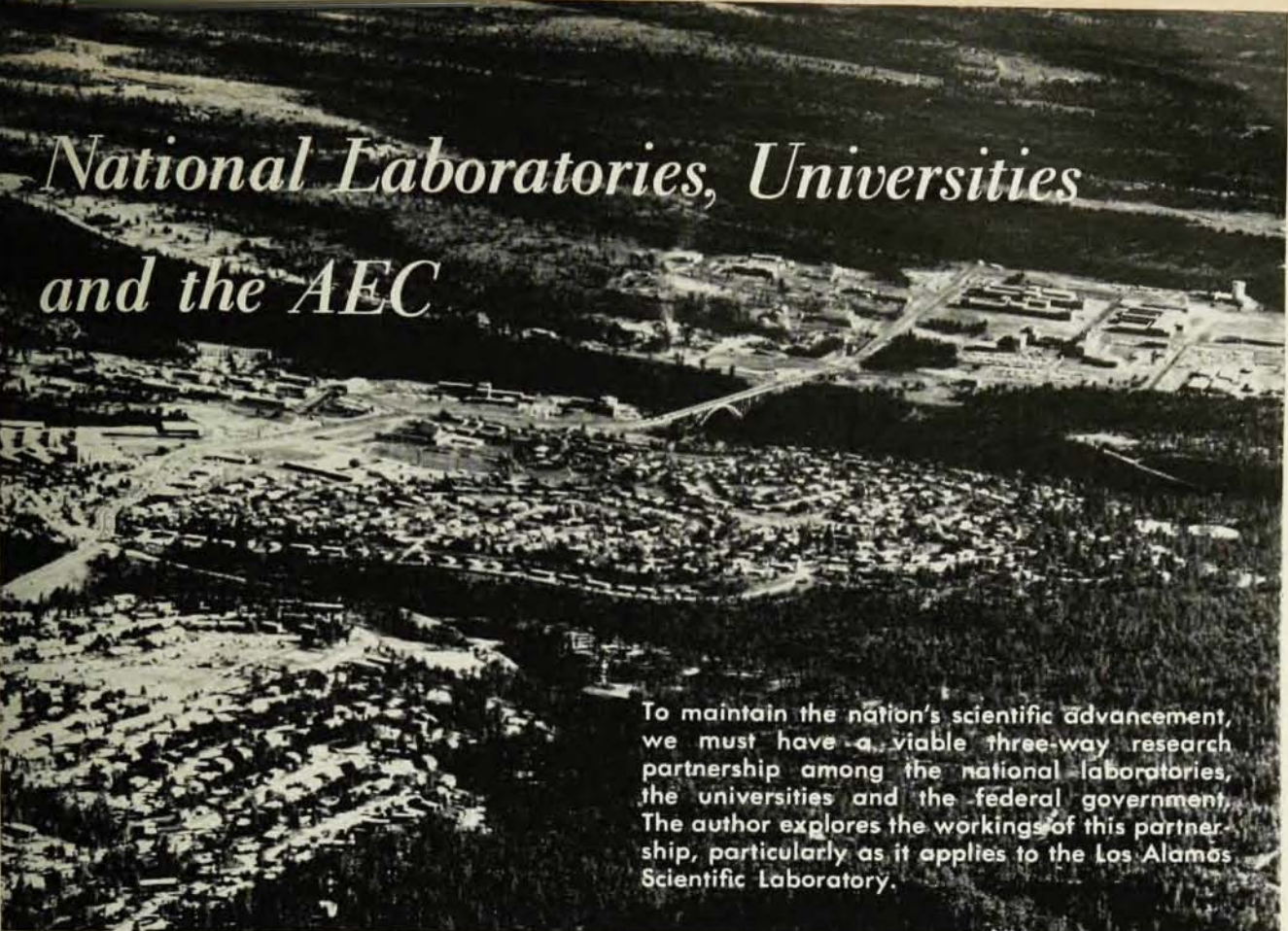


National Laboratories, Universities and the AEC



To maintain the nation's scientific advancement, we must have a viable three-way research partnership among the national laboratories, the universities and the federal government. The author explores the workings of this partnership, particularly as it applies to the Los Alamos Scientific Laboratory.

by George A. Kolstad

LOS ALAMOS, New Mexico, as seen from the air. In the background is the Los Alamos Scientific Laboratory.

