Geopolitics of plate tectonics

Soviets reject hypothesis but there are signs of future flexibility

Talking to earth scientists these days is like talking to biochemists a decade ago when they were zeroing in on the chemical structure of life, or to physicists in the early 1900's when they were deciphering the nature of matter. There is a sense of intellectual excitement, of turmoil, of participation in a period when detailed observations collected during more than a century are for the first time being brought into focus. Together, these details are fitting into a consistent world-view of the evolution of the earth's surface features.

The geologists, with the help of their geophysicist colleagues, at last have a unifying theory—plate tectonics (SN: 11/8/69, p. 430). The expression of slow horizontal movements of the earth's surface in terms of 100-kilometer thick slabs is being used to explain mountain belts, earthquake zones, volcanoes and a variety of other geologic phenomena.

"Geology is right smack in the middle of a Darwinian revolution," says Dr. John M. Bird of the State University of New York at Albany. Many of his colleagues in geology would agree.

But while earth scientists in the West are busily applying the ideas of plate tectonics to continental geology, their colleagues in the Soviet Union refuse to embrace the concept.

The Soviets have long adhered firmly to the idea that isostasy—vertical movements of the earth's surface in response to differences in density—can explain the major surface features of the Eurasian continent. Operating almost entirely on continental rocks from within their own huge land area, Soviet geologists have been slow to acknowledge the evidence, from paleomagnetic, seismic, heat-flow and deep-drilling experiments, of extensive horizontal movements of the earth's crust.

Many American and English geologists believe the Soviet scientists are following a scientific party line that denies the validity of plate tectonics. They tell stories of pressures on Soviet earth scientists traveling abroad not to support the concept. One rumor claims that a Soviet paleomagnetist who has discovered evidence that a segment of northern Asia has rotated 90 degrees to close a former ocean basin is not allowed out of the country to describe his work. It is an acknowledged fact that the influential V. V. Beloussov, of the U.S.S.R. Academy of Sciences' Institute of Physics of the Earth and director of the International Upper Mantle Project, will have nothing to do with the idea of plate tectonics

"A big fight is going to start in Russia over plate tectonics," predicts one American geologist. "There is an incredible geopolitical situation going on there."

But an interview last week in Flagstaff, Ariz., with a prominent Soviet geophysicist indicates that although there is undeniably a strong reluctance in Russia to accept the new geophysical ideas, their earth scientists are not as rigidly dogmatic about the subject as some Western scientists seem to believe. The rejection of plate tectonics in Russia is not necessarily permanent.

"Sometimes it is necessary to have a little patience," said Prof. V. A. Magnitsky. He urges scientists of other countries to be understanding during what is obviously a difficult period of adjustment for earth scientists in Russia. He feels that in perhaps three years the situation might change.

Prof. Magnitsky, head of the geophysics department at Moscow State University and a member of the Institute of Physics of the Earth, is respected and admired by his Western colleagues. He was in Flagstaff as head of a small Soviet delegation attending the International Symposium on Mechanical Properties and Processes of the Mantle. He is one of two Soviet representatives on the new Inter-union Commission on Geodynamics (SN: 7/4, p. 9), which he emphasizes has a mandate much broader than merely the examination of the plate tectonics hypothesis.

"These precautions are a result of our history," says Dr. Magnitsky. "The history of the geotectonics of the whole century has been the introduction of new ideas and then their collapse. This is why so many of my colleagues are in this position."

The new ideas may be correct for the ocean floors, he believes, but not for the continents.

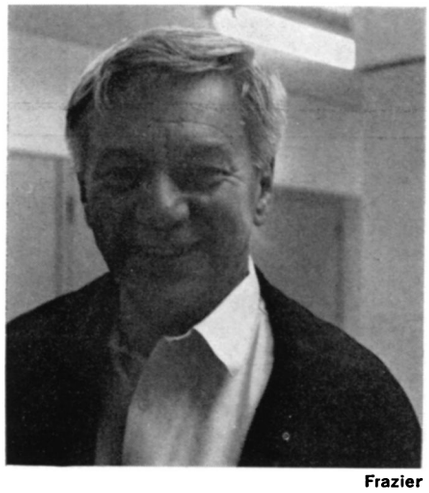
"Some of the difficulties in accepting the new ideas are imaginary, based on some of the traditions of geology," he says, "but some are quite real in character. It seems to me that the new theory fits the data from the ocean floors very well—I can't propose an alternative. From this standpoint this theory is the best one nowadays. But on the continents, the explanation does not fit so nicely all the information we have."

Prof. Magnitsky concedes that the symmetrical patterns of magnetic linearities on either side of the ocean ridges and the increasing ages of sediments at increasing distances from the ridges constitute strong evidence for a continually spreading sea floor. The rebuttal of many Soviet scientists to this evidence is that the symmetrical patterns could be a product of very special magnetic conditions that pertain to the ridges only. The sedimentage distributions cannot absolutely be depended upon, they say, because older sediments may have somehow been covered with basaltic basement rock not yet completely penetrated. Most Western scientists would regard these arguments as tenuous at best.

Prof. Magnitsky says he believes the recently developed capability of the United States' Deep Sea Drilling Project to reenter a borehole on the bottom of the ocean (SN: 6/6, p. 547) and thus obtain cores from deeper basement rock may eventually dispel all Soviet doubt about the sea-floor spreading hypothesis.

"I am not an antagonist to this process," says the Soviet scientist. "I think it is an interesting idea. But I think the final solution to this problem will depend on the new material from the ocean floor which we expect to have in two or three years. Let's wait and see. Maybe then I will become an active protagonist of these processes."

Until then, Western scientists are counselling tolerance. "It is important," says one, "to encourage them to continue working in these fields until attitudes change." □



Frazier

Magnitsky: Patience necessary.