ership, however, is reported to feel that the discussions should be used to reach agreement on changes which would make NAEP acceptable. One such change would be elimination of regional comparisons of achievement.

Despite AASA's opposition, a national assessment program closely resembling NAEP seems likely to be carried out, and with considerable support from the education establishment. The national assessment concept has the backing of the National Education Association's elementary and secondary school principals' departments. The National School Boards Association also has indicated its support, provided the national assessment is used as only one of the tools by which educational progress is measured.

The Association for Supervision and Curriculum Development is one of the few groups clearly opposing NAEP. The Council of Chief State School Officers is reported to be divided on the national assessment issue, and its cautiously worded resolution on the subject probably could be cited either for or against NAEP. In fact, given the division of opinion within AASA itself, it is not at all certain that the association can exert much pressure to force drastic modification or abandonment of NAEP.

The question of whether NAEP will reach safe political terrain may depend in part on how wisely the question of who is to administer the actual assessments is decided. Several alternative solutions are being considered. For example, NAEP might be put in the hands of a Presidential commission. Such a body, if well chosen, might enjoy high prestige and influence —but it would have to expect allegations that it was created as a willing tool of the U.S. Office of Education. Another possibility would be to turn NAEP over to an organization set up by foundations, universities, and other educational interests. If broadly representative, such a group might command wide respect and support—but it, like the Presidential commission, probably would be criticized on the grounds that state and local school officials were not adequately represented. On the other hand, if dominated by school officials, the group no doubt would be criticized as a "captive" organization of the education establishment.

Among other possibilities being considered is that of asking the new Educational Commission of the States (set up under an interstate compact) to administer NAEP. This commission, now based in Denver, is dominated by the state governors, but school groups and educators have a voice in its councils.

Although at one time the Office of Education was interested in conducting the national assessments, sentiment against OE's assuming such a role has been hardening. The administration's budget proposal last year would have enabled OE's National Center for Educational Statistics to make the first assessment after the NAEP tryouts were completed. But the House Appropriations subcommittee on education denied OE funds for this purpose. Commissioner of Education Harold Howe, II, has said recently that the assessments should not be conducted by the federal government. However, he added, "It may be in the interest of all involved in education to have the government support it financially."

Accordingly, OE is seeking a $2-million appropriation this year to support the initial assessment. Howe and his associate commissioner for research, Louis Bright, have been in general agreement with the work of the Tyler committee. Bright has suggested that the assessment could be carried out by a special Presidential task force or by a private agency working under an OE contract. However, in view of AASA's opposition and the fact that the House Appropriations subcommittee now has its most conservative membership in years, the $2 million may be withheld.

The NAEP program is currently operating under grants by Carnegie and the Fund for the Advancement of Education (a Ford Foundation offshoot). In the event no federal appropriation is forthcoming, it seems unlikely that the foundations would let NAEP die. "It's my hope and belief that in one way or another the national assessment will be carried out," says Lloyd N. Morrisett, a Carnegie vice president and a member of the Tyler committee.

The case for a national assessment seems compelling to many people because, all too often, local school programs have failed to keep pace with the demands of the times. As John H. Fischer, president of Columbia University Teachers College and a proponent of NAEP, has observed, "Young people have to acquire facility in mathematics and science not because their town considers science important or because a nearby university has installed a cyclotron, but because of the character of the 20th Century."

—LUTHER J. CARTER

Some New Targets Defined for French Science Policy

Paris. The legislative elections in France produced a more narrowly divided National Assembly and a more cohesive opposition to the Gaullist majority, but the import of the elections for French science policy or science budgets is not regarded as great. Barring any major political contretemps, the fate of ambitious government plans in science and technology for the rest of this decade is likely to depend less on what happens in the political arena than on the performance of the French economy. Since last summer, however, there have been clear indications that French science policy is entering a new phase. Most significant has been the creation of new governmental organizations intended to improve liaison between research institutions and industry.

Until recently it could have been fairly said that French science policy has been directed primarily toward achievement of political rather than economic objectives. Science policy has served the ends of President de Gaulle's concept of national independence. In the military sphere this has meant creation of a French nuclear deterrent based first on a fleet of bombers armed with nuclear bombs and, in the 1970's, on nuclear submarines armed with Polaris-type missiles with thermonuclear warheads and on special army divisions equipped with tactical nuclear weapons (*Science*, 1 January 1965).

