

translation difficulties). The text also tends to be longwinded and repetitive. On a more serious note the book appears to be largely a reiteration of Balk's 1937 memoir (which I find much easier to understand) and the text pays scant attention to developments in this area of study and in related fields that have been published in the last 15 years. For example, Holder and Ramsay's quantitative ballooning model is not mentioned, let alone discussed and there is no mention of the general measurement and use of deformed xenoliths to quantify strain gradients in deformed granites. Much of the theoretical treatment of strain comes from the late 1960s and there is no acknowledgement for example that "flow" strains can be compounded simple and pure shears. This particular deficiency leads to the conclusion that low angles between fabrics and the contacts of adjacent undeformed granite are the result of "intense simple shear strains" without any independent evidence for such an assertion. The book therefore is rather out-of-date and it accepts almost in totality the conclusions of Cloos that "flow fabrics" are generated by movement of magma into spaces without any critical discussion of this. The alternative view, that regional tectonics can have an important role in generating pre-full crystallization "flow" fabrics in granites is only briefly considered with respect to the Sierra Morena plutons (the work of Brun and Pons) and it is unfortunate that this is not more fully contrasted with the Cloosian view throughout the book. Finally, the author draws about 80% of the examples from the Pyrenean Querigut complex and one must question whether such a geographically biased data set can be considered adequate for what is presented as a general text book.

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Correlation not quite global

Leonov, Yu. G. & Khain, V. E. (Editors) 1987. *Global Correlation of Tectonic Movements*. John Wiley & Sons, Chichester. 286 pp. Price £45.00.

This much promising title covers a collection of 14 papers by 29 authors—a product of IGCP Project 107 *Global Correlation of Phases and Epochs of Tectogenesis* (1975–1980). It must be said, first, that the title is not entirely appropriate: all of the papers but one concern Eurasia alone, and almost exclusively treat the Alpine belt and its Cenozoic movements. The distribution of authors is rather one-sided, too: only two of the papers came from Western Europe and only one of them deals with this region. Even the elaboration of the Euroasiatic Alpine Chain exhibits gaps: the type localities of the western Alps (apart from inclusion in a paper on Italy), the Pyrenees, a substantial part of Carpathians, Crimea, Caucasus, the orogens of Turkey and of Middle Asia. (Some of these regions were considered but in terms of tectono-gravitational or volcanic processes.) The substance and organization of individual chapters are inconsistent. Along with an introduction to the problems of the correlation of tectonic movements (by the Editors of the volume) there are two general chapters rather loosely connected with the book's subject, and regional chapters based on tectonic units (Carpathians, Himalayas), as well as on geographical regions (Balkan Peninsula, Eastern Asia, Cuba) and on particular countries (Italy, Hungary). Some of these chapters analyse the tectonic–magmatic–paleogeographical evolution, and others are more specific, for example on olistostromes or volcanism.

Another reason for the impression that individual parts of the volume have not been co-ordinated enough are the differences in data presentation. For example, the series of paleotectonic maps, introduced in the Preface as one of main goals of the Project, entered only a few of the papers. In some chapters, even a tabular list of local tectonic events is lacking, as well as the lack of comparisons with other regions. In addition to that, the geochronological scales used by the authors differ substantially even for younger periods (for example, Miocene: 24–5, 23–5, 22.5–5, 23–10 My) as well as does stratigraphical nomenclature (for example that for the Neogene).

In spite of the 7 years since the Project finished, the authors do not seem to have studied their companion papers, because there is no apparent attempt to discuss and compare the material, even as far as different approaches to the same region are concerned (compare for instance Schwan's and Săndulescu's analyses of Balkan regions). The list of such shortcomings is extensive. One can easily understand the reasons of at least part of the inhomogeneities and gaps in the volume. Nonetheless they are a serious drawback for a book on *correlation*.

I have no doubt that individual chapters will contribute substantially to the international effort to correlate various geological develop-

ments. Among the regional papers a review of Cenozoic olistostromes of the Alpine belt by I. G. Scherba shows that along a great part of this belt, from the Pyrenees to Caucasus, the development of tectono-gravitational phenomena ("mixtites" as they are called by M. G. Leonov in an accompanying paper) was synchronous and took place in six phases, fitting well with the phases of Stille. M. Săndulescu, starting from a well-documented analysis of evolution of Balkan tectogens came to the conclusion (which seems to represent the majority of other authors) that synchronism and heterochronism of compressional events are complementary rather than exclusive features, since these events occur within some correlatable periods, but they are not ubiquitous—their deformational effects are often very limited in space. Naturally enough, an analysis of Mesozoic tectonics and magmatism over vast areas of the Eastern Asia (M. S. Nagibina, Yu. G. Gatinsky, G. A. Grinberg, C. S. Gusev & V. I. Kovalenko) has brought a less harmonious picture—simultaneous compression (folding) and tension (subsidence) in different places. In the same chapter there is an interesting attempt to explain the parallelism of tectonic activity in mobile belts and inside continents, but the shortcomings are: no list of radiometric data, poor legibility of some figures, the lack of summary conclusions and the somewhat one-sided bibliography (only nine non-Russian sources, including only one Chinese).

