rights-of-way for the SSC. It also has set up a nonprofit corporation, SSC for Illinois, Inc., to coordinate the private sector's role in the state's drive.

■ New York has narrowed its site candidates to Wayne County in the central part of the state, an area encompassing Stewart International Airport near New Jersey, and Franklin County along the Canadian border. It plans to make its final site decision in the next few weeks.

■ Texas began planning 5 years ago and has ten potential sites. To coordinate efforts on the SSC, the state legislature in 1985 established the National Research Laboratory Commission. In the past, officials have said that the state might fund construction of the SSC tunnel and provide the land, but no firm decisions have been made.

Despite these activities, Herrington stresses that there are no "preordained decisions" at DOE on the SSC. Illinois, he says, does not necessarily have an advantage because Fermilab is located there. The existing campus, buildings, and accelerator rings are thought to have a potential value of $500 million. Herrington says, however, that there may be problems in trying to use these existing rings as an injector for the SSC. In any case, he says, states seem to recognize that they will have to match anything that Fermilab has to offer.

Although DOE's siting criteria document will not be published for several weeks, it is clear that the ability of states to provide land, rights-of-way, buildings, and other financial support will greatly influence the selection decision. Comments DOE's Trivelpiece, "There is no point in submitting a proposal if you are not going to be in the competitive range." Just how far states will go in the bidding war to land the SSC may not be clear until the filing deadline draws near this summer. ■ **MARK CRAWFORD**

Teacher Certification Program Under Way

In an effort to improve standards, status, and pay of science teachers, a novel certification program is being launched

THE National Science Teachers Association has named the first group of teachers to win approval under a novel teacher certification program. The program, launched last October in response to accumulating evidence that science teachers in many American schools are inadequately prepared, is aimed at establishing high standards for training and employment of science teachers. NSTA, the biggest professional association for science teachers, also hopes that by identifying those who are well qualified to teach science, certification will become a criterion for decisions on hiring and pay.

The first round of certification was something of a trial run, with the committee meeting in Washington and the first group of candidates offering unusually strong qualifications. The eight teachers certified represented elementary, middle/junior high, and high schools. NSTA plans to form regional committees to handle the process as the volume of applicants rises. The committees will be made up of science teachers at the appropriate grade levels, a college professor of science, and a professor of science education. NSTA has planned the certification program to be self-financing. The application fee is $50.

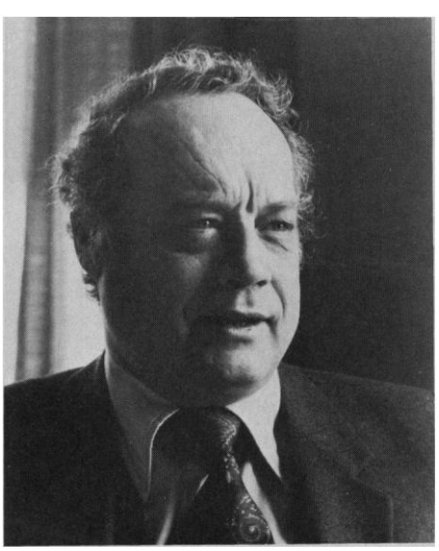
The new certification process is an exacting one requiring documentation of academic background and noncredit educational experience, official evaluations of teaching performance, and testimony from colleagues on the candidate's effectiveness as a teacher based on recent observation in the classroom. To be considered, a teacher must have at least 3 years of teaching experience.

Since the program went into operation in early October, requests for more than 1700 applications for certification have been filled, says NSTA executive director Bill G. Aldridge. Aldridge says that despite the fact that there has been little publicity on the certification program so far, NSTA sees signs of interest in it that lead him to think the program "will get a huge response." NSTA has about 50,000 members. Aldridge says that there are some 56,000 science teachers in grades 7 to 12. A recent survey indicated that among the roughly 1.2 million teachers in elementary grades, as many as a third have the kind of preparation in science that would lead them to seek certification.

The NSTA certification process is a direct product of the education reform campaign in this decade. NSTA collects data on science teachers and in the early 1980s called attention to a worsening shortage of science and mathematics teachers as few college students prepared to teach in these fields. More recently, the association noted that school boards were responding to pressures for reform by raising science requirements and had to have science teachers teach subjects outside their fields or assign teachers without training in science to science courses. NSTA acknowledges that multiple assignment is a fact of life in U.S. education and is lobbying for a number of measures by the federal government to ameliorate the problem. The association offers multiple certification to allow teachers to qualify in more than one subject.

While not mounting a head-on challenge to the current system, the NSTA program is obviously aimed at influencing teacher training. Colleges and universities with teacher training programs set standards in teacher specialties, and generally conform to the requirements of regional accrediting organizations such as those that operate under the National Council of Accreditation of Teacher Education (NCATE). NCATE is using NSTA standards in deciding on its accreditation of science teaching programs in colleges and universities.

A major influence on standards in teacher preparation in the past has been state licensing requirements in those states that license



Bill Aldridge: *NSTA president predicts program "will get a huge response."*

teachers in particular subjects. Standards vary greatly from state to state. The NSTA standards are more rigorous than those in many states, and Aldridge says the association hopes "to work with state boards of education to upgrade their standards."

