two paths $2P'A'$ and $2P'B'$ (measured by counting fringes) is a reliable measure of the sine of the angle rotated through.

It can be readily shown that if the gamma-ray source can be made to coincide with the optical interference point P, first order errors due to shake or looseness in the pivot at O become unimportant. In the actual instrument, in order to get the beam splitting mirror out of the way of the gamma-ray source and still enjoy the benefits of freedom from errors caused by looseness or inaccuracies in pivot O, two diverting mirrors are introduced at M_1 and M_2 so that the light paths are bent out of the plane of the drawing in such a way also as to make them intersect the beam splitting mirror at a much more convenient and economical angle (from the point of view of the required size and cost of this expensive component).

It is planned to count the fringes at rather high speed with photomultiplier tubes, keeping a record of the total on a scaling circuit, and by means of a quadrature phase arrangement to cause the scaling circuits to count backward (deduct the count) when the direction of rotation of the crystal table reverses. We hope and aim at a ten-fold increase in precision over our present 2-meter instrument with this new optical interferometer, say from perhaps a part in ten thousand to a part in a hundred thousand in the half million volt region. The two trihedral mirrors and their mounts have been constructed. Each consists of three $4'' \times 4''$ flats provided with microadjustments to render the three dihedral angles accurately 90°. These components have been successfully adjusted to give circular interference fringes on a beam-splitting mirror and there is therefore every reason to expect success from the eventual instrumental design.

[1] A. C. G. Mitchell, Rev. Mod. Phys. 22, 36 (1950).
[2] Arne Hedgran, "Precision Measurements of Nuclear Gamma Radiation by Techniques of β-Ray Spectroscopy," Ark. Fysik, Vol. 5, No. 1, Part I, p. 2 (1952).
[3] S. Devons, *Excited States of Nuclei*, Cambridge Univ. Press, p. 141 (1949).
[4] R. E. Bell and L. G. Elliot, Phys. Rev. 79, 282 (1950).
[5] J. W. M. DuMond, D. A. Lind, and B. B. Watson, Phys. Rev. 78, 1226 (1949).
[6] Jesse W. M. DuMond, Rev. Sci. Instr. 18, 626 (1947); *ibid.* 18, 617 (1947). Many improvements and modifications have been made in the instrument since the publication of this paper, notable among which is the development of a scintillation crystal detector to replace the original multicellular G-M counter which was used at first, and the perfecting of a completely automatic robot system for making the wavelength settings and recording the results in printed form on a paper strip.
[7] Y. Cauchois, J. phys. et radium 3, 320 (1932); *ibid.* 4, 61 (1933); Ann. phys. 1, 215 (1934).
[8] B. B. Watson, W. J. West, D. A. Lind, and J. W. M. DuMond, Phys. Rev. 75, 505 (1949).
[9] J. W. M. DuMond, D. A. Lind, and B. B. Watson, Phys. Rev. 75, 1226 (1949).
[10] The adjustment referred to is that of DuMond and Cohen, Rev. Mod. Phys. 20, 82 (1948). The values obtained at that time have been revised in more recent adjustments using recent atomic beam and microwave data to a state of still higher accuracy but the changes make no material difference in the present argument. For the most recent review of the subject see DuMond and Cohen, American Scientist 40, 447 (1952).
[11] A. Hedgran and D. A. Lind, Phys. Rev. 82, 126 (1951).
[12] Jesse W. M. DuMond and E. Richard Cohen, "A Least-Squares Adjustment of the Atomic Constants as of December 1950." A Report to the National Research Council Committee on Constants and Conversion Factors of Physics.
[13] A table giving these results will be mailed upon request to interested physicists. A paper describing this research work with interpretations of some of the decay schemes is now in the hands of the editors of the Physical Review.

a report by th

THE Atomic Energy Act of 1946 provides in Section 2 (b) that "There shall be a General Advisory Committee to advise the Commission on scientific and technical matters relating to materials, production, and research and development, to be composed of nine members, who shall be appointed from civilian life by the President." The Act further directs that "The Committee shall designate one of its own members as Chairman. The Committee shall meet at least four times in every calendar year." Beyond that, the Act does not specify how the Committee is to perform its advisory functions, how it is to obtain the information and analysis on which to base its advice, nor how to determine the issues to which it should direct its attention.