THE NEED FOR A CLOSER RELATIONSHIP between universities and national laboratories was very well expressed by AEC Chairman Glenn Seaborg in a speech in June 1963 at the University of Colorado:

In the competition that exists today for top quality manpower, that laboratory or institution which falters or lags behind in its struggle for excellence or pre-eminence rapidly falls farther behind due to the "snowball effect." Just as success breeds success, so does failure beget failure. In a period such as this, when we are faced with serious shortages of engineers, mathematicians and physical and biological scientists, as well as with rapidly increasing research costs, it is particularly important that serious thought be given to maintaining our pace of advancement by strengthening our existing centers of excellence and increasing the level and quality of cooperation between the universities and the national laboratories. In this way I believe the AEC, in concert with the universities and national laboratories, can contribute both directly and indirectly toward meeting the

goal of an accelerated rate of training of engineers, mathematicians and physical and biological scientists.

This point of view, particularly with regard to the Los Alamos Scientific Laboratory, is further bolstered by the widely-recognized need to keep Los Alamos a strong, viable weapons laboratory and by the conclusions of AEC's ad hoc advisory committee on the proposed Los Alamos Meson Physics Facility (LAMPF). The committee recommended that LAMPF be built and operated as a "national facility." It is therefore important that in the months and years ahead, considerable thought be given to the best way of maintaining a strong weapons laboratory at Los Alamos and at the same time developing strength in basic science through cooperation with the universities of the region.

As you know, AEC supports research in several areas of science—in biology, medicine, engineering, chemistry, metallurgy, mathematics and computer development, high-energy physics and nuclear and other areas of physics. The high-energy physics program (that is, research with accelerators with a maximum primary-beam energy exceeding 1000 MeV) was separated from the rest of the physics research program about two years ago and estab-

The author, assistant research director for physics and mathematics programs in AEC's research division, provided this article in response to interest expressed by his colleagues. The article was adopted from a talk given in Feb. 1965 at a Los Alamos Scientific Laboratory-Associated Rocky Mountain Universities regional conference.

lished as a separate activity. At the same time a new activity, medium-energy physics (50 to 1000 MeV) was also established.

Thus, along with the Bethe panel, we in AEC consider nuclear physics to contain two separable (and separately financed) domains: low-energy physics (0 to 50 MeV) and medium-energy physics (50 to 1000 MeV). This arbitrary division, while not wholly satisfactory or meaningful to the physicist, is useful for program administration.

In addition the physics research program of AEC includes research in extra-nuclear properties of matter, physical methods of isotope separation and the production and distribution of separated stable isotopes for research. I must admit that we have a bit of a problem with theorists who refuse to be tucked into these neat little categories, but so far this problem has not proved insurmountable.

The overall financing of AEC's physical research program, as contained in the President's budget request for fiscal year 1967, is shown in the table below. It is important to emphasize that the amounts in the 1967 column represent the *request* to Congress; the amounts appropriated may well be different from the amounts requested.

I have been concerned about improving the match between AEC's major mission-related activities and research that is supported by the physics

and mathematics programs. One conclusion I have tentatively drawn points to a need for AEC to bolster its support of research in the geophysical sciences (for example, seismology, heat-flow studies, geology, geomagnetism, geochronology, plasma physics, atmospheric physics and the study of fields and radiations in space). AEC, of course, is giving considerable support to geophysics now, particularly in areas that bear a short-range relationship to some of AEC's applied programs. The problem is to strike a better balance between the more university-oriented programs of AEC's research division and the more immediately practical activities financed by other divisions.

It is apparent that AEC has gone underground with weapons testing and has increased its emphasis on Project Plowshare, the study of peaceful uses of nuclear explosives. Moreover, the mission-oriented program of AEC draws heavily on basic geophysical information for such activities as the detection and analysis of underground nuclear explosions; the monitoring of outer space for test-ban violations; the diffusion and distribution of fallout and stack gases; the siting of reactors, accelerators and other large or potentially hazardous facilities; the disposal or long-term storage of radioactive wastes; the discovery of new deposits of raw materials; and gas-plasma phenomena. It seems

Financing of AEC's Physical-research Program

Operating costs (\$ thousands)			
<u>Activity</u>	<u>Actual FY 1965</u>	<u>Estimate FY 1966</u>	<u>Estimate FY 1967</u>
High-energy physics	\$ 87 147	\$ 97 850	\$109 800
Medium-energy physics	5 590	9 310	11 000
Low-energy physics	24 513	26 810	28 800
Mathematics and computer research	5 199	5 900	6 400
Chemistry research	46 188	49 850	53 500
Metallurgy and materials research	22 647	24 780	26 800
Controlled thermonuclear research	21 278	21 500	22 600
Total physical research program	\$212 562	\$236 000	\$258 900