NSTA currently offers certification for elementary science teachers, middle/junior high science teachers, and at the secondary level, for teachers of biology, chemistry, physics, physical science, earth and space science, and general science.

Requirements vary according to the grade level and subject the applicant teaches. To be certified, an elementary teacher must have completed 12 semester hours in laboratory or field-oriented science, including courses in biology, physical science, and earth science, have taken an elementary science methods course, and had student teaching experience.

High school teachers must have a bachelor's degree or its equivalent in science. They must also meet a double set of criteria, one general, a second in a specific subject. Satisfying the general criteria requires completion of a minimum of 50 semester hours in science, math, statistics, and computer applications, plus evidence of "breadth and depth in science background." Competency in basic mathematics, statistics, and computer applications must be demonstrated, for example, by the study of math at least to the level of introductory calculus.

Criteria for certification of a high school physics teacher would include, in addition to satisfying the general requirements, completion of 32 semester hours in physics in subject matter ranging from classical mechanics and electricity and magnetism to relativity and quantum mechanics.

The association has also been looking hard at advanced certification for highly qualified and able people in the field. "We're a little tired of the criticism of teachers," says Aldridge, and advanced certification is seen as a response.

As a basic qualification, a person would have to score above average on the regular Graduate Record Examination. With that on the record, says Aldridge, "You would have to agree that the person is just as smart as a person who goes into research."

Further requirements would be strong evidence of both teaching ability and educational leadership. As proof of the former, command of subject matter and performance in the classroom, probably documented on videotape, would be required. Leadership would be demonstrated by publications and the candidate's record of activities in the field. Aldridge says he expects the NSTA board to act on the advanced certification proposal in March. ■ **JOHN WALSH**

Treaty Compliance Rated Good

In the past few years, the United States and the Soviet Union have publicly accused each other of some 40 violations or potential violations of arms control agreements. And the accusations are expected to be stepped up soon when the Reagan Administration releases another new report on Soviet treaty compliance. The report is currently under review in the White House, where national security adviser Frank Carlucci is refereeing an interagency dispute over whether it should include a charge that the Soviets are preparing to break out of the 1972 Antiballistic Missile (ABM) Treaty (*Science,* 30 January, p. 524).

In contrast, a study released last week by Stanford University's Center for International Security and Arms Control* concludes that "overall, U.S. and Soviet compliance with the terms of existing arms control agreements has been good." The mutual public recriminations, coupled with some questionable Soviet and U.S. actions, have resulted in "a real crisis based on false perceptions about compliance," says the report.

The Stanford study notes that the Administration has already cited concerns about Soviet compliance as a reason for withdrawing from the SALT II Treaty and the SALT I Interim Agreement on Offensive Weapons. "U.S. withdrawal from these agreements is not justified on the basis of the Soviet compliance record," the report states. The study has been endorsed by 16 academics, most of whom are associated with the Stanford center, and six former government officials including three previous arms control negotiators.

The report, the product of an 18-month review of the record, did not find an unblemished history of treaty compliance. It cites one violation—the now infamous Krasnoyarsk radar in Siberia whose location is prohibited by the ABM Treaty—and three areas of "questionable" compliance, two on the Soviet side and one on the U.S. side.

The Stanford group says the evidence that Krasnoyarsk radar violates the ABM Treaty is compelling, and the Soviet's argument that it is to be used for space tracking—a permitted function—is not persuasive. The report therefore recommends that the Soviets should either dismantle the facility or open it up for international inspection to verify their claims about its functions.

The two questionable areas of Soviet compliance relate to the encryption of telemetry data during ballistic missile tests and a dispute over whether the SS-25 intercontinental ballistic missile is truly a new missile or a modification of an earlier intercontinental ballistic missile. In both cases, the study concludes that the Soviet practices fall in grey areas of the treaty where the language is ambiguous.

The one questionable area of U.S. compliance concerns programs to replace old early-warning radars at Thule in Greenland and Fylingdales in England with large phased-array radars. The concern is that they may contravene a clause in the ABM Treaty that attempts to restrict such radars to the periphery of each nation's territory (*Science*, 30 January, p. 525). Again, however, the study notes that the treaty lanugage is not crystal clear on this issue.

In addition, the report expresses alarm that recent Administration statements about potential early deployment of strategic defenses, coupled with moves to adopt a new interpretation of the ABM Treaty, threaten to undercut the treaty and "make highly unlikely any further offensive nuclear arms limits."

These conclusions echo many of the arguments the arms control community has made in response to previous U.S. and Soviet charges of treaty violations.

The Stanford group argues that disputes over compliance are inevitable. However, the study complains that in recent years both sides have resorted to acrimonious public accusations rather than attempt to resolve disputes through quiet diplomacy. In particular, the Standing Consultative Committee, a bilaterial panel that is supposed to thrash out treaty compliance disputes between the two sides has barely been functioning in recent years. Its central recommendation is that both sides abandon the public recriminations and breathe new life into the Standing Consultative Committee. However, it concedes that a return to quiet diplomacy may require a thaw in the current chilly U.S. Soviet relations. ■ **COLIN NORMAN**

*"Compliance and the Future of Arms Control," Center for International Security and Arms Control, Stanford University.