Mississippi-Valley-type Pb/Zn deposits, and throws little new light on their genesis.

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Carswell, D. A., Ed. *Eclogite Facies Rocks.* Blackie (Glasgow & London), Chapman & Hall (New York), 1990. xv + 396 pp. Price £77.00.

This is the second book ('book 2' here) to appear which is devoted to eclogite-facies rocks, the first ('book 1' here) being: Smith, D. C. (Ed.), '*Ecologites and Eclogite-Facies Rocks*', Elsevier Science Publishers (Amsterdam & New York), 1988, xxii + 524 pp., price £60, which constituted n° 12 in the Elsevier Series 'Developments in Petrology'. Although they are both multi-author books with about 20 authors each, they are complementary rather than competitive. Thus whereas book 1 dealt in great detail with a few selected topics (since earlier special volumes of three journals (ed. Smith, D. C.) dealt with many other selected topics), book 2 attempts to provide a comprehensive review of all relevant topics but in significantly less detail. Unlike book 1, book 2 is however one of those books where editorial control is exercised strongly by the editor being coauthor of most of the chapters, only 5 of the 13 chapters having escaped.

In chapter 1 D. A. Carswell introduces his versions of the definitions and classifications of eclogites and of the elusive eclogite facies; unfortunately chapter 1 reviews only certain favoured opinions and perpetuates some well-entrenched but disputable ideas without attempting to find a consensus such that it cannot succeed in providing a major advance for the 1990's. A. Mottana, D. A. Carswell, C. Chopin and R. Oberhänsli describe eclogite-facies mineral parageneses for various kinds of bulk-rock compositions (chapter 2) and thus provide a petrological basis for the rest of the book.

A pair of chapters by S. L. Harley and D. A. Carswell and D. A. Carswell and S. L. Harley respectively summarise a number of experimental studies on natural and synthetic rock compositions (chapter 3) and a range of geothermobarometric methods relevant to eclogites (chapter 4); however, despite a well-organised approach, there are several notable omissions for supposedly comprehensive reviews, whereas one receives an overdose of 'evaluation tests' by Carswell and Gibb (1980a, b, 1987a, b) and of their rather subjective assertions of 'superior' geothermobarometric methods based on dubious philosophic foundations.

D. C. Rubie explains modern ideas on the kinetics of mineral reactions (chapter 5) and D. Gebauer provides a modern review on isotopic systems used for the geochronology of eclogites (chapter 6); both of these chapters are particularly important when dealing with polymetamorphic terrains, which is often the case of eclogite-bearing terrains.

The subsequent chapters principally concern one or more specific geographical regions displaying eclogite-facies rocks. Thus M. Schliestedt reviews low-*T* eclogites in California, New Caledonia and Greece (chapter 7), whereas high-*T* eclogite xenoliths in Kimberlites and other diatreme environments are reviewed by W. L. Griffin, S. Y. O'Reilly and N. J. Pearson (chapter 12) and/or by J. B. Dawson and D. A. Carswell (chapter 13). The three principal medium-*T* eclogite-bearing orogens in Europe are dealt with in reviews by S. J. Cuthbert and D. A. Carswell (Caledonides: chapter 8), P. J. O'Brien, D. A. Carswell and D. Gebauer (Variscides: chapter 9) and G. T. R. Droop, B. Lombardo and U. Pognante (Alps: chapter 10).

In chapter 11 L. G. Medaris and D. A. Carswell summarise the available data on Mg-Cr garnet-peridotites in Europe, these rocks representing certain utlrabasic bulk-rock compositions at high *P* which is a subject where Carswell does have a solid reputation.

The various chapters incited innumerable praiseworthy comments but also innumerable condemnations such that the first version of this review almost became a new 'book 3'. However space limitations necessitated the present format which is obliged to concentrate on repudiating one appalling chapter (n° 8) which sets the clock back a decade just when most petrologists are preparing for the new models of the next century as the coesite saga blossoms with further discoveries of ultra-high *P* metamorphism in China, Russia, Switzerland and Germany in addition to the already-classic discoveries in Italy and Norway; indeed the publications on the Norwegian occurrences are now being treated as reference descriptions by other researchers so it is essential to get the record straight concerning Norway. All of the references cited below may be found in book 1.

