of certain sections and additional (recent) references have been included. The References and Index sections have undergone a particular improvement in legibility. Despite the fact that it now runs to some 60 pages more than the first edition, this one will fit into the same slot on the library shelf, thanks to the use of thinner paper. I also found the printing quality of the figures better in this new edition, and many of the drawings have been improved as well.

Chapters 1, 2 and 4 are essentially little changed, but chapter 3 has a considerably expanded section on the roles of volatiles in granitic magmas. Chapter 5 contains two new figures and three new sections on: porosity during crystallization, crystal nucleation and growth, and magmatic epidote, mafic minerals and redox conditions. Chapter 6 has expanded sections on crystal–liquid separation during differentiation, and isotope zonation (including a new figure). There is also a new section on convective flow and mineral orientation. Chapter 7 contains a new section discussing the question of whether rhyolitic and granitic magmas represent the same thing, only differently emplaced. Chapter 8 has a considerably expanded section on the S- and I-type granites, as recognised in the type area of southeastern Australia. There is a minor rearrangement of figures in chapter 9, and chapter 10 contains a new section on the possible [minor] role of liquid immiscibility in granite petrogenesis. Chapter 11 has enjoyed quite a bit of change, with some figures dropping out and new ones being introduced. The section on ballooning plutons has been replaced by one entitled "a modern debate on bursting the bubble", and one on "a return to multiple prejudices". This is followed by a section relabelled as "the special case of magma blisters". This chapter covers one of the most hotly debated areas of granite studies, and it is here that the author makes an admission that granitic diapirs may not exist! Chapter 12 has an expanded section on the rates of magma ascent, and chapter 13 (on plagiogranites and extreme differentiation) is twice as long as in the previous edition. It contains a new section on ferrogranophyres formed in the great mafic sills of intracontinental settings. Cordilleran batholiths are discussed in chapter 15, and here there is a new case study of the Cordillera Blanca batholith. This emphasizes the lack of reaction between the granitoid magma and its wall-rocks, during magma ascent along a pre-existing fracture pathway. Chapter 15 remains substantially unaltered, but, in chapter 16 (on migmatites), the section on anatexis and relationships with granitic magmas has been reworked, with additional subheadings, to make it more readable. Chapter 17 (on pegmatites) now includes a section on the relationship between uplift/level of erosion of granitic complexes and the types of ore deposits exposed. There has been some reordering of the discussion, for clarity. The final two chapters (18 and 19) remain essentially the same.

Chapter 19 is where the author expresses his search for order in the complexity of granite phenomena. Chaos may rule supreme in the Universe, but I have sympathy for Wally's search because much in nature is the product of non-linear dynamics that produce not chaos, but self-ordering into complex and beautiful patterns. In a bid to reduce chaos, I therefore recommend buying and reading this moderately priced but extremely valuable book.

J. D. CLEMENS

Keary, P. *The New Penguin Dictionary of Geology.* x + 366 pp. Penguin Books. Price £6.99. ISBN 0-14-05151277-2.

I suppose that I should own up and admit to never having owned a Dictionary of Geology. Until now I have never known why.

This volume provides over 7500 concise definitions of geological terms, most of them cross-referenced many times. It includes very brief descriptions of a large number of rock types (mainly defined on their petrographic rather than geochemical features) and minerals, many of which come with simple mineral formulae, although without a clear description of their crystal structure or place in a complex n-dimensional chemical solid solution. Were I to wish to search for a definition of a rock or mineral type, then this is not the place that I would go. Similarly, I find the definitions of structural features bland and, due to the total lack of simple black and white figures, potentially incomprehensible to a non-expert.

On the basis of a few minutes trawling through the book I pick out a few points which I feel highlight its major shortcomings. I stress that this is a far from exhaustive list of what I spotted, and I am sure that a more detailed analysis would have caused me considerable irritation.

Concentrating on the mineral kingdom: I am told that anthophyllite is a white amphibole, but to find that it is an orthoamphibole I have to look up "orthoamphibole" which, ironically, is not mentioned as a sub-set of the amphiboles under the heading "amphibole". Orthoclase is a "common feldspar", plagioclase "a series of feldspars with the range $NaAlSi_3O_8$–$CaAl_2Si_2O_8$"; microcline "the

low temperature form of potassium feldspar", sanidine "a high temperature form of potash feldspar"; maybe not wrong, but inconsistent, not very informative and possibly misleading. Sillimanite (fibrolite) is "a nesosilicate found in metamorphic rocks rich in alumina", kyanite is "a nesosilicate commonly formed by regional metamorphism of an argillaceous rock" and andalusite is "a nesosilicate important in metamorphic rocks". Maybe nothing wrong there, other than an inconsistency, but is that all to say even in a volume of concise descriptions? The sillimanite minerals (sic) are a "group of anhydrous aluminium silicates comprising andalusite, kyanite and sillimanite..." yet the kyanite group is "an industrial name for the sillimanite minerals".

Clearly, there are errors. Some, such as alkali feldspar "a general term for feldspar of the albite-anorthite series" are careless; others such as amphibolite is a "non-foliated, metamorphic rock..." or oblique slip fault "a fault with similar magnitudes of strike-slip and dip-slip displacements" test credulity, and others such as migmatization "the process of melting.. under extreme (sic) metamorphism" merely irritate. Similarly, defining granulites as being high pressure metamorphic rocks formed in the lower continental crust ignores much recent data, and the suggestion that granulites form at temperatures of >650°C, although strictly correct, is misleading as the diagnostic orthopyroxene forming reactions typically occur at somewhat higher temperatures than that. Also, to describe the Alpine Himalayan orogeny as affecting Europe and Asia during "Triassic–Miocene" times is stratigraphic nonsense. How many structural geologists would accept that the Grenvillian orogeny affected solely the Canadian Shield? What about Grenvillian effects in Scotland? How many geochemists will go to bed happily knowing that X-ray fluorescence analysis is widely used in archaeology to characterize artefacts and their sources? What about its geological use?

One could go on, but it is barely worth it. The book stands or falls on its boast that its definitions are concise and fully cross-referenced. I suppose that that is what defines a dictionary. Yet the combination of concise cross referenced entries results in few major features being described succinctly. Surely, even a dictionary can include tables and diagrams. After all, many geological features and materials are commonly interlinked and classified comparatively against other features and materials, and the clearest way to do this is diagramatically and by tabulation. Yet this book totally eschews such an approach. I believe that a geological dictionary should be full of lists, tables, diagrams and plots. Possibly the most useful part of this book is the 15 page bibliography which lists a whole array of text books and data source books which span the whole field of geology from palaeontology to mineralogy, from engineering geology to geomorphology. It makes for a great reading list for an undergraduate, but I would not recommend this book to an undergraduate or amateur geologist as I believe that many of its definitions are disappointingly shallow and often misleading. Now, at last, I finally know why I never bought a geological dictionary!

P. J. TRELOAR