

tion on industrial research. The questionnaire will be pre-tested with the aid of a selected list of firms in various industrial fields.

The ultimate scope of the study will be to develop data on research personnel, expenditures of research, capital investment in research facilities, and the relationship of research expenditures to corporate sales and invested capital. Also information will be sought on how companies determine the size of research programs, how they appraise the return on research, and the effect of taxes and other government policies on industrial research.

Research by State Governments

This study will be done in two parts: (1) by the Bureau of the Census, Department of Commerce, and (2) by the Institute for Research in Social Science, University of North Carolina. The Census Bureau plans to analyze the pertinent information already available in its extensive files and supplement the results with additional investigations in one state. From this exploratory study the Bureau expects to construct a suitable pattern of investigation for studying state-financed and controlled research throughout the country. The Institute at North Carolina will participate in the analysis of the experience of the Census Bureau and will conduct the follow-up investigations in other states. Information will be gathered on research costs, manpower, research administration, and research content of state-supported programs.

Research by Trade Associations

This study will be conducted by the Battelle Memorial Institute. There are approximately 16 000 trade associations in the United States, and it is believed 200 to 400 of these conduct or support research programs in the physical and biological sciences. In addition, the study will include certain professional societies which conduct research programs, largely supported by industry, and other types of cooperative industrial research organizations.

Research at Institutes and Commercial Laboratories

This study will be conducted by the Maxwell Research Center, Syracuse University. It is planned to explore the research programs of the 50 to 100 independent nonprofit research institutes and the estimated 250 to 400 commercial research laboratories in the United States. In many instances these organizations are concerned with research of interest to industry, but they differ from industrial laboratories in that their principal business is research, with manufacturing, if any, secondary to research.

In addition to these special surveys, the NSF staff is now conducting two major studies of research supported or sponsored by the Federal Government and by American universities and colleges.

The Foundation's broad survey of the current status of science and research in the United States will cover all types of organizations conducting, supporting, or sponsoring research in this country. It will include all

branches of physical and biological science, as well as certain areas of the social sciences. Information will be collected primarily on current activities, but some historical information will be gathered extending back to 1925. The survey will provide background information on research trends which is needed by many groups in the development of effective national science policies and for the promotion of research and education in the sciences.

Information to be gathered will include present and past expenditures for research, scientific manpower statistics, research facilities inventory, capital investments in research and research facilities, tax incentives for research, and an appraisal of some of the economic effects of research on industry, agriculture, and public health and welfare.

Decision

THE Atomic Energy Commission announced on June 29th that it had reached a decision in "the matter of Dr. J. Robert Oppenheimer". By a vote of four to one the AEC decided that Oppenheimer should be denied access to restricted data. Commissioners Lewis L. Strauss, Thomas E. Murray, Eugene M. Zuckert, and Joseph Campbell voted to deny clearance, and Commissioner Henry D. Smyth voted to reinstate clearance. Strauss, Zuckert, and Campbell signed the majority opinion, Murray concurred with the majority in a separate opinion, and Smyth submitted a dissenting opinion. Both Zuckert and Campbell issued statements in amplification of their views.

The AEC majority decision was preceded by a majority recommendation to deny clearance and a minority recommendation to restore clearance submitted to AEC General Manager K. D. Nichols on May 27th by the members of the Gray Board. On June 12th Nichols submitted his findings to the Commission, reaffirming the recommendation of the Gray Board majority. The General Manager expressed his feeling that Oppenheimer had been of "tremendous value and absolutely essential" during World War II, but that his value as a scientist and consultant had since declined "because of the rise in competence and skill of other scientists and because of his loss of scientific objectivity probably resulting from the diversion of his efforts to political fields and matters not purely scientific in nature". Noting that the Commission had made use of Oppenheimer's services only during six days in the past two years, Nichols found him "far from being indispensable".

Smyth, who warned in his dissent that "failure to employ a man of great talents may impair the strength and power of this country", stated that the conclusion that Oppenheimer is a security risk "cannot be supported by a fair evaluation of the evidence" and charged that "Those who do not accept this view cull from the record of Dr. Oppenheimer's active life over the past fifteen years incidents which they construe as 'proof of fundamental defects in his character' and as

alarming associations." Asserting that Oppenheimer's testimony "has the ring of honesty" Smyth said: "I urge thoughtful citizens to examine this testimony for themselves, and not be content with summaries or with extracts quoted out of context."

