

# Negotiating the Ice Age

Political pressure to end Soviet-American bilateral exchanges may frustrate recent advances in ice age paleoclimatology

BY SUSAN WEST

The stage was set for a week-long round of tough Soviet-American negotiations. Wires ran crazily across tables, chairs and floor. An earphone dangled into each chair, waiting to spill its tales.

Manuscripts, reprints and diagrams littered the two tables; English on one table, Russian on the other. Someone had taped a bright blue and yellow symbol resembling the Chinese yin and yang to the blackboard. The interwoven Russian and English declared hopefully: "Reciprocal Soviet-American Conference."

The "negotiations," held at Lamont-Doherty Geological Observatory in Palisades, N.Y., were the Second Reciprocal U.S.-U.S.S.R. Conference on Climates of the Pleistocene and Holocene, part of the bilateral agreement on environmental protection made during Nixon's administration. Rather than discuss missile stockpiles, Soviet and American scientists met to compare information stockpiles about the world climate during and since the maximum of the last Ice Age 18,000 years ago. Tripping over cultural and ideological hurdles, the Americans negotiated for data to verify their model of the world climate during that period, data that are exclusively the Soviets'. Though encumbered by time-consuming translations, the five Soviet and six American researchers hammered out plans for future exchanges of information and scientists and for the first joint publication of bilingual monographs detailing Ice Age and post-Ice Age conditions in each country.

But their plans may be encumbered by more than just language or culture. Government displeasure with recent Soviet human rights violations may mandate the end of all bilateral meetings. American researchers also have actively protested treatment of their Soviet colleagues, but few would go so far as to halt the exchanges. Not only are such meetings scientifically vital, but they may provide a powerful one-on-one means of communicating American sentiment. However, political rumblings — such as Sen. Robert Dole's (R-Kan.) now-rescinded proposal to restrict National Science Foundation support of scientific journeys to Russia — threaten to shake the control

over scientific protests out of scientific hands.

In an attempt to preserve autonomy, scientific groups such as the Federation of American Scientists, the American Association for the Advancement of Science and even the notoriously apolitical National Academy of Sciences have made clear they want hands-off from the government. "Individual members and institutions in the American scientific community can decide for themselves what limits to set on the quality and extent of their exchanges with the Soviets and they are doing precisely that," AAAS executive officer William Carey told a recent House committee hearing on the Shcharansky trial. "They do not need, nor want, government to preempt those decisions."

As far as paleoclimatologists are concerned, the scientific gains of holding the climate conference far outweighed the political profit of canceling it. In the field of paleoclimatology, Soviet data are a must.

Based primarily on sea-surface temperatures derived from deep-sea cores, U.S. climatologists have reconstructed a numerical model of the earth's climate at the last glacial maximum 18,000 years ago. The value of such a model is its predictive ability. Given specific changes in its boundary conditions, the model can generate the climatic response in any part of the world. Thus, the model can reproduce the dynamic processes responsible for global climate and ultimately may lead to understanding how and why the earth's climate swings between ice ages.

However, a model's predictions must be verified against independent evidence such as pollen profiles and tree-ring samples, which give climate information for a specific region and time. Though the model can predict generally the conditions in the Soviet Union during and since the last Ice Age, detail and accuracy can be added only by in-hand samples. Soviet data are particularly crucial because the USSR covers such a vast area and is characterized by wide extremes of moisture and temperature. The extent and effect of such extremes is unknown, however, and without points from the central regions, the model becomes more general with each mile inland. "It's very discouraging," says William Ruddiman of Lamont-Doherty. "How can we develop a model without data from this huge landmass? It's just a huge blank."

According to John Imbrie, head of the U.S. delegation, small meetings such as this and the exchange of individual scientists are the only ways of filling in the blanks, particularly in climatology. "In

physics, for example, a problem can be studied anywhere," Imbrie told SCIENCE NEWS. "It's the same atom whether it's smashed in New York or Russia. But no matter how smart, well funded or well instrumented we are, we can't deduce rainfall in the Soviet Union 25,000 years ago."

