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The Postwar Laboratory

R.A. Meade, ed.

Editor's Note

Most people who work at Los Alamos are aware that J. Robert Oppenheimer created and led Los Alamos during World War II. Few are probably aware that in September 1945 the Laboratory faced a very uncertain future. Having fulfilled its one and only mission – to aid the war effort – Los Alamos no longer had a formal reason for staying in existence when the war ended. From September 1945 until January 1947, Los Alamos struggled to stay operational until Congress passed some form of atomic energy legislation. Only then would the Lab's continued existence be assured. The Laboratory remained functional during this very difficult period because of the efforts of Norris Bradbury, who succeeded Oppenheimer as Laboratory Director in October 1945, and a group of dedicated scientists. In August 1946, Bradbury asked a small group of laboratory leaders to draft a policy statement, based on comments from staff members that would guide the work of Los Alamos until such time as atomic energy legislation was passed. Their report is presented below.¹

Introduction

Recent discussion of project policy has met with a widespread feeling that important alternatives were not being properly considered. These alternatives will be discussed here from the point of view of research personnel concerned with formulation a laboratory policy based on the wartime experience of Los Alamos. This policy is discussed on the primary assumption that the national investment here in facilities, in tradition, and in the existence of an going research and development laboratory organization ought not to be lightly discarded, but also ought not to be wholly continued without reexamination under the new conditions of peace. Others will discuss this policy more broadly, and others will make the decision of continuation; but the purpose of the present document is to suggest a policy which might help answer the question of what to do with Los Alamos.

The future of Los Alamos cannot be discussed without touching upon grave political issues which affect national policy. It is the uniform feeling of the writers that laboratory policy ought to be predicated upon national policy, and must be flexible and general enough that its acceptance does not tend to make irrevocable the policy now adopted.

The History of the Site

Perhaps none of the many establishments that employed science in the war effort had such strange duties as Los Alamos. By late 1945, we were engaged in the manufacture of plutonium spheres, of high explosive lenses, of bridge wire detonators - all complicated and

¹ With some minor editing to enhance readability.

novel industrial production jobs. We were making test drops for the construction of bombing tables, studying the tactical employment of the weapon, packing supplies for overseas shipment, and carrying on research. Los Alamos did all parts of this complicated job. It was a very great change from the beginnings as an isolated laboratory of nuclear physics, with a small shop and some few ideas of expansion. The mushroom growth and all-inclusive duties of the site had many causes. The pressing urgency of the job, the demands of the most extreme secrecy, the great feeling of responsibility which came with being a very small neck of a very large and costly bottle, and even the personality of the laboratory leadership played a part in the wide assumption of responsibilities. But it is hard to believe that the same enthusiasm to do an engineering and logistic and often a routine job can be kept up among research-trained personnel in peacetime.

Nor should it be. Both economical and sound engineering and supply and fruitful research will be more easily obtained if the jobs are separate from the point of view of responsibility as well as administratively and physically. The limited facilities of Los Alamos, no less than the limited national capabilities for fundamental research, cannot serve both ends. In no industrial operation are research staff and facilities one with development and production. In no military laboratory has the combination worked. The peacetime reputation of Naval Research Laboratory, to choose by no means a very bad example, was that of a lab capable of no first-rate fundamental research, because its objectives were limited by the demands of development and testing. When the immediate objectives of a current and pressing program must be met, the less well defined and longer range prospects of fundamental research will always suffer if they must compete for the same people, the same lathes, or even the same attention from laboratory leadership.

It is the thesis of this document that fundamental research in fields underlying the military utilization of atomic energy ought to be separated from all development testing and production. It still remains to argue which of these separate functions this mesa should carry out. In the next sections it is proposed to describe what this laboratory can do and what it should stop trying to do, and on this detailed basis a general program is proposed.

The Fields of Los Alamos Activity

Some seventy-five millions of dollars are invested here. Probably more important is the two or more years of time devoted to the establishment of a going laboratory with some nearly unique equipment and a wealth of experience in the most varied techniques. There are a number of fields in which no other laboratory duplicates the facilities and experience of Los Alamos. These fields, as well as those for which Los Alamos is [suited] to do useful supplementary work, are included in the following list:

1. Research in nuclear physics, especially in the field of the heaviest nuclei, the light nuclei, neutron and fission physics generally, and all problems associated with thermo-nuclear reactions.

2. Research, both theoretical and experimental in the field of shock physics. This includes H.E. physics, detonation problems, the behavior of shocks in solids and gases, the problems of matter under quasi-stellar conditions, and many other familiar Mesa subjects. The phenomena of atomic explosions ought to be included here, taking into account much knowledge under "1" [above].
3. The chemistry and metallurgy of plutonium and polonium, and many special techniques (powder metallurgy, deposition of films from high vacua) of interest for their own sake and as tools.
4. The health and biological problems of the field of atomic energy, with emphasis on acute radiation exposures and chronic exposure to alpha-emitting materials.
5. Fields still only beginning here, the general research and development of the small fast neutron chain reactor. The metal Dragon, critical assemblies, nuclear safety, and related problems, and the possible uses of such devices as heat sources, radiation sources, and propulsion machines, ought all to be considered.