It is now almost six years since the Atomic Energy Act became law. Three members of the General Advisory Committee will shortly have served their full statutory term. This seems to us an appropriate time to give an account of how the Committee has attempted to fulfill its obligations.

The Committee was initially appointed by the President late in 1946, and met for the first time in the early days of January, 1947. It proceeded according to the statute to elect a Chairman, as it has at the first meeting of each calendar year, and to establish a schedule for its future meetings. In the five and one-half years since its inception, it has held 30 such scheduled meetings.* These have each occupied two or three days, largely devoted to study and discussion by the Committee of documents and oral reports on the problems before it. With rare exceptions, every meeting has been attended by every member of the Committee. At the close of each meeting, the Committee has addressed, in the form of a letter from its Chairman to the Chairman of the Commission, a report of facts, and opinions, and of such advice as it was prepared to give. These

* Subcommittees and panels of the Committee have met at Los Alamos, Washington, Berkeley, Princeton, Pasadena, Oak Ridge, and the Argonne.

AEC general advisory committee

The following statement, prepared earlier this year by the nine scientists who comprise the General Advisory Committee of the Atomic Energy Commission, describes the nature of the Committee, its responsibilities, and its manner of operation. The names of the members are listed at the end of the report.

letters are for the most part of very high classification. They discuss the often numerous technical problems that had come before the Committee at the meeting in question. They are the principal record of our advice to the Commission. In almost every case, we have discussed the more important and difficult problems with the Commissioners directly, before reporting to them in writing. We have also made available to the Commission minutes of the meetings, in the hope that a full account of our discussions might give a better understanding of the views expressed by us. We have asked that these minutes not be given a wider circulation, but have allowed the Commission complete freedom with regard to the distribution of our reports. On occasion, usually at the request of the Commission, we have submitted *ad hoc* communications on specific controversial subjects, either for public release, or as a basis for discussion with other agencies of the Government, or for the advice of the Commission itself.

From the first, the Committee has seriously considered whether to employ staff of its own. It has been clear to us that such staff could be of great assistance in assembling information, in preparing analyses, in reporting views and policies of other agencies, in studying the fate of such advice as we had given, and determining to what extent this advice had been practicable, and to what extent, and in what way, it had in fact been put into effect. We understood that the two other statutory Committees, the Military Liaison Committee and the Joint Congressional Committee, made extensive use of staff. Nevertheless, we have always rejected this alternative, because we believed that it was inappropriate for a group of scientists, devoting only a part of their time to the problems of the Commission, to seek in any way to establish itself as an autonomous agency. The single exception is that we have throughout had a secretary, who worked with us on a part time basis. The first secretary was Dr. John Manley, then Associate Director of the Los Alamos Laboratory; the second secretary is Dr. Richard Dodson, Chairman of the Department of Chemistry of the Brookhaven National Laboratory. The secretary has arranged with the Commission for the scheduling of our meetings, and has been responsible for recording and reporting the facts and opinions discussed during them. We have had reason to be grateful to our secretaries.

In a field as complex, as new, as rapidly changing, and above all as highly classified as that of atomic energy, information always turns out to be a central problem. We have looked to the Commission as our source of information. It is true that individual members of the Committee have sometimes brought relevant and important knowledge to our deliberations. In at least two areas of the Commission's program members of the Committee have had an immediate first-hand knowledge. One of these is the support of basic physical science, and the training of scientists. A second, especially at first, was the program of the Los Alamos Laboratory; at least six members of the original Committee had been closely associated with that Laboratory during the war. Inevitably, through association with scientists working for the Commission and its contractors, we have learned of developments that called for our attention; and to a lesser extent this is true of us as individuals because of discussions with officers and civilians in the Department of Defense. The important point is that we have not depended upon, nor cultivated, these random sources of information.

Whenever we have wished to talk to Commission contractors, to laboratory directors, scientists, or consultants, we have asked the Commission to arrange the meeting. Where we have thought that a military judgment was an essential part of the background for a technical problem, we have attempted to obtain this through the Commission, and its statutory liason agency, the Military Liaison Committee. When we were persuaded that the information was inadequate for

a decision—and this has happened time and again—we have suggested to the Commission means whereby the information might be gathered. We have not in general sought to do this for ourselves.