Contacts at large international meetings are fruitless; papers are delivered without interpretations. Not much research is translated from either country except review papers, which do not contain detailed information. Even if American researchers could decide which were the most important Soviet papers, translation is time-consuming and costly. "The most beneficial thing would be if they published in English," U.S. delegate Herb Wright said. But even if they did, Russians do not usually include charts of raw data or descriptions of samples and sample sites in their reports. That means Americans have no way of judging if the evidence is sufficient or if the techniques are appropriate.

Soviets have similar problems with American research. Because they are not so concerned with developing a global view of climate, much American data are worthless to them. The samples and techniques they rely on are often ignored by American researchers.

Steven Porter of the University of Washington summed up what both sides want: "What we need is to visit the critical areas, evaluate what they're doing, get additional data and use our techniques on it."

But getting the necessary raw data is not quite like picking up a gallon of milk at the corner store. The delegates have had to struggle through a morass of language and culture before learning what to ask for and how to ask for it. The most superficial barrier at the meeting was language. At least two members of the Soviet delegation could speak conversational English, but, ever nationalistic, few Americans bother to learn Russian. "Americans are not fully aware of the information available [because of the language problems]," USSR delegation head I. P. Gerasimov said, "But our American colleagues are beginning to speak and read Russian." Translation made the meetings cumbersome and exhausting: Even with curtailed discussion time and pointedly worded questions, only about eight papers were covered during 12- and 14-hour sessions.

More difficult than leaping the language barrier was evaluating each other's techniques and areas of competence. Just as no two scientists approach a problem similarly, Soviets and Americans tackle paleoclimatology with completely different philosophies. Soviets use a descript-

ive, naturalist approach. They rely heavily on soil types, vegetation and pollen. They have developed expertise in describing the extent of ice sheets and permafrost, but have not ventured much beyond their own borders. Gerasimov attributes the Soviet philosophy to geography and tradition. The USSR is so large and the climate so diverse from region to region that he says the natural approach has been to amass land data and learn as much as possible about their own country.

Such a subjective approach is frustrating to American researchers who take a much more quantitative, global view. Wright says the lack of detail and hard data limit the usefulness of Soviet findings. Many paleoclimatological techniques, such as using tree rings and deep-sea cores, which are standard for Americans are nonexistent or still in their infancy in the Soviet Union. Other techniques long abandoned by U.S. researchers are integral parts of Soviet paleoclimatology. "I have a feeling that their techniques are about 20 to 30 years behind," one researcher told SCIENCE NEWS.

Even in fields of common expertise, varying techniques make it difficult to evaluate the results. Soviets may use average annual temperatures and derive their results from one faunal group where Americans use average monthly temperatures and use two or more faunal groups. Soviets may not bother to tell the source, type or control points of their data while Americans describe theirs at length. But at least both sides seem willing to try the philosophy.

Since the initial meeting of this group in 1976, the Soviets have calculated ice age sea-surface temperatures in the North Atlantic with a technique used by only one other group outside the U.S. And according to Gerasimov, "Now the U.S. — with typical American efficiency — is getting more land data."

The most frustrating and least manageable problem is physically getting the information out of the Soviet Union. Much information is simply unavailable, even to Soviet researchers. "There you can't even get topographic maps. Here you can walk into any mountaineering store and get them," said Roger Barry of the Institute of Arctic and Alpine Research. When the materials are available, they may become clogged in some bureaucratic pipework. It is virtually impossible, even for world organizations, to obtain information from Soviet regional centers or to find out which center may have what is necessary, Barry said.

Even having a Soviet contact or the promise of cooperation doesn't guarantee anything. Hal Fritts of the University of Arizona has sent a Soviet scientist batches of tree-ring samples on the promise of exchange, but has received nothing in return. At the 1976 climate conference, Soviets showered the U.S. scientists with so much information they couldn't carry

all of it and the Soviets promised to send it. It has yet to arrive.