Equipment obligations (\$ thousands)			
<u>Activity</u>	<u>Actual FY 1965</u>	<u>Estimate FY 1966</u>	<u>Estimate FY 1967</u>
High-energy physics	\$ 18 831	\$ 21 200	\$ 21 760
Medium-energy physics	3 345	1 255	1 400
Low-energy physics	4 754	6 515	5 500
Mathematics and computer research	297	450	450
Chemistry research	5 093	5 300	5 290
Metallurgy and materials research	2 394	2 600	2 600
Controlled thermonuclear research	1 305	1 780	1 780
Other capital equipment	2 541	5 800	1 300
Total physical research program	\$ 38 560	\$ 44 900	\$ 40 080

appropriate that some significant portion of AEC's basic-science support should go into areas of science underlying these mission-related activities—in other words, that AEC “put a nickel back into the pot” by providing a more reasonable share of the federal support of geophysics research. It also seems to me that our posture, as the United States develops its activities in peaceful uses of nuclear explosives, will be greatly enhanced by the existence, within AEC, of a strong supporting effort in both basic and applied research in geophysics.

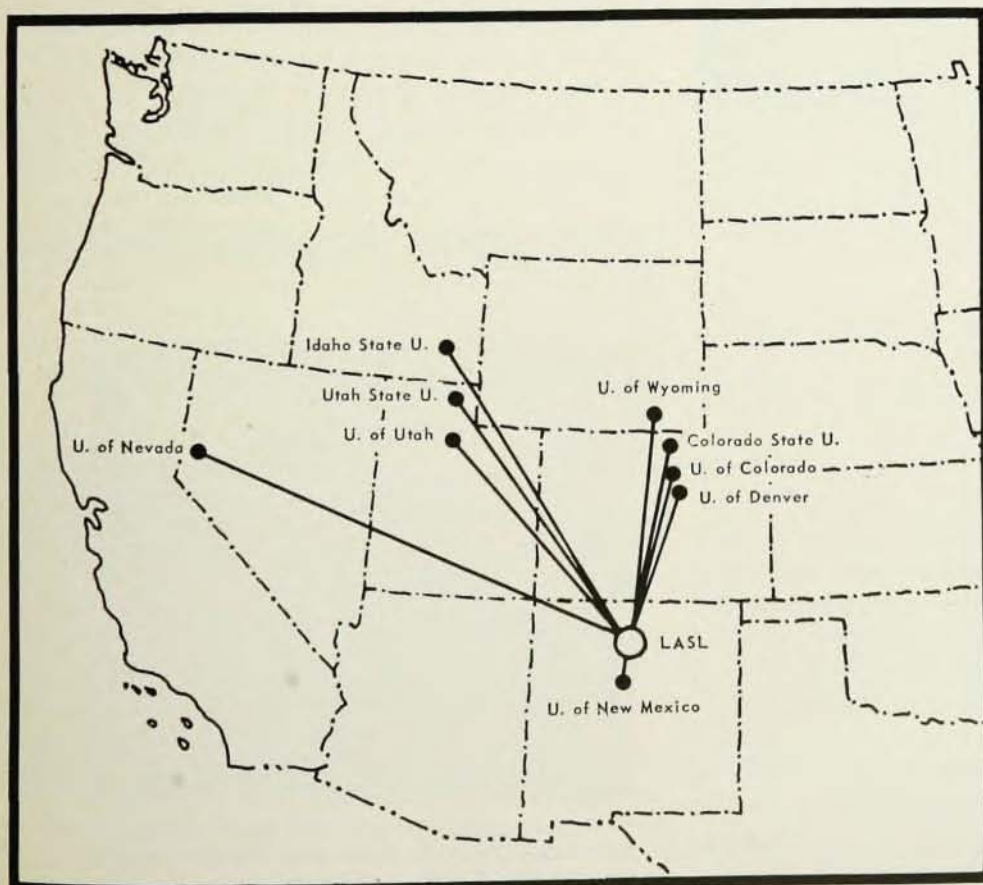
National laboratory-university relations

The question is, how can Los Alamos be developed as a national laboratory while maintaining the technical strength so essential to our defense? The first important consideration is making relevant facilities broadly accessible to the universities. Because of the nature of the Los Alamos Scientific Laboratory, the problem there is more severe than that faced by the northeastern universities in their relations with Brookhaven National Laboratory or by the midwestern universities in their relationship with Argonne National Laboratory. AEC operates each of its national laboratories by a different arrangement. At Brookhaven the AEC contract is with Associated Universities Incorporated (AUI); at Oak Ridge the contract is with Union Carbide

Corporation; at Argonne the contract is with the University of Chicago. Oak Ridge and Argonne have separate organizations (Oak Ridge Associated Universities, Inc., and Associated Midwest Universities, respectively) for liaison with the universities of the region.

