section showing maximum birefringence on which to measure extinction angles. It is stated in this book that the trace of the prismatic cleavage should be set parallel to the N–S cross-wire and then the stage rotated to the extinction position and the angle noted as I. The cleavage should next be aligned parallel to the E–W crosswire and rotated to the N direction until extinction occurs: the angle is noted as II. "The direction which halves the two angles I and II is the direction of maximum extinction". In the example which the authors give, I is 41° and II is 45° hence the maximum extinction angle for this crystal is 43° It makes not the slightest difference which cross-wire the extinction angle is measured from and if we adopted the procedure described here all minerals would have an extinction angle of 45°. Of course, there are two different angles which together measure 90° and the smaller of the two is usually quoted.

Part C consists of three Appendices made up of tables and diagrams. There are 22 tables in Appendix 1, the most comprehensive of which is table 7a in which the minerals are arranged in the same order as in Part B and give the same information in summary. I cannot see the need for this table. Appendix 2 contains diagrams for the classification of magmatic rocks – from this diagram it appears that the plutonic equivalent of a rhyolite is a syenogranite and of a rhyodacite is a monzogranite – there is no granite!

Throughout the text there are errors too numerous to list. In many places words are used which have largely become obsolete. There seems little advantage in re-introducing them without good reason and most of them are not defined nor do they appear in the index. Even ideas which have long disappeared appear here. For example we are told that there are "six plagioclase minerals" which was the case before it was recognized that they were members of a solid-solution series. We are told that the intergrowth plane in pericline twins is (001) in the plagioclases. "Alkali feldspars show characteristic perthitic internal textures which are absent in plagioclase" but we have already been warned about antiperthites a few pages earlier — what do they look like? It is stated that anorthoclase has cross-hatched twinning according to the microcline law. Where is the microcline law defined? I had occasion to look up the mineral melilite. Here I find the statement that melilite "is not a feldspathoid but is considered to be a desolidified pyroxene (sic) and belongs to the dark components of a rock". What is a desolidified pyroxene?

Terms which have gone largely out of common use include 'diadochy' rather than solid solution, and another is 'diaphthoritic', referring to a metamorphic rock which has suffered retrograde metamorphism. Neither grammatite nor amianthus are currently approved mineral names. There are dozens of spelling errors and inconsistencies between data in the tables and in the main text, and the index is not very good.

It is clear that some of the errors are due to the authors, although this book was translated after a second German edition was published; some errors may be due to the translator. However, the greatest responsibility for the weaknesses of this book lies with the publishers of this English language edition or their advisor(s). Why did they choose to translate this particular book and why didn't they have the translation read by a mineralogist? What justification is there for setting this ridiculous price. It is difficult to know who would wish to buy it even at a third of this price when there are a number of excellent books on this topic already available in English and they are unlikely to go out of date very much.

W. S. MACKENZIE

Pitcher, W. S. *The Nature and Origin of Granite* (second edition). London and New York (Chapman & Hall), 1997. xvi + 387 pp. Price £55.00. ISBN 0-412-75860-1

As the nineteenth century quotation that opens this book states "Granite is not a rock which was simple in its origin ...". That this is true has been made abundantly clear to students of the subject ever since the petrological renaissance of the 1970s brought granitic rocks once again into their share of the limelight. The first edition of 'Wally's book', as it has become known, appeared in 1993 and was sufficiently popular to warrant a reprinting two years later. This is the second edition, which contains a number of refinements and additions, including discussions of some of the latest topics and controversies that have sprung up. As it lay on my desk, awaiting attention, more than one colleague at Kingston University remarked that they "must get hold of a copy". Surely this augurs well for sales of this work, which represents the author's personal views on a wide range of topics within granitic rock petrogenesis.

This new edition has a much better (and far more amusing) cover photograph than the first. It is also produced with a clearer and more attractive typography and layout. The type is larger and easier to read and there has been a general rephrasing

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