Consequently scientific resources went heavily into atomic energy research and reactor and weapons development.

Within the last 2 or 3 years concern has grown about American influences on the French economy through investment or control of licenses and patents. In particular, an incident with both diplomatic and economic implications (high-performance American computers were for a time denied France by U.S.-government policy on grounds that they contributed to development of French nuclear weapons) did perhaps more than anything else to spur French action on the technology gap.

The activist era in French science policy is usually dated from the beginning of the de Gaulle regime in 1958. During the recent election campaign, in which science policy was discussed but by no means became a flaming issue, the incumbent science minister Alain Peyrefitte stressed the sharp rise in the science budget under de Gaulle. He pointed out that the financial effort in R & D in both public and private sectors had risen from 0.97 percent of the gross national product in 1958 to 1.63 percent in 1963 and 2.06 percent in 1965. He acknowledged that the French effort still lags behind that of the British for whom the corresponding figure was 2.3 percent in 1964. The R & D effort for the U.S. was about 3 percent of the gross national product, for a much larger population with GNP per capita double that of the French. The French Fifth Plan for economic and social development calls for an increase in the effort to 2.5 percent.

Awareness at official levels of the importance of science and technology was acute enough, even in the period immediately after the Liberation, to have prompted the establishment of such agencies as the Atomic Energy Commission and the National Office for Aeronautical [now Aerospace] Studies and Research. In fact, concern about an apparent decline in French science between the two wars had led to the creation by the Popular Front government, just before World War II, of the Centre National de la Recherche Scientifique (CNRS), which has a role similar to that of the National Science Foundation in the United States. But the task of reconstructing French industry, after the war, and government preoccupation with rehabilitation of nationalized transport, communications, and utilities services, on the one hand, and financial weakness and political instability on the other made it impossi-

Battery Additives: AID's Chagrin

Battery additives are supposed to make electric batteries last longer, but the evidence is that what they really do is make government officials look ridiculous.

In 1953 there was the celebrated case of AD-X2 (*Science*, 29 December 1961), a top-selling battery additive which the National Bureau of Standards (NBS) had found to be without merit, though numerous customers swore that AD-X2 made their batteries peppier, long-lived, perhaps immortal. The Post Office subsequently moved to bar the product from the mails, and the manufacturer of AD-X2, Jess M. Ritchie, sought the help of various congressmen and of the newly installed, business-minded Eisenhower administration. Sinclair Weeks, Secretary of the Commerce Department, of which NBS is a part, said the NBS finding may have been good science but it was bad business. He demanded and received the resignation of NBS Director Allen V. Astin. A vast row ensued in which the administration was accused of having no respect for the integrity of science. Since no modern government can comfortably endure such a charge, Astin was reinstated shortly before his resignation was to become effective, and AD-X2 still stood condemned. Its market appeal subsequently declined, though at one point the Federal Trade Commission grappled with the placebo problem and arrived at the conclusion that advertising cannot be deemed misleading when the customers voluntarily come forward to proclaim their satisfaction.

In any case, little or nothing has been heard of battery additives in recent years until just last week when the Agency for International Development (AID) admitted that it had shelled out some $260,000 for a product known as "Higgins 10-Year Battery Life," named after its manufacturer, Thomas Edison Higgins, of Treasure Island, Florida. Standing defenseless as the Senate Permanent Subcommittee on Investigations pummeled from one side and the House Subcommittee on Foreign Operations and Government Information worked from the other, AID officials acknowledged the following tale.

Last year, the government of South Vietnam issued to Higgins 27 licenses for the importation of "10-Year Battery Life." AID, as part of its program of assistance to South Vietnam, issued to Higgins various letters of credit which he cashed in at American banks in payment for shipments sent to Saigon. Altogether, some 240,000 3-ounce packets, with a retail price of $1.60 each, were shipped, but, as it turned out, no market developed in Vietnam.

