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Book Review

Geochemie. K.H. Wedepohl. Sammlung Göschen - Walter de Gruyter, Berlin, 1967, 220 pp., 26 illus., 37 tables, DM.7.80.

When a geochemist of international renown like Professor Wedepohl writes a book on geochemistry in the *Sammlung Göschen*, one logically entertains high hopes that this book will be the long-awaited introductory textbook on geochemistry to be recommended to beginning geochemistry students. Next to this it should give the interested layman a clear understanding of the aims and methods of geochemistry, and still be sufficiently detailed to be of interest to the professional geochemist as well.

Maybe all these goals are unattainable in one single volume, and in fact the book falls short of these in several respects. The author has tried to give too much, and instead of limiting himself to a smaller number of problems, he has saved space by merely mentioning several geochemical concepts, without explaining them, or else by presenting many factual data, without trying to bring these together into one framework. The book is therefore unaccessible to laymen without an ample background in geology and petrography.

The student who is just beginning his studies in geochemistry might also, on first reading, get the wrong impression that geochemistry is mainly concerned with the collection of analytical facts on all kinds of geological material, without much regard for the ultimate purpose, the unraveling of past or present geological processes.

Given these limitations, one should in all fairness point out that Wedepohl has brought together from a prodigious knowledge of the geochemical literature, as well as from his own extensive geochemical work, a wealth of data, touching on all possible fields of geochemistry.

It is unfortunate that some conclusions are presented in a somewhat apodictic form; e.g., from the near-equality of the heat flows under the oceans and on the continents, it is concluded that there are large chemical differences between the mantle under the oceans (still relatively rich in U, Th, and K) and under the continents (depleted in these elements). As these postulated differences have to be permanent in order to maintain the equality of the heat flows, it is concluded, following geophysicists and geochemists like MacDonald and Ringwood, that continental drift cannot have taken place. A conclusion based on a sequence of hypotheses which each taken alone are not unreasonable, is very likely to be wrong, if the chain of argumentation becomes too long, unless it is corroborated by the convergent results of several independent arguments. It has been shown elsewhere that the equality of the heat flows can very well be reconciled with the hypothesis of continental drift.

Too much stress is placed also on the large-scale geochemical processes as a one-way street, due to a progressive degassing of the mantle, still a very fashionable concept in geochemistry. Cyclical processes, on the other hand, get a very scanty treatment, or are not mentioned at all. It is clear that large amounts of geological material, formerly thought to be of juvenile origin, have gone through several cycles of erosion–sedimentation–metamorphism–remelting–intrusion–erosion; this holds also for large

amounts of the volatile elements. Wedepohl brings himself a number of good arguments for this cyclical nature, but still everything is explained by progressive degassing of the mantle.

In the section on the composition of the earth's crust, the author states on p.70 that we have no geological observations of a zonal transition from a granitic upper crust to a lower gabbroic or dioritic crust, as postulated by seismologists. This is the continuous misunderstanding between seismologists and petrologists. When the seismologists say "basalt", they merely indicate a set of physical parameters which the rock must have. Anorthosites, granulites, basic and acid charnockites are more likely components of the lower crust than gabbros. These rocks certainly are exposed in the deeply eroded parts of mountain ranges (southern Norway, Madagascar, India, Greenland, Adirondacks, also as inclusions in lavas from Alaska, the Central Massive of France). Geochemists in their calculations should consider these rocks to compose the lower crust.

In the short section on metamorphism there is a rather strong insistence on metasomatic processes. The metamorphic facies and the facies series are treated rather inadequately in a long table listing the minerals which can occur in the different metamorphic facies. This section would be shorter and clearer if this table of six pages were replaced by a *pt* -diagram of the different metamorphic facies series, as presented by Tröger, Miyashiro or Den Tex, for example.

It seems strange that geochemical prospecting, which accounted for over 13 million chemical analyses last year, is nowhere mentioned.

The book is reasonably free of printing errors; one stands out rather particularly, where the half-life of the longest living Tc-isotope is stated to be $2.6 \cdot 10^6$ years on p.15, and $2.2 \cdot 10^5$ on p.21.

In a book where space is clearly of major importance, as shown by the very incomplete list of references (a restriction imposed by the editor), a list of minerals and their properties (p.35) which have only been found in meteorites is of doubtful value.

The non-German reader will occasionally have some problems to untangle a few sentences; on the whole, however, the style is not particularly trying. It must be concluded that the book fails as an introduction of geochemistry to the layman; for the geochemistry student the best use of the book will be as a back-up for a geochemistry course, but definitely not instead of such a course.

For a later edition it is hoped that Wedepohl will be able to reduce the number of subjects treated and the amount of facts given, and to concentrate on fewer geological processes treated more extensively. Especially a shortened version of the cosmochemical part (pp.12–45) will improve the book considerably.

Such changes, and an eventual translation into English, may make the book into a useful text for the beginning geochemistry student.

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