B. L. Whorf [*Language, Thought, and Reality* (M.I.T. Press, Cambridge, 1966), pp. 57–64, 207–219] has argued that a people's view of physical reality is conditioned by the structure of their language. Scientific concepts developed in one culture might be rejected, or misunderstood, in another. According to Whorf, the Hopi language embodies a metaphysics of space and time that is opposed to the classical Newtonian world view. (ii) *Child-rearing patterns.* A Japanese sociologist has suggested that "the introduction of modern science over the last century [has] been especially accelerated because Japanese culture values childhood curiosity and, unlike some other societies, does not attempt to repress it" [*Science* **143**, 776 (1964)]. (iii) *Political nature of a society.* A. de Tocqueville [*Democracy in America*, P. Bradley, Ed. (Knopf, New York, new ed., 1948), vol. 2, pp. 35–47] believed that a democratic nation, fostering the individual's pursuit of profit and power, would necessarily excel in technology and applied science, while aristocratic societies would be predisposed to cultivate the theoretical aspects of science.

45. See *Science* **55**, 55 (1922).
46. See *In the Matter of J. Robert Oppenheimer: Transcript of Hearing Before Personnel Security Board* (Government Printing Office, Washington, 1954), pp. 464–465. Remarks made by two other scientists on the late emergence of American science may be found in J. H. Van Vleck, *Phys. Today* **17**, 21 (1964), and F. Seitz, *Science* **151**, 1039 (1966). Many historians claim that American science achieved maturity at an earlier date, sometime in the 19th century. D. Fleming does not think so [see *Cahiers Hist. Mondiale* **8**, 666 (1965)].
47. For the controversy over "free" and "planned" science in Great Britain, see N. Wood, *Communism and British Intellectuals* (Columbia Univ. Press, New York, 1959), pp. 121–151, 190–193.
48. For recent evaluations of Soviet science, see *Survey: A Journal of Soviet and East European Studies* **1964**, No. 52 (July 1964); J. Turkevich, *Foreign Affairs* **44**, 489 (1966).
49. I. Newton, *The Mathematical Principles of Natural Philosophy*, F. Cajori, Ed. (Univ. of California Press, Berkeley, 1934), p. 398.
50. See R. K. Merton in *The Sociology of Science*, B. Barber and W. Hirsch, Eds. (Free Press, Glencoe, Ill., 1962), pp. 19–22.
51. See *The Personal Papers of Anton Chekhov* (Lear, New York, 1948), p. 29.

NEWS AND COMMENT

Educational Testing: National Program Enters Critical Phase

Although school children are taking a variety of tests, from standardized achievement tests in reading and other subjects to "college boards," none of the testing now being done provides a uniform, nation-wide measure of educational achievement. The idea that the results of the taxpayer's huge, multi-billion-dollar investment in education should be systematically assessed through a national testing program is not terribly radical. Yet the first effort to initiate such a program faces opposition from a number of members of the educational establishment who contend that it would generate coercive pressures leading to a "national curriculum."

The object of these fears is the experimental "National Assessment of Educational Progress" (NAEP), a program which was begun in mid-1964 under Carnegie Corporation sponsorship and which has now reached a phase where answers will have to be forthcoming to several major questions —all more or less controversial. First, judgments must be made as to the value and administrative feasibility of the tests and sampling techniques which have been developed. Second, if current tryouts of the test instruments prove satisfactory, what kind of body will actually administer the national assessment? Third, who will finance the assessment?

The controversy over NAEP seems to arise partly from the circumstance that the program has come along at a time when the federal role in education is expanding rapidly. Through new programs such as the Elementary and Secondary Education Act of 1965, the government has become a major force in shaping the policies of local school districts. Although under private auspices, the NAEP program grew out of a proposal made to the Carnegie Corporation in 1963 by Francis Keppel, who was then U.S. Commissioner of Education. It got under way the next year when Carnegie, after holding a series of conferences with school people and testing experts, set up an Exploratory Committee on Assessing the Progress of Education. Ralph W. Tyler, director of the Center for Advanced Study in the Behavioral Sciences at Stanford, was named chairman.

