

Three Recent Russian Works on Global and Continental Metallogeny

Reviewed by Peter Laznicka
 Department of Earth Sciences
 The University of Manitoba
 Winnipeg, Manitoba R3T 2N2

No matter what reservations one might have towards the Soviet political system and by implication towards the Soviet geology which operates within its framework, it cannot be denied that the system creates conditions favourable for certain types of geological work and certain types of publications unsurpassed in the rest of the world. Those geological disciplines which require large quantities of data, large numbers of employees, fixed genetic models and disproportionately costly publications sold for a low price, apparently benefit from such a set-up and metallogeny is one of them.

With the plate tectonic model now entering its fifth, or mopping-up phase in Kuhn's scheme of scientific revolutions, the North American metallogenic thinking shows renewed interest for alternative models of ore deposition in time and space. The geosynclinal-orogenic model is hardly correct in explaining processes but a wealth of data has accumulated within its framework. A large share of such data has been gathered, processed and published by the Soviet school and the Canadian geologist should be kept informed about its progress.

This review is of three works: two of them (#2, #3) appeared during 1975, and one (#1) has been around for several years. It is, however, reviewed because of its fundamental importance and because the item #2 is in essence an explanation book to the map item #1.

1. Metallogenicheskaya Karta S.S.S.R. (Metallogenic Map of the U.S.S.R.) 1:2.5 million

18 sheets 90 x 60 cm

Vsegei, Moscow, 1967

Price 4.35 roubles, about \$60 at Telberg Book Corp., Sag Harbour, N.Y., 11963, U.S.A.

The Metallogenic map is another member of the admirable family of

recent 1:2.5 million maps covering various aspects of geology of the U.S.S.R. (such as the Geologic Map, Tectonic Map, Map of Magmatic Associations, etc.). The map has over 100 contoured layer colours, is printed on 18 large sheets and like the other maps in this series it is technically a remarkable achievement. The amount of information packed into this map and the complexity of their expression is overwhelming and can only be grasped by examining the four and a half sheets of legend. The American reader, I am afraid, will find the legend overclassified and will wonder what the ratio of facts versus hypotheses might be.

The base map is essentially a modified tectonic map in which the Soviet territory is subdivided into six fundamental geotectonic groupings. These, in turn, are subdivided into fifty second order areas and for each of these areas the legend distinguishes up to 25 lithologic associations developed in progressively more advanced phases of the geosynclinal-orogenic model.

In comparison with the base map the metallogenic overprint is relatively simple so it is explained on a single page of the legend only. The map contains both point plots of individual deposits - some 100 deposits per sheet on the average - as well as contours of "structural-metallogenic zones". In a mineral deposit symbol is incorporated the information on genetic type, "ore formation" (association) and geotectonic conditions of formation. Unfortunately the size and importance of a locality is not distinguished, the localities are neither named nor numbered and their plots are not accurate (at this scale a symbol covers an area of about 160 sq.kms.) and some are (? deliberately) displaced. This familiar major shortcoming reflects the official Soviet bureaucratic requirement for excessive secrecy where it is hardly justified and sharply reduces the scientific value of the map. The reader may hardly be tempted to invest time and energy into a study of a genuinely anonymous map and as a consequence this map, in the Western World, is currently being more often used as a wall decoration rather than a well of geological information which took the effort and time of so many people to produce (not considering the cost).

2. Regional'naya Metallogeniya S.S.S.R. (Regional Metallogeny of the U.S.S.R.)

By K. B. Il'in

237 p., Nedra, Moscow, 1974.

Price 2.71 roubles.

The ideas on ore deposition as related to development phases and environment in the geosynclinal model used officially in the U.S.S.R. are known to the American reader from a translation (by E. Alexandrov, 1968) and from an application to Canada (by McCartney and Potter, 1962), of the much earlier Bilibin's paper (Bilibin, 1955). When the belief in the geosynclinal theory faded away in the early seventies many North American geologists have completely lost their interest in this model (even in its positive aspects) so the 1955-1975 Soviet progress in this field remained unrecorded here. Il'in's book, therefore, is indispensable to any serious user of the previously reviewed Metallogenic Map because in the first chapter, it gives the background information, describes the model on which the map is based, and shows how to read the map.

The second and main part of the book describes the regional metallogeny of the U.S.S.R., area-by-area. It will provide the globally thinking geologist with essential information on the mineralization of the bewildering array of Soviet geotectonic and geographic subdivisions rarely available under a single cover. The student of North American metallogeny will quickly be able to extract essential data on Soviet geotectonic units located in the Trans-polar and Circumpacific extensions of corresponding North American structures.

