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BASIC RESEARCH AND GRADUATE EDUCATION: SCIENCE ADVISORY COMMITTEE ISSUES IMPORTANT REPORT

In a report issued on November 20 and entitled "Scientific Progress, the Universities and the Federal Government", the President's Science Advisory Committee appraised the roles of the Federal Government and the universities in the national scientific research effort. The committee stressed the interdependence of graduate education and basic research. In a statement accompanying the report, President Eisenhower said: "I call particular attention to the conclusion of the Science Advisory Committee that the process of basic scientific research and the process of graduate education in universities must be viewed as an integrated task if the nation is to produce the research results and the new scientists that will maintain the leadership of American science. In this great endeavor, the partnership between the Federal Government and the nation's universities will assume growing importance in the future."

In a discussion of this problem, the Committee emphasizes the value of a large national investment in science, both for the security of the nation and for the economic advances which scientific developments permit, at the same time pointing out the ability of science to enrich our civilization. The Committee remarks that, while its primary concern is with the sciences, it recognizes that the pursuit of artistic, literary, and other scholarly activities are equally worthwhile and must not suffer through the diversion of resources to the sciences.

The report concentrates on the role of research in advancing scientific understanding and in preparing college graduates to become scientists. The fundamental contention of the report is that graduate education and basic research belong together at every possible level. The Committee insists that the would-be scientist can learn what it is like to do science only through research. It is pointed out that every research field needs roots in the universities, the sources of trained scientists. "As learning and teaching require research, so research cannot be sustained without teaching".

Research Grants Better Than Contracts

In discussing the role of the Federal Government, the report expresses the view that the contract, with its concept of "purchase of services", is an unsatisfactory means of supporting science. It tends to separate research from teaching and does not recognize that the educational process is as important to the development of science as is research. The Committee favors instead the use of research grants. It points out that the Government must concern itself with the development of new fields of science and must give its support to areas of scientific promise. Particularly where large facilities are needed, or where interdisciplinary programs are required, the Federal Government must lead the way. It is also the Government's responsibility to ensure that university science is as strong as possible. "Whether the quantity and quality of basic research and graduate education in the United States will be adequate or inadequate depends primarily upon the government of the United States. From this responsibility the Federal Government has no escape. Either it will find the policies—and the resources—which permit our universities to flourish and their duties to be adequately discharged—or no one will."

The Committee feels that too often the universities have neglected research and have not recognized its fundamental contribution to the teaching process. It points out that universities traditionally budget for teaching without giving corresponding consideration to research, while the "teaching load" of the professors makes a serious research program difficult. At the other extreme, the Committee condemns the

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OUR GROWING POPULATION— ARE THERE ENOUGH PHYSICIANS?

The increase in physicians in the United States is not keeping pace with the population increase. "If the minimum goal . . . is to be met, the present medical school facilities must be increased substantially and new schools must be established. This expansion must be undertaken at once. Delay will only magnify the problem." This is a quotation from the Bane Report made by a Consultant Group on Medical Education to the Surgeon General of the United States (Public Health Service Pub. No. 709, 1959). The situation can be appreciated in terms of the declining number of family physicians (pediatricians, internists and general practitioners) which has dropped from 90 to 65 per 100,000 population during the past two decades. (This is due in part, of course, to an increased number of doctors engaged in research, teaching and in the practice of various specialties.) But more important, to maintain the present physician-population ratio at a period 15 years from now, a 50 percent increase in the number of first year enrollments in medical schools will be needed by 1971. "Even if the medical schools were able to expand to capacity . . . in the next 11 years, the U.S. would still be lacking about 2100 places for first-year medical students or the equivalent of 21 medical schools with an average entering class of 100." (AMA Council on Medical Education, J.A.M.A., 11-12-60.)