The chronology of tectonic processes in Italy by R. Malaroda is a single paper with such a broad chronological scope (from Precambrian) and the only one whose essence is contained in such a comprehensive correlation table. It is a pity that this erudite study is devoid of more general inferences and is of a paleodynamic background. Some problems arise from the two separate and mutually isolated papers about relatively small sections of the Outer Carpathian arc: Czechoslovakian by D. Vass, Z. Stráňík & I. Krystek and Polish by N. Oszczypko & K. Żytko. The first is devoid of any radiometric data and the bibliographic sources are exclusively local: even a comparison with the neighbouring, Polish part of Western Carpathians is lacking. In the second there is an obvious need for tabulation of the events and the maps are misleading because they do not demonstrate "tectonic activity at the beginning of the Oligocene" (disregarding the palinspastics). In this paper the continuous character of tectonic evolution deserves attention as distinct from more episodic development in the light of other papers. The chapter on middle and late Alpine phases in Hungary (G. Császár, J. Haas, J. Halmaj, G. Hámor & L. Korpás) is in fact a review of the geological history of this country in the given time-span, performed mainly by means of 14 ingenious, clear maps. They are completed with a correlation table, but unfortunately without data on isotope chronology.

It is obvious why the relative precision of analyses of European tectogenes could not have been equalled by the review of the Himalayan orogeny (B. N. Raina, U. C. Pati & N. Srimal), which is limited mainly to the Indian part. However, a series of maps and sections as well as a survey of selected, more recent published opinions will be valuable for readers not acquainted with the complex problems of the tectono-magmatic evolution of Himalayas. It is a pity that the authors did not illustrate their review with a schematic map of the geotectonic development of that part of the globe.

The volume closes on a different tone—with a paper by A. V. Lukyanov on self-excited oscillations in geological systems. This specific question, investigated by the author for a dozen years, has been presented mainly with the help of non-tectonic examples. Those concerning rhythmic sedimentation seem to be most important; however, possible analogies to large-scale tectonic phenomena, although promising, so far look rather distant and have not been explained by the author. No doubt, theoretical and methodological aspects of the correlation of tectonic movements deserve a special treatment, which should be executed against the background of recent problems of stratigraphical correlation (so expanded in recent years).

To point out formal defects in a volume composed of translations may seem over-critical. However, there is a limit of tolerance, which I feel has been exceeded in the case of *Global Correlation*. Only a few examples of the various mistakes and omissions can be given here: $\alpha\beta$ mixtites instead of $\gamma\beta$ mixtites in Table 1 (p. 29); supposed Miocene–Quaternary mixtites in Outer Carpathians shown in the map on p. 31 and absent in the table on p. 33; missing locality of sections (quoted on the figures) on p. 74; early Oligocene (25 m.y.) instead of early Miocene on p. 77; missing legend to Fig. 11 on p. 113; unexplained letter symbols in Fig. 1, p. 120; Albanian transgression instead of Albian transgression on p. 176; lack of titles of figures on pp. 201–209; and numerous distortions of the authors' addresses. Many of the maps are of dubious value to the reader due to missing or faint topographic description; for instance those on pp. 14, 126, 214–217, 219, 220. Not

a single section has been located on a map, and the description of some sections based on local names is insufficient.

Last but not least—the bibliography. In a book of this nature it plays an essential role. *Global Correlation* was edited in 1987, but the bibliography is mainly up to 1980, except for 26 1981 works, and only eight younger (up to 1985). Those youngest citations provide a proof that the including of more recent works (in a more respectable number) was not impossible.

To sum up the importance of the volume edited by Leonov and Khain is unquestionable. It would be more proper, however, to entitle the book *Materials for Global Correlation of Tectonic Movements*. From reading this book, it is clear how far we are, not only from the global correlation of tectonic deformations, but also from an effective co-ordination of international research in this field.

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