The conclusions I draw from this wide spectrum of formal university-national laboratory organizational relationships is that the form is much less important than the spirit. For a sound and effective relationship to develop between national laboratories and universities, there *must* be established a spirit of mutual confidence, respect and trust. Without mutual understanding and give and-take, no formal organizational relationship can be worth the paper it is printed on.

Another potential difficulty in the relationship between national laboratories and universities is the participation of the universities in policy-making. At Brookhaven, for example, the trustees are appointed and expected to serve *as individuals*, not as official representatives of their universities. They serve as trustees for the good of the whole scientific community-national laboratory relationship, and most of them make a real effort not to grind the axe on behalf of their own institutions. It should be borne in mind that AUI is a sponsorship rather than a membership organization, and that



LOS ALAMOS Scientific Laboratory (LASL) is located at left in relation to member institutions of the Associated Rocky Mountain Universities (ARMU). Members of ARMU cooperate in furthering research among university and government scientists.

a trustee has a public responsibility with respect to the use of federal funds. His is therefore a responsibility to the national scientific community, not to a single institution, group of institutions or geographical region. Only to the extent that this spirit and point of view is maintained can the relationship succeed.

Another problem that constantly must be faced in the relationship between national laboratories and universities is that of the internal strength of the laboratories. A dilemma is involved in maintaining a balance between the internal scientific strength of a laboratory and the number and quality of guest scientists. This problem usually ends up with neither side being fully satisfied.



PHOEBUS 1A, a 1000-MW nuclear-propulsion reactor, at LASL's nuclear-rocket development station in Nevada.

It seems to me that some of the things a national laboratory should avoid are:

- domination by either the inside or the outside group
- insufficient hospitality to visitors at all levels; this includes not only social hospitality but, more important, adequate logistic support
- ego involvement of the staff: the "Herr Professor" complex and empire building; if this needs to be explained, it is already too late
- development of partisan behavior
- isolation of an individual or group
- development of cliques.

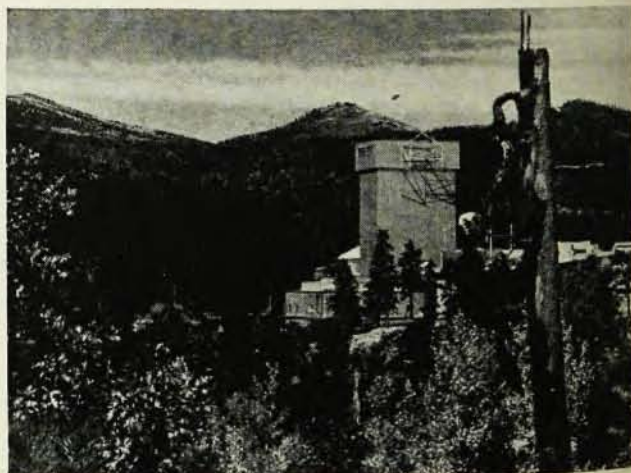
In addition, of course, adequate provision must be made for screening experiments on an equitable basis and for housekeeping. It is important that housekeeping be done by a capable, broadly-



ULTRA HIGH TEMPERATURE reactor building at Los Alamos for high-temperature nuclear experiments.

oriented physicist. These are some of the matters to consider in developing a closer and more intimate relationship between the universities and the Los Alamos Scientific Laboratory.

The case for a three-way research partnership among the universities, the national laboratories and the federal government is not just a matter of common interest in scientific and technical progress. It is not just a matter of the growing need for new and improved research facilities or the obligation to train scientists and engineers in increasing numbers and quality. It is not just a race to develop atomic energy, reach the moon, improve our health or search for knowledge. Indeed, it is all these—but it is also an adventure in the purpose and performance of a free people building private and public institutions, large and small, and in the interaction of these people in their personal relationships, their community, their state, their region and their country. □



VAN DE GRAAFF ACCELERATOR. This structure at Los Alamos Scientific Laboratory houses a vertical and tandem Van de Graaff installation.