

Report on Russia: Geochemistry and Politics

Soviet geologists are busy with a host of projects,
but in their off-hours they enjoy talking politics.

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During March of this year I was privileged to spend three weeks in the Soviet Union as a visiting scientist, for the purpose of exchanging views on education and research with Russian geologists and geochemists. By good fortune I had also an exceptional opportunity to learn something about the attitude of my Russian colleagues toward world problems.

My itinerary took me to the universities and institutes of the Academy of Sciences in four cities: Moscow, Leningrad, Kiev, and Tashkent. Nearly everywhere I was received with the greatest cordiality, and was able to see laboratories and talk freely about current research problems. The talk often strayed beyond scientific subjects to politics and world affairs, and with the aid of an extremely able interpreter I found it possible to explore such extracurricular matters in great detail. The interpreter, a geologist with an enviable command of idiomatic American speech, was himself much concerned about social questions and was eager to give me all possible opportunities to correct my misconceptions about his country and to learn the viewpoints of Russian scientists. Some of these viewpoints are worth reporting, since they represent the thinking of an important group in Soviet society.

In these pages, therefore, I shall summarize briefly the current status of geochemical work in Russia—greater detail is hardly warranted, since the subject has been discussed elsewhere (1)—and then describe, I hope objectively, some of the opinions of Russian geologists regarding current relations between their country and ours.

Geochemical and Geological Research

My geological and geochemical colleagues were for the most part very cooperative in exhibiting their laboratories and in discussing research projects. These subjects are not politically "sensitive," so there was no reason to expect secretiveness, but I was nevertheless pleasantly surprised at the lack of hesitation in bringing out field maps and rock specimens and in discussing details of research techniques. Americans often complain that published geologic work by Russians is annoyingly vague about exact locations and scales of maps and about experimental details, but there was little vagueness in our conversations.

Geology in general is an active field of science in present-day Russia. Mapping is in progress in many parts of the country, under the supervision of the Ministry of Geology (an organization analogous to the U.S. Geological Survey, but lacking the Survey's extensive research activities), aided during the summer season by personnel from the universities and academies of science. Geologic mapping on a scale of 1:250,000 will soon be completed for the entire country, I was informed, but these maps are not available for public sale. Russian geologists express the same sense of excitement about the little-explored areas of Siberia and Central Asia that American geologists felt about our Far West a generation ago. These are the lands of the future, they say, lands full of fascinating geologic problems and abounding in mineral wealth, the discovery of which has only just begun.

The special field of geochemistry

has a long and honored tradition in the Soviet Union, since two of the pioneers in the modern development of the subject, A. E. Fersman and V. I. Vernadsky, were Russians. Active research is under way in most branches of the field, the kinds of problems and methods of investigation being very similar to those in the United States. Two sorts of problems receive special emphasis: the development of methods of prospecting by analyzing soil, water, and vegetation for trace elements and the use of geochronometric methods based on radioactivity for answering questions about stratigraphy and structure. In almost every institute I visited, laboratories of geochemical prospecting and geochronometry were in operation.

The laboratories I saw were well equipped with modern instruments. Requests for instruments, I was told, are seldom disallowed, but procuring of the equipment may be subject to long delays. Overcrowding is serious in some of the laboratories, but everywhere the provision of more space for scientific work has a high priority in the building program. Especially worthy of note is the number of laboratory assistants and technicians, the latter including highly trained analysts, physicists, and electrical engineers.

Research activity is scattered among many institutions. Most research in geological fields is concentrated in the Academies of Sciences, organizations that have no real counterpart in America. Perhaps the various laboratories of the Carnegie Institution provide the closest analogy, but the Russian academies are supported by the government rather than by private funds and are responsible to the government. Academies or branch academies are located in most of the principal cities, the largest and most famous being the National Academy in Moscow. Each academy is divided into institutes specializing in particular fields of science, the number and character of the institutes varying from city to city in accordance with local needs and interests. Both practical and theoretical research projects have a place in the academics, the emphasis being more on practical work in the academies of outlying cities and on theoretical research in Moscow. Besides the institutes of the academies, there are a number of independent in-

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stitutes engaged in geological research, mostly of a practical nature.

Universities in Russia are primarily institutions for teaching, but good facilities are available for training students in research techniques and for considerable research by faculty members. Geological research is stressed particularly at the State University in Moscow. Faculties in geology at the universities are large, and instructional equipment is good. My contacts with students were limited, but on the basis of a few conversations I judge that the quality of the professional education in the four schools I visited is comparable to that in good American institutions. Close cooperation between the universities and academies of science is the rule, professors often holding dual appointments and advanced students being permitted to work in academy laboratories.