With the case generating an unpleasant aroma, both the House committee and AID asked the National Bureau of Standards to test "10-Year Battery Life." NBS acknowledged some experience with such products and replied that the latest entry was without merit. (Each $1.60 packet was found to contain about 4½ cents worth of magnesium sulfate and ammonium sulfate.) Higgins subsequently had his licenses amended to cover a "rust inhibitor" called "White Magic," which drew another $100,000 out of AID. NBS concluded that this product not only was ineffective but "might possibly be dangerous." Meanwhile, AID officials discovered that, in violation of currency regulations, Higgins' sales agent in Saigon was salting away large sums in Swiss and New York banks. On 20 December, they testified, they turned the case over to the Justice Department.

This being so, asked Senator Karl E. Mundt (R–S. Dak.), why was Higgins able to cash in a $9810 letter of credit on 6 March? A lawyer for AID said that could easily be explained. Once issued, he said, an AID letter of credit is an inexorable instrument, beyond the power of man or government. But, he said, Higgins has no more letters of credit and no more will be issued to him.

Such is the latest installment in the relationship between battery additives and government. Further episodes will be reported as they occur.

—D.S.G.

ble for the country to open new horizons in science policy.

With the change of regimes in 1958, several new governmental civil science organizations were created, old ones were reformed, and budgets began a steady upward movement. A three-part structure based on the law of 1958 provides an interministerial committee for science and research, an advisory committee made up of a dozen members chosen for individual distinction in a variety of scientific and technical fields, including the social sciences, and a secretariat, the Délégation Générale à la Recherche Scientifique et Technique (DGRST).

In making policy for civil science the new apparatus has gained in effectiveness from its role in the budgeting process. Each ministry isolates its request for research funds from the rest of its budget, and these requests are assembled under the supervision of the science minister in the so-called "*enveloppe recherche*" or research block appropriation. It is reviewed by the advisory committee and the interministerial committee. The science minister then pleads the case for research before the Minister of Finance and the legislature, and the procedure is regarded as having given the science minister added leverage in influencing overall science policy.

The block appropriation, it must be noted, includes a relatively small part of total government expenditures on R & D. As in the United States and Britain, defense and nuclear research and development are by far the most costly items and are treated separately. The block appropriation is made up primarily of funds for support of basic research—of the CNRS budget and of funds for research in universities and government establishments. According to a highly informative 1966 OECD report* on France (one in a series of reviews of national science policy), the block appropriation in 1963 contained about 15.5 percent of government R & D funds. In 1965 the total research block appropriation amounted to something over 1 billion francs (about $200 million). Not included are funds for international scientific programs, which are controlled by the Ministry of Foreign Affairs, and appropriations for telecommunications research and for most of the research related to French foreign aid programs. It is significant that Peyrefitte's official title, Secretary of State for Scientific Research and Atomic and Space Questions, gives separate billing to atomic energy and space.

While the block appropriation has grown steadily, it has continued to con-

*Reviews of National Science Policy: France (Organization for Economic Cooperation and Development, Paris, 1966).

Hornig on Research Policy: Public Understanding

An extensive statement on the scientific and technical policies of the Johnson Administration was delivered on 26 April, in a speech to the American Physical Society, in Washington, by Donald F. Hornig, special assistant to the President and director of the Office of Science and Technology (OST). Copies of the complete text may be obtained by writing to OST, Executive Office Building, Washington, D.C. The following are excerpts from Hornig's address:

At the end of the World War II we awoke with a start to the realization that this country was not properly cultivating its scientific base, not only in physics but in other areas like health research. . . . There was a vacuum to be filled and we proceeded to fill it at a breath-taking pace. At times, in some fields, the doubling period was 2 or 3 years; over all, the doubling period was of the order of 4 to 5 years through much of the two decades following World War II. What has changed now is not that there are restraints to be imposed on science either by the Congress or by the Executive, but that the initial vacuum has largely been filled and a new situation has arisen which requires new thought.

When I say that the vacuum has been filled, I mean that we have built a strong, viable scientific establishment in this country. In a whole variety of fields, from particle physics to molecular biology, the quality of American science is second to none. . . .