We have also depended on the Commission for telling us on what technical problems it sought counsel. It is true that, especially in the first year or two, we would tend to raise questions about which we thought the Commission should be concerned; but increasingly, as time has passed, we have asked the Commission what its problems were, and what were the decisions with which it was faced. Our agenda has thus for the most part reflected the Commission's current preoccupations. We believe that this procedure has perhaps led us to postpone too long the consideration of some technical problems, but that it has worked well in those cases where the Commission or we were aware of a problem, and where the technical information in fact existed.

When the Commission was first formed, it was apparent to us that there were many technical fields in which the Committee was not well versed. There has been no one on the Committee who has been competent in biology or in medicine; for a long time no member had even a marginal competence in geology, mining, and the whole domain of raw materials. Initially we suggested that we supplement this deficiency by the creation of panels. The Commission preferred to establish its own independent advisory committees on raw materials, and on biology and medicine. We have met from time to time with these committees, and have occasionally encouraged them to explore points which to us seemed vital.

These procedures have seemed natural to us; but they have often left us rather remote from the realities even of those decisions for which technical arguments were of the greatest importance. Thus, although we have often pointed out to the Commission the critical interdependence of technical and military evaluations, we have not thought it proper to discuss directly with representatives of the military establishment their assessments of military worth, or their establishment of military requirements. When we have talked directly with the Military Liaison Committee, it has been in an attempt to make available to that Committee facts and evaluations of which we were quite confident, and on the basis of which the Commission wished to proceed. We have followed a similar policy with regard to the Commission's dealing with other agencies of the Government, and with its own contractors, discussing matters directly with them only where the Commission desired that we do so in furtherance of its program.

We have sometimes found ourselves forced to consider, or asked to advise on, matters which were not in any narrow sense scientific. There are two reasons for this: one is that technical development cannot of course prosper in the absence of general policy and of understood, if not always explicitly formulated, objectives. The other is that the execution of technical policy necessarily depends on the organizational and practical arrangements which are made to carry it out.

Thus we have from time to time faced the question of the assignment of a technical responsibility; or we have had to make an assessment of the conditions under which the necessary high level of scientific talent would in reality be devoted to a problem of great importance. There have been questions of the organization of the Commission staff itself, and of its arrangements with its contractors. There have, more rarely, been questions of over-all military and Commission policy, without a determination of which scientific effort would at best be wastefully employed. We have spoken freely to the Commission on thoses matters, though typically in an informal way, and without recorded recommendations. From time to time the Commission has thought that it would be useful to have an expression of our views even on matters which are only marginally within the terms of reference of the Committee; and when they have felt so, we have not hesitated in one form or another to record what we thought. As examples of such questions, we cite the organization of the Commission's development work in reactors, the organization of the Commission's research and development efforts in the field of raw materials, the need for weapons tests, the relation between the problem of custody of atomic weapons and the combat readiness of such weapons, the creation of an informed general understanding of the prospects for civil power, the objectives of the thermonuclear program, the need for an accessible atomic proving ground, and the technical benefits to be derived from collaboration with our wartime partners, the United Kingdom and Canada.

We can briefly summarize this account of how the Committee has operated. We have held that if our experience, our knowledge, and our advice were to be useful, they could be so only in the measure in which they were understood and accepted by the Commission, the agency responsible for and able to execute policy. It is for this reason the Committee has not sought to establish its own staff, or to develop its own direct connections with other agencies of the Government, or with the Commission's laboratories.

We have throughout tended to act as a committee, on almost all important points seeking, if not quite always achieving, unanimity. With a very few exceptions, our views have been unanimous.

We do not wish to suggest that the procedures we have adopted are the only ones or the best ones, either for the past or for the future. In fact, we make this report partly with the thought that if our past way of work is understood, it may be helpful in determining how to proceed in the future.

Oliver E. Buckley
James B. Conant
Lee A. DuBridge
Willard F. Libby
Eger V. Murphree
John von Neumann
I. I. Rabi
Walter G. Whitman
J. R. Oppenheimer, *Chairman*