This scattering of research activity aroused my curiosity about problems of coordination. In response to queries I was told that coordination of research is handled by committees, and that the work of the committees is generally satisfactory. Issuance of the recent decree on reorganization of research, however, suggests that coordination is indeed a serious problem, at least in some fields of Russian science. It seems likely that henceforth the academies will devote themselves more exclusively to basic research and that practical investigations will be left to the specialized institutes (2).

The best equipped and best staffed laboratories are those of the academy in Moscow, as might be expected, but even in a spot as far off the beaten track as Tashkent the amount of modern laboratory apparatus is most impressive. Two institutes of the Academy in Moscow are particularly noted for the amount and excellence of their geochemical work, the Vernadsky Institute of Geochemistry and Analytical Chemistry (A. P. Vinogradov, director) and the Institute of the Geology of Ore Deposits, Petrography, Mineralogy, and Geochemistry (F. V. Chukhrov, director). Examples of current geochemical projects at the two institutes are given in the accompanying box (page 541). Several other institutes of the Academy in Moscow are engaged in geochemical work, notably the Fersman Museum, the Institute of Rare Metals, the Institute of Hydrogeology, and the Institute of Oceanography.

In Leningrad the principal field of geochemical interest is geochronometry. E. K. Gerling, chief of the geochronometric division of the Laboratory of Precambrian Geology, is the recognized Russian authority in this field. In Kiev most of the geochemical effort is directed toward problems of interest to the Ukraine—ages of the Precambrian rocks, origin of the iron and manganese deposits, and geochemical prospecting. In Tashkent, likewise, most attention is given to problems of local interest, especially the composition and movement of ground water and the origin of loess, but laboratories are being set up for work on more theoretical problems such as the distribution of stable isotopes and high-temperature reactions of silicates.

What sort of assessment can one make of the Russian geochemical effort as a whole? Any generalization of this sort is dangerous, especially when it is based on such brief observation. The amount of work is impressive: tremendous numbers of young scientists have been drawn into this rather specialized field, and geochemical papers appear in great profusion. Some of the papers are remarkably good, but perhaps the sheer number of workers makes the average quality of the product seem mediocre. To an outsider, a disproportionate amount of the Russian work appears to be of the empirical, fact-gathering sort, without much imaginative insight into the reasons for gathering the facts or into the meaning of the facts once gathered. This may well be the result of training so many people so fast; it may also be the kind of geochemistry that is most needed at the moment in a country where geological exploration is only now getting under way. Certainly I think an American can say, without meaning to be boastful and without in any way disparaging the best Russian papers, that no Russian laboratory so far can point to a record of consistent, long-continued excellence in research comparable to the records of a few laboratories in this country. Very likely this is only a question of time. With the good equipment available, the numbers of assistants, the rigorous university training, and the widespread public enthusiasm for science, geochemical research in Russia during the next few years should have every opportunity to become the equal of the best research elsewhere in the world.

Political Views of Russian Geologists

Geologists in Russia are no more experts on political and social questions than geologists in America, but like their American colleagues they have strong opinions which they enjoy talking about. It was my good fortune to hear many of these opinions expressed under very informal circumstances, in conversations that grew out of scientific discussions in the laboratories. All in all, I must have discussed political and social questions with nearly two dozen geologists and geochemists. These conversations, either with individuals or with groups, and interlaced with scientific matters, ranged from brief exchanges to sessions that were continued far into the night in Russian homes.

Neither the Russians nor I had any idea at the time that these impressions would ever be written down, so the paragraphs that follow are not to be considered as accurate opinion sampling. The Russian views seemed in many ways startling, for they represented the thinking of men with the same professional background as my own, reasonable and well-educated men who have made an honest effort to examine the issues that divide our troubled planet, and who have arrived at conclusions diametrically opposite to those that a Westerner thinks self-evident.

Underlying the world view of my geologist friends is a deep enthusiasm for communism. In part this is an expression of gratitude for benefits received: many geologists have come from humble origins, and say proudly, "I am the son of a worker," with the implication that only under communism could a worker's son rise so high. But the enthusiasm has deeper roots than this. In large measure it is a sense of mission, of dedication to a great cause, of being part of a progressive movement that will make the world a better place. The ideals of communism, however much we in the West think of them as perverted by an oppressive dictatorship, live on in the minds of these scientists. The Great October Revolution is as much a source of inspiration and a guide to action for these geologists as the American Revolution has been for us.

To a Western observer the enthusiasm seems hardly justified by the material rewards that communism has brought to the Russian people. The drabness of life in the Soviet Union—the unimaginative clothing, the monot-

Examples of Current Projects at Two Institutes of the National Academy of Sciences in Moscow

Vernadsky Institute

A. P. Vinogradov: radiocarbon dating; sulfur isotopes; geochemistry of tungsten; titanium content of bauxites; chemical evolution of the earth.