Such problems are not necessarily the result of malevolent or deliberate uncooperativeness, but an example of the Soviet socio-political system at work. Like everything else in the Soviet Union, science is centralized. Unlike U.S. researchers, Soviet workers are not free to direct their own research. A scientist-politico hybrid like Gerasimov, who is a member of the influential USSR Academy of Science, dictates the area of research, the techniques to be used and the manpower needed. Gerasimov, for example, commands a virtual army of 1,500 paleoclimatologists; in the United States there are about 20 principal workers in the field. For one of those 1,500 to begin a joint research project with a U.S. scientist without a directive or at least approval from Gerasimov, it could be scientific, and possibly political, suicide. Therefore, though Gerasimov is also subject to censorship, little paleoclimatological data could be sent to the United States except with Gerasimov's blessing. American researchers have to learn that buttons one would push in the United States don't have the same result in the USSR. Likewise, Soviets do not know how to handle the U.S. free-for-all system. "They don't understand that here the government can't command Bethlehem Steel to provide Russia with its research results," one of the interpreters said.

In spite of cultural confusion and the threatening political ambiance, the scientific gains of the meeting were "more than we dared hope," according to Imbrie. Some of the most significant findings the Soviets provided concern the drastic differences in the U.S. and USSR climates during the last 20,000 years. The generally accepted model shows massive ice sheets in North America extending into present-day southern Illinois with a small area of permafrost and tundra. In contrast, the model shows a small northern ice sheet and a vast area of permafrost in the Soviet Union. Due to lack of information, a major point of conflict has been the extent of the USSR ice sheet and permafrost. The methodology and results of a reconstruction of the ice sheets at the Kara and Barents seas presented by the Soviets may help resolve some of the conflict. In addition, geographic data provided at the meeting show permafrost conditions existed as far south as the Caspian Sea. The new evidence is a "major clue about the climatic response of the two continents," said Imbrie. "We never realized there was that major a difference."

Another important question about Soviet paleoclimate is the timing of the climatic optimum — the period following the Ice Age during which the climate was warmer than it is today. Discovering the causes of global climatic change depends in part on whether or not the optimum occurred simultaneously worldwide. In

answer to a request made at the 1976 conference, the Soviets presented detailed radio-carbon-dated diagrams recording 100,000 years of climate from Moscow to the Pacific coast of Siberia. They show that the optimum occurred in the west as expected, about 6,000 years ago. But in Eastern Siberia, the warming occurred as much as 9,000 years ago. It is the first time the regional variation of timing has been carefully documented, Imbrie said. In addition, Soviet scientists presented a description of the history of the Caspian and Black seas that will permit U.S. scientists to reconstruct rainfall for that region and to compare the history of that area with the history of the Great Basin Lakes in the United States.

Future meetings promise even more significant results. The "centerpiece" of future work, as Imbrie calls it, will be joint publication of national monographs for each country. The monographs, which researchers hope will provide a standard data base for future analyses, will describe the climatic history of the two continents over the last 25,000 years. They will include maps and models of glacial history, sea-level changes, vegetation, fauna, soils and the advance of primitive cultures (to satisfy Soviet naturalist urgings), as well as descriptions of techniques. Because Soviets and Americans have different names for similar regions and techniques, each group will edit the other's translation to be sure appropriate terms are used. It will be the first such project attempted in U.S. geological sciences, Imbrie said. At a third conference, planned for Moscow in 1980, delegates will give progress reports and examine the studies completed for the monographs.

That is, provided there will be a third conference. Throughout the meeting the American researchers adeptly ducked when anyone pointed to the overhanging political cloud. But the cloud finally broke as the Soviet delegation boarded the plane. Sens. Harold C. Hollenbeck (R-N.J.) and Tom Harkin (D-Iowa) caught wind of the meeting and had a letter delivered to Gerasimov asking him to convey American sentiments about Soviet human rights actions. Gerasimov assured his worried American colleagues the letter did not change his eagerness to cooperate. But more recent White House actions — such as killing a \$6.8 million computer sale to Tass and canceling science adviser Frank Press's trip to Moscow — have made scientists watch warily for the Soviet reaction and the possibility of U.S. cancellation of bilateral meetings. Gene Bierly of the National Science Foundation, which partially funded the conference, says there has been no apparent reaction from Gerasimov's group, but he knows the Americans "tread a thin line." As for the United States ending the bilateral exchanges just as researchers are prying open Soviet paleoclimatology, Bierly says bluntly, "It would be disastrous." □