

the advisory committee has played an important part in charting the course the directorate has followed. Not so incidentally, the advisory group offers the political fringe benefit of bolstering the program's credibility and clout with Congress and within NSF.

Increasingly, the directorate will be judged on actual performance as more of its projects are completed and its products used in the classroom. Holton says that the advisory committee has been keeping close watch on the evaluation process employed by the directorate to monitor development of the projects and, so far, the committee has been favorably impressed with their quality.

Some observers question whether in avoiding large national curriculum projects in the former style the directorate may be sacrificing broad impact. NSTA's Aldridge, for example, acknowledges that opinions differ on the effectiveness of "trying to leverage publishers into incremental change."

The major question, however, is whether funding for the education directorate will grow substantially. A strategic plan for education at NSF done by the SRI think tank projects \$600 million a year as required for the task. Aldridge points to a common view in the education community that this year's budget was a modest success, but that the "magnitude of the problem" requires spending of \$400 to \$500 million a year for several years.

When the Administration last year announced a goal of doubling the NSF budget in 5 years, Bloch went on record saying that funding for the education directorate would increase faster than the total NSF budget, but no specific figures or timetable was mentioned. This year a 19% increase in NSF funding is targeted by the Administration, but chances for such an increase or for the doubling in 5 years are being called into question on Capitol Hill in the new round of NSF authorization and appropriations hearings. The strong implication is that Congress will have to make hard choices in funding and so will the agencies.

Does this mean that NSF faces a return to budget Darwinism in which education has given way to research when money has been scarce? Holton acknowledges that a tightening of research funds would create a "difficult atmosphere," but compares what has been accomplished in education to establishment of a "base camp" and sees cause for optimism that the ascent will continue.

As for Shakhshiri, he says he is encouraged by the interest in education expressed by NSF's congressional patrons at the recent hearings. His strategy now: "Count our blessings and keep on going." ■

JOHN WALSH

Test Ban Test Back on Track

A team of Soviet seismologists arrived in the United States on 6 April to monitor a series of chemical explosions that will be set off near the underground nuclear test site in Nevada. The experiment, which is being jointly sponsored by the Soviet Academy of Sciences and the Natural Resources Defense Council (NRDC), a U.S. environmental organization, is part of a novel reciprocal arrangement aimed at laying the groundwork for verifying a ban on nuclear testing.

The blasts, the first of which will take place on 29 April, are designed to study the propagation of seismic waves from precisely calibrated explosions in the area around the nuclear test site. The aim is to gather baseline data that could be used to detect small explosions and tell them apart from other seismic events.

An equivalent set of chemical explosions was set off last September in the Soviet Union, and the seismic signals were monitored by similar equipment installed near the Soviet nuclear test site at Semipalatinsk.

The planned Nevada experiments are being hailed by the NRDC as evidence that the cooperative arrangement with the Soviet Academy is back on track after a difficult political period. The private venture, which has never been popular with the U.S. government, has encountered obstacles put up by officials on both sides (*Science*, 7 August 1987, p. 594).

The troubles began last February when the Soviet government refused to accept visa restrictions, set by the U.S. State Department, on Soviet seismologists who were planning to help supervise the installation of seismic equipment at the monitoring stations established near the Nevada test site. As a result, the seismologists were prevented from visiting the stations.

This time, however, unrestricted visas were issued both for the technical team and for observers and Soviet journalists who will witness the experiment. "At last, the Soviet seismologists have been accorded the same latitude to conduct research here as our scientists have enjoyed for almost 2 years in the Soviet Union," says S. Jacob Scherr, a senior staff attorney at NRDC.

Operations in the Soviet Union have not been without problems, however. Three seismic monitoring stations were established under the cooperative arrangement near the Semipalatinsk site, with the expectation that they would be kept running continuously. When the Soviets resumed nuclear testing last February after an 18-month moratorium, however, they insisted that the seismic equipment be shut down during the tests. This interrupted the flow of seismic data from around the test site, and the equipment was often shut down by Soviet military officials so thoroughly that there have been difficulties restarting the seismic stations.

Under an agreement signed by NRDC and the Soviet Academy last summer, the three stations near Semipalatinsk were shut down at the end of last year, following the series of chemical explosions equivalent to the planned Nevada tests. They are being replaced by five stations, each located at least 1000 kilometers from the test site. Thomas Cochran, NRDC's senior scientist, says that although "we were hoping that they wouldn't shut us down" near the test site, the new stations will more closely resemble those that would be required to verify a test ban. Moreover, they will be permitted to operate during nuclear tests. Equipment will be installed at the new stations this summer, Cochran says.

The aim of the experiments is to demonstrate that seismic monitoring will be capable of verifying compliance by each side with a ban on all nuclear tests or a very low limit on the permitted size of underground nuclear blasts. This has been a point of contention. The Reagan Administration has argued that a more intrusive monitoring technique known as CORRTEx is required to verify that nuclear blasts are indeed below a specified limit. The technique requires placing a cable in a borehole right next to the shaft containing the nuclear explosive. The Administration is insisting that CORRTEx be used to monitor the Threshold Test Ban Treaty, which sets a limit of 150 kilotons. The treaty, which was signed in 1974, has not been ratified by the U.S. Senate, in part because of the dispute over monitoring.

A dramatic test of CORRTEx is planned for later this year, when U.S. and Soviet scientists are expected to set off nuclear explosions at each others' test sites in order to test the sensitivity of monitoring technologies. Teams of scientists visited the sites earlier this year to plan for the test. ■ COLIN NORMAN