N. I. Khitarov: reactions at high temperatures under hydrothermal conditions; solubility of water and carbon dioxide in silicate melts; pressure-volume-temperature relations in the system H_2O-CO_2 ; conditions of formation of zeolites.

A. I. Tugarinov: geochronology; lead isotopes; ratios of rare-earth metals and hafnium-zirconium in minerals and rocks.

G. P. Malyuga: geochemical and biogeochemical prospecting.

A. B. Ronov: distribution of rare metals in sedimentary rocks of the Russian platform; paleochemical maps; geochemical history of atmosphere and hydrosphere.

V. V. Scherbina: behavior of trace metals in the weathering zone; concept of acidity in silicate melts.

V. L. Barsukov: geochemistry of tin and boron.

Institute of the Geology of Ore Deposits

F. V. Chukhrov: occurrence and mineralogy of clay deposits.

D. S. Korzhinsky: theoretical thermodynamics, especially thermodynamics of open systems; thermodynamics applied to magmatic processes, metamorphism, and ore deposits.

I. I. Ginzburg: geochemistry of weathering; origin of laterites and bauxites; geochemical prospecting.

A. A. Saukov: geochemistry of mercury; prospecting for metals and oil.

G. D. Afanasiev: geochronology, igneous rocks, and ore deposits of the Caucasus.

A. A. Ostrovsky: solid-state phase relations at high temperatures and pressures.

G. S. Gorshkov: geochemistry of volcanic exhalations in Kamchatka and the Kuril Islands off the coast of Japan.

L. N. Ovchinnikov: ore deposits of the Urals; hydrology of northeast Siberia.

onous food, the inadequate housing, the crowded stores with dull show-window displays—is remarked by every tourist from the West. There was no argument on this point by my geologist friends; they know enough of the West, either through personal visits or through conversations with foreigners, to realize how low the Russian standard of living is by comparison. Their reaction was simply that a low living standard is not important as long as conditions are improving. “Look at the primitive conditions we started from,” they insist. “Remember that only recently we fought a disastrous war in which much of our land was overrun by the enemy. We have made great strides already, and now progress is visible from month to month, almost from day to day.” The feeling of steady improvement, the joy of seeing more and more goods available in stores, the satisfaction of watching apartment houses materialize almost overnight, are enough to nurture enthusiasm despite present scarcities.

An important ingredient in the world outlook of Russian scientists is the idea that their government has given them freedom in large and increasing measure. This attitude came as a shock to my Western ears, so long accustomed to hearing the West

described as the “free world,” in contrast to the “slave world” of the Communists. Far from acting like slaves, my Russian acquaintances boasted of their freedom, maintaining even that in some respects freedom under communism is superior to that in the West. They seemed genuinely puzzled by the assurance of Westerners that true freedom exists only outside the Soviet world. The confusion arises in large part from a difference in usage of the word *freedom*—or more precisely, a difference in the kinds of freedom that seem particularly important on the two sides of the Iron Curtain.

Perhaps uppermost in the minds of my Russian acquaintances when they speak of freedom is freedom of opportunity—opportunity to get an education and then to work at a job and in a place of one's own choosing. Every Russian, I was repeatedly told, as part of his elemental rights is guaranteed a free education up to the limit of his abilities—and the opportunity does not depend on the size of his father's fortune or the color of his skin. If a Russian is trained in a profession he is expected to work for a few years in that profession (this seems reasonable inasmuch as the state has paid for his schooling), but sub-

sequently he can change employment as he wishes. His opportunity to move to another job in another city is limited only by the scarcity of housing, which in some parts of the country is still acute.

Freedom from fear of arbitrary arrest is another blessing that my friends rated very high, perhaps especially high because it is a freedom that has come to the Soviet Union only recently. Political prisoners have been released from the notorious Siberian camps, I was told by two geologists who have worked in Siberia, and the camps are now used only for common criminals. Two geologists went so far as to maintain that Soviet law ensures greater protection for individual rights than do the laws of Western nations. What measure of truth there is in these assertions I will not here attempt to judge, but they are articles of belief among Russian scientists.

Freedom from another kind of fear, the fear of economic insecurity, has been very largely attained in Russia, I was told, for the government guarantees employment, medical care, and old-age support. So accustomed are my friends to regarding continuous employment as a basic right of every citizen that they find unemployment in Western states hard to comprehend.

"How can a country as rich and powerful as the United States permit six million people to be unemployed?" I was often asked. Joblessness in the eyes of these Russians is a relic of barbarism, something that excites the same sort of physical revulsion that we in the West feel when we read about arbitrary executions in Communist lands.