"We ought to be producing a surplus of doctors beyond our own needs to send to underdeveloped areas—as the Russians are already doing." (Rutstein, "Do You Really Want a Family Doctor?", Harpers, Oct. 1960). In contrast, our own needs are so great that many of our hospitals are using the services of "graduates of foreign medical schools, most of them sub-standard, who now fill about one-quarter of all approved hospital internships and residencies in the United States" (Rutstein, ibid). In an attempt to maintain adequate minimum standards, the AMA has required these foreign graduates who are here on educational exchange visas, to take a qualifying examination. Among the nearly 9000 foreign physicians who recently took the exam, an estimated 2000 failed; if the AMA pursues its policy and requires hospitals to discharge the doctors who failed, this large group of physicians will face deportation.

It is clear, therefore, that the present physician—population ratio should be improved, and yet even to maintain this ratio will involve a tremendous expansion of medical school facilities. This expansion, according to the Bane Report, cannot be made without public money, derived from both the States and Federal Government. Will we find students to fill the new medical schools? Deans of our present medical schools report increasing difficulty in filling their classes with acceptable students, and during the past four years the proportion of students failing or withdrawing in poor academic standing has been rising. In attracting good candidates, the medical school must now compete with other professional fields, and is perhaps at a disadvantage because of the high cost and many years of training required. Various Federal agencies already offer fellowships to graduates in physical, life and social sciences, but there is no comparable assistance for medical students. The Bane Report recommends that "the Federal Government should establish educational grants in aid for medical students on the basis of merit and need."

The problem of educating physicians could be partly alleviated if the necessary period of training were shortened. In the opinion of Dr. David Rutstein (Professor of Preventive Medicine at Harvard Medical School) the medical schools should set up two divergent courses of study—one for medical research workers and specialists, and another for the family physician. These ideas will be debated vigorously as attempts are made to train enough doctors to meet our growing needs.

AEC REACTOR TRAINING

Thirty-seven scientists and engineers—15 from eight foreign countries and 22 from the US—have started reactor technology training at the AEC's Oak Ridge National Laboratory. The group is enrolled in the third session of one-year courses in either nuclear reactor hazards evaluation or nuclear reactor operations supervision. Students from non-communist foreign nations and the US may enroll in the courses and currently the foreign countries represented are Finland, India, Indonesia, Japan, New Zealand, Pakistan, Philippines and Vietnam. Most of the students are connected with reactor projects in these countries. (NY Times 11/13)

The need for increased production of qualified nuclear energy personnel to keep pace with the expected accelerated growth in various uses of atomic energy during the next decade was emphasized in a recent speech by Harold L. Price, director of the AEC's Division of Licensing and Regulation. Speaking at the dedication of the University of Virginia's million-watt atomic reactor, Mr. Price said that, although in the '60s the US can expect to benefit from current nuclear education programs, colleges and universities must substantially increase their capability of producing nuclear engineers, scientists and medical personnel. (W. Post 11/26)

The AEC has published the first full-fledged laboratory manual on radioisotopes for use in college and university chemistry courses. The manual is designed to introduce the chemistry student to radioisotope techniques and to demonstrate their potential contribution to his future work. Preparation of the manual reflects the growing routine use of isotopes in chemistry and biology laboratories, hospitals and scientific research centers. (AEC Release 11/3)

The first issue of **Nuclear Fusion**, a quarterly international scientific journal devoted to plasma physics and controlled thermonuclear research, was published last month by the International Atomic Energy Agency. (Science 11/11). The AEC has established a Neutron Cross Section Evaluation Center at Brookhaven to provide a centralized source of information on neutron cross section data needed by reactor engineers, designers and physicists. Inquiries should be directed to: Brookhaven Cross Section Evaluation Center, Building T-130, Brookhaven National Laboratory, Upton, N. Y. (Science 11/18)

Basic Research and Graduate Education

(Continued from page 1)

practice of exempting the best research men from teaching, thereby artificially separating research from teaching. It finds that universities have been slow in adapting education to the demands of a new era, have isolated research programs from the main-stream of student life, and have ignored new fields which inconveniently cross departmental barriers. The Committee recognizes that the main problem in the universities is a lack of money and points out that, while the Federal Government has a major responsibility, local authorities and the public must also give additional support.

