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Presentation of the Roebling Medal of the Mineralogical Society of America for 1980 to Dimitrii Sergeevich Korzhinskii

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Mr. President, Ladies and Gentlemen:

We all give lip-service to the novel and unconventional in science, but when confronted with it in a familiar area where our modes of thought are so deeply entrenched that they have become "rules of the game", we tend to resist. It is easy to be virtuous when sandcastles cherished by others are threatened by the waves of innovation. Virtue is much more difficult when our own favorite sandcastles are threatened.

Thus, despite the pious attitudes of science in the abstract, the going can often be rough, when it comes down to cases, for those who are truly original and creative. The problem can be serious, even in one's own immediate community, where barriers to communication are minimal and numerous opportunities exist for "thrashing things out" informally. These difficulties are compounded, when the information must filter through to a distant land where the relevant publications are not readily available and, if found, are further obscured by a veil of language and even alphabet. Translations help, but translators, rarely professional scientists, are especially hard-pressed when translating something conceptually new.

These remarks may help, I hope, to explain, if not justify, the belated recognition by this Society of one of the great petrologists of our time.

D.S. Korzhinskii was born in St. Petersburg (later Petrograd, and now Leningrad) at the end of the last century. Son of the eminent botanist and academician, S.I. Korzhinskii, he spent his early years in what was then the nerve-center of Russian science and culture, graduating from the Leningrad Mining Institute in 1926. Among those providing his training there were V.N. Lodochnikov and A.N. Zavaritskii, successors there to E.S. Federov. In the late twenties and early thirties Korzhinskii spent much of his time in the field, mapping in Kazakhstan and in the crystalline rocks of the Aldan Massif in eastern Siberia, though also lecturing on metamorphism, during part of this time, at Leningrad.

His early contact with geologic reality in the field provided the stimulus for much of Korzhinskii's later theoretical work. The rigors of field work in wild and remote regions also developed his talent for unusual and resourceful solutions to difficult problems. There are many stories of Korzhinskii's deeds during this period. Often retold, there are, by now, several versions of each. I will share with you one story, as I first heard it: A boat carrying his party across a major river capsized. Korzhinskii, then unable to swim, disappeared beneath the surface, much to the consternation of his companions. In a few moments, however, the water some yards nearer shore began to boil and Korzhinskii emerged, took a great gulp of air, and disappeared again. Repeating this process, leaping kangaroo-style from the riverbed, the future Roebling medalist was able to reach shore safely. According to Dr. Korzhinskii, his actual method of reaching shore was far less spectacular—but I like the story and feel that it is a sincere compliment, indeed, to be the inspiration of legend.

Korzhinskii realized, early in his professional life, that the solutions to many of the fascinating problems of petrology would require the aid of disciplines such as chemical thermodynamics that were but a minor part of the conventional geologic curriculum of that time. Accordingly, with the encouragement of one of his mentors, he embarked on a program of self-education. This, combined with the demands of field work, meant that publications were sparse for a while. This course of action would be most unwise in the academic and professional marketplace of today, but it was clearly, here, the preparation of a firm foundation for a brilliantly productive career in Korzhinskii's middle and later years.

Korzhinskii's promise as a theoretician of petrology became apparent with the appearance of four memorable papers. The first of these, in 1935, dealt with metamorphic reactions involving a gas phase.

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The other three, in 1936, dealt, respectively, with the metamorphism of the marbles of the Aldan Massif, with Archaean granulites near Lake Baikal, and with application of the phase rule to open systems. The paper on the Aldan marbles is notable in that it presented ideas and concepts that were not well understood in the West until the classic paper published four years later, in 1940, by N.L. Bowen.

These papers were so far ahead of their time that they received little recognition outside Russia, even though brief summaries in English or German were appended. It is of interest that Korzhinskii sent copies of each to Esper Larsen, then at Harvard. When Larsen retired he passed them on to Marland Billings, who, in turn, passed them on to me when he became aware of my interest in such matters. They are among my prized possessions; in fact, I have them right here! They were a bit out of Larsen's line, but in one, the marginal comment, "Good!" is still clearly visible in Larsen's handwriting.

In 1937, following the appearance of these papers, Korzhinskii became a senior scientist at the Institute for the Geology of Ore Deposits, Petrology, Mineralogy, and Geochemistry of the Academy of Sciences in Moscow, becoming director of the Institute for Experimental Mineralogy there in 1969. At the geological institutes of the Academy of Sciences, Korzhinskii found the environment for full realization of his potential, as his numerous publications through subsequent decades attest. Much of this has been summarized in two major works: "Physico-chemical Basis for the Analysis of the Paragenesis of Minerals" (1957) and "Theory of Metasomatic Zoning" (1969). These have now become classic works in theoretical petrology.

A characteristic of Korzhinskii's writing is the skill with which he applies sophisticated geometric and algebraic techniques to multicomponent, polyphase systems, greatly extending the earlier methods developed by Federov, Niggli, Eskola and others. One of his major contributions has been to our understanding of the constraints that must be considered in the treatment of open systems, namely that rock systems respond to variations in the ambient values of certain chemical potentials as well as to variations in temperature and pressure. In dealing with such systems he also showed that energy functions other than the classic set of four presented by Gibbs are often convenient. To the conventionally-minded of a decade and more ago this seemed an outrageous and unnecessary tampering with long-established procedures, certainly upsetting, and possibly down-right wrong. Experimental petrologists, however, soon got the message. Experiments with systems buffered by controlled activities are now commonplace, whether or not a specific investigator may realize that the function that is minimized in the charge inside the capsule, when it equilibrates, is *not* its Gibbs free energy.

Korzhinskii's honors in his native land have been many but it is fitting that we also honor him in recognition of the value of his contributions to the world at large. Mr. President: I am pleased to present the Roebling Medalist for 1980: Dmitrii Sergeevich Korzhinskii.

Addendum

The four pioneering papers referred to above by D. S. Korzhinskii, are:

(1) Thermodynamics and geology of some metamorphic reactions with separation of gas phase. Mem. Russ. Min. Soc. Ser. 2 (1935), Vol. 64, No. 1, 1–20, (in Russian with German summary).

(2) Archaen marbles of the Aldan Platform and the problem of depth facies. Trans. Central Geological and Prospecting Institute, Moscow, No. 71 (1936), 60 p., (in Russian with English summary).

(3) Paragenetic analysis of quartz-bearing, almost calcium-free crystalline schists of the Archaean complex south of Lake Baikal. Mem. Russ. Min. Soc. Ser. 2 (1936), Vol. 65, No. 2, 247–280, (in Russian with English summary).

(4) Mobility and inertness of components in metasomatism. In: Source Book in Geology, K.F. Mather, editor, Harvard University Press (1967), 291–303; originally in: Bull. Acad, Sci., U.S.S.R., sect. math. and phys. sci., no. 1 (1936), 35–60.