Following the adverse decision, 26 of Oppenheimer's colleagues at the Institute for Advanced Study issued a statement expressing "in the light of the charges brought against him" their complete confidence in his loyalty, discretion, and concern for the safety, strength, and welfare of the United States. "For seven years now," they said, "he has with inspired devotion directed the work of the Institute for Advanced Study, for which he has proved himself singularly well suited by the unique combination of his personality, his broad scientific interests, and his acute scholarship. We are proud to give public expression at this time to our loyal appreciation of the many benefits that we all derive from our association with him in this capacity."

Major Documents in Oppenheimer Case

1. Letter dated December 23, 1953, from Major General K. D. Nichols, General Manager of AEC, to Dr. J. Robert Oppenheimer. *Bul. Atom. Sci.*; X:5:174 (May 1954).
2. Letter dated March 4, 1954, from Oppenheimer to Nichols. *Bul. Atom. Sci.*; X:5:177 (May 1954).
3. Statement issued April 13, 1954, by AEC. *Bul. Atom. Sci.*; X:5:187 (May 1954).
4. Report of Special Personnel Security Board dated May 27, 1954, including majority report by Gordon Gray and Thomas A. Morgan, and minority report by Ward V. Evans, printed in full by *The New York Times*, June 2, 1954, and in part by *Bul. Atom. Sci.*; X:6:243 (June 1954).
5. Letter dated June 1, 1954, from Lloyd K. Garrison, counsel for Oppenheimer, to Nichols. *Bul. Atom. Sci.*; X:6:251 (June 1954).
6. Text of main portion of brief filed with AEC by Oppenheimer's counsel. *The New York Times*, June 16, 1954.
7. Transcript of Hearing before Personnel Security Board "In the Matter of J. Robert Oppenheimer". For sale by the U. S. Government Printing Office, Washington 25, D. C.; 992 pp.; \$2.75.
8. AEC decision and statements. *The New York Times*, June 30, 1954.

Fast Camera

MOTION PICTURES of explosive phenomena can now be made at a rate of 15 million frames per second by means of an improved version (see cover) of a high-speed camera that has been under development at the Los Alamos Scientific Laboratory for the past several years. An earlier version, "Model 6", was first described by Berlyn Brixner of the Los Alamos staff in October 1952 at a meeting of the Society of Motion Picture and Television Engineers in Washington, D. C. Then heralded as the fastest known camera, Model 6 was able to take photographs only at the sluggishly slow rate of 3.5 million frames per second.

The four-fold increase in rate attained by the present camera, "Model 8", is made possible by the devel-

opment of a three-sided steel mirror rotated in a helium atmosphere at 23 000 revolutions per second on oil-pressure lubricated bearings. The mirror, which is made of special steel having a tensile strength exceeding 300 000 pounds per square inch, is powered by a small helium-driven turbine.

In action, the spinning mirror sweeps a beam of light across a row of lenses which direct separate images to a strip of standard high-speed 35 millimeter film. The film strip used with the camera provides up to 96 consecutive photographs of a single event. Since the entire film is exposed in about 1/150 000th of a second, no mechanical shutter could be devised to close fast enough to prevent the reflected beam from sweeping across a second time and double-exposing the film. Brixner and his associates arranged an electric detonator to shatter a glass block in the light path, the shattered block being opaque enough to bar the light until a mechanical shutter can close.

According to information from Los Alamos, the light from explosions photographed with the camera is so brilliant that the optical system may be as slow as F:25 to F:100. In the case of a nonluminous event, however, the light must be furnished by some other source. One secondary source mentioned in this connection is the light emitted by an explosion shock-front traveling through argon gas, where the argon atoms give off an intense flash when excited by the shock front.

Heavy-Particle Accelerators

CONSTRUCTION of two \$1.2 million linear accelerators (one at Yale University and the other at the University of California Radiation Laboratory) has been authorized by the Atomic Energy Commission, according to an announcement made on May 20th. Both instruments will accelerate heavy particles (atomic nuclei ranging from beryllium, with an atomic weight of 9, to neon, with an atomic weight of 20) to an energy of approximately ten Mev for each particle in the nucleus. This will be sufficient to allow the nuclei to interact with even the heaviest known elements. The accelerator at UCRL will be used primarily in nuclear chemistry studies such as the possible production and identification of new elements and new isotopes of known elements. The Yale machine will be used principally in studies of the physics of heavy particle nuclear interactions.

Simultaneously with the AEC announcement, Yale issued a release stating that ground-breaking will begin next September for construction of a new building to house the accelerator. The new structure will be built into the hillside of Yale's Pierson-Sage Square and will be completely shielded by concrete and earth. The accelerator is planned to be approximately 100 feet in length and eight feet in diameter. E. R. Beringer, associate professor of physics, will be director of the new heavy-particle accelerator project at Yale.