is safer than underground mining, and healthier for the miners. And wages for the machine operators and truck drivers are better than for the thousands of miners who now work the small underground truck mines, the "dogholes," which can't match the efficiency of the big mechanized deep mines, where union wages are paid.

An estimated 40 percent of coal mined in eastern Kentucky is now strip- and auger-mined, and it is mined by proportionally fewer men than produce the deep-mine coal. With its mechanization and higher miner productivity, stripping, therefore, extends the trend toward better jobs for fewer men.

It should also be noted that resistance to the broad-form deed can be misconstrued. State officials familiar with eastern Kentucky and sympathetic to the landowners affected by stripping say that the landowners' objections are centered not on the effects of stripping—though these are bad enough—but on the fact that they have lost the right to bargain.

This is not to minimize the effects of strip mining but only to suggest that it is by no means the only problem besetting eastern Kentucky. In this region and in western Kentucky the pattern has been for the state not to require much of strip-mine operators in the way of reclamation and for the operators to do no more than is required. The Kentucky Reclamation Association, an organization of coal companies, has operated since 1948, giving technical advice to member companies on reclamation problems and cooperating with federal, state, and private agencies on projects in reclamation research and field experimentation. While the association can point to successes in rehabilitating slopes and ponds in stripped areas, few people, even coal partisans, are likely to argue that the industry can't do more.

The 1964 Kentucky law and the projected revised regulations obviously tighten controls on strip-mining methods. Governor Breathitt has stated that further action will be required in the 1966 Legislature. Because, with tightened controls, companies in states with strip-mine laws less demanding than Kentucky's, or with none at all, would enjoy a competitive advantage over Kentucky companies, Breathitt has advocated a federal strip-mining law. He is also working for adoption of interstate compacts containing uniform standards of regulation and reclamation by strip-mining states.

Until recently the states, through choice or inaction, have been essentially on their own in dealing with strip mining. The good offices of federal research agencies have not been used in strip-mine reclamation as extensively as they have been, for example, in dealing with other problems in agriculture and forestry. A fair amount of productive research on strip-mine reclamation problems has been done over the years, especially by the Soil Conservation Service and Forest Service of the Department of Agriculture, but the knowledge has not been widely or systematically applied and the state of the art is far from having reached its ultimate boundaries.

Recently, prospects for cooperation between federal and state agencies have broadened. Kentucky, for example, has sought aid from federal experts in setting criteria under new regulations. The Appalachia Act provides for a survey of the extent and condition of stripped land and includes funds for reclamation work on public lands affected by stripping. And the Tennessee Valley Authority has lately —belatedly, critics say—thrown its weight on the side of mandatory reclamation by coal operators. The implications of greater federal involvement in research and regulation and the pivotal role of TVA will be discussed in another article in this space.

—JOHN WALSH

DOD: Johnson Appoints Foster, Chief of Weapons Laboratory, to Head Pentagon Research Unit

President Johnson's penchant for making surprising appointments was displayed again recently with his nomination of John S. Foster, Jr., to be Director of Defense Research and Engineering (DDR & E). Foster, who has been Director of the Lawrence Radiation Laboratory at Livermore, California, since 1961, has a reputation as a creative weapons scientist and talented administrator. In his views on matters affecting politics, however, he has been only slightly less controversial than his more vociferous Livermore colleague Edward Teller. Like Teller, Foster was among the small band of scientists who publicly opposed the test-ban treaty with the Soviet Union in 1963.

Foster, a 43-year-old physicist who looks barely 33, is the son of physicist John Stuart Foster. Foster Jr., whom everyone he has ever met appears to call "Johnny," was born in the U.S. but grew up in Canada and attended McGill University. His undergraduate studies were interrupted by World War II, when he moved to Cambridge, Massachusetts, to work in the Radio Research Laboratory at Harvard on electronic countermeasures to German radar. In 1944–45 he followed up his laboratory work by serving as a civilian adviser to the 15th Air Force in Italy, helping to train crews in the proper use of the countermeasure equipment. Returning to Canada after the war, Foster graduated from McGill with honors in 1948, then moved on to Berkeley for graduate work in physics under E. O. Lawrence.

Foster obtained his Ph.D. (for work on ion properties) in 1952, the year in which the long argument over building the hydrogen bomb came to an end with Truman's decision to go ahead. The debate, and the conviction of many war-scarred scientists at Los Alamos, the government's chief atomic weapons facility, that the H-bomb was not needed, had persuaded many defense and scientific leaders that an additional source of scientific talent and advice in the weapons field was desirable. Lawrence was chosen to set up a new laboratory, and with him to Livermore went a group of young men who have subsequently played key roles in shaping the U.S. defense establishment. In his new post Foster will follow two other Livermore "graduates," Herbert York (now Chancellor of the University of California at San Diego) and Harold Brown, who is moving over from the DDR & E post on 1 October to become Secretary of the Air Force. (Both York and Brown also preceded Foster as directors of Livermore.) Other members of the Livermore staff have served in other Pentagon roles.