The country need not be convinced any longer that we need strength in basic research. This is accepted by the Executive, by the Congress, and by the people of the country. . . . What is *not* accepted is the notion that every part of science should grow at some automatic and predetermined rate, 15 percent per year or any other number, as a consequence.

The simple fact is that science and technology, research and development, have changed from being frosting on the cake of defense expenditures, health expenditures, and so on, to being a significant national expenditure which must compete with other claimants on national resources. The question is not whether we should have basic research, whether we should have research and development, or even whether it should continue to grow—but rather in what ways and for what purposes it should be expanded. The answer to this question will have to be supplied not by me but by all of us.

What has happened seems plain enough to me. Not so long ago, science was "pure" and could be conducted by people who talked largely to each other; now the country has become convinced of its significance and has provided the resources which have enabled it to grow into an important national activity. By any standards, we provide a higher proportion of our very high national income to science than does any other society in the world. But now, instead of languishing in the wings, science is on front stage center; it is in the spotlight and the quality of its performance is reviewed by public critics in the popular press.

The goals of our scientific effort and the nature of our scientific effort are being examined not only within the scientific community but by various organs of my office and, more important still, by numerous committees of the Congress. There is every reason why they should do so, just as they do for every other important national activity. The heightened interest in this case undoubtedly

stitute a modest percentage of the science budget as compared with expenditures for defense, atomic energy, and, more recently, space research. An expanded role for civil science in promoting economic growth and modernization, however, may well result in a bigger slice of the science-budget pie.

In the argument developed during the campaign, principally by Peyrefitte, the United States was used as both an example and a threat. American industry has devoted much more effort and money to research than French industry has, Peyrefitte noted, and heavy expenditures by the U.S. government on defense and space research, particularly in the private sector, have given the United States a long lead in vital high-technology industry. If France is to maintain independence of action in the economic as well as the military sphere, it is necessary for the French government to take action against what the French call, for short, "*le gap*."

Government action is, in fact, foreshadowed in the Fifth Plan (for 1966 through 1970), which was formulated during 1964 and 1965, well before the technology gap became a political soccer ball in Europe, around the beginning of 1966. Development of the science section of the Plan involved closer cooperation than had ever before existed between the Commissariat du Plan and DGRST and, reportedly, the collaboration of a large number of researchers and administrators from the universities and industry. Creation of a group of new organizations, devoted principally to the promotion of civilian technology, was announced in the last half of 1966; most of these are anticipated in the Plan.

A Centre National d'Exploitation des Océans (CNEXO) has been set up to coordinate present activities in oceanography and also to see that oceanographic research, where possible, yields industrial and commerical benefits. With about 100 laboratories, under eight or nine ministries, now operating in the field, the problem of rationalization resembles that in the United States, and CNEXO is looked upon as roughly the French equivalent of the new Marine Resources Council in the United States. While the law is somewhat vague, CNEXO will reportedly have authority to direct the use of equipment, particularly the use of research vessels.

Another new organization specifically created to link fundamental research and applications is the Agence Nationale pour la Valorisation de la Recherche (ANVAR). French officials are frank in saying that the details are far from settled, but that ANVAR will be essentially an information service designed to open channels between universities and industry and will seek ways to overcome prevailing habits and preju-

Essential to Scientific Progress

arises because it is new and has not been so examined in the past. In short, if support is to continue to grow, it is no longer adequate to arrive at a subtle conviction of the needs within the scientific community or to communicate those needs to me and to the relevant agencies. The scientific community is going to have to learn to articulate its hopes, to describe the opportunities which are before us for practical advance, to express the excitement of the new intellectual thrusts—but to do these in terms which the American people, who are expected to pay the bill, will generally understand and have faith in. There is no alternative.

An excellent start has been made in the Pake Report, *Physics—A Survey and Outlook*, and in the Whitford Report, *Ground-Based Astronomy*. But the dialogue will have to be carried to the newspapers, to the schools, to the public and to the Congress, as well as to the Federal agencies and the Bureau of the Budget. It is not that we have entered a period of restraint—it is that science has matured, and to move ahead we must explain over and over again why and how. . . .

Now I would like to say a word about basic research in comparison with applied research and development. The facts are very simple. We are determined that the knowledge and understanding we have gained from science will be put to use to meet the needs of our people and the world as expeditiously as possible. . . . To this end the Federal Government supplies research and development funds where the results are technically feasible and economically or socially worthwhile.