Major Conclusions

Among the major conclusions of the report are the following:

1. In the next fifteen years this country must double the number of first-rate academic centers of science.

2. Graduate education leading to the Ph.D. should include a genuine experience in research. More and more scientists will be needed, so that opportunities for research at the graduate level must be expanded. Likewise, talented students must be attracted to science, so that teaching in the high schools and colleges must emphasize the fascination of science and the spirit of inquiry as represented in scientific research.

3. Graduate education must be modernized with outmoded programs dropped, new methods tested, and interdepartmental programs encouraged.

4. More money must be available to students so that they may pursue their studies on a full-time basis. The best means of support is the graduate fellowship program. This program should encourage the development of new centers of research; thus fellowships should be established at particular promising places as well as given directly to individuals. Recognizing that tuition does not cover the full costs to the university, the report recommends that the fellowship include supplemental grants to support related work of the university. Research assistantship programs should also be designed with their effect upon graduate education kept clearly in mind. As the Committee views it, the ideal arrangement would provide for full support of the student from a general fund, with his work in research, teaching, etc., arranged to meet his needs as well as those of the university and the national program.

5. The report endorses Federal grants for specific scientific facilities, and encourages increased Federal support of interdisciplinary activities.

6. Research installations should be integral parts of universities wherever possible. Universities should make full educational use of these facilities, and their members should be associated with the teaching process. Likewise, scientists in government or industrial laboratories should be able to contribute to the graduate programs in nearby universities.

7. Universities should recognize the growing importance of postdoctoral studies, and make a regular place for them in their programs.

8. Outstanding faculties are essential to the growth of science. The universities must pay higher salaries and must make provision for research in assigning teaching loads. The Federal Government must support the development of strong permanent faculties, and the universities must accept Federal assistance for faculty salaries. The Committee urges the development of such cooperative programs, but makes no specific recommendations on them.

9. Universities must improve their representation in Washington.

10. Government programs in education and science should be coordinated and centrally-directed through the office of the President.

PIGS, COWS AND FALLOUT

The October 1960 issue of "Nuclear Information", published by the Greater St. Louis Committee for Nuclear Information, carried under the above title an analysis of data on the incidence of lymphomas in cattle and swine in relation to fallout level. The newsletter used data published by the Dept. of Agriculture Meat Inspection Division. In the United States nearly 100 million animals are slaughtered for meat every year. Each animal is checked for disease by an inspector and a detailed record is kept of each diseased animal that is rejected for the market. Inspection of these records revealed that the incidence of lymphoma, a disease similar to leukemia in man, had a relatively stable rate from about 1920 to 1948 and then showed a definite rise at the time when fallout began. In addition, there was a definite correlation between the incidence of lymphoma and the Sr^{90} content of milk.

Does Fallout Cause Lymphoma? Despite the fact that there has been a significant increase in the incidence of lymphoma in the cattle and swine population in the period 1948-1959, caution should be used in interpreting this fact as evidence of a casual relationship between fallout and cancer in domestic animals. Interpretation of such data must take into account the possible contribution of such things as antithe age of the animals at slaughter to the rising incidence biotics, use of hormones, changes in feeding practices and of disease. None of these factors is correlated with the rise in lymphoma incidence, but "new kinds of observations could be made that might prove or disprove the possibility that fallout can cause increased incidence of lymphoma."

Why Study The Incidence of Disease in Animals? "There is one compelling reason. Because of the difficulties associated with studies of the effects of low-level radiation in man —it is likely that domestic animals may prove to be the only good source of information on this subject. Unless steps are soon taken to make the studies needed to establish whether or not fallout has caused the observed increase in lymphoma in domestic animals, it will be a long time before we will be able to find out what low levels of radiation do to the incidence of leukemia in man."