Chapter 8 reviews various aspects of eclogites in the Scandinavian Caledonides in a superficially elegant fashion which helps to hide the fact that the authors lead the reader into a minefield otherwise known as the 'Norwegian eclogite controversy'. This began in the 1960s and was based essentially on the recognition of a significant difference in *P* between very high-*P* eclogites (in the range 20–40 kbar) and lower-*P* country-

rock gneisses such that the eclogite lenses had been tectonically introduced as foreign bodies (e.g. the 'foreign' school of Lappin, 1966; O'Hara, 1976; Lappin and Smith, 1978; etc . . .), and the refusal to recognise any *P*-difference such that the eclogite lenses had simply been metamorphosed co-facially *in situ* within the country-rock gneisses (e.g. the '*in situ*' school of Bryhni, 1966; Mysen and Heier, 1972; Krogh, 1977; etc.). The controversy has evolved considerably and starkly contrasting recent reviews are available in Griffin (1987) and Smith (1988).

The collision between an immovable object (the *in situ* school's amazingly fixed belief in relatively low-*P* eclogitisation, which has gradually increased over the years from 7 kbar up to about 20 kbar, see review Table 1.6 in Smith (1988)), and an irresistible force [the relatively high-*P* eclogitisation, ≥about 30 kbar, subsequently confirmed by the presence of definite coesite by Smith (1983, 1984)], has inevitably led to the generation of much friction. An amusing consequence of the fixed belief is the publication of a series of deduced eclogite *P–T* trajectories which run parallel to and very close to the line of the albite = jadeite + quartz reaction, very close merely because they were politically not allowed to traverse the line despite the absence of any scientific contraints (e.g. Cuthbert *et al.*, 1983; Griffin *et al.*, (1985; see points 1.6.1.(g) and (h) in Smith, 1988).

In conformity with the traditional mafia-like techniques of certain members of the *in situ* school, chapter 8 proceeds with misleading imprecise reporting and with diversional non-reporting, rather than with exact reporting followed by scientific criticism of those points that the authors do not believe (see the evidence presented below). The need to discuss a number of key points in the controversy is neatly avoided by referring the reader to the 'comprehensive reviews' of Cuthbert *et al.* (1983), Griffin *et al.* (1985) and Griffin (1987) which are all largely identical in promoting the relatively low-*P* *in situ* model in a characteristic unbalanced fashion, and by not referring to a long detailed review (Smith, 1988) which challenged, if not demolished, much of the data and conclusions of those earlier reviews and which was published in book 1 well before book 2 went to press. To avoid repeating the same challenges, many of which had previously been published but rarely counteracted, the reader is referred to Smith (1988) (which, incidentally, openly declared (p. 5) that its section 1.6 was biassed in order to redress the balance) such that only a few points in chapter 8 of book 2 will be criticised here.

1. (p. 185, 193, and 200): That the high-*P* *jadeite + quartz* association 'has not been reported' in Norway is untrue (e.g. see the descriptions thereof by Kechid and Smith (1985) and Smith (1988)). Likewise the existence of several other relevant high- or very high-*P* indicators in the eclogites are ignored, such as coexisting magnesite + diopside (e.g. Lappin & Smith, 1978, 1981); nyböite (e.g. Ungaretti *et al.*, 1981; Smith and Lappin, 1982); etc . . . That *nepheline* 'has not been described from retrograde eclogites' in Norway is also untrue [e.g. see the descriptions of Ca-Na-nepheline by Rossi *et al.* (1984) and Smith *et al.* (1986)]. Again many other indicator minerals recorded in retrograded Norwegian eclogites are not mentioned although they are relevant to any petrological discussion, e.g. preiswerkite (Smith and Kechid, 1983); pumpellyite (Smith, 1984); lisetite (Rossi *et al.*, 1984; Smith *et al.*, 1986); etc . . .

2. (p. 185): *P estimates* in the country-rock gneisses '*compatible* with those derived from eclogites' is a widely-publicised but pathetic argument based on the overlap of the highest *P* estimates for *certain* gneisses with the lowest *P* estimates for *certain* eclogites which are quite different from the coesite-eclogites such that there is still no evidence yet that any, let alone all, of the gneisses passed through the same ≥30 kbar metamorphic stage as the coesite eclogites. Cuthbert and Carswell avoid mentioning the *incompatibility* between certain published field descriptions and what one can actually observe in the field; notable discrepancies include a key locality at Midöy (Carswell and Griffin, 1985) about which substantial doubts were expressed by several members of the 1987 International Eclogite Excursion (see point 1.6.1.(n) in Smith, 1988).

3. (p. 187): Three different kinds of *reaction pathways* are described which can lead to the creation of *c.* 20 kbar eclogites by pressurisation. A fourth pathway, by depressurisation, from the ≥30 kbar coesite-eclogite facies into the quartz-eclogite facies is totally ignored in the text. It does however appear in the legend to Figure 8.6 where the authors mention the '*possible* presence of coesite' in Norway despite the publications with microphotographs of critical textures and of unequivocal physico-chemical data to confirm the coesite nature of the SiO_2 structure (e.g. Smith, 1984; Boyer *et al.*, 1985). The *maximum P* in the Scandinavian Caledonides is clearly expressed twice (p. 194–196) by Cuthbert and Carswell as being at about 20 kbar in absolute conflict with the presence of coesite which hence does not fit into the geotectonic model proposed in chapter 8.

