion of toxic gases from lakes.

Some two-thirds of the book are devoted to a discussion of the causes and results of the Lake Nyos disaster. Also discussed in shorter sections