The Tyler committee, which has several state and local school administrators among its members, has called on teachers, curriculum specialists, and others in the education establishment and interested lay public to help in developing and reviewing the NAEP tests. However, a number of school administrators—aware that some day NAEP might exercise a strong influence on their districts—have felt left out.

Some observers of the internal politics of the education establishment believe that the Tyler committee blundered in not involving the American Association of School Administrators (AASA) in the NAEP project early in the game. As matters have developed, much of the opposition has come from association leaders, such as Forrest E. Conner, the executive secretary, and Harold Spears, immediate past president of AASA and superintendent of the San Francisco schools. The association itself has adopted resolutions opposing some key elements in the NAEP concept. However, given AASA's attitude, it is arguable whether or not the association could have been drawn into the project without hamstringing it.

Tyler has said repeatedly that the purpose of NAEP is not to evaluate the performance of individual students, teachers, and school districts. The purpose, Tyler says, is to provide census-like data on the educational achievement of broad segments of the school-age and young adult population. The present plan is to "assess a probability sample for each of 256 populations defined by the following subdivisions: boys and girls, four geographic regions [Northeast, South, Midwest, and Far West], four age groups (9, 13, 17, and adult), four divisions by large city, small city, suburban and rural classifications, and two socio-economic levels." The sampling will include children in private as well as public schools. No comparisons will be made below the regional level, Tyler has emphasized.

"The fact that populations are to be assessed and not individuals makes it possible to extend the sampling exercises far beyond that of an individual test in which the person takes it all," Tyler says. The tests will assess reading and writing skills, and knowledge and skills in the fields of science, mathematics, social studies, citizenship, art, music, literature, and vocational education.

The assessment, which might be repeated at 3- to 5-year intervals, would

involve not only written tests but the use of interviews, questionnaires, and other devices. Although most testing would be done in the schools, school dropouts, adults, and possibly some school children would be tested at home or elsewhere. Polling organizations such as the National Opinion Research Center, of Chicago, as well as test-construction agencies such as the Educational Testing Service at Princeton, have taken part in developing the tests.

These tests differ significantly from the standardized tests, long in use in the schools, through which performance norms and averages for various grade levels are established. According to Tyler, such standardized tests fail to measure the progress of the poorest and the best students. The NAEP tests, on the other hand, are designed to indicate the progress of students at all levels of achievement. A tryout of the tests is now going on in various school districts across the country and may continue into the fall. The spring of 1968 would be the earliest time an actual assessment could be undertaken.

Educational Testing Service, assisted by a panel representing science teachers, curriculum specialists, and scientists, has developed the science tests. The panel, which included faculty members from Rutgers, Princeton, Indiana University, and Michigan State, formulated four main objectives of science education as the basis for the tests: "(i) know the fundamental facts and principles of science; (ii) possess the abilities and skills needed to engage in the processes of science; (iii) understand the investigative nature of science; and (iv) have attitudes about and appreciation of scientists, science, and the consequences of science that stem from adequate understanding."

The tests, whatever their merit, have not escaped criticism. An article by Tyler in the September issue of *The Science Teacher*, journal of the National Science Teachers Association, has inspired comment in the magazine's letters column. For instance, a science teacher in Baker, Oregon, is critical of the following test question, which Tyler had cited as an example of questions designed to test a 17-year-old's understanding of the investigative nature of science.

All of the following questions are amenable to scientific inquiry except:
(a) How does the motion of a body change under the action of force?
(b) What metal alloy can be used to make the strongest nails?
(c) How can the most efficient heat engine be made?
(d) What proportion of the federal budget should be spent for space exploration?
(e) What colors of paint reflect the most light?

The Oregon teacher reported that although 99 percent of the 137 high school juniors to whom he gave the above question had given the correct answer, only 12 of the students could give a clear definition of "amenable," a key word. "I would hypothesize that students today are familiar with this type of test and know how to make educated guesses," the teacher commented.

Critics have also maintained that the advisory panel should have included a classroom science teacher. In fact, the AASA leadership, besides objecting to the national assessment in principle, suspects that development of the tests has been influenced unduly by university scholars. "These university people are experts in their fields, but a professor of physics isn't qualified to say how much an 11th grader should know," says one AASA official.