This final summary of the problem of fallout as it stands today was presented by the St. Louis group and it is a sobering reminder that very little is being done to pursue the problem.

EUROPEAN GROUPS GET FUSION PLAN

A far-reaching plan for fusing the executive groups of the three inter-European communities—the coal-and-steel pool, the Common Market and Euratom—has been drawn up by the European Assembly's political committee and delivered to the annual Foreign Ministers' meeting of the six nations involved. The plan would substitute a 15-member super-executive for the present independent directorates of the three communities. (W. Post 11/22)

FAS COUNCIL DISCUSSES DISARMAMENT, GRANTS, INSURANCE

The Council of the Federation of American Scientists met on November 25 at the University of Chicago. No public statement was issued, but several problems were discussed and FAS policy for the coming months was outlined.

It was agreed that the FAS should continue to support the nuclear test ban negotiations and to point out the military and political disadvantages of the resumption of testing. The FAS should support the efforts of the new Administration to re-evaluate the proposals and objectives of the current negotiations and should encourage a greater effort on the part of this country to bring these negotiations to a successful conclusion.

FAS Role in Disarmament Studies

The Council discussed current disarmament studies, and expressed concern that opponents of disarmament are using the concept of "arms control" to subvert efforts toward true disarmament. Too often the term "arms control" describes measures which improve this country's capacity for deterrence while contributing little to a reduction of armaments. The Council agreed that FAS should continue to stress the long-range goal of controlled disarmament under a world of law.

The Council passed resolutions opposing the transfer of control of nuclear weapons to NATO, and favoring the placing of responsibility for test-ban detection and evasion studies in the hands of a government agency which does not have responsibility for weapons development.

The Council approved the co-sponsorship, with the National Committee for a Sane Nuclear Policy, of a discussion on Disarmament in conjunction with the AAAS in New York in December. It also requested the Executive Committee to consider sponsoring an open meeting on Disarmament at the time of the American Physical Society meeting in New York in February.

NSF Grant Discussed

Several matters of internal concern to FAS were also discussed. The Council agreed to submit to the National Science Foundation a proposal for a grant to conduct a national inventory of surplus scientific equipment and books. If this survey should indicate a sufficient supply, a public or private foundation might be encouraged to support measures for distributing these materials to less privileged institutions in this country and overseas.

The Council also agreed to permit a life insurance company to initiate a group insurance plan with the members of FAS. The members will be informed of the details later by the company.

Council Meeting and Elections

The FAS Council will hold its next meeting in New York City on Feb. 3 and 4, 1961, at the same time as the APS meetings there. Details in the January 1961 Newsletter.

Please send your nominations for delegates-at-large and for Chairman and Vice-Chairman to: Dr. Charles C. Price, Chem. Dept., U. of Penna., Philadelphia.

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Chairman ..... M. Stanley Livingston

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The FAS is a national organization of scientists and engineers concerned with the impact of science on national and world affairs.

POLARIS AND PARLIAMENT

In the past month a growing furor has arisen in England in regard to the U.S.-British agreements on the use of military bases in Britain. In late October, Prime Minister Macmillan announced that a revised U.S.-British agreement had been concluded concerning the use of USAF bases in England. The revision had been initiated as a result of the political storm raised last summer after a U.S. reconnaisance plane, an RB-47, on a flight from a base in Britain was shot down off the northern part of the Soviet Union. Simultaneously with the announcement of the airforce agreement, information was released in regard to revisions in the negotiations for the stationing of a sub-tender and floating dry-dock at a port in Scotland (Holy Loch in the Firth of Clyde). This port would support Polaris submarine operations.

Because of the agreement, a series of controversies arose between U.S. and British officials. The disagreement was based on the question of whether the firing of the Polaris missile (as well as for the flights of U.S. planes from English bases) was to be subject to prior consultation with the British. Macmillan under sharp attack from the opposition and trying to give assurances to Parliament, contended that it was, but he also pointed out that in emergencies, the lack of time may make such consultation impossible. The United States reaction at first was to repudiate any such commitment, especially when the submarines were operating outside of British waters. However, later statements indicated that consultation would always be desirable if there were time.