But, because we are determined to make use of every bit of available knowledge whose application is feasible, economic, and useful, it does not follow in the slightest that this implies a decreased interest in basic research. The two activities are separate and usually done by different groups of people. On the one hand, there are people who feed the pool of knowledge and understanding into which we dip for our practical achievements and on the other hand there are people who recognize human needs and find new ways to meet them. Both are important, both demand creativity, imagination, enterprise, and talent, and both will go forward.

The President has put this very clearly in his recent message to the Congress transmitting the Annual Report of the National Science Foundation. After describing the practical benefits provided by scientific advance, he said:

> We know that we can continue this flow of benefits to mankind only if we have a large and constantly replenished pool of basic knowledge and understanding to draw upon. For the path between basic discovery and its application can be both long and uncertain. . . .

Unhappily, these points have not always been understood by government project officers, and there undoubtedly are unfortunate instances of efforts to mix the two and to warp basic research projects in the direction of application—or even to judge basic research projects not by the standards of scientific excellence but by the likelihood of practical advance. This we are trying to change. We are trying to get clear recognition that even when basic research is supported by a mission-oriented agency, its role is to build up the basic reservoir on which applications will rest rather than to define an application supporting the mission in each and every project. . . .

dices which prevent contacts between university and industrial researchers.

A third new organization, the Institut de Recherche d'Informatique et d'Automatique (IRIA), will apparently concentrate on encouraging the training of manpower needed to design, build, and use computers on an internationally competitive scale and also, where necessary, to develop "software" for the French computer industry. The IRIA is a complement to the French "Plan Calcul," the governmental effort to encourage the development of an indigenous computer and electronics industry competitive with American companies at home and abroad. A high priority has been given the Plan Calcul (the effort will be discussed in another article in this space).

Plans, announced in December, to create two other new research organizations indicate as much as anything a maturing of some sectors of fundamental research in France in the last decade. The first of these organizations, the Institut National d'Astronomie et de Géophysique, is designed, it seems, to reorganize research in astronomy and geophysics in order to promote cooperation between researchers in various institutions and to make better use of funds, facilities, and equipment.

The other organization, the Institut National de Physique Nucléaire et des Particules, it would appear, would have as its main reason for being the building and administration of a projected all-French 45-Bev proton accelerator. High-energy physics in France has fared well even during the period of modest rations for many areas of fundamental research. (France has probably, for instance, managed to combine participation in CERN with the national research program in particle-physics research more effectively than any other CERN member nation.) But prospects for building the 45-Bev machine appear uncertain, and informed observers think neither the machine nor the institute may come into being.

It should be emphasized that all the other organizations—even IRIA, which is the farthest advanced—are very much in the formative stage. The French, like the British, have embarked on a serious effort to deploy science and technology in the direct support of economic policy. No proven formula exists, unfortunately, as the British have found in their attempts to achieve a higher rate of economic growth. Like the British, the French since the war have hopefully increased investment in education, particularly science education. The British capacity for fundamental research in the universities and government research stations seems to have outrun the ability of the scientists and managers in industry to use the results of this research. In France, with technocratic tradition, the problem seems to be the reverse.

The use of civil science in the national interest is written boldly into the Fifth Plan in France. And of all Europeans, the French are perhaps the most faithful to their Plan. But their Plan, as French officials point out, is only "indicative." The main limitations tend to be financial. The French science budget for the past year has shown a buoyancy regained at the beginning of 1966 after Michel Debré became Finance Minister, replacing Valéry Giscard d'Estaing, who had presided over a period of "stabilization" during which inflation in France was curbed at the expense of economic growth. Last year was one of expansion for France, but lately economic indicators have suggested that the economy is losing momentum, as have the economies of most of France's European neighbors. What happens to the economy will probably have great influence on how fast the new departures in French science policy—ironically designed to boost the economy—progress from the paper stage.—JOHN WALSH

New Members of Science and Engineering Academies

Announcement of the election of 45 new members to the National Academy of Sciences and 93 to the National Academy of Engineering was made last week. This brings the NAS total to 783 and the NAE total to 188.