Where evidence of the previous higher *P* event in the gneisses exists (e.g. the presence of typical symplectites after omphacite), the authors follow the *in situ* school in assuming that the earlier high-*P* event was the *same* one as that in 'the' eclogites without any evidence whatsoever for any identity in *P* or *T* (or in time) with the coesite-eclogite facies metamorphic event.

4. (pp. 201–3): The statements that the Western Gneiss Region (WGR) was 'largely a coherent body during eclogite-facies metamorphism' and 'It is now clear that these "type B" eclogites are not "geologically out of place", but shared their entire metamorphic history with the high-grade gneisses in which they lie' both fit in nicely with the overall *in situ* school's model of a single, around 20 kbar, quartz-eclogite facies metamorphic event with a regional *P–T* gradient; Cuthbert and Carswell however ignore various data indicating that the metamorphism was neither single, nor constrained to 20 kbar, nor even regional with gradients (see section 1.6 in Smith, 1988). Apart from the scandalous neglect of *definite* coesite (see also p. 348), the major problem is the flagrant inability of the *in situ* school to conceive that different localities of eclogites displaying differences in field relations and textures, in mineral assemblages, compositions and reactions, in bulk-rock chemistry, and/or in *P–T* estimates might represent completely-different geological events. The authors do recognise differences between the WGR and certain other Scandinavian regions (Bergen, Tromsö, Seve) but they unjustifiably lump together *all* of 'the' eclogites in the WGR; this is analogous to declaring that *all* of 'the' granites in Scotland shared the same history but that they do different from those in Cornwall or Donegal!

If ever it can be reasonably shown that the *entire* WGR did experience ultra-high *P* coesite-eclogite facies metamorphism (e.g. by the discovery of coesite or of its traces at many widespread localities of the different types of country-rock gneiss), then, perversely, both schools would have simultaneously won and lost:

—*lost* by the *in situ* school since their repeated attacks on ultra-high *P* would have been erroneous and/or unjust, *won* since the *in situ* metamorphism model would have become credible;

—*won* by the foreign school since their consistent maintenance of ultra-high *P*, in the face of a cascade of ridicule, would have been vindicated, but *lost* since the foreign tectonic introduction model would have become unnecessary.

In conclusion, the publication of a book is also an event, both scientific and politico-scientific. Chapter 8 thus has to be considered in the context of other politico-scientific events such as:

(i) the publication of book 1, followed by its diversionary, hence destructive, review by Carswell (1990, *Mineralogical Magazine,* **54**, pp. 345–7) which contrasts with all the other published reviews of book 1;

(ii) the *in situ* school's successfully-orchestrated attempt at the Second International Eclogite Conference (Vienna, 1985) to convert a programmed debate on the *significance* of coesite found in eclogites into heated, but wasteful, dispute over the *existence* of coesite;

(iii) The fact that the symposium on *High-P* Metamorphism' at EUG VI in Strasbourg in 1991 was reorganised after the sudden replacement of the originally-invited convenors (including D. C. Smith) by another group (including D. A. Carswell) because 'in some cases politics is at least as important as science' (the official explanation confirmed in writing by the EUG VI presidential office: 3 August 1990); and

(iv) Carswell's audacious coauthorship of an open letter (10 September 1990) inviting geologists to come and join discussions at this symposium on 'exciting . . . developments', including the fact that 'coesite is now being found increasingly in Europe'.

If it is true that Carswell at last believes in the *existence* of coesite in Norway, then one may contemplate whether chapter 8 has any value at all.

As for recommending, or not, that this book be bought by libraries and individuals, I do not repeat Carswell's (1990) attempt to place only one of books 1 and 2 on bookshelves. Both books have sufficient merit for library acquisition, and honest uncensored science requires that both books 1 and 2 stand side-by-side to provide the widest possible access to the often-conflicting data and ideas available to readers wishing to formulate their own opinions, which, to be independent, must be based mainly on *critical* examinations of the data in *original* articles rather than on other peoples' *uncritical* reproductions thereof. Likewise specialists on metamorphism should have both books handy, regardless of the contrast between a book 1 limited to detailed specific topics and a more comprehensive book 2 with blinkers on.

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[We regret this review was received late: it refers to an earlier review of a book on the same topic in *Min. Mag.* (1990) **54**, 345.]