British Protest U.S. Air and Sea Bases

This misunderstanding helped touch off the furor that followed within Britain itself. There were immediate angry protests in the House of Commons and demonstrations in Scotland. A major political debate ensued on British defense policy, with Labor, pacifists, and left-wing members of Parliament leading the agitation against the agreements. The Conservative Government still seems to enjoy a strong majority because the Labor party is split between those wanting a unilateral nuclear disarmament and those who want collective security. The principal issues exploited by the opposition center on the potential direct nuclear danger to Great Britain, the authority of the United States in Britain and the apparent fuzziness of the British control over the use of the missiles. Several independent groups have also voiced opposition. An editorial in Lord Beaverbrooks' Evening Standard called for "utter rejection" of the Polaris agreement.

A strong Russian reaction was delivered (Nov. 6) by F. R. Koslov, a secretary of the Communist Party Central Committee, who warned the British in a speech that they had committed an act that could lead to "serious consequences".

New Submarine Fleet Scheduled

In the midst of it all, on Nov. 15, the George Washington, the first nuclear powered submarine to be armed with 16 Polaris missiles, became operational and put to sea on its first "deterrent patrol" somewhere in the Atlantic Ocean. A second ship, the Patrick Henry, is due to be at sea before the end of the year and it is expected that both vessels will be serviced at the Scotland base sometime about February. A dozen submarines of this type have been authorized and by 1965, the Navy plans to have about 45 such vessels. (N.Y.T. Nov. 3, 5, 7, 9, and 13)

HIGH COURT TO REVIEW REACTOR BAN

The Supreme Court has agreed to settle a dispute over atomic plant safety which could have a far-reaching effect on the development of nuclear energy by private industry. The court decided to review a controversial ruling by a lower court in a dispute over a fast-neutron breeder reactor which is being installed for power purposes at Lagoona Beach, Michigan. The lower court had attacked the AEC's policy of allowing a company to start building a power reactor after only a tentative showing of safety and said the AEC must settle the safety question definitively before construction starts. The government had contended that such a requirement could seriously delay the peacetime atomic energy program. If the Supreme Court should uphold the lower court ruling, many atomic energy law experts may urge Congress to change the law. (W. Post & Wall Street Journal 11/15) A few days after the Supreme Court decided to review the case, the AEC announced that it had extended for seven months, to next July 15, the completion date for this reactor. (W. Post 11/20)

ENGLAND ON DISARMAMENT

On November 3, Hugh Gaitskell was reelected leader of Britain's Labor Party in Parliament by a 2 to 1 majority over Harold Wilson; the election sharpens the crisis in the Labor Party over the question of disarmament. At the annual conference of the general Labor Party last month a policy "supporting NATO under the American nuclear deterrent" (W. Post 10/5) was defeated by a close vote as the conference called instead for the government to "press for an international agreement on complete disarmament" and to embrace "a policy of unilateral nuclear disarmament and neutrality for Britain in the struggle between the U.S. and the Soviet Union" (N.Y. Times 10/6). The resolutions passed demanded rejection of "any defense policy based on the threat of . . . nuclear weapons" (Manchester Guardian 10/13) and "unilateral renunciation of the testing, manufacture, stockpiling, and basing of nuclear weapons in Great Britain" (N.Y. Times 10/6), which could mean withdrawal from NATO. Mr. Gaitskell, on the other hand, has consistently opposed unilateral disarmament or "neutralism" as a policy which would leave Britain "defenseless and alone" (N.Y. Times 10/6). He therefore vowed "to fight to reverse" the conference decision, and his reelection by his Parliamentary colleagues has strengthened this determination (W. Post 11/4). However, those in favor of unilateral disarmament remain dissatisfied. Mr. Gaitskell's leadership has been challenged as leading "one [Party] faction against the other" rather than reconciling them (W. Post 10/30) and the unilateralists have already declared war on the Gaitskell position on the floor of Parliament. This episode was set off when Prime Minister Macmillan stated that anchorage would be allowed in Holy Loch for American Polaris missil-firing nuclear submarines (see "Polaris and Parliament" elsewhere in this issue).