Livermore men have generally been noted for an exuberant, enterprising spirit and, particularly in the case of Foster, for a relative freedom from the kinds of moral uncertainties about weapons development that have characterized older generations of atomic scientists. An article about Livermore which appeared in *Fortune* in 1962 quotes Foster as saying: "Force, nuclear force or any other, is not in itself immoral. Morality involves how it is used."

At Livermore, Foster rose through a series of promotions, becoming a division leader in 1955, associate director in 1958, and director in 1961. After beginning his work there on Project Sherwood, one of the laboratory's at-

John S. Foster, Jr.

tempts to explore the peaceful uses of atomic energy, Foster switched to weapons. Although the precise nature of his contributions is secret, he has been referred to as a leading designer of smaller nuclear weapons, and is reported to have been influential in pursuing development of the so-called "clean" or neutron bomb. In 1960, as one of the first recipients of the Ernest O. Lawrence memorial award, Foster was cited by President Eisenhower "for unique contributions demanding unusual imagination and technical skill" in the development of atomic weapons. And, at the same time that he was involved in weapons work on the scientific level, Foster was serving as an adviser to all three military services; in this capacity he is said to have been an outspoken advocate of military strategies utilizing some of Livermore's inventions. He has also been a consultant to the President's Science Advisory Committee.

A skeptic about the unpoliced moratorium on nuclear testing that ended with the Russian test series in September 1961, Foster did his best to keep the laboratory in a state of readiness and is generally credited with having held it together during that period. That experience appears to have been partly responsible for his opposition to the test-ban treaty, about which he testified, "we must provide a scientific climate that will not discourage [military] developments . . . From purely technical-military considerations, the proposed treaty appears to me disadvantageous."

So far, the Foster nomination has evoked relatively little response. The Washington *Post* seemed to question the propriety of appointing a test-ban opponent to the third highest civilian job in the Pentagon, stating in the headline of a front-page story, "Pentagon Science Boss Is 'Hawk'" and reporting that, on the basis of his attitude toward the test ban, "Foster is looked upon by many in the scientific community as a hawk. . . ." Members of the security-minded Senate Armed Service committee, however, who voted last week to endorse the appointment after confirmation hearings that lasted less than 15 minutes, went out of their way to commend Foster for his test-ban testimony and seemed immensely pleased by his selection.

How relevant Foster's past views will be to his new position is uncertain. The chief function of the DDR & E is to advise the Secretary of Defense in scientific and technical matters relating to research, development, testing, and evaluation of new weapons systems. In practice, under Foster's predecessor Harold Brown the office became a stronghold of supporters of McNamara's policies and figured heavily in operational decisions such as those to cancel development of the Skybolt missile and the Dyna-Soar air-space plane (*Science*, 23 July).

The office has recently undergone a reorganization which resulted in the elimination of some of its responsibilities in the space field, and before the selection of Foster there was speculation in the trade press that, with Brown as Air Force Secretary and General Bernard Schreiver of the Air Force Systems Command directing the new manned-orbiting-laboratory program, the influence of DDR & E in the Pentagon might be downgraded. With Foster in charge, this development seems less probable. He and Brown are longtime associates (Brown seems to have recommended Foster as his successor), and a Brown-Foster team is more likely to strengthen the office than to weaken it. The new team could also strengthen the position of the "defense intellectuals" (with whom Brown is identified) in dealing with the military services.

What Foster's attitude will be toward the political and foreign policy questions that may come his way is harder to predict. The disarmament front has been quiet for some time—the Johnson administration's evident determination to press the Vietnam war may be one reason why Foster's selection has been greeted with such warmth. But there have been reports recently of the possibility of a new Russian initiative in the disarmament field—perhaps in the form of a proposal to extend the test ban to underground explosions above the level of force at which verification requires direct inspection. If such a proposal is actually forthcoming, the man in Foster's new slot will have a lot to do with evaluating the advisability of accepting it. In Washington, the feeling seems to be that, while Foster has disagreed with McNamara on such issues in the past, the broader responsibilities of his new job will in time lead him to take a more compatible position.

—ELINOR LANGER

Congress: Birth of NSF Recalled as New Foundation Is Established To Strengthen Arts, Humanities

New ventures in federal support of educational and cultural affairs seldom come without struggle and controversy. This rule was illustrated again recently when Congress finally created a National Foundation on the Arts and the Humanities (NFAH), sister agency to the National Science Foundation, which itself had a difficult birth 15 years ago. Proposals for federal assistance to the arts have been before Congress at least since the late 1950's, but not until last year was approval obtained for even an arts advisory council. This year, in the most liberal Congress since the early New Deal, the bill (see box) establishing the new foundation won approval handily, but provoked warnings of "federal control" and "culture czars" that recalled the debates that preceded the creation of NSF.

The measure grew partly from a strong recommendation by the academic community, however, and carried the enthusiastic endorsement of a number of scientists. In the spring of 1964 a Commission on the Humanities, sponsored by the American Council of Learned Societies, the Council of Graduate Schools in the United States, and the United Chapters of Phi Beta Kappa, completed a year's study and issued a report urging that a National Humanities Foundation be established.

"The laudable practice of the federal government of making large sums of money available for scientific research has brought great benefits, but it has also brought about an imbalance in one field of study and dearth in another," the commission said. Creating