In January, AASA's executive committee recommended to association members that they refuse to participate in the test tryouts and in the eventual testing program. The assessment project, the committee said, will "inevitably lead to the pressures of regional, state, and

Miami Chosen for ESSA Facility

Sites on Virginia Key and Dodge Island, Miami, Florida, have been selected for the Environmental Science Services Administration's (ESSA) East Coast Oceanographic Research Facility, after nearly a year's search covering 115 competing locations.

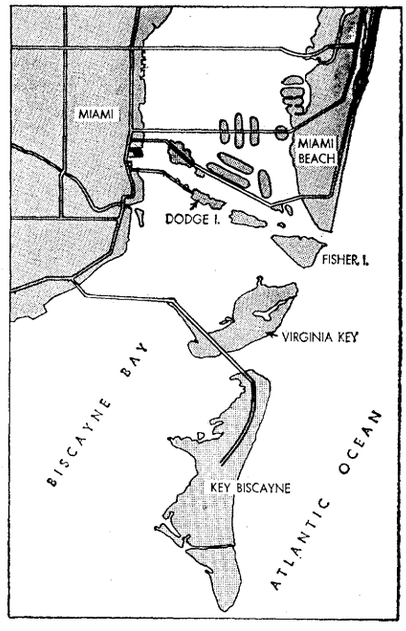
The facility will include the East Coast Laboratory of ESSA's Institute for Oceanography and the base for Atlantic oceanographic ships of the ESSA, Coast and Geodetic Survey.

Three Institute research groups will be centralized there: Marine Geology and Geophysics Laboratory, headed by Dr. George Keller; Physical Oceanographic Laboratory, headed by Bernard D. Zetler; and Sea-Air Interaction Laboratory, headed by Feodor Ostapoff. The facility is expected to have a staff of 300 persons and an annual payroll of $3.5 million.

The Dade County Commissioners have offered to provide without charge sufficient land on Virginia Key for the location of the ESSA facility, and adequate space for ship operations at Dodge Island.

Ships to be berthed at the island include *Discoverer*, commissioned 29 April; *Researcher*, being built in Toledo, Ohio; and a coastal survey ship as yet unnamed.

J. Herbert Hollomon, acting Under Secretary of Commerce, said the decision on the site was a difficult one. "Many of the sites offered to us were of extremely high caliber," he said, and ". . . the East Coast is a virtual treasure house of oceanographic potential. . . . Ultimately, however, Virginia Key–Dodge Island emerged as the logical choice."



Dr. Harris B. Stewart, Jr., head of the Institute for Oceanography, served as chairman of the Site Evaluation Committee.

The West Coast oceanographic laboratory is at Seattle.

NEWS IN BRIEF

• **HOUSE APPROPRIATIONS:** A bit less than the amount that was sought, but a bit more than was appropriated last year—that's the pattern of House action in the appropriations bill covering the Deparment of Interior and several other agencies. The bill, which was passed last week, provides a total of $1.3 billion, which is $32 million above last year's appropriation, but $78 million below the President's request. Among the research-related agencies in the bill is the Geological Survey. Last year it received $80 million; this year it sought $88 million, and the House voted $85.5 million. The Bureau of Mines' appropriation for research and resource development came to $34.7 million last year. This year it sought $39.9 million; the House verdict came to $38.1 million. The National Foundation on the Arts and the Humanities last year received $9 million. This year it sought $16.3 million; the House voted to appropriate $11.7 million. The Smithsonian Institution received a small lecture in addition to the standard budgetary treatment. Last year it received $22.5 million. This year, it sought $25.1 million. The vote was for $23.7 million. The report of the appropriations subcommittee stated that "The Committee continues to view with some concern the energetic efforts to expand the scope of activity by the Smithsonian Institution." Having said this, the Committee stated that it "reiterates its desire and intent that the Smithsonian shall take a very active part in the celebration of the bicentennial of the American Revolution."