That freedom of speech now exists in Russia is amply attested by our conversations, which were held in public places as well as private, and always without the slightest show of apprehension. My friends were candid in admitting that a few years ago such conversations would have been impossible, and they point to this relaxation as a sign of the progressive nature of the Soviet regime. A Russian is still not permitted to publish articles critical of the government or to make critical speeches, but in private conversations he may express his views freely, to foreigners as well as to fellow Russians.

One area of freedom in which a Westerner can claim real superiority is that of ability to obtain information. A Westerner can read in his own language, as his Russian colleagues cannot, critical discussions of important issues from many points of view. The Russians hear the Western viewpoint only from broadcasts by the BBC and the Voice of America, to which they are now permitted to listen—another relaxation of recent years. Otherwise, in newspapers and magazines, they are limited to news as it is sifted and interpreted by their government and by Communist governments elsewhere. My acquaintances admitted readily that this is a kind of freedom about which the West can justifiably boast. They explained its absence in their country on the grounds of political inertia: in the past, when Russia was weak, restrictions on outside information were necessary; now that the country has become strong the restrictions should be lifted, but politicians are slow to change their ways.

Freedom to choose candidates for public office should, seemingly, be another place where the Westerner would have the better of the argument, but this proves to be a difficult subject to discuss because words are used in different senses. It is almost impossible, for example, to explain to a Russian what "free election" means. "How can you call your elections 'free'?" he will ask, "when no candidate can get his name on the ballot unless he has pow-

erful financial backing, and when the opinion of the electorate is molded by the expenditure of incredible sums for radio and television broadcasts?" In Russia, he will explain, candidates are discussed openly and thoroughly in meetings of the local soviets; once a candidate is selected by this process and is approved by the Party, the electorate rallies behind him and gives him the 99-percent majority which always seems so ludicrous in American eyes. My acquaintances seemed quite sincere in regarding this way of choosing candidates as actually more democratic than the American method.

In all these many aspects of freedom, Russian geologists find only a few areas where they concede superiority to the West, and these, they feel, are balanced by the areas where their own brand of freedom is more extensive. Very probably, of course, members of other professions—artists and writers, for example—would feel the Communist restrictions on freedom more acutely. But it seems important to note that, for at least one group of educated Russians, life is full and satisfying under the Soviet system, so much so that the Western variety of freedom has little attraction for them.

When our talk turned to the relations between Russia and the rest of the world, a sharp difference in the image that each side holds of the other made discussion difficult. The Westerner regards the Russians as controlled, for the most part without their knowledge, by an oligarchy of rapacious and malevolent men who seek constantly to foment world revolution. The Russian is equally convinced that the West (which means really America, for in Russian eyes all other Western countries are American satellites) is being victimized by a small group of profit-mad "monopolists" who pull the strings that control government, press, and radio and who try to instigate wars in order to sell munitions. On the level of informal conversations such as ours it was impossible to resolve this difference in viewpoint. Each of us was repeating what he had read in his own newspapers, and each was suspicious of the other's sources.

The contrast in our images of each other became particularly evident when we discussed parts of the world where communism and capitalism are currently in sharp conflict. In south-east Asia, for example, my geological friends picture their country as the

defenders of the workers and peasants against corrupt ruling classes who have exploited the people mercilessly for thousands of years. The Soviet Union is not intervening but is only sending materiel and advisers to the people's armies to counter the military aid which Western monopolists give the exploiters in order to protect their investments. If I objected that the West also is interested in the people's welfare, I was met by queries as to why we then support petty dictators, and why American monetary aid always finds its way into the pockets of the wealthy classes. If I maintained that the West was trying to preserve the people's freedom, I was taunted with the old questions, "Freedom for what? To live in abject ignorance and hopelessness? To have their labor exploited for another five thousand years?" If I suggested the desirability of free elections, the answer came back: "How can there be free elections when the people are ignorant and their votes will be bought by the exploiters?" My acquaintances seemed to have no doubts of the benign intentions of their government, or of the evil purposes of the capitalist nations—just as we in the West see only noble motives in our own governments and nothing but evil in the Communist leadership.

Except for their suspicions of our government and especially of supposed unscrupulous financiers behind it, the Russians I talked with were uniformly well disposed toward Americans. They genuinely admire our high standard of living, our efficient industries, and our scientific accomplishments. They are eager for scientific exchanges and scientific cooperation with Americans. Many times I heard the wish expressed that our governments could patch up their differences so that Russians and Americans could get better acquainted. Russian geologists share the convictions of their leaders that communism will eventually dominate the world, but for the present they see no reason why communism and capitalism should not exist side by side in peaceful competition. Above all, they do not want war. It is ludicrous, or tragic, or terribly frustrating, according to one's mood, to hear a Russian scientist say fervently: "How happy the world could be, if only America weren't so belligerent!"

References

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