Fields that the Laboratory Should Drop

The production facilities of Los Alamos are by no means small, though they represent less than half of the total technical investment. The policy here presented urges that Los Alamos relinquish all responsibility for any particular routine operation, any development of a particular bomb to the stage where it has a specific color, shape, or physical location. Such responsibilities, which are day-to-day and which are clearly defined as to objective and outcome, do not belong to a research laboratory. Especially as regarding weapons, they belong to the armed forces. Many such problems of stockpiling, manufacture, surveillance, new delivery schemes, tactics, engineering and even efficiency improvements, are still at hand. They can be solved on a continuing basis by an organization devoted to their solution but not by a laboratory which is devoted to fundamental research. One or the other will suffer from an attempt to crowd them both onto the present site. We therefore propose:

1. The operations at S-Site, already freed from routine charge manufacture, be still further curtailed to the level of fundamental developments in explosives and fabrication of experimental charges. The detonator manufacture should be farmed out forthwith.
2. The semi-routine measurements, like RaLa and pin method, be greatly curtailed, used only as aids in a general research program. Probably one group to handle all the existing sites could carry out such a job. Koski's² studies, for example, need pursuing as matters of real novelty and fundamental interest. All tests and development studies like those on the present Fat Man be, as soon as possible, farmed out to a military or commercial organization.

² Walter Koski, Group Leader for flash photography.

3. The engineering activities of Z and X divisions - everything like fusing, firing sets, detonators, ballistics, aircraft mechanical problems, and mold manufacture which is development of a given model of weapon - be divorced from the site. This should extend to the procurement, testing, and stockpiling now done by both X and M divisions.
4. DP East and DP West be directed towards research on fabrication and processing methods and on preparing the materials for research use. All routine production and testing should be farmed out as a continuing responsibility. The hastily designed and built plant is not satisfactory from [a] point of view of health or of permanency, and it is not likely that it can be adequately staffed and operated as production unit at such a place as Los Alamos under the sponsorship of a research organization. Production and research are not run by the same sort of people. The investment in the whole plant is small, and the plant will make an excellent basis for a good laboratory.

The Resulting Program

The scheme here outlined returns Los Alamos to the conception of a research laboratory. It would be concerned with research in fields fundamental to nuclear weapons - and, of course, to other possible developments of atomic energy. It would be the repository of the best knowledge in the field of atomic weapons and in the subjects related to them. It would have a unified research program of a sufficiently wide scope to attract and hold research personnel of the highest qualifications. It would be freed from the pressure for day-to-day results, for constant small improvements, and for troubleshooting trivial production problems. Its research personnel would work at research and would have a chance to produce fundamental advances in knowledge. Naturally any organization charged with more immediate responsibilities would find here a wealth of consulting and advisory talent and a constant source of new techniques and knowledge. Whether the objective is a better bomb or simply new knowledge, the results of such an enterprise judged on a ten-year and not a six-month time scale are, in our opinion, bound to justify the sacrifices made in immediate convenience.

The Transition

There are certain commitments accepted by the present laboratory. We strongly urge that all the non-research responsibilities assumed by the laboratory under the conditions of wartime be transferred as rapidly as possible to other organizations. We should offer to train personnel, military or civilian, in the techniques required. We should agree to carry on - with adequate aid in obtaining the necessary staff - the routine problems with which we are now entrusted, but only for a time, to be stipulated by agreement with the successor organizations. Particularly we should undertake to finish the design of a levitated composite Fat man and to decide upon the virtues of the inverted urchin. But we should propose to end with that job all research into a specific model

of Fat Man bomb. It is probable that under the McMahon Bill³, the Director of Military Utilization will set up an engineering and production organization, perhaps partly based on Sandia [and] Inyokern, to discharge the armed forces' responsibility to protect the country with the best existing weapons. But it should cease to be the job of Los Alamos to worry about the existing weapons. That is a military job and cannot be carried on otherwise in times of peace.

Steps should be taken immediately to urge transfer of the responsibility ties for Mk-IV, LB, field reliability tests, etc. The problems involved are not in any way new or fundamental, and would serve as excellent beginning problems for a new organization, with Los Alamos advice and training.

Bomb Testing

It does not seem likely that any future test of an atomic bomb - and there are arguments for many different tests - can be made in the manner of Trinity. The problem of personnel, of logistics, and of public relations and public liability, will in every case be a serious problem. It is proposed that Los Alamos accept responsibility for no such tests. They are not part of the job of a research laboratory. The laboratory should be given the right to participate, when it chooses, in any such test, if it wishes to study some phenomenon related to its general interests. But assembly, blast measurement, and even radiochemistry, are now routine and can be relinquished. The laboratory will of course have to advise the organization conducting the test and may desire to develop wholly new tests and experiments, but it should not be robbed yearly of half its personnel to do radio linkage or mechanical assembly.

If it cannot avoid the responsibility now accepted, Los Alamos will have to undertake to test the levitated composite fat man upon design completion. But unless new investigations are proposed, the measurements made should be the minimum required to check the success of the model. Probably an alpha measurement, gamma ray timing, and radiochemistry are needed.

Conclusion

The adoption of such a program involves no glossing over of the weapons responsibility of Los Alamos. But it substitutes for the present catch-all responsibility, a research program from which either really new weapon development or new and important peaceful application can stem. It makes possible a separate, efficient, and smoothly-running production and development organization free from the exigencies of research and run by and for the military to fulfill the day-by-day military responsibilities. It leaves Los Alamos in a position to get the best personnel and to carry on a program based on what it can do best. When every week makes a difference, you can run a factory well with research people and research improvisation. But when years alone count, it is best to keep the laboratory and the plant working together, but not merged.

³ McMahon Bill was the unofficial title for what became the Atomic Energy Act of 1946. Named after Connecticut Senator Brien McMahon.

The policy presented in the preceding document is a summary of the results of a conference of the following members of the laboratory:

Alvin C. Graves
L. D. P. King
John Manley
Philip Morrison
Robert Richtmeyer
Roderick Spence

It is based on a discussion by the Interim Council of a document on project philosophy by Norris Bradbury and on a conference of about thirty-five group and division leaders of M, P, and T divisions. It is believed that this policy will be very generally accepted by senior members of the laboratory as well as by scientists not at present connected with the laboratory.

August 9, 1946