The third part of the book discusses the metallogenic zoning of the U.S.S.R., based mostly on geochemical basicity-acidity of metallogenic belts. A colour map of metallogenic zoning of the U.S.S.R., 1:10 million, is included with the book.

3. Metallogeniya (Metallogeny)

By I. G. Magak'yan

304 p., Nedra, Moscow, 1974.

Price 3.15 roubles.

In contrast to items #1 and 2, this book is relatively easy reading and was prepared by the Armenian Academician Magak'yan primarily as a textbook for university courses. After a very brief introduction summarizing the history of metallogeny and its concepts, the metallogeny of geotectonic regions of the world, arranged chronologically from the oldest to the youngest, is described. The description of each region is necessarily very brief (e.g., 3½ pages are devoted to the Canadian Shield), but due to the curious absence of any similar work in English this part of Magak'yan's book can be warmly recommended to the North American geologists seeking elementary information on the metallogeny of, e.g., the Siberian Shield, Sino-Korean Shield or the Norwegian-Appalachian belt. Bibliography conveniently follows description of each area and it usually contains at least one fundamental local work.

The second part of the book deals with metallogeny of selected metals. Principal mineralization types are described and world distribution of the largest ore deposits is recorded.

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Metamorphism

By H. G. F. Winkler

Springer-Verlag, New York,

Heidelberg, Berlin

320 p., 1975.

\$9.80.

Reviewed by G. B. Skippen

Department of Geology

Carleton University

Ottawa, Ontario K1S 5B6

The first edition of this widely-read book appeared in 1965 and has undergone substantial revisions in the Second and now Third Editions. Unlike the previous editions, which were translated from German into English, the Third Edition has been written in English with editing by Dr. Edgar Froese of the Geological Survey of Canada.

One of the most significant changes in the Third Edition is the emphasis given to a few key mineral reactions as a means of subdividing the range of metamorphic conditions. This is a more comprehensible approach than presenting a few representative ACF or AFM projections to define metamorphic facies and subfacies. The problem with such projections is that hundreds of diagrams are needed to describe all possible phase relations in rocks as complex as calc-silicates or pelites. This change in emphasis from projections to mineral reactions as a means of introducing students to metamorphic petrology is described by Professor Winkler as an abandonment of the facies principle. *Abandonment* is perhaps too strong a word since mineral reactions are implicit in the definitions of facies and subfacies and constant reference to the classical metamorphic facies is made throughout the text. The importance of identifying the specific reactions by which minerals appear or disappear in the field is underlined in the text by the introduction of a new term, *isoreactiongrad*. The use of this term is advocated for those cases in which a specific reaction can be assigned to an isograd.

The introductory chapters of the textbook are similar to the previous edition except for a somewhat laborious chapter drawing the line of demarcation between diagenesis and

metamorphism. The introductory section also defines four major subdivisions of metamorphism on the basis of mineral reactions that occur widely in the field and that have been calibrated experimentally. These subdivisions are called very low grade, low grade, medium grade and high grade metamorphism and correspond respectively to the traditional zeolite, greenschist, amphibolite and granulite facies. Separate chapters are then devoted to detailed descriptions of the metamorphism of carbonates, marls, ultramafic rocks, mafic rocks, graywackes and pelites. From a Canadian point of view, it is unfortunate that this list could not have been expanded to include iron formations. Chapters are also presented in the later part of the book on granulites, eclogites, and anatexis. Of particular note is the terminology applied to rocks from the granulite facies. Because of ambiguities in the term, *granulite*, a new term, *granolite*, is introduced for those rocks that contain minerals diagnostic of granulite facies metamorphism. The term, *granoblastite*, is used for rocks from the granulite facies that lack diagnostic mineral assemblages.

The greatest weakness (or strength, depending on the approach of the reader) in the book is the lack of some theoretical material that is pertinent to the subject. There is little consideration given to thermodynamic theory although this theory is essential for correlating laboratory studies on idealized, end-member minerals with field data involving phases of varying compositions. A chapter entitled, *Factors of Metamorphism*, attempts to discuss the mechanics of metamorphic rocks without the benefit of theoretical constraints. Thus, it is possible to dismiss "tectonic overpressures" because rock strengths are negligible under metamorphic conditions but at the same time to allow "internally created gas overpressures" of "perhaps some 1000 bars" in these same rocks with negligible strength. Statements of this type would have been easier to accept if they had been presented in the context of some basic principles of mechanics.