Meanwhile, Bertrand Russell has resigned as president of the Campaign for Nuclear Disarmament, devoting his efforts instead to the organization, with Rev. Michael Scott, of a large-scale demonstration (minimum 2000 volunteers) of civil disobedience against "the ever-growing menace of nuclear war" (M. Guardian 10/6).

FRENCH NUCLEAR DETERRENT

The French Government has now won twice against a censure move in the National Assembly over possible establishment of a French atomic striking force. President de Gaulle's plan for a French nuclear deterrent, outside of NATO, has brought forth the sharpest opposition his government has yet faced, but it will become law if a third censure move is again lost—and this without the bill itself ever having been voted in the legislature. The plan has been severely attacked as being incompatible with cooperation within NATO and as requiring unnecessary and wasteful expenditure by France (W. Post 10/19), but the French government has claimed that it is essential to French national defense and power, and a logical answer to U.S. domination of NATO (W. Post 10/14). Since the bill itself risked defeat in the Assembly, Prime Minister Debre introduced it as a vote of confidence issue for his entire government, thereby evoking a censure motion by the opposition. A censure move, however, requires an absolute majority of the entire lower house (277 votes), with abstentions and absentees counting for the Government; an upset for the government is also currently complicated by other issues, notably the Algerian crises. A censure move on October 25 lost by 70 votes, which meant passage of the bill (W. Post 10/25). The bill was subsequently tabled by the Senate and, after a joint parliamentary committee failed to reach a compromise, was returned to the Assembly (W. Post 11/18). There it was again introduced by the Government as a question of confidence, with the censure move (on November 22) receiving this time 214 votes. A third win will automatically make the bill law (W. Post 11/27). The fight over the bill has been a focal point for criticism of de Gaulle's opposition to NATO and his dislike for U.N. and for international integration in general (W. Post 10/21; M. Guardian 10/20).

U.N. ON DISARMAMENT

The U.N. Political Committee suspended discussion on disarmament this month pending possible east-west agreement on resumption of disarmament negotiations (N.Y. Times 11/11). Additional proposals were put before the Committee, notably one introduced by Canada, Norway, and Sweden, asking U.N. to name a small committee, composed exclusively of non-nuclear states, to consider opposing resolutions and outline principles on which agreement might be reached (N.Y. Times 11/2, 11/11). This idea has the support of Britain but apparently not of the U.S. or the Soviet Union (W. Post 11/28). A carefully formulated "compromise" resolution proposed by India and ten other nations also failed to get general support (W. Post 11/16). The consensus of opinion in the Committee seems to be that as long as east-west disagreement about resuming negotiations persists, no resolution can hope to receive mutual support, and any vote on the various opposing resolutions, or any directives by the Committee about negotiations, could not be made binding and might only widen the east-west gap. Pressure by neutral nations to break the deadlock has so far failed but hope persists that private discussions may yet accomplish this. Mr. Wadsworth, for the U.S., and the Soviet Union's Mr. Zorin held one (17-minute) private session on November 1; no progress was announced, but additional meetings may be possible. Also, there is some possibility that views of the incoming U.S. administration might be made clearer within the next few weeks. It has, therefore, been suggested that disarmament discussions might be considered again in December after disposal of other matters (N.Y. Times 11/11).

Erratum: Victor F. Weisskopf's appointment to CERN was incorrectly described in the last Newsletter (XIII, 8). Professor Weisskopf has been appointed a scientific director of the 13-nation European Organization for Nuclear Research. He will be a member of a newly-formed five-member directorate created by the 13-nation council of the organization. (Science 11/18)

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