NAS also elected ten scientists as foreign associates of the Academy.

The new members are:

National Academy of Sciences

Philip W. Anderson, Bell Telephone Laboratories

Elso S. Barghoorn, Harvard

Charles S. Barrett, University of Chicago

George H. Bishop, Washington University School of Medicine

Raymond L. Bisplinghoff, Massachusetts Institute of Technology

George F. Carrier, Harvard

Paul J. Cohen, Stanford

Seymour S. Cohen, University of Pennsylvania

Frank A. Cotton, M.I.T.

Bernard D. Davis, Harvard Medical School

Robert H. Dicke, Princeton

James D. Ebert, Johns Hopkins

James J. Gibson, Cornell University

Robert A. Helliwell, Stanford

Dudley R. Herschbach, Harvard

William W. Howells, Harvard and Peabody Museum

Vernon W. Hughes, Yale

Martin Karplus, Harvard

Henry G. Kunkel, Rockefeller University

Moses Kunitz, Rockefeller

Anton Lang, Michigan State University

Luna B. Leopold, U.S. Geological Survey

Norman Levinson, M.I.T.

Francis E. Low, M.I.T.

Jay L. Lush, Iowa State University

Clement L. Markert, Yale

Walsh McDermott, Cornell Medical College

Robert L. Metcalf, University of California, Riverside

Karl Meyer, Columbia

Guido Munch, California Institute of Technology and Mount Wilson and Palomar Observatories

Walle Jetze Harinx Nauta, M.I.T.

Marshall W. Nirenberg, National Heart Institute

James Olds, University of Michigan

Eugene N. Parker, University of Chicago

Charles M. Rick, Jr., University of California, Davis

Edwin E. Salpeter, Cornell

Berta V. Scharrer, Albert Einstein College of Medicine

Ascher H. Shapiro, M.I.T.

Herbert A. Simon, Carnegie Tech.

Robert L. Sinsheimer, California Institute of Technology

Charles P. Slichter, University of Illinois

Stanley G. Stephens, North Carolina State College

James B. Thompson, Jr., Harvard

Anthony Turkevich, Enrico Fermi Institute for Nuclear Studies and University of Chicago

Kenneth B. Wiberg, Yale

NAS Foreign Associates

Fritz Baltzer, University of Berne, Switzerland

Robert Glen, Department of Agriculture, Canada

C. J. Gorter, State University of Leyden and the Kammerlingh-Onnes Laboratory, The Netherlands

A. Gustafsson, Royal College of Forestry, Stockholm, Sweden

André Kolmogorov, Moscow State University, U.S.S.R.

Claude Lévi-Strauss, Collège de France, Paris

Ilya Prigogine, Free University of Brussels, Belgium

Frederick Sanger, University Postgraduate Medical School, Cambridge, England

C. E. Tilley, Cambridge University, England

Carl Wagner, Max Planck Institute for Physical Chemistry, Göttingen, Federal Republic of Germany

National Academy of Engineering

William C. Ackermann, Illinois State Water Survey

Robert Adler, Zenith Radio Corp.

Gene M. Amdahl, IBM

James B. Austin, U.S. Steel Corp.

Walter C. Bachman, Gibbs & Cox, Inc.

Robert A. Baker, Sr., Public Service & Gas Co., Newark, N.J.

Arnold O. Beckman, Beckman Instruments, Inc.

Manson Benedict, M.I.T.

Maurice A. Biot, Shell Development Co.

Ray H. Boundy, Dow Chemical Co.

James Boyd, Copper Range Co.

Harold Brown, Air Force, U.S. Department of Defense

William F. Cassidy, Engineers, Department of the Army, Department of Defense

Harry E. Chesebrough, Chrysler Corp.

Marvin Chodorow, Stanford

Edward J. Cleary, Ohio River Valley Sanitation Commission

Karl P. Cohen, General Electric Co.

Frank W. Davis, Fort Worth Division, General Dynamics Corp.

Harmer E. Davis, University of California, Berkeley

Don Uel Deere, University of Illinois

John H. Dessauer, Xerox Corp.

Donald W. Douglas, Douglas Aircraft Co.