• **BIOLOGY HISTORY JOURNAL:** Plans for a *Journal of the History of Biology*, to be published by Harvard University Press, have been announced by Everett I. Mendelsohn, Harvard associate professor of history of science, who will serve as editor. The biannual journal will be about 160 pages in length with the first issue scheduled for October. It will contain articles in all fields related to biology, except medicine, and include background on recent discoveries as well as long-established theories. An international advisory board has been formed to promote contributions from other countries. Members of the editorial board are Ernst Mayr, Harvard; H. Bentley Glass, State University of New York, Stony Brook; Jane Oppenheimer, Bryn Mawr; and Hebbel E. Hoff, Baylor.

• **RADIO ASTRONOMY:** Sir Bernard Lovell, director of the University of Manchester's radio observatory at Jodrell Bank, England, has announced that his radio astronomy group is designing a 400-foot dish steerable radio telescope. The 250 foot dish antenna at Jodrell Bank is currently the world's largest steerable radio telescope. Lovell estimated that the new antenna will cost about $12 million. The British scientist announced the plans at a Space Science and Astrophysics Seminar recently at Stanford University.

• **PHYSICS FOR POETS:** Morris Shamos, chairman of the department of physics, New York University, has announced a new course in physics for nonscience majors, titled Physics for Poets. It will deal with the impact of physics on social, philosophical, and aesthetic movements from ancient Greece to the present. Through the course, Shamos said, he hopes to "open the eyes of arts students to the freedom and creativity in scientific thought as an intellectual activity."

• **LAWRENCE AWARD WINNERS:** The Atomic Energy Commission (AEC) last week presented its 1967 Ernest O. Lawrence Awards, consisting of a $5000 stipend and a gold medal, to the following: Murray Gell-Mann, California Institute of Technology; Mortimer M. Elkind, National Cancer Institute; John M. Googin, AEC's Oak Ridge, Tenn., facility; Allan F. Henry, Bettis Atomic Power Laboratory, Pittsburgh; John O. Rasmussen, Lawrence Radiation Laboratory, Berkeley, Calif.; and Robert N. Thorn, AEC's Los Alamos, N.M., Scientific Laboratories.

• **PHS RESEARCH GRANTS FOR 1966:** The Public Health Service has published the 1966 edition of *Research Grants Index*, containing scientific subject-matter summaries of research projects in the biomedical and health-related fields supported by PHS grants during fiscal 1966. The two-volume index is available from the Superintendent of Documents, GPO, Washington, D.C. 20402, for $12.75.

local comparisons, and it will have national overtones in the dispensing of federal aid."

"No board of education or school staff in an area with an inferior school image would be able to withstand the heat which would be put on by power structures, legislatures, and parents," the committee added. "The pressures on teachers and school systems to teach for the national assessment tests would be too strong to resist. Thus the tests would become coercive, and control of the public school curriculum would be in the hands of a private group [the assessment, Tyler has said, is expected to be run by a commission of respected citizens] with no legal responsibility to the U.S. Office of Education, to any state, or to the electorate." Although the fear expressed here was that a private group would dominate curriculum planning, some AASA leaders say their principal concern is that the assessment program will inevitably come to be administered by the Office of Education.

The association, at its February meeting, did not adopt the executive committee's tough policy of noncooperation, though it did speak out against any uniformly applied national assessment involving regional comparisons. The committee's position had been condemned in hundreds of newspaper editorials. "The interpretation, almost without exception, was that AASA was against the examination of school performance by an outside agency acting on behalf of the American public," an AASA official says. Comment from within AASA reportedly ran 15-to-1 in favor of the committee position, but among the dissenters were a number of prominent AASA members, such as Theodore Sizer, dean of Harvard's Graduate School of Education, and James E. Allen, Jr., New York's commissioner of education.

Although it is not yet clear that AASA and the Tyler committee will find a *modus vivendi*, they have agreed to form a joint committee for discussion of the NAEP tests and procedures and the purposes to which they will be put. The committee will hold its first meeting on 3 June, and at that time several representatives of other professional groups and of the general public may be invited to join in the discussions. Tyler believes that AASA's opposition to NAEP is based on a misunderstanding of the program—a misunderstanding which he hopes the joint discussions will clear up. The AASA lead-

ership, however, is reported to feel that the discussions should be used to reach agreement on changes which would make NAEP acceptable. One such change would be elimination of regional comparisons of achievement.

Despite AASA's opposition, a national assessment program closely resembling NAEP seems likely to be carried out, and with considerable support from the education establishment. The national assessment concept has the backing of the National Education Association's elementary and secondary school principals' departments. The National School Boards Association also has indicated its support, provided the national assessment is used as only one of the tools by which educational progress is measured.

The Association for Supervision and Curriculum Development is one of the few groups clearly opposing NAEP. The Council of Chief State School Officers is reported to be divided on the national assessment issue, and its cautiously worded resolution on the subject probably could be cited either for or against NAEP. In fact, given the division of opinion within AASA itself, it is not at all certain that the association can exert much pressure to force drastic modification or abandonment of NAEP.

The question of whether NAEP will reach safe political terrain may depend in part on how wisely the question of who is to administer the actual assessments is decided. Several alternative solutions are being considered. For example, NAEP might be put in the hands of a Presidential commission. Such a body, if well chosen, might enjoy high prestige and influence —but it would have to expect allegations that it was created as a willing tool of the U.S. Office of Education. Another possibility would be to turn NAEP over to an organization set up by foundations, universities, and other educational interests. If broadly representative, such a group might command wide respect and support—but it, like the Presidential commission, probably would be criticized on the grounds that state and local school officials were not adequately represented. On the other hand, if dominated by school officials, the group no doubt would be criticized as a "captive" organization of the education establishment.

Among other possibilities being considered is that of asking the new Educational Commission of the States (set up under an interstate compact) to administer NAEP. This commission, now based in Denver, is dominated by the state governors, but school groups and educators have a voice in its councils.

Although at one time the Office of Education was interested in conducting the national assessments, sentiment against OE's assuming such a role has been hardening. The administration's budget proposal last year would have enabled OE's National Center for Educational Statistics to make the first assessment after the NAEP tryouts were completed. But the House Appropriations subcommittee on education denied OE funds for this purpose. Commissioner of Education Harold Howe, II, has said recently that the assessments should not be conducted by the federal government. However, he added, "It may be in the interest of all involved in education to have the government support it financially."

Accordingly, OE is seeking a $2-million appropriation this year to support the initial assessment. Howe and his associate commissioner for research, Louis Bright, have been in general agreement with the work of the Tyler committee. Bright has suggested that the assessment could be carried out by a special Presidential task force or by a private agency working under an OE contract. However, in view of AASA's opposition and the fact that the House Appropriations subcommittee now has its most conservative membership in years, the $2 million may be withheld.

The NAEP program is currently operating under grants by Carnegie and the Fund for the Advancement of Education (a Ford Foundation offshoot). In the event no federal appropriation is forthcoming, it seems unlikely that the foundations would let NAEP die. "It's my hope and belief that in one way or another the national assessment will be carried out," says Lloyd N. Morrisett, a Carnegie vice president and a member of the Tyler committee.

The case for a national assessment seems compelling to many people because, all too often, local school programs have failed to keep pace with the demands of the times. As John H. Fischer, president of Columbia University Teachers College and a proponent of NAEP, has observed, "Young people have to acquire facility in mathematics and science not because their town considers science important or because a nearby university has installed a cyclotron, but because of the character of the 20th Century."

—LUTHER J. CARTER

Some New Targets Defined for French Science Policy

Paris. The legislative elections in France produced a more narrowly divided National Assembly and a more cohesive opposition to the Gaullist majority, but the import of the elections for French science policy or science budgets is not regarded as great. Barring any major political contretemps, the fate of ambitious government plans in science and technology for the rest of this decade is likely to depend less on what happens in the political arena than on the performance of the French economy. Since last summer, however, there have been clear indications that French science policy is entering a new phase. Most significant has been the creation of new governmental organizations intended to improve liaison between research institutions and industry.

Until recently it could have been fairly said that French science policy has been directed primarily toward achievement of political rather than economic objectives. Science policy has served the ends of President de Gaulle's concept of national independence. In the military sphere this has meant creation of a French nuclear deterrent based first on a fleet of bombers armed with nuclear bombs and, in the 1970's, on nuclear submarines armed with Polaris-type missiles with thermonuclear warheads and on special army divisions equipped with tactical nuclear weapons (*Science*, 1 January 1965).