Walter S. Douglas, Parsons, Brinckerhoff, Quade and Douglas

Daniel C. Drucker, Brown University

John P. Eckert, Jr., UNIVAC Division, Sperry-Rand Corp.

Charles W. Elston, General Electric Co.

Gordon M. Fair, Harvard

Merrell R. Fenske, Pennsylvania State University

Antonio Ferri, General Applied Science Laboratory, Inc., Marquardt Corp., and New York University

Lester M. Field, Hughes Aircraft Co.

Alexander H. Flax, Air Force, U.S. Department of Defense

Mars G. Fontana, Ohio State University

Jay W. Forrester, M.I.T.

Donald N. Frey, Ford Motor Co.

Clifford C. Furnas, Western New York Nuclear Research Center, Inc.

T. Keith Glennan, Associated Universities, Inc.

Martin Goland, Southwest Research Institute

Peter C. Goldmark, Columbia Broadcasting System, Inc.

Harold B. Gotaas, Northwestern University

James Hait, FMC Corp.

George A. Hawkins, Purdue University

Seymour W. Herwald, Westinghouse Electric Corp.

James Hillier, Radio Corporation of America

Mark D. Hollis, Pan American Health Organization

Marshall G. Holloway, The Budd Co.

Jerome C. Hunsaker, M.I.T.

Arthur T. Ippen, M.I.T.

Edward C. Jordan, University of Illinois

Charles H. Kaman, Kaman Aircraft Corp.

John R. Kiely, Bechtel Corp.

Jack St. Clair Kilby, Texas Instruments, Inc.

James R. Killian, Jr., M.I.T. Corp.

Chalmer G. Kirkbride, Sun Oil Co.

John M. Kyle, Jr., Port of New York Authority

Jerome Lederer, Flight Safety Foundation

Willard D. Lewis, Lehigh University

Tung-Yen Lin, T. Y. Lin & Associates and University of California, Berkeley

Frederick C. Lindvall, California Institute of Technology

Donald P. Ling, Bell Telephone Laboratories, Inc.

Bernard D. Loughlin, Hazeltine Research, Inc.

Jerry McAfee, Gulf Oil Corp. and Gulf Eastern Co.

James S. McDonnell, McDonnell Aircraft Corp.

Douglas C. MacMillan, George G. Sharp Co., Inc.

Theodore H. Maiman, Korad Corp., subsidiary of Union Carbide Corp.

William R. Marshall, Jr., University of Wisconsin

John W. Mauchly, Mauchly Associates, Inc.

Jack A. Morton, Bell Telephone Laboratories

George E. Mueller, U.S. National Aeronautics and Space Administration

Nunzio J. Palladino, Pennsylvania State University

Joseph M. Pettit, Stanford University

Perry W. Pratt, United Aircraft Corp.

Hyman G. Rickover, U.S. Atomic Energy Commission

Louis H. Roddis, Jr., Pennsylvania Electric Co.

George S. Schairer, The Boeing Co.

Bernard A. Schriever, Air Force Systems Command, U.S. Department of Defense (retired)

Timothy E. Shea, Western Electric Co. (retired)

Herman E. Sheets, General Dynamics Corp.

William E. Shoupp, Westinghouse Electric Corp.

Chester P. Siess, University of Illinois

Abe Silverstein, Lewis Research Center, NASA

Markwick K. Smith, Jr., Geophysical Service, Inc., subsidiary of Texas Instruments

George E. Solomon, TRW, Inc.

William J. Sparks, Esso Research and Engineering Co.

Lombard Squires, E. I. du Pont de Nemours & Co.

Richard H. Tatlow, III, Abbott, Merkt and Co.

Anton Tedesko, Roberts and Schaefer Co., Engineers

Wernher von Braun, Marshall Space Flight Center, NASA

Edward C. Wells, The Boeing Co.

Elmer P. Wheaton, Lockheed Missiles and Space Co.

Lyman D. Wilbur, International Engineering Co., Inc., and Morrison-Knudsen Co., Inc.

Stanley DeWolf Wilson, Shannon and Wilson, Inc.

Carlos C. Wood, United Aircraft Corp.

